Australian Government

Australian Centre for International Agricultural Research

ACIAR

ANNUAL OPERATIONAL PLAN 2020–21

About ACIAR

Research that works for developing countries and Australia

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

202 agricultural
research-for-development projects

34 partner countries
throughout the Indo-Pacific region

404 partners organisations
in Australia and internationally

7 international partnerships
in global research collaboration

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.

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.

Responsible minister

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

Governance

ACIAR has an executive management governance structure headed by the Chief Executive Officer, who reports to the Minister for Foreign Affairs.

ACIAR

ANNUAL OPERATIONAL PLAN 2020–21

ACIAR

This report should be attributed as the ACIAR Annual Operational Plan 2020–21

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Cover photo: During 2020–21, the ACIAR research portfolio will develop a greater focus on the application of digital technologies to smallholder production systems and value chains.

Welcome

Australia is a world leader in agricultural innovation. This is a strategic national capability that the Australian Government, through the Australian Centre for International Agricultural Research (ACIAR), is able to mobilise by forming international research partnerships to improve food security, food system resilience and the livelihoods of smallholder farmers in the Indo-Pacific region.

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 and our economy. Through our research partnership model, ACIAR supports regional stability, health security and economic recovery and builds scientific and policy capabilities for more productive and sustainable agriculture, fisheries and forestry sectors.

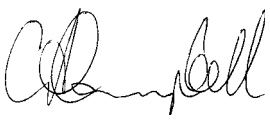
ACIAR is established by the *Australian Centre for International Agricultural Research Act 1982* (ACIAR Act) and is an agency of the Foreign Affairs and Trade portfolio. Our mission is to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships. We broker, facilitate, invest in and manage strategic partnerships in agricultural research-for-development in the Indo-Pacific region.

This Annual Operational Plan sets out the structure and programs of ACIAR for the 2020–21 year. It describes how we will continue to build the partnerships, knowledge and capacity required to achieve more productive and sustainable agricultural systems in the Indo-Pacific region. Some of the major influences of our operating environment have been in play for some time—such as rapid social, economic and political change within partner countries and an increasingly variable and changing climate. However, the most significant shaper and disruptor of our 2020–21 operating environment will be the COVID-19 pandemic.

The COVID-19 pandemic is a global health and economic crisis that will disrupt the lives and livelihoods of diverse communities around the world for years to come. The pandemic is amplifying existing vulnerabilities and exposing new risks in food systems at local, national and regional levels. Our work during the coming year will be framed by striving to understand how to mitigate future disruptions to food systems across the Indo-Pacific region and developing new ways of operating to overcome restrictions on international travel and restrictions on travel within partner countries.

This Annual Operational Plan provides a comprehensive outline of the investment by ACIAR of around 2.5% of the Australian official development assistance budget during 2020–21. It explains the context and priorities of our program areas, and describes our partnerships and projects. These range 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 and regional research projects. The research 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 and food security.

I have every confidence that our committed and skilled staff and partners will deliver this plan successfully. 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

Definitions

ACIAR	Australian Centre for International Agricultural Research
Alliance	Alliance for Agricultural Research and Development for Food Security—a joint initiative between ACIAR, the Syngenta Foundation for Sustainable Agriculture and the Crawford Fund
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 Programme
CAAS	Chinese Academy of Agricultural Sciences
CABI	Centre for Agricultural Biosciences International
CATAS	Chinese Academy of Tropical Agricultural Sciences
CGIAR	now identified by the initialism, but formerly the Consultative Group for International Agricultural Research—a global organisation of funders and international agricultural research centres
CIMMYT	International Maize and Wheat Improvement Center
COVID-19	a highly infectious disease, primarily affecting the lungs, caused by a new strain of coronavirus. 'CO' stands for corona, 'VI' for virus, and 'D' for disease. Formerly, this disease was referred to as '2019 novel coronavirus' or 2019-nCoV'.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CultiAF	Cultivate Africa's Future Fund
DFAT	Australian Government Department of Foreign Affairs and Trade
FAO	Food and Agriculture Organization of the United Nations
G20	an international forum for global economic cooperation, based on its membership of 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, United States) and the European Union
GDP	gross domestic product
GENDER	Generating Evidence and New Directions for Equitable Results
IDRC	International Development Research Centre (Canada)
IFPRI	International Food Policy Research Institute
LIFE	Livelihood Improvement through Facilitator Extension
MERS	Middle East respiratory syndrome
OECD	Organisation for Economic Co-operation and Development
PCAARRD	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
PSM	Public Service Medal
SARS	severe acute respiratory syndrome
SDIP	Sustainable Development Investment Portfolio
SFSA	Syngenta Foundation for Sustainable Agriculture
SPC	Pacific Community—the principal scientific and technical organisation supporting development in the Pacific region; an international organisation established by treaty (the Canberra Agreement) in 1947
TADEP	Transformative Agriculture and Enterprise Development program
UN	United Nations
WorldVeg	World Vegetable Center

Contents

Plant doctor, Maca Vakaloloma, with Fijian farmer, Cheung Ho Fai, using the Pacific Pest and Pathogens app for mobile devices to diagnose a problem in dalo plants. The app is one of the innovative tools used by graduates of a program that is a partnership between ACIAR, the University of Queensland and the Pacific Community (SPC).

Photo: Dave Lavaki. ACIAR project: HORT/2016/185.

1

Overview

Overview

The Australian Centre for International Agricultural Research (ACIAR) works with regional partners to tackle the intersecting and complex challenges of growing more food, improving human nutrition and reducing poverty while using less land, water and energy. At the same time, we must adapt to and mitigate the effects of 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 that emerges from collaborative international research.

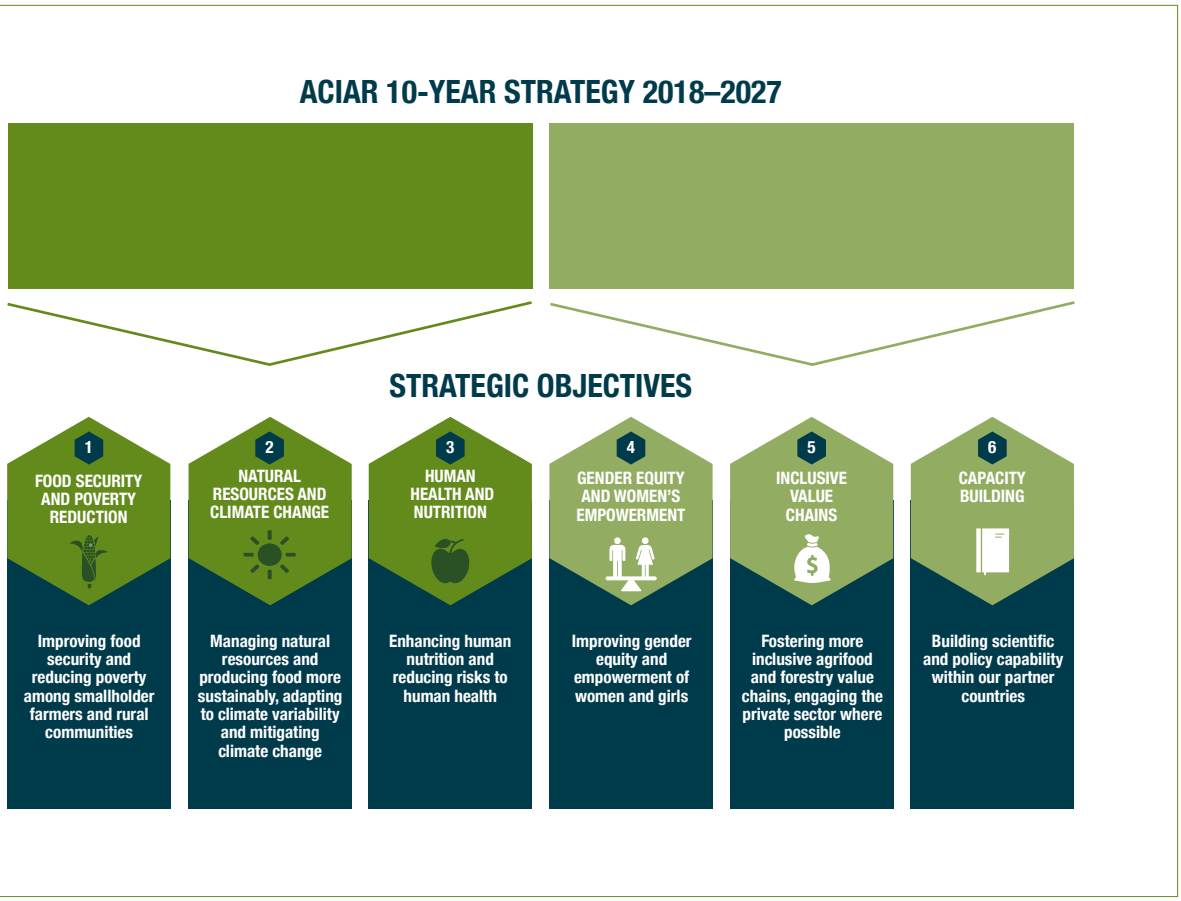
We support research collaboration to improve livelihoods in agriculture, fisheries and forestry, while emphasising individual and institutional capacity building and opportunities for development led by the private sector. This work also focuses on economic diplomacy and women's economic empowerment.

Our work reflects Australian Government 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.

Diversity and flexibility are key to our work, but it is equally important that all programs, projects and partners are working towards common objectives and goals.

The ACIAR 10-Year Strategy 2018–2027 sets out six high-level strategic objectives that guide our partnerships and research programs. These objectives are consistent with the purpose stated in our enabling legislation and reflect the policy imperatives of the Australian Government. Three of these objectives build knowledge to underpin crucial development objectives, and three ensure that our work is equitable, inclusive and empowering.



2020–21 operating environment

ACIAR has well-established ongoing plans and programs to ensure continuity in building the partnerships, knowledge and capacity required to achieve more productive and sustainable agricultural systems in the Indo-Pacific region. These plans have been developed in the context of a changing climate and the triple burden of nutrition (acute hunger, malnutrition and nutrition-related disease) that many partner countries face. However, all plans and operations must now take into account the immediate and unfolding impact of the COVID-19 pandemic.

Responding to COVID-19

The COVID-19 pandemic is a global health and economic crisis that will disrupt the lives and livelihoods of diverse communities around the world for years to come. While the global health crisis of COVID-19 is yet to precipitate a global food crisis, many international experts and agencies have highlighted that risk. In May 2020, ACIAR commenced an assessment of the impacts of the pandemic, and the responses to it, on smallholder farmers and food systems in the Indo-Pacific region. The first report, *Food systems security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19: a rapid assessment (ACIAR Technical Report No. 95),* is published on the ACIAR website.

The ACIAR response to the pandemic reflects the Australian Government's policy, articulated in *Partnerships for Recovery — Australia's COVID-19 Development Response*, published on the website of the Department of Foreign Affairs and Trade.

Australia is a world leader in biosecurity and One Health—the intersection of animal, human and environmental health. Like severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola and human immunodeficiency virus (HIV), COVID-19 is a zoonotic disease that has 'spilled over' from animals to humans. Strengthening a One Health approach—developing far more effective integration across the human and animal health systems in regulatory systems, surveillance, diagnostics and response—is critical if our region and the world is to prevent even more infectious and deadly zoonotic diseases.

ACIAR is well placed to harness the strengths of the Australian agricultural innovation system in these areas to provide scientific leadership in our region. As many countries tackle the multifaceted challenge of 'building back better', a key aspect will be improving the safety and resilience of food systems. Our response to the COVID-19 pandemic is central to our first strategic objective of 'improving food security and reducing poverty among smallholder farmers and rural communities' in our region.

Regional stability and economic security

Australia's security and economic interests remain linked with the countries of the regions in which ACIAR operates. The Australian Government's investment 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.

Redesigning the way we work

On a broader scale, the work of ACIAR and our partners will be vital in the next few years. Smallholder farmers in the Indo-Pacific region need to have the knowledge, skills, technology and frameworks to restore disrupted production systems and value chains across the agriculture, fisheries and forestry sectors. The breadth of the ACIAR research portfolio underpins the significant and valuable contribution that we make in our region—from the sciences that support productivity, biosecurity and sustainability to the disciplines that support the development of effective value chains, adoption processes, policies, regulations and institutional arrangements.

In the coming 12 months, and beyond, we will be reshaping our traditional operating models that have depended heavily on international travel by Australian scientists to partner countries, extensive regional travel within partner countries, and travel to Australia for training by scientists from partner countries. While a global crisis accelerates this remodelling, it also presents new opportunities to experiment with new technologies and new modalities to achieve our purpose more efficiently.

The reviews, development and innovation we undertake in response to the COVID-19 pandemic will strengthen our business models and allow us to continue working with our partners on ongoing social, economic and environmental challenges. This will almost certainly mean even closer links with the more than 800 ACIAR alumni across our region, as we seek to maintain on-ground momentum within ACIAR-funded programs and projects.

Working in a changing climate

Our second research-based objective is 'managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change'. To focus and strengthen our capacity to work towards this objective, ACIAR will establish a new Climate Change Research Program. This new program will focus on agriculture's contribution to climate change, and opportunities to reduce greenhouse gas emissions from the agriculture, fisheries and forestry sectors in our region. Many of our partner countries are interested in tapping into deep Australian expertise developed through, for example, the Carbon Farming Initiative, as they seek to meet their own nationally determined emissions reduction contributions to the Paris Agreement. Adaptation to climate change and extreme weather events is woven through all ACIAR research programs and will continue to be a cross-cutting issue throughout the portfolio.

ACIAR will consolidate Australia's reputation and expertise in climate science in agriculture when chairing the Global Research Alliance for Agricultural Greenhouse Gases in 2020–21. This alliance of more than 60 countries acknowledges the significant challenge of meeting a dramatic increase in global food demand, while reducing the contribution of the agriculture sector to greenhouse gas emissions. The focus of the alliance is to foster research collaboration. Leading Australian researchers will play an important role in the alliance, often through ACIAR-supported projects.

Building healthier food systems

Leaders in farming, business, science and government recognise that if the United Nations' Sustainable Development Goals are to be achieved by 2030, there must be a global transformation in how food is produced, processed, distributed and consumed (CGIAR Research Program on Climate Change, Agriculture and Food Security website, accessed July 2020).

ACIAR works across the Indo-Pacific region with the strategic objective of 'enhancing human nutrition and reducing risks to human health'. In our region, there are countries, provinces and communities experiencing the triple burden of nutrition—acute hunger and malnutrition alongside increasing levels of obesity and diet-associated diseases, such as diabetes and heart disease.

During 2020–21, ACIAR will continue to develop partnerships and broker research relationships that address the many factors that influence the nutritional value of food harvested and the safety of the food production system. Our current research portfolio includes projects such as:

- analysis and policy development to address the paradox of apparently abundant fish, vegetables and root crops but poor public health outcomes in Pacific island countries
- investigation of safe use and reduced application of pesticides in fruit and vegetable production in the Philippines
- identification of food safety interventions in the pork value chain in Vietnam.

Operational and supporting structures

Through ACIAR partnerships, we will continue to grow the knowledge base for farming and food systems, 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.

Our work is planned around three key areas.

1. **Global research collaborations:** We develop and foster partnerships and relationships with other international research and development agencies. One integral partner is CGIAR. We also develop and foster partnerships with development donors and the private sector to pursue shared goals and ensure that ACIAR-funded research results are implemented at scale.
2. **Bilateral and regional research projects:** We generate knowledge from ACIAR projects and programs to empower smallholder farmers, extension agents, scientists and policymakers to take on the intersecting challenges of growing more and healthier food and reducing poverty while using less land, water and energy.
3. **Scientific and policy capacity building:** We identify and establish opportunities for individuals and institutions in partner countries to boost technical, policy and management skills in agriculture, fisheries, forestry and management of land and water resources.

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 compelling 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 senior positions occupied by women increased from 11% in 2016 to 58% by June 2020.

To measure our performance and ensure alignment with our strategic objectives, we continue to develop and implement our portfolio planning and impact evaluation processes. This enables us to design effective research-for-development projects and programs, and develop methods to appropriately monitor and assess the contribution of our investments to development outcomes across our whole portfolio. The process also informs our accountability to the Minister for Foreign Affairs, the Australian Government and the Australian public.

Development of national skills and knowledge

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 building knowledge and capacity to contribute to stability and prosperity in our region, it is also important that we look at our own agency and ensure we are operating in line with initiatives for comparable agencies across the Australian Public Service. We will achieve this through continuous review and implementation of efficiencies in the way we operate, as well as reviewing and applying robust risk-management processes, overseen by the ACIAR Audit Committee.

During 2020–21, new Commissioners and a new Chair will be appointed to the Commission for International Agricultural Research (the Commission). The Commission's critical governance role under the ACIAR Act is to provide strategic advice to the Minister and the Chief Executive Officer (CEO) of ACIAR. The Commission will continue to play an important role as a sounding board and source of strategic advice for ACIAR as we develop and refine new business models in response to a radically disruptive global pandemic.

The Commission is complemented in the governance architecture of ACIAR by the Policy Advisory Council, comprising eminent international experts from our partner countries. The role of the Policy Advisory Council under the ACIAR Act is to advise the Minister and ACIAR on the agricultural problems of developing countries, providing rich contextual detail and insight that informs the design and implementation of ACIAR-funded research. The Policy Advisory Council has played an important role in providing feedback on the early phases of our rapid assessment of food system risks and resilience. It will be a valuable source of advice as we begin to design intervention options in response to the assessment.

An enduring operational model

Ensuring that the best of Australian science can be combined with local knowledge and implemented effectively in the field depends on the quality and durability of partnerships between scientists and farmers, researchers and industry, government and academia. Our outstanding track record of building and sustaining deep, trusting partnerships over the last 38 years is now a great strategic asset as we seek to help partner countries meet unprecedented challenges in the face of travel and other restrictions.

The ACIAR business model of brokering science partnerships in agriculture, fisheries and forestry between the Australian innovation system and neighbouring countries in our region is even more relevant today than when ACIAR was established in 1982. The strength of these partnerships enables us to be flexible and responsive in transforming how we work in response to unprecedented disruption.

During 2020–21, the 'how' of our work may evolve faster than in any previous period, but the 'why' and the 'what' are enduring.

High return on investment

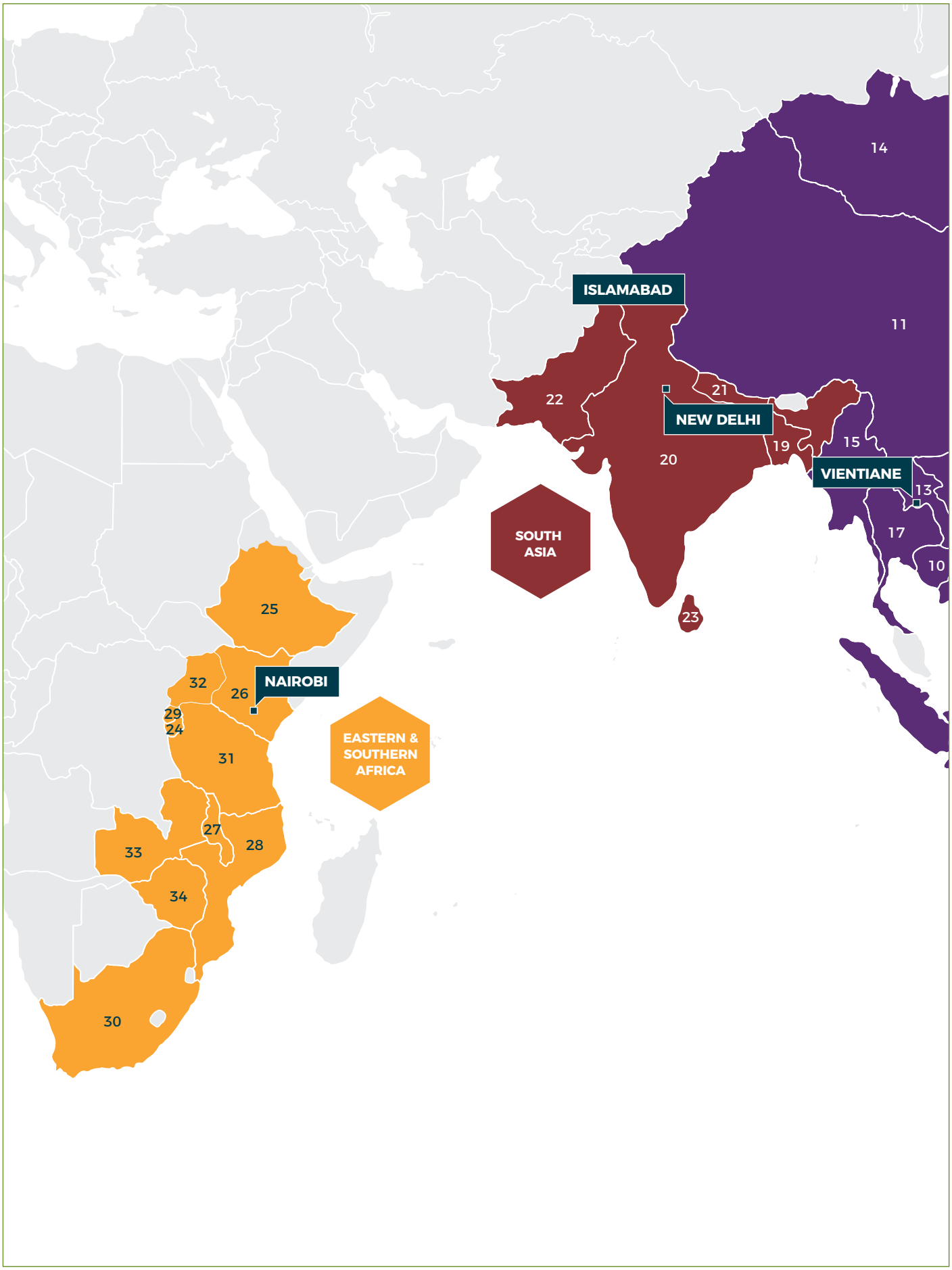
Independent evaluations of ACIAR projects and programs have consistently found high returns on investment. These returns are, on average, 5:1 but in some instances are as high as 60:1.

These findings are consistent with studies by the United States Agency for International Development in 2017 that 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.

ACIAR Country Manager for Papua New Guinea (foreground), Doreen Iga, and staff of the National Agriculture Research Institute at the Kerevat research station, East New Britain, where ACIAR-supported research is commercialising the production and marketing of galip nuts. Photo: Aaron English. ACIAR project: FST/2017/038.

ACIAR partnership model

ACIAR regions and partner countries




KEY
Pacific
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ACIAR executive management

ACIAR is part of the Australian Government Foreign Affairs and Trade portfolio. 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 has an executive management governance structure headed by the CEO, who reports directly 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.

Chief Executive Officer
Professor Andrew Campbell FTSE FAICD

The CEO 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, Northern Territory. Andrew has played influential roles in sustainable agriculture and natural resource management in Australia for more than 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 (information technology), 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 Partnerships
Dr Peter Horne

The General Manager, Country Partnerships is responsible for leading and setting the research strategy for ACIAR country (bilateral) programs, managing the ACIAR Country 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, 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, 2020–21**

Budget estimate		
Funding		**A$ million**
Administered	Administered appropriation	93.18
	Special accounts	11.50
	Total administered funding	**104.68**
Departmental	Departmental appropriation	9.36
	s 74 Retained revenue receipts[a]	2.40
	Expenses not requiring appropriation[b]	0.38
	Total departmental funding	**12.14**
Total funding		**116.82**
Expenditure		
Administered	Bilateral and regional research projects[c]	74.53
	Global research collaborations[d]	18.80
	Scientific and policy capacity building activities[e]	9.35
	Outreach	2.00
	Total administered costs	**104.68**
Departmental	Total departmental costs[f]	12.14
Total expenditure		**116.82**

a) Revenue from external sources. b) Depreciation, amortisation and audit fees. c) Includes program support and impact evaluation. d) Includes 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 contribution to ACIAR activities by external funders or partners, 2020–21**

Activity area	Partner funder	Expenditure
		A$ million
Regional and country projects (e.g. Sustainable Development Investment Portfolio)	Department of Foreign Affairs and Trade	5.48
Postgraduate scholarships	Department of Foreign Affairs and Trade	4.48
Support of international organisations (e.g. Global Research Alliance on Agricultural Greenhouse Gases)	Department of Foreign Affairs and Trade	0.70
Food Futures project	International Development Research Centre	0.36
Climate change projects	NZ Ministry of Primary Industries	0.48
Total		**11.50**

Note There is no external funding expenditure on projects and programs in Africa by Department of Foreign Affairs and Trade.

Table 1.3 **Australia's funding to international agricultural research centres, 2020–21**

	Unrestricted	Restricted (project specific)	Total
	A$ million	**A$ million**	**A$ million**
CGIAR	17.30	6.87	24.17
Other centres	1.5	—	1.5

Note 'Other centres' encompasses international partners that do not belong to the CGIAR network.

Table 1.4 **Planned project expenditure by country, 2020–21**

Region and country	Target appropriation budget allocations	ACIAR base appropriation	DFAT and other external funding	Total allocation
	%	A$ million	A$ million	A$ million
Pacific	**31**	**17.23**	**2.90**	**20.13**
Fiji	—	3.17	—	3.17
Kiribati	—	0.53	—	0.53
Samoa	—	0.72	—	0.72
Solomon Islands	—	0.93	—	0.93
Tonga	—	0.80	—	0.80
Tuvalu	—	0.07	—	0.07
Pacific island countries	—	1.57	2.00	3.57
South Pacific general	—	0.41	—	0.41
Papua New Guinea	—	7.50	0.90	8.40
Timor-Leste	—	1.53	—	1.53
East and South-East Asia	**43**	**23.86**	**1.41**	**25.27**
Cambodia	—	2.65	0.40	3.05
China	—	0.20	—	0.20
Indonesia	—	5.71	0.83	6.54
Laos	—	3.19	0.18	3.37
Myanmar	—	4.39	—	4.39
Philippines	—	3.24	—	3.24
Thailand	—	0.02	—	0.02
Vietnam	—	4.46	—	4.46
South Asia	**14**	**7.67**	**1.17**	**8.84**
Bangladesh	—	2.34	0.38	2.72
India	—	0.41	0.39	0.80
Nepal	—	0.61	0.40	1.01
Pakistan	—	3.64	—	3.64
Sri Lanka	—	0.67	—	0.67
Eastern and Southern Africa	**12**	**6.55**	—	**6.55**
Burundi	—	0.05	—	0.05
Ethiopia	—	1.22	—	1.22
Kenya	—	0.91	—	0.91
Malawi	—	0.50	—	0.50
Mozambique	—	0.79	—	0.79
Rwanda	—	0.31	—	0.31
South Africa	—	0.60	—	0.60
Tanzania	—	0.51	—	0.51
Uganda	—	1.01	—	1.01
Zambia	—	0.12	—	0.12
Zimbabwe	—	0.53	—	0.53
Total project expenditure	**100**	**55.31**	**5.48**	**60.79**

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

In partnership with RMIT University and University of the Philippines (Mindanao), ACIAR supports a project to improve agricultural extension in conflict areas, using a new approach based on the Australian landcare model. Central to the project's success is the use of social networks to bring people together, such as these residents working in a communal garden in Mindanao.

Photo: Jeoffrey Maitem.
ACIAR project: ASEM/2012/063.

2

Global collaborations

Global collaborations

ACIAR works with international partners to foster and implement global research collaborations that support strategic development in agriculture, fisheries and forestry.

The ACIAR 10-Year Strategy 2018–2027 proposes that by leveraging strategic international partnerships, ACIAR can continue to influence and promote more productive and sustainable agricultural systems for the benefit of low- and lower-middle-income countries and Australia. ACIAR builds and maintains multilateral partnerships with a range of international organisations, institutes and associations that are engaged in agricultural research and the delivery of global public goods. Our goal is to be a valued, engaged donor and a strong, innovative partner in international agricultural research.

The funding and support of international agricultural research centres is one of the roles of ACIAR, mandated by the ACIAR Act. ACIAR fosters and maintains active working relationships with international agricultural research centres by providing timely, reliable and consistent funding, as well as strategic advice on research and governance.

The largest component of support is provided to the CGIAR (formerly the Consultative Group on International Agricultural Research Centres). The CGIAR is 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.

In addition to CGIAR, ACIAR establishes and fosters partnerships with other international research centres and networks relevant to our mission. A snapshot of these is provided on pages 19–20.

ACIAR also develops and manages co-investment alliances and partnerships with like-minded organisations and donors (page 21). Co-investment partnerships demonstrate deep trust, enabling partners to leverage capacity and complement research strengths to build a critical mass of resources to invest in more ambitious research.

During 2020–21, ACIAR will seek to strengthen multilateral collaborations by serving the international research community in three key ways:

- as an engaged investor
- as a strategic research facilitator
- as a broker of Australian science (by engaging relevant Australian research expertise).

Australia as a global contributor

Partnerships built by ACIAR Global Research Collaborations contribute to Australia's global citizenship goals. Our deep engagement in collaborative international research maximises the influence of the Australian agricultural innovation system and the international standing of Australian agriculture.

Investing in global agricultural innovation

Australia has invested in CGIAR since it was established in 1971. CGIAR is the world's largest global agricultural innovation network, comprising 15 international agricultural research centres with more than 8,000 scientists who work mostly in low- and lower-middle-income countries. The location of these centres is displayed in Figure 2.1. The centres work towards a world free of poverty, hunger, malnutrition and environmental degradation.

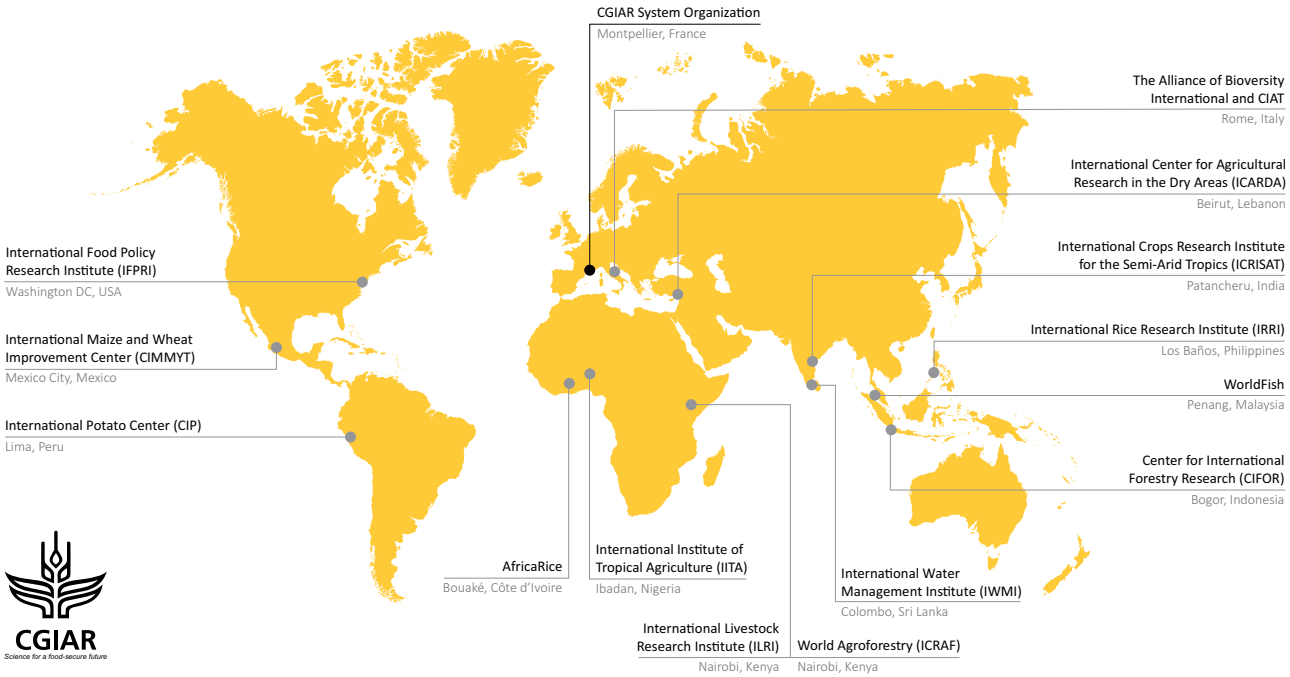
With a presence in more than 70 countries, and a deep knowledge of local customs, values and markets, CGIAR research centres work closely with more than 3,000 partner organisations. These include national and regional research institutes, civil society organisations, academia and the private sector.

CGIAR, which approaches its 50th anniversary in 2021, is better connected to the global development agenda 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 CGIAR 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.

During 2020–21, CGIAR will move towards a unified and integrated 'One CGIAR.' This will better equip the network to swiftly respond to new challenges such as the COVID-19 pandemic. In essence, the reform involves a move from the network of 15 independent international research centres, currently configured mostly around agricultural commodities, to a more cohesive structure under a common board. ACIAR will be deeply engaged in the reform process, as it will involve profound change across CGIAR, its culture, values, people, policies and systems. ACIAR will actively contribute to the reform to ensure CGIAR is well placed to deliver against both the UN Sustainable Development Goals and the Paris Agreement, as well as to attract new funder contributions.

Figure 2.1 **Agricultural research centres of the CGIAR system**



Source: CGIAR

Impressive return on investment

CGIAR delivers impressive economic and social returns on research investment. The return on investment for every US$1 provided to CGIAR is US$17. The outcomes of CGIAR investment contribute to the achievement of the UN Sustainable Development Goals and advance the interests of all countries.

Australian agricultural industries have benefited from CGIAR research for five decades. Research outputs have helped keep Australian farmers competitive in world markets, by increasing yields and reducing costs. CGIAR germplasm has been incorporated into, and has greatly improved, Australian plant and livestock breeding programs.

For example, 98% of all wheat grown in Australia is derived from CGIAR wheat varieties, representing a major contribution to increased productivity on Australian grain farms. CGIAR germplasm is also prominent in improved varieties of sorghum, maize and chickpea in Australia.

ACIAR has been a regular and significant funder and research partner to CGIAR since 1982, as mandated by the ACIAR Act. Accordingly, Australia has high-level representation on CGIAR governance bodies, which in 2020–21 includes the System Council and its Strategic Impact Assessment Monitoring and Evaluation Committee, Transition Consultation Forum and Transition Advisory Groups.

Australia contributes to CGIAR alongside the World Bank, United States of America (USA), Bill and Melinda Gates Foundation, Germany, India, United Kingdom, European Commission and Mexico among many others. Further information on CGIAR governance and funding can be found on the CGIAR Governance and CGIAR Dashboards sites on the CGIAR website. Australian scientists contribute at the highest levels of leadership within the CGIAR as Board Chairs and Board Members, Directors General and Research Program leaders.

Australian investment in 2020–21

ACIAR provides both unrestricted (core) and restricted project funds to CGIAR. More than half of the funding is unrestricted, and this is reviewed annually. Restricted funding is delivered through specific research projects delivered by individual centres in the CGIAR network. Australian support of CGIAR in 2020–21, through ACIAR, is forecast to exceed $24 million (Table 1.3).

Two specific CGIAR initiatives supported by ACIAR, by way of example, are the newly created CGIAR Generating Evidence and New Directions for Equitable Results (GENDER) Platform and the well-established Agricultural Science and Technology Indicators (ASTI) program.

The CGIAR GENDER Platform was created to put equality at the forefront of global agricultural research for development activities. It is well established that gender equality and empowerment of women is crucial in reducing poverty. The aim of the GENDER Platform is to transform gender research, within and beyond the CGIAR, and initiate genuine change towards greater equality and improved lives for smallholder farmers worldwide.

The ASTI program, active in South-East Asia and the Pacific, 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. ACIAR has supported the program since 2017. During 2020–21, ACIAR will continue to 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.

To ensure research excellence and value for investment for Australia during 2020–21, ACIAR will:

- participate at the highest levels of governance of the CGIAR system, through active membership and leadership on the CGIAR System Council, the Strategic Impact Monitoring and Evaluation Standing Committee, Transition Consultation Forum and Transition Advisory Groups
- collaborate with other donors through participation in multifunder activities, that align with ACIAR strategy and Australian interests
- lead coordinated Australian engagement with CGIAR, including consultation with DFAT and other Australian organisations, primarily through the CGIAR Australian Leadership Group, established by ACIAR in 2015
- engage ACIAR Research Program Managers and Associate Research Program Managers in the technical oversight of CGIAR Research Programs.

Partnering in global and regional programs

In addition to our partnership with CGIAR, ACIAR has formal multilateral partnership arrangements with international agricultural research centres and networks. During 2020–21, we will support global research collaborations with:

- The Pacific Community (SPC)
- Asia–Pacific Association of Agricultural Research Institutions (APAARI)
- World Vegetable Centre (WorldVeg)
- Centre for Agricultural Biosciences International (CABI)

The Pacific Community

The Pacific Community (SPC), previously known as the Secretariat of the Pacific Community, has been the principal scientific and technical organisation working to support development in the Pacific region since 1947. SPC is an international development organisation owned and governed by 26 country and territory participants. It works in seven key areas relevant 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 and ACIAR have worked in partnership for over 30 years and SPC is a key partner for both ACIAR and DFAT. SPC helps deliver Australia's wider strategies to support strong benefits from the region's fisheries, agriculture, forestry and biosecurity sectors. ACIAR currently provides both core and project funding to the Land Resources Division and Fisheries Aquaculture and Marine Ecosystems, with the current core strategic partnership arrangement ending on 31 December 2021.

The 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 funding is also aimed at building stronger strategic relationships between the two organisations, enhancing strategic management capacity in the Land Resources Division and strengthening capacity for coastal fisheries development in Fisheries Aquaculture and Marine Ecosystems. ACIAR is committed to supporting SPC to maintain the institutional capacity to sustain the capabilities of these divisions.

SPC facilitates the participation and engagement of ACIAR in regional consultation processes such as Pacific Week of Agriculture, Heads of Agriculture and Forestry Services and Ministers of Agriculture and Forestry Services. During 2020–21, ACIAR and SPC will collaborate to progress strategic regional initiatives, particularly mitigating the impacts of current and future risks such as the COVID-19 pandemic. ACIAR will also engage with SPC to consider the nature of the strategic partnership after 2021.

Asia–Pacific Association of Agricultural Research Institutions

The Asia–Pacific Association of Agricultural Research Institutions (APAARI) promotes and coordinates the national agricultural research institutes in the Asia-Pacific region, through inter-regional and inter-institutional cooperation. APAARI's Strategic Plan 2017–2022, *Pathways to strengthened agrifood research and innovation systems in Asia and the Pacific*, identifies strategic priorities that are used to inform our input into its wider regional consultation process.

ACIAR has a history of working with and supporting APAARI. ACIAR provides annual core funding 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 2020–21, ACIAR will chair the APAARI Executive Council and the Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources, and support APAARI as the long-term coordinating agency for the ASTI Program for the South-East Asia and Pacific region. ACIAR will also engage with APAARI to establish a formal partnership arrangement.

ACIAR partners with regional organisations, such as the Pacific Community, to particpate in forums that promote the development of agriculture and its role in improving livelihoods.
Photo: Jessica Douglas

World Vegetable Center

The World Vegetable Center (WorldVeg) is an international non-profit research and development institute committed to alleviating poverty and malnutrition in low- and lower-middle-income countries through increased production and consumption of vegetables. It also manages the world's largest vegetable gene bank. WorldVeg undertakes research and development to realise the potential of vegetables for healthier lives and more resilient livelihoods. Through its extensive networks and research partnerships WorldVeg disseminates improved varieties of vegetable crops and promotes improved production methods to farmers. 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 core funding and project-specific funding. ACIAR has a strategic partnership arrangement with WorldVeg (2019–22), which supports breeding activities and capacity-building in low- and lower-middle-income countries in Asia and Sub-Saharan Africa. The partnership is targeted at supporting vegetable breeding activities and capacity-building through the development of improved vegetable varieties (49% funding allocation), introduction of agricultural practices (36%) and collaboration and capacity building of public and private seed sectors (15%).

ACIAR funding has enabled:

- efforts to better conserve vegetable crop biodiversity and develop more resilient crops to address current and future biotic and abiotic constraints to vegetable production in the context of climate change
- the development, evaluation and validation of good agricultural practices for vegetable production that are safe for consumers, profitable and sustainable for all value-chain stakeholders
- collaboration to strengthen the capacity of smallholder farmers and national partners from both the public and private sectors in vegetable production and commercialisation.

WorldVeg has brought significant benefits to Australian agriculture, particularly through its mungbean breeding program, which has provided the varieties grown across much of northern Australia for many years. WorldVeg also holds breeds of tomato with genetic resistance to tomato yellow leaf curl virus, which poses an ongoing threat to the Australian tomato industry.

Centre for Agricultural Biosciences International

The Centre for Agricultural Biosciences International (CABI) is an intergovernmental, not-for-profit organisation established by a United Nations treaty, of which Australia is a member country along with 49 other member countries from Africa, Asia, the Americas and Europe.

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. CABI improves lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment.

Australia's funding, through ACIAR, enables CABI to address key issues of importance to both organisations. The four-year partnership (2019–23) between ACIAR and CABI supports Plantwise, the CABI Development Fund and Australia's CABI membership (services relating to CABI's scientific expertise, products and resources).

Plantwise is a network of plant clinics that provide practical advice to farmers. It is an award-winning global program led by CABI, that aims to increase food security and improve rural livelihoods by helping farmers reduce crop losses due to pests and diseases.

The CABI Development Fund invests in pilot projects to enable the development of strategies for climate change adaptation and mitigation actions in smallholder agriculture.

Australia's investment in CABI has contributed to improved agricultural outcomes for low- and lower-middle-income countries, and delivered benefits to Australian agriculture.

Building strength through collaboration

Co-investment programs enable ACIAR to harness the complementary skills of partners, leverage ACIAR funds, and engage in larger and more ambitious programs. Co-investment programs take many forms, from shared design and implementation of a suite of research, to programs designed to support industry and build capacity.

International Development Research Centre

Our most significant partner in terms of co-investment is Canada's International Development Research Centre (IDRC). IRDC was the model for ACIAR when Sir John Crawford submitted his recommendation to Prime Minister Fraser in 1981 to establish a centre for international agricultural development. Of all our partners, IDRC is most like ACIAR in that it is a specialist statutory agency investing official development assistance (ODA) in research.

IDRC has an agreement with ACIAR to build collaborations on a range of research initiatives of mutual interest until 2027. Current co-investment is a 50:50 partnership worth CA$25 million, of which CA$20 million has been allocated to the Cultivating Africa's Future Fund (CultiAF2), described on page 163, and CA$5 million is allocated to the exploratory Food Futures Research Program. In 2020–21 ACIAR and IDRC will work to co-design new research investments that share the vision of both organisations.

Food Futures Research Program

The Food Futures Research Program is an innovative partnership between ACIAR and 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 in the near future. ACIAR and IDRC have jointly committed A$5 million to the program, which ACIAR is managing on behalf of the partnership. The program has undertaken 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 research. The USA's Foundation for Food and Agricultural Research co-invested in this work which was undertaken by XPRIZE. The research resulted in the publication of an Impact Roadmap.

During 2020–21, the program will design and commission innovative agricultural research to address identified obstacles to help deliver a sustainable and food and nutrition secure future. Its research will identify and explore new ideas to address the challenge of reducing food loss in low- and lower-middle-income country value chains.

Alliance for Agricultural Research and Development for Food Security

The Alliance for Agricultural Research and Development for Food Security (Alliance) 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 Alliance recognised the potential for demand-led plant variety design to transform plant breeding for small-scale agriculture and food security. In 2014 it established the project 'Demand-led plant variety design for emerging markets in Sub-Saharan Africa' (see page 161), which engages with plant-breeding and university sectors in many countries in southern and eastern Africa.

In 2020–21 the Alliance will co-design a portfolio of new research projects aligned with the vision of all Alliance members. The first project will investigate how farmers' hubs are being used to deliver solutions and services to farming communities in countries such as Bangladesh and Cambodia. Specifically, the research will focus on the context and role of farmers' hubs in disseminating information about new products, practices and services to smallholder farmers and the broader farming community.

Dr Julianne Biddle is the Director, Multilateral Engagement at ACIAR. Julianne has 20 years' experience in plant science, working in research, science communication, education, policy and management. She has a keen interest in conservation biology, plant-pathogen interactions, ecology and plant physiology. Before joining ACIAR, Julianne worked at the University of Queensland focused on demand-led plant breeding in Africa and coconut physiology. Julianne grew up on a cattle farm in Central Queensland and has a Bachelor of Science with Advanced Studies in Biochemistry, Molecular Biology, Cell Biology and Biological Sciences from Griffith University, Honours in Biochemistry and Molecular Biology and a Doctor of Philosophy in Ecology, Evolution and Genetics from the Australian National University.

Researchers and project participants inspect a cereal crop in Bangladesh, grown as part of a conservation agriculture-based sustainable intensification project operating across three countries on the Eastern Gangetic Plains. The project is one of several projects managed by ACIAR within the Australian Government's Sustainable Development Investment Portfolio (SDIP). Photo: Conor Ashleigh.

3

Country partnerships

Country partnerships

To maximise our effectiveness as an agricultural research-for-development agency, ACIAR builds and maintains partnerships with in-country agencies and organisations.

ACIAR has 10 country offices throughout the Indo-Pacific region. Staff located throughout the Indo-Pacific region make up the ACIAR Country Network, which develops and maintains the strategic directions of our investments with in-country partner agencies. The network also manages relationships, communication, coordination and administration of activities within the countries in which our offices are located, and in neighbouring countries where we have no representative office.

The Country Network also supports partner research institutions to develop, establish and administer activity related to research collaboration and capacity building. Our Country Network is a vital link between Australian and international researchers and the relevant in-country research agencies.

Many ACIAR country partnerships are undergoing rapid change as local research capacity grows. At the same time, the COVID-19 pandemic has severely impacted the ability of partner agencies to participate in research collaboration. Both of these circumstances have created an imperative for our Country Network to renegotiate relationships for when our partner agencies emerge from the pandemic crisis. Throughout 2020–21, and for the duration of the pandemic, the network will continue to monitor and manage three distinct phases in our relationships with partner countries and in-country agencies:

- response
- re-engagement
- recovery.

Our partner countries are moving through these phases at very different rates and with highly variable degrees of control and management of risk. Our Country Network is building its capacity in partnership brokering and knowledge management so that, when our partner agencies are ready to re-engage, we will have the necessary skills, tools and plans in place so that re-engagement can happen as quickly as possible.

Depending on ongoing restrictions and responsibilities of partner agencies in response to the COVID-19 pandemic, during 2020–21 we plan to confirm new long-term partnership strategies with the Pacific, Papua New Guinea, Indonesia, Myanmar, Bangladesh and Pakistan.

ACIAR Country Offices

ACIAR Country Network staff are located in the offices of Australian high commissions or embassies in the following countries:

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

* ACIAR staff are located in Myanmar but the location is a remote site of the regional office in Laos, not an ACIAR Country Office.

ACIAR regional and country managers

Pacific

Ms Florence Rahiria
Regional Manager, Pacific and Papua New Guinea

Ms Florence Rahiria is based in Fiji but also performed the role from the ACIAR office in Papua New Guinea for two years. Before joining ACIAR in 2016, Florence worked in several roles managing development programs for DFAT at the Australian High Commission in Papua New Guinea. She also worked in the public sector and banking industry in Papua New Guinea. Florence holds a Bachelor of Business 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

Ms Doreen Iga is based in Port Moresby. She has more than 20 years' experience with environmental non-government organisations, AusAID programs, international non-government organisations in Papua New Guinea and DFAT. Before joining ACIAR in August 2019, Doreen worked with DFAT from 2013 and managed 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 of Development Studies from the University of Auckland.

East and South-East Asia

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

Ms Dulce Carandang Simmanivong 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. Previously, 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

Mr Wang Guanglin is based in Beijing. He joined ACIAR in 1998 and became ACIAR Country Manager for China in 2011. 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, he is exploring opportunities for ACIAR and China to work with other countries on common opportunities and challenges in agriculture.

Ms Mirah Nuryati PSM
Country Manager, Indonesia

Ms Mirah Nuryati 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 AIDAB/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 (PSM) for her contribution to strengthening ACIAR collaboration with relevant Indonesian ministries.

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

Ms Mai Alagcan 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 a 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 PSM
Country Manager, Vietnam

Ms Nguyen Thi Thanh 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. In 2020, An was awarded an Australian Public Service Medal for her outstanding public service in fostering the Australia–Vietnam bilateral relationship in agricultural research.

South Asia

Dr Pratibha Singh
Regional Manager, South Asia

Dr Pratibha Singh is based in New Delhi, India. 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. Before joining ACIAR in 2018, Pratibha was head of the Technology Advancement Unit of the Indo–Swiss Collaboration in Biotechnology for eight years. She also has worked at the Indian Agricultural Research Institute, New Delhi; USDA–Dale Bumpers National Rice Research Center; Cornell University; and Agriculture and Agri-Food Canada. She also worked as a scientist and Coordinator of Research Management System in a corporate biotech industry (E.I. DuPont India). Pratibha holds a Bachelor of Agriculture and Animal Husbandry and 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.

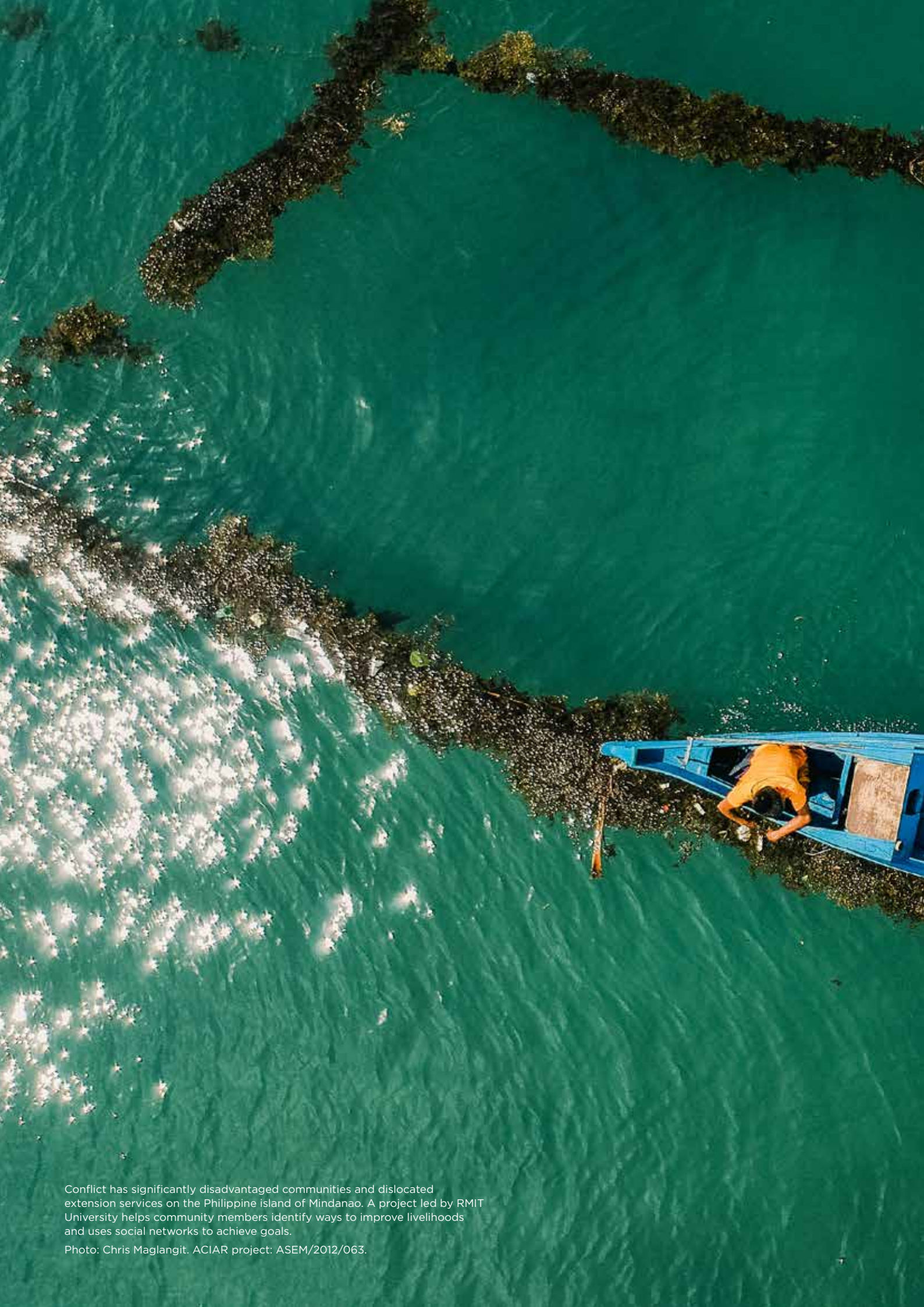
Dr Munawar Raza Kazmi
Country Manager, Pakistan

Dr Munawar Raza Kazmi is based in Islamabad. He joined ACIAR in 2010 and became Country Manager for Pakistan in 2015. 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

Dr Leah Ndungu is based in Nairobi and 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, USA, and a PhD in Veterinary Science with a specialisation in Agricultural Economics from the University of Pretoria, South Africa.



Conflict has significantly disadvantaged communities and dislocated extension services on the Philippine island of Mindanao. A project led by RMIT University helps community members identify ways to improve livelihoods and uses social networks to achieve goals.

Photo: Chris Maglangit. ACIAR project: ASEM/2012/063.

4

Bilateral and regional research

Bilateral and regional research

ACIAR works with scientists in Australia and partner countries to use science and technology to improve the livelihoods of smallholder farmers and the sustainability of food systems throughout the Indo-Pacific region.

Our work in each partner country and within our four regions is determined through various processes, consultations and forums. ACIAR-supported research addresses the specific challenges and opportunities arising in local environments and builds on established relationships.

The ACIAR research portfolio is organised into 10 programs:

- Agribusiness
- Climate Change
- Crops
- Fisheries
- Forestry
- Horticulture
- Livestock Systems
- Social Sciences
- Soil and Land Management
- Water.

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.

From September 2020, ACIAR has a new research program that focuses and strengthens our work in relation to our strategic objective that addresses climate variability and climate change.

We 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.

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

We also work with other government agencies to implement programs and projects with shared goals. Since 2006, our largest and most important partnership with another government agency is with portfolio partner, DFAT. A new partnership agreement (Record of Understanding) was established during 2019–20, under which ACIAR will manage 11 activities and an investment of almost $11 million. These activities include projects and activities associated with programs such as the Sustainable Development Investment Portfolio (page 132) and Research for One Health Systems Strengthening (pages 48 and 77).

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

Our research portfolio evolves in response to new research opportunities enabled by new knowledge and technologies, and new research and development imperatives. For example, during 2020–21, we are developing areas of activity addressing:

- links between human, livestock and ecosystem health
- the application of digital technologies to smallholder production systems, including the full value chain
- the contribution of agriculture to greenhouse gas emissions
- new biosecurity threats such as fall armyworm and African swine fever.

Projects and partners

202

Projects and small research activities

34

Countries where projects are located

58

Commissioned organisations

404

Collaborating institutions

Note: The same organisation or instiution may partner with ACIAR on more than one project.

Research portfolio

25
Agribusiness projects

5
Climate Change projects

21
Crops projects

25
Fisheries projects

19
Forestry projects

18
Horticulture projects

31
Livestock Systems projects

18
Social Sciences projects

14
Soil and Land Management projects

16
Water projects

This list was compiled in July 2020. Additional projects will be commissioned during 2020–21.

Agribusiness

The Agribusiness Program focuses on research and adoption of innovations to improve business outcomes for smallholder farmers, their communities and their industries 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 post-harvest activities such as shipping, processing, packaging and marketing of farm products.

The program seeks to understand and identify skills and opportunities to help smallholders, communities and industries manage complex and interrelated factors, issues and tasks in the production chain, to understand and link markets and adopt new enabling technologies. The program investigates the availability of finance for smallholders to participate in value chains, biosecurity, quality control and quality management of farm production, and compliance with market and government regulations. The program also works and co-invests with private firms to improve the effectiveness, efficiency and sustainability of commercial agrifood chains that link smallholder farmers and their private sector partners to markets.

Projects brokered by the Agribusiness Program strive to build and improve communication and information transfer up and down the value chain, as well as management skills of value-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 genetic improvement and sustainable intensification and diversification.

Projects within the genetics theme address specific 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 are partnerships to enable the release of improved breeding 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. 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 of 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, while exploring opportunities to reduce their climate change footprint. 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.

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 challenging 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 in 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 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 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. He 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.

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

Forests and trees provide social, economic and environmental benefits. The goal of the Forestry Program is to increase these benefits to the human community in the present while enhancing environmental integrity and natural assets for future generations. The program focuses on opportunities to support livelihoods of the rural poor in partner countries from enterprises associated with forests and agroforests. The densification of tree cover outside forests now occurring globally has heightened the economic opportunity associated with tree crops.

The current Forestry Program portfolio includes projects that span the value chain from seedlings to processed timber products. During the period 2020–25, the aim is to develop research projects in which the science is strong, prominent and broadly applicable across geographies and forest types while development outcomes are concentrated in focal countries.

ACIAR is participating in the UN Decade of Forest Restoration (2020–30) with research examining management actions to channel natural processes toward ecosystem aggradation—the building of carbon stores, water-holding capacities, trophic complexity and biodiversity. These projects aim to restore and expand forest cover and the benefits of forests for a diversity of stakeholders.

Horticulture

The Horticulture Program aims to improve the productivity, profitability and sustainability of fruit, vegetable, ornamental and beverage crop production in partner countries and Australia.

The program focuses on improving production practice to increase yield, and minimising pre-harvest and post-harvest loss. The program works 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 increases 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. Priority is also given to nutrition-sensitive solutions that link production to nutrition.

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 where ACIAR works.

The challenges for horticulture research are to improve livelihoods in rural areas and deliver the safe nutritious food necessary for health and nutrition in both rural and urban regions. Higher intensity 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.

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 longstanding 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.

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 three key areas of focus:

- livestock and climate change—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-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 takes a people-centred approach to agricultural research-for-development to reduce poverty.

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 reduce poverty.

The program's key research areas are:

- agricultural extension
- gendered social relations
- women's empowerment
- natural resource management
- 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. However, 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.

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 most of her career working in international livestock development and public health programs in Africa and South-East Asia. This 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. She 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 holds a PhD in Anthropology from the Australian National University and is a Graduate of the Australian Institute of Company Directors. Jayne is fluent in Bahasa Indonesian and Malay.

Soil and Land Management

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, 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

The Water Program (formerly 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 three main themes:

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

In South Asia, the Water Program coordinates activities that were established by the DFAT Sustainable Development Investment Portfolio and focus on sustainable ways to intensify and diversify food systems in the Eastern Gangetic Plains, 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. Before joining ACIAR, Robyn was a principal researcher with the International Water Management Institute, including three years as the institute's 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.

Climate Change

In September 2020, ACIAR initiated a new research program—Climate Change—to focus on an issue that represents an acute threat to global food security and successful poverty eradication. ACIAR already has supported and brokered research that aims to build adaptive capacity and reduce vulnerability of smallholder agricultural systems to climate change.

Previously, through the Water and Climate Program, we worked with partner countries and national and international research agencies to improve our understanding of specific risks of climate change and potential transformational adaptation responses for smallholder farmers. We have invested in research that builds institutional capacity to understand and implement practical emissions reduction activities.

The new dedicated Climate Change Research Program will build on this work 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 maximise the opportunities from developing new markets
- build regional capacity to reduce agricultural emissions and measure, report and verify emissions to meet country nationally determined contributions (NDC) targets
- assist in the development of in-country regional/commodity-based climate change adaptation plans that include smallholder farmers in target countries.

The program will also work with other ACIAR research programs to:

- increasingly consider the current and future risks of climate change when planning research project investments
- incorporate emissions management considerations into research project investments.

ACIAR will continue to engage internationally on climate change and play a greater leadership role through participation and collaboration on national forums such as the Global Research Alliance on Agricultural Greenhouse Gases. Working with other countries toward common goals by sharing expertise and resources allows scientists to achieve results that would be impossible if they were working in isolation.

Dr Veronica Doerr is the Research Program Manager for Climate Change. Her diverse research background has been characterised by integration of social and biophysical sciences, including research co-design with land managers and policy-makers. Before joining ACIAR, Veronica spent 15 years at CSIRO where she transferred to research management to shape collaborations for climate adaptation and transition. She built the Climate Risks and Resilience Group, served as Research Director for the Sustainability Pathways Program, and was a core member of the Land and Water Leadership Team. Veronica has a Bachelor of Arts degree from Yale University and a PhD from the University of Nevada – Reno.

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. Lee had leading roles in the development of the Australian Government'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.

Cross-cutting issues

The ACIAR research portfolio is designed and implemented on the basis of 10 key research areas that address the gaps in knowledge, technology and capacity encountered in agricultural research-for-development. However, 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:

- economics and policy
- farming systems analysis
- gender
- One Health.

Economics and Policy

Our economics and policy activities focus on research and initiatives that support sustainable and inclusive economic development. This addresses ways to manage profitable and sustainable food and resource systems from smallholders to 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-making tools and financial products to manage their systems effectively.

The Associate Research Program Manager for Economics and Policy works 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. Our work in this area is concerned with the processes that support the translation of scientific, social and economic knowledge into policy for sustainable and inclusive economic development.

Farming Systems Analysis

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

Smallholders farmers do not just manage one crop type. They 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. As such, methods and tools to examine the farming system as a whole are required to assess the value of proposed interventions.

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 on the farm household or the broader environment. The farming systems analysis program has been examining how farming system analysis is currently being used by research teams to address diverse project objectives.

The goal of this work is to find ways to build capacity for systems thinking in research teams and document practical approaches that researchers might use to understand complex systems. This is of particular relevance to questions about how to sustainably intensify production systems.

Dr Todd Sanderson is the Associate Research Program Manager for Economics and Policy. Before joining ACIAR, Todd was a CSIRO research scientist working 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.

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 eastern 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 triggers 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, both internally and externally.

Our in-house gender expertise creates a gender focal point and guides all ACIAR staff, partner agencies and program leaders to understand and identify opportunities for gender equity impact and transformation. This allows us to ensure that 80% (at a minimum) of ACIAR investments reflect principles of gender equity in project design and implementation, consistent with the ACIAR Gender Equity Policy and Strategy and Australia's aid program targets.

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. ACIAR funds a number of One Health projects under pillar three of its Livestock Systems Research Program. One of these initiatives is the Research for One Health Systems Strengthening program, a co-investment partnership between ACIAR and DFAT's Indo-Pacific Centre for Health Security. The partnership is one of several programs under a Record of Understanding between ACIAR and DFAT.

The Research for One Health Systems Strengthening program comprises a portfolio of projects that are investigating human communicable diseases in the context of land use changes, veterinary systems strengthening and antimicrobial resistance. These projects are described on page 48 (Pacific region) and page 77 (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, 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 as a zoonotic disease epidemiologist and One Health practitioner for the World Health Organization in Laos and China.

Planning and evaluation

Portfolio planning and impact evaluation helps us refine our priorities and 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 our work lies in strategically planning for, and measuring, the impact of our investments. Our Portfolio Planning and Impact Evaluation team is responsible for the ongoing development of organisation-wide performance frameworks and the evaluation of our investments in the medium and long term. The team engages with emerging thinking on the design of 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. They analyse economic return on investment, assess social and environmental impacts and understand 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 team has two key areas of focus during 2020–21.

Systematic portfolio planning, monitoring and reporting system

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

We are continuing to 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 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 is Research Manager for Portfolio Planning and Impact Evaluation. 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.

Joseph Ntirivamunda and his daughter Gysele are farmers in Musanze, Rwanda. They participated in the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project, which assisted more than 230,000 farmers to adopt sustainable intensification technologies.
Photo: Peter Lowe.

5

ACIAR in the Indo-Pacific

ACIAR in the Indo-Pacific

ACIAR is well recognised and regarded for its longstanding partnerships and support for a significant and diverse portfolio of collaboration throughout the Indo-Pacific region. This portfolio covers research on productivity, resilience, sustainability and equity in agriculture, forestry and fisheries systems to reduce poverty and improve livelihoods.

The on-ground work we support with our partners in the Indo-Pacific region is dominated by bilateral and regional research projects underpinned by longstanding country partnerships. During 2020–21, approximately 200 projects will be active in our operational area. These projects are collaborations between Australian and international scientists with in-country partners, and brokered by ACIAR research program managers, across 10 areas of research.

The projects are varied in design, execution and outcomes. Very broadly, projects range from research or investigations conducted by a group of partners across a number of field sites, taking several years to develop new knowledge, technology or methodology to small research activities where an individual agency or specialist may conduct a desktop or scoping study over 12 months.

When establishing research projects, research program managers work closely with the Country Network to:

- ensure that the research aligns with in-country priorities
- build connections and relationships with in-country organisations and institutions.

The Country Network guides the development and regular adjustment of the strategic direction of our research investments with our key country partners.

This chapter describes our research collaborations with each region and country in 2020–21. Our work is organised around the four regions of operation in the Indo-Pacific:

- 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 bilateral and regional projects brokered by the research program managers, ACIAR also conducts global research collaborations and scientific and policy capacity-building activities.

5.1 Pacific

Philmah Seta Waken is an agronomist and researcher with the Papua New Guinea National Agricultural Research Institute. Philmah has worked on ACIAR projects to promote sustainable vegetable production and community gene banks with farming communities. Photo: ACIAR.

Pacific

Regional summary

The agriculture, fisheries, forestry and tourism sectors are of vital economic importance to the Pacific region. The agriculture sector underpins livelihoods for a large proportion of the region's population, which is dependent on subsistence production, and also accounts for an important share of the export earnings for many countries in the region. The high dependency on certain subsectors, however, makes relatively weak economies vulnerable to external economic shocks, natural disasters, environmental degradation and impacts of climate change. These vulnerabilities have restricted the development of commercially oriented agriculture, fisheries and forestry and limited their contribution to economic growth.

Each ACIAR partner country in the Pacific region is confronted with constraints to agriculture. These are major challenges to sustaining food security and commodity export incomes and supporting vulnerable groups, especially the rural poor, women and youth. While many of these constraints are shared with other countries, they can affect an individual country (or islands within countries) differently, depending on the local context. Some of the main shared challenges are:

- continued population growth
- urbanisation and labour migration
- low or stagnant agricultural production and yields
- land tenure and use
- skills gaps
- inadequate government investments in agriculture
- increased dependency on imported food
- environmental degradation
- market access.

Additionally, countries in the Pacific region face intense competition in international markets for agricultural exports, and income from most of these products is not growing. Strengthening the environment for private sector development within the agriculture sector remains an important challenge for industries and governments.

The Pacific region is also contending with the implications of a triple burden of acute hunger, malnutrition and a high prevalence of nutrition-related diseases. The falling productivity of domestic food production and the increasing availability of cheaper food imports has led to increasing dependence on imported food and dietary transition towards food that is high in salt, sugar and fats. This has led to an increase in conditions such as diabetes, heart disease and micronutrient deficiencies.

Weather and climate have a major influence on the agriculture sector in the region. Natural disasters (such as cyclones, floods, droughts, earthquakes and tsunamis) are a regular event. Current climate projections suggest that extreme weather events (such as heatwaves, droughts and floods) are likely to increase in frequency and intensity, and projected rainfall and rainfall patterns are likely to create problems for the region. Extremely high tides and storm surges continue to threaten low-lying islands and continued sea-level rise may contaminate fresh groundwater.

Despite these challenges, there are many reasons for optimism in the Pacific region. Sustained investment in capacity building over decades has resulted in a growing network of highly skilled, motivated and influential researchers within the region. They underpin ACIAR research collaborations and address the many common elements within each of our partner-country development strategies. These include:

- strengthening policy, legal and regulatory frameworks
- increasing agricultural productivity and food security
- decreasing food imports
- improving nutrition and diets
- sustainably developing aquaculture and fisheries
- improving marketing and export performances
- enhancing sustainable resource management
- developing human capacities.

Countries in the ACIAR Pacific region

- Fiji
- Kiribati
- Papua New Guinea
- Samoa
- Solomon Islands
- Timor-Leste
- Tonga
- Tuvalu
- Vanuatu

Drivers of regional collaboration

There are many bilateral and multilateral development partners who provide substantial assistance to Pacific island countries. To ensure this assistance translates into sustainable development gains, priority must be given to better coordination and harmonisation of support between development partners.

For ACIAR, working through a regional approach presents an opportunity to identify complementarities and improve coordination of development resources, based on respective comparative advantages of different organisations.

ACIAR-supported projects in the Pacific region are mostly regional, rather than bilateral, except for our program with Papua New Guinea, where projects are mostly bilateral. While acknowledging individual country-partner needs and research and development priorities, the scattered geographical nature of the Pacific region and small populations mean that several countries cannot address all their challenges and opportunities in agriculture alone.

ACIAR has a strong focus on enabling regional collaboration, especially through our close relationship with the Pacific Community (SPC) and we will develop a new strategic partnership with SPC in 2020–21. While our program focuses on nine countries in the region, SPC plays a key role in communicating research outcomes of relevance broadly across the region. Our support of SPC under the new agreement will assists the organisation to deliver strategic public goods in agriculture, fisheries and forestry 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

As part of Australia's official development assistance (ODA) program, ACIAR is part of a whole-of-government approach to deliver results in line with government policies.

The Pacific Step-up is Australia's foreign policy that specifically prioritises support towards building a resilient region. The step-up responds to the significant long-term challenges faced by our partners in the Pacific, including:

- climate change and responding to natural disasters
- sustaining economic growth and boosting education, developing skills and jobs for growing populations
- pursuing gender equality and recognising the essential role of women in achieving better development outcomes
- preventing major disease outbreak
- tackling transnational crime.

During 2020–21, ACIAR will build on its long history of engagement with the Pacific region through its new 10-year strategy with the Pacific island states and Papua New Guinea, which identifies high-level priorities for the region. ACIAR is developing country-specific implementation plans in consultation with partner countries and national and regional research and development agencies. The research priorities in the implementation plans with each partner will be revisited and adjusted through consultations with the heads of these agencies every two years at Pacific Week of Agriculture and Forestry.

A key focus of ACIAR in the region is enabling more regional collaboration in research and capacity building to address common issues and opportunities, including projects addressing biosecurity, climate-resilient livelihoods and opportunities for stronger agribusiness development. ACIAR contributes to this through the way it funds regional research collaboration, through its support of SPC and through its support and chairmanship of APAARI. ACIAR is also contributing through its membership of the Pacific Week of Agriculture and Forestry working group, which aims to make this the premier event drawing global attention to agriculture and forestry in the Pacific. Pacific Week of Agriculture and Forestry provides a forum to showcase recent R&D achievements, creates opportunities for regional and international collaboration and brings together regional leaders around implications and opportunities for supporting policy.

Australia's *Partnerships for Recovery: Australia's COVID-19 Development Response* recognises that COVID-19 has had a profound impact on the region and notes that many countries:

> have closed their borders or limited movement, with substantial initial success in stopping the spread of the virus. But most have a narrow economic base, and all are experiencing an economic shock. This has seen the collapse of government revenue, foreign reserves and cash balances, and the loss of incomes and livelihoods in contexts where formal social safety nets are limited. Critical industries such as tourism have effectively shut down. Most countries have limited capacity to mobilise an effective health or economic response. Some countries are at risk of debt distress, limiting their options for raising finance to respond. A number have underlying security vulnerabilities, including from the climatic threat and natural disasters. A concurrent health and economic crisis could exacerbate these vulnerabilities…

ACIAR is supporting an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This assessment is monitoring, documenting and analysing food systems vulnerabilities resulting from the COVID-19 crisis and their impacts on smallholder farmers. It will identify possible actions that could be taken by governments and other food systems stakeholders to increase food systems resilience in the face of future shocks. This assessment may influence future ACIAR investments in the region.

In 2020–21, ACIAR takes over the chair of the Global Research Alliance on Agricultural Greenhouse Gases. The alliance brings together 62 member countries to find ways to grow more food without increasing greenhouse gas emissions. Many countries already have research underway to better understand, measure, and manage agricultural greenhouse gases emissions. By linking these efforts through the alliance, we can achieve faster progress towards the solutions needed to improve agricultural productivity but reduce greenhouse gas emissions. This year, with co-funding from Australia and New Zealand, ACIAR will organise and host a Pacific regional forum on agriculture and climate change inviting representatives from across the Pacific to discuss the challenges of 'growing more food without growing greenhouse gas emissions'.

During 2020–21, 62 ACIAR-supported projects will be active in the Pacific region (Table 5.1).

Research for One Health Systems Strengthening

One Health is an approach that recognises that the health of people, animals and the environment are interconnected. Approximately 75% of newly emerging infectious diseases are zoonoses (diseases that can transmit from animals to humans) that arise as a result of one or several factors that are anthropogenic, genetic, ecologic, socioeconomic and climatic in origin. Across the Indo-Pacific region, animal production systems are changing rapidly; however, local and regional capacity to diagnose, treat and control diseases is generally weak and under-resourced.

Projects in the Pacific region

- 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)
- Enhancing the management of antimicrobial resistance in Fiji (LS/2019/119)

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)
- Collaboration on One Health economic research for systems in Cambodia (LS/2019/118)

Securing the future of coconut

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 decline from pest and disease, 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, particularly in the Asia-Pacific region.

During 2020–21, ACIAR, DFAT and the International Coconut Community will continue their collaboration to reinvigorate and sustain the Coconut Genetic Resources Network (COGENT). The program will focus on better coconut science, through a global coconut strategy to address the challenges outlined above. The program will work with other organisations to ensure a viable COGENT secretariat to safeguard coconut genetic resources and better address disease threats.

The network is active throughout the Asia-Pacific region and led by Dr Jelfina Alouw, Executive Director of the International Coconut Community, who is based in Jakarta, Indonesia.

ACIAR project GP/2018/193

Table 5.1 **Current and proposed projects in the Pacific region, 2020–21**

Project title	Project code	Country
Agribusiness		
Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach	ADP/2018/131	Fiji, Vanuatu
Pacific Agribusiness Research in Development Initiative – phase 2 (PARDI 2)	AGB/2014/057	Fiji, Tonga, Vanuatu
Crops		
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	Papua New Guinea, Solomon Islands
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	Timor-Leste
Managing basal stem rot in oil palm by converting infected logs to biochar	CROP/2019/147	Papua New Guinea
Fisheries		
Developing pearl industry-based livelihoods in the western Pacific	FIS/2014/060	Fiji, Papua New Guinea, Tonga
Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea	FIS/2014/061	Papua New Guinea
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	Tonga, Vietnam
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	Kiribati, Solomon Islands, Vanuatu
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	Indonesia, Timor-Leste
Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	FIS/2018/151	Papua New Guinea
Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators	FIS/2018/154	Papua New Guinea
Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region	FIS/2018/155	Kiribati, Solomon Islands, South Pacific general, Vanuatu
Towards more profitable and sustainable pearl-industry based livelihoods in the western Pacific	FIS/2019/122	Fiji, Papua New Guinea, Samoa, Tonga
Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands	FIS/2019/124	Solomon Islands, Timor-Leste
Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa	FIS/2019/125	Kiribati, Samoa
Forestry		
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	FST/2014/067	Fiji, Papua New Guinea, Solomon Islands, Vanuatu
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	Fiji
Enabling community forestry in Papua New Guinea	FST/2016/153	Papua New Guinea
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	Vanuatu
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	Fiji, Tonga
Enhancing private sector–led development of the Canarium industry in Papua New Guinea – phase 2	FST/2017/038	Papua New Guinea
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	FST/2018/178	Papua New Guinea
Coconut and other non-traditional forest resources for the manufacture of engineered wood products	FST/2019/128	Fiji

Project title	Project code	Country
Horticulture		
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	Regional
Enhanced fruit production and postharvest handling systems for Fiji, Samoa and Tonga	HORT/2014/077	Fiji, Samoa, Tonga
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	Fiji, Samoa, Solomon Islands, Vanuatu
Integrating protected-cropping systems into high value vegetable value chains in the Pacific and Australia	HORT/2014/080	Fiji, Samoa, Tonga
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	HORT/2014/083	Papua New Guinea
Developing the cocoa value chain in Bougainville	HORT/2014/094	Papua New Guinea
Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea	HORT/2014/096	Papua New Guinea
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	Papua New Guinea
Responding to emerging pest and disease threats to horticulture in the Pacific islands	HORT/2016/185	Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands	HORT/2017/025	Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	Papua New Guinea
Enhanced fruit systems for Tonga, Samoa and Fiji (phase 2): community-based citrus production	HORT/2019/165	Fiji, Samoa, Tonga
Livestock Systems		
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	Timor-Leste
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	LS/2014/042	Fiji, Papua New Guinea
Improving small ruminant production and supply in Fiji and Samoa	LS/2017/033	Fiji, Samoa
Evaluating the opportunities for smallholder livestock keepers in Timor-Leste	LS/2017/035	Timor-Leste
Sectoral analysis and investment requirements for improving the Fiji and Samoa small ruminant sector	LS/2018/183	Fiji, Samoa
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	Timor-Leste
Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu	LS/2018/185	Vanuatu
A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (One Health)	LS/2018/213	Papua New Guinea
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in three provinces in Papua New Guinea (One Health)	LS/2018/217	Papua New Guinea
Enhancing the management of antimicrobial resistance in Fiji (One Health)	LS/2019/119	Fiji
Improved animal health surveillance in Timor-Leste	LS/2019/158	Timor-Leste
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia

Project title	Project code	Country
Social Sciences		
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	Papua New Guinea
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Papua New Guinea
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems	ASEM/2016/101	Fiji, Tonga
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	Papua New Guinea
Improving agricultural development opportunities for female smallholders in rural Solomon Islands	SSS/2018/136	Solomon Islands
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	SSS/2018/137	Papua New Guinea
Landcare—an agricultural extension and community development model at district and national scale in Fiji	SSS/2019/140	Fiji
Soil and Land Management		
Better soil information for improving Papua New Guinea's agricultural production and land use planning—building on PNGRIS and linking to the Pacific Regional Soil Partnership	SLAM/2019/106	Papua New Guinea
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	Papua New Guinea
Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal	SMCN/2016/111	Fiji, Kiribati, Samoa, Tonga, Tuvalu
Water		
Closing the loop between agriculture and wastewater discharge: a novel technique for turning wastewater into fertiliser in the Pacific	WAC/2019/135	Kiribati, Vanuatu Tuvalu
Climate Change		
Climate change and Pacific food systems: decision-making for transformational change (proof-of-concept)	WAC/2019/148	Samoa, Solomon Islands
Conservation agriculture and sustainable intensification of smallholder farming systems in Pacific countries as a pathway to transformational climate change adaptation and reducing greenhouse gas emissions	CROP/2020/185	Fiji, Samoa
Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa	WAC/2019/150	Fiji, Indonesia, Kenya, Vietnam

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled during July 2020. Additional projects, not listed in this table, may be commissioned during 2020–21.

Pacific island countries

A$10.2 million
Budgeted funding

29
Bilateral and regional research projects

6
Small projects and activities

Prior to the COVID-19 pandemic, Australia's assistance program to Pacific island countries aimed to support a stable, secure and prosperous Pacific region by addressing challenges to regional development and economic growth. Investments aimed to increase global and regional trade, increase finance for business activity, deepen labour markets and create better-quality employment opportunities. The program works with Pacific countries, regional organisations and multilateral development banks to improve market access and value-chain development in the agriculture and fisheries sector; as well as improve product quality, meet biosecurity requirements and strengthen resource management.

COVID-19 is now having a profound impact on the region. Australia's COVID-19 response will focus on the Pacific and South-East Asia, with the Pacific, Timor-Leste and Indonesia as first-tier priorities. These are our closest neighbours, where we have the strongest national interests in providing support and where we can have the greatest impact. These countries are also vulnerable to the effects of the pandemic. Their recovery is critically important to Australia's own security and economic recovery.

An overview of Australia's aid program in Pacific island countries is available on the DFAT website.

Agriculture, fisheries, forestry and tourism are important sectors in the Pacific region, particularly for their contributions to the livelihoods, food security and gross domestic product (GDP). According to the Food and Agriculture Organization of the United Nations (FAO), about 67% of the Pacific region's population depends on agriculture and fisheries for livelihoods.

Fisheries resources represent a major source of food and income, and offer sustainable development options, particularly for atoll nations. Accordingly, any improvements in the output of agriculture and fisheries benefit the population by increasing its access to food and improving its ability to meet dietary needs.

Forests and trees have enormous environmental and economic implications for people in the Pacific region. They act as a buffer for the impacts of climate change and contribute to biodiversity and the protection and maintenance of ecosystem services. Unfortunately, despite their critical role, these valuable resources are under continuous threat from human activities, such as expansion of agricultural areas and unsustainable logging. Degeneration of forests due to unsustainable harvesting of timber and non-timber products is a serious concern. Loss of mangroves to aquaculture and settlement expansion in several smaller nations has increased the vulnerability of coastal zones to natural disasters.

Threats to biodiversity due to the spread of invasive tree species and pests are common to the region, such as the coconut rhinoceros beetle (Guam biotype) and Bogia coconut syndrome. Island environments have inherited limited natural resilience in the face of aggressive invasive species, and recent years have been marked with rapidly spreading outbreaks of several devastating invasive pest species. Emerging diseases of livestock (and potentially fisheries) may also be equally destructive.

Overall, the importance of agriculture and fisheries to food security and livelihoods in the region is clear. The sector makes significant contributions to economic growth; however, the uncertain impacts of climate change and the rapid increase of non-communicable diseases remain a significant challenge for the region.

Pacific leaders continue to raise concerns about the uncertain impacts of climate change as climate models suggest that, over the longer term, some Pacific islands will become drier and others wetter. In the meantime, stronger periods of drought and wet weather, associated with El Niño cycles, are expected.

While undernutrition remains a problem in rural areas of Pacific island countries, changes in diets and lifestyles related to increasing incomes and urbanisation have led to Pacific island countries having some of the highest levels of obesity within the world, together with record levels of type 2 diabetes and heart disease. Moreover, as well as taking an enormous toll in terms of human wellbeing, the rising incidence of non-communicable diseases imposes a major burden on health services as well as the economy of Pacific countries.

Regional priorities

Australia's Pacific Step-up, foreshadowed in the Australian Government's 2017 Foreign Policy White Paper, committed Australia to a deepened engagement within the Pacific region. The Pacific Step-up emphasises the importance of the ongoing and diverse ACIAR program in the region, involving all research programs. Protecting the delicate natural resource base of the Pacific islands is a closely linked priority in ensuring the resilience of agrifood systems. Australia's response to the COVID-19 pandemic is a reflection of this deeper engagement with the region.

Prior to the COVID-19 pandemic, Pacific leaders had already emphasised the need for greater resilience within Pacific food and agriculture systems to counteract vulnerabilities and to strengthen food and nutritional security. While investing in agriculture has been widely recognised as one of the most effective ways of stimulating broad-based economic growth, increasing resilience rather than focusing primarily on increasing productivity has become a statement that underpins the entire agricultural development agenda in the Pacific. This focus has become even more important given the vulnerabilities in food systems of the region exposed by the COVID-19 pandemic.

SPC emphasises integrated approaches to increasing food systems resilience, including:

- deploying a diversity of species and products in trees, crops, livestock and aquaculture, which 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, which contributes to more sustainable and resilient agricultural landscapes
- diversifying crops, which contributes in various ways to greater food security, nutrition and health
- better managing coastal fisheries and aquaculture, which underpins healthier nutrition and more resilient livelihoods
- strengthening market chains for greater equity and inclusion, which contributes to improved and more resilient livelihoods.

Regionally, interdisciplinary approaches are required to reduce the vulnerability of the resource base, and to form climate-smart agricultural landscapes. 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. Achieving this requires numerous and well-coordinated innovations in technology and ways of working.

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

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

Strengthening regional biosecurity trade protocols and capacity to support the expansion 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. However, building and sustaining research capacity is a particularly difficult challenge, with many small island states having low populations. In response to that challenge, ACIAR is delivering targeted capacity-building initiatives for the region that is focused on both individuals and institutions.

2020–21 research program

ACIAR supports 35 projects in Pacific island countries, 25 of which are specific to one or more of these countries. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

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 has focused on opportunities for export in the established high-value markets of coffee, ginger, cocoa and coconut. Led by Professor Jen Carter of the University of the Sunshine Coast, the study reviewed policies, policy drivers and programs to understand how government and non-government groups can best deliver public–private partnerships in extension. The project will deliver its findings in early 2021.[1]

The Pacific Agribusiness Research and Development Initiative (PARDI) has been a significant program of work, starting in 2010, to promote sustainable livelihood outcomes for Pacific islands households through research and innovation, with the regional goal of catalysing and informing a more vibrant, diverse and viable agribusiness sector. Led by Marita Manley, Research Fellow at the Sunshine Coast, phase 2 studied the benefits to community livelihoods from successful agribusiness developments and ways to make economic benefits more inclusive and sustainable. In its final year, the initiative will identify constraints and bottlenecks in value and supply chains for primary products in Pacific island countries, and ways to overcome these. PARDI has linked several ACIAR projects with other Pacific donor programs, such as the Pacific Horticultural and Agricultural Market Access program and the Market Development Facility.[2]

Crops

Oil palm is a long-term and economically important perennial crop that is grown in large plantations and on smallholder farms in South-East Asia and Pacific island countries. The industry is threatened by basal stem rot, a disease caused by the fungus *Ganoderma boninense*, the incidence of which increases with each successive planting of the crop. A seven-year trial led by Professor Ian Godwin of the University of Queensland is starting to show differences in susceptibility to the disease between lines from 81 breeding families that have been genotyped. The 2020–21 activities will try to identify the genetic basis of resistance and select candidate germplasm for resistant planting material.[3]

The Pacific Agribusiness Research and Development Initiative (PARDI) is a significant program of work, now in its second phase, promoting sustainable livelihood outcomes for Pacific islands' households through research and innovation, with the regional goal of a more vibrant, diverse and viable agribusiness sector. Photo: Conor Ashleigh. ACIAR project: AGB/2014/057.

Fisheries

Mabé pearl jewellery and shell handicraft industries provide income opportunities for both coastal communities and women's social enterprises in the western Pacific. Past project activities have increased the technical skills of communities in the production of juvenile oysters and the farming of half-pearl (mabé) shell in Fiji and Tonga, and in the production of shell-based jewellery in Papua New Guinea. In the final year of two projects led by Professor Paul Southgate of the University of the Sunshine Coast, researchers will determine the economic and socioeconomic impacts of pearl- and shell-based livelihood development in Fiji, Tonga and Papua New Guinea[4], and its potential development in Tonga and Vietnam[5]. The development of greater technical capacity and a better understanding of gendered preferences and aspirations sets the basis for a new project in Fiji, Tonga, Papua New Guinea and Samoa. Country-specific interventions are required to ensure uniform mabé pearl jewellery/shellcraft production protocols and standards, improve capacity for sector governance within partner institutions and stakeholders, develop marketing strategies and ensure optimal benefits flow to both men and women across the value chains.[6]

A four-year project working with SPC supports implementation of the 2015 strategy, 'A new song for coastal fisheries – pathways to change'. The project, led by Professor Neil Andrew of the University of Wollongong, will continue its work to bring together communities and fisheries agencies in developing culturally suitable co-management practices that support sustainable coastal fisheries, and associated food security and wellbeing. The project aims to improve institutional capacity for scaling out community-based fisheries management. It is undertaking research to support policy reform, strengthen fisheries research and management capacity of institutions, and build community capacity to manage their fisheries resources.[7]

In Pacific island countries, the paradox of apparently abundant fish, vegetables and root crops but poor public health outcomes presents a significant challenge for policymakers. Professor Neil Andrew of the University of Wollongong leads a project that is continuing its analysis of the agrifood systems in the region using newly integrated data sources that allow mapping and analysis of what food is being produced, distributed, traded and sold, at multiple levels and across regional case studies. The results of the analysis will provide a basis to strengthen policy coherence and develop diagnostic tools to improve public health and agriculture/fisheries policy interventions and reporting. Ultimately the project aims to link agriculture and nutrition in policy decision-making and associated implementation strategies, to promote healthier and more diverse diets in the region.[8]

Fish-based livelihoods play a critical role in the economies of coastal communities in Solomon Islands and Timor-Leste, and participation in catching, processing or trading of fish is an important pathway to poverty reduction. A new project led by Dr Hampus Eriksson of the University of Wollongong will identify and support community-identified opportunities to enable innovation within the coastal fisheries post-harvest sector, with a focus on income benefits for both men and women. This new approach addresses the lack of success at the community level of large state-led investments in fisheries sector infrastructure and advanced technologies. It seeks to influence policy on how fisheries institutions can support remote communities through more appropriate infrastructure investments.[9]

Nutrition-sensitive agriculture ensures the sustainable production of nutritious, affordable and safe foods to meet the dietary requirements of local communities. In the Pacific region, there is an opportunity to transform seaweed fisheries into nutritionally sensitive food systems comprised of short supply chains, village-based processing, sustainable use of natural resources and marketing for families. Dr Libby Swanepoel of the University of the Sunshine Coast will start a small research activity in 2021 to develop and evaluate gender-inclusive activities in Kiribati and Samoa to broaden the focus of seaweed production from an export commodity to one that provides direct benefits to the health and wellbeing of communities.[10]

Forestry

Agroforestry systems are well suited to the Pacific region, and provide food, timber, non-wood forestry products and ecosystem services. However, returns from agroforestry trees take several to many years to be realised. Since 2015, Professor Helen Wallace of Griffith University has led a project to enhance the economic, social and environmental benefits of agroforestry in Fiji, Solomon Islands, Vanuatu and Papua New Guinea. Concluding in 2021, the project will complete training and facilitation activities enabling smallholders to participate in value-adding opportunities identified by the project. These include growing short-term crops in the agroforestry systems and processing and marketing products from the system, e.g. nuts, muesli and dried fruit.[11]

Appropriately designed and managed agroforestry systems are essential to improve the productivity and sustainability of much of the land in Fiji, which is relatively steep. Dr Tyron Venn of the University of Queensland leads a team that is developing extension material and economic models that will provide information to government agencies, landholder communities and individual farmers on system design and expected financial and economic performance. This information is expected to influence the development of the policy, institutional and governance frameworks needed to encourage adoption of new systems.[12]

Agroforestry is the key element supporting the 'Decade of reforestation' initiated by the Vanuatu Government. Dr Tony Page of the University of the Sunshine Coast leads a project to support 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. In addition to identifying genetically superior planting material and refining silvicultural techniques for increased productivity, in its final year the project will investigate the applicability and effectiveness of peer-mediated learning (farmer-led extension) in Vanuatu to overcome constraints to government and institutional extension services.[13]

Native sandalwood (*Santalum yasi*) is commercially valuable but the overexploitation of wild stands has resulted in fragmentation and local extinction of natural populations. Dr David Bush of CSIRO National Research Collections is producing a conservation and genetic improvement strategy and a roadmap for the sandalwood industry in Fiji and Tonga, based on improved understanding of the species gained by the project. With the establishment of conservation and seed production stands, and training of government agency staff in domestication and breeding of wild tree species, the project provides smallholder farmers and commercial investors with planting material that has improved genetic diversity and productivity.[14]

Renewal of the coconut estate is a priority for governments, development agencies and researchers throughout the Pacific. A new project in Fiji, led by Dr Rob McGavin of Queensland Department of Agriculture and Fisheries, strives to create market pull for senile coconut stems by converting them to high-value engineered wood products. A market for old palms will encourage coconut growers to remove them, reducing phytosanitary risk and incentivising new, more productive planting. The project will deliver and validate wood-processing technologies to transform coconut and other low-value forest resources into high-value products suitable for local and international markets. Project benefits will extend along the value chain, contributing to smallholder livelihoods and regional economic growth.[15]

Horticulture

Fruit industry development in the Pacific region enhances food security, rural economies and healthy eating initiatives. A four-year project in Fiji, Samoa and Tonga has worked towards these benefits by supporting the development of resilient value chains for five regionally-significant fruit crops: papaya, pineapple, mango, breadfruit and citrus. The project led by Professor Steven Underhill of the University of the Sunshine Coast concludes in 2020 with final capacity-building activities of private sector and government extension services, and increased engagement of smallholder farmers and communities in functional supply chains.[16] A new project will build on the community and school-based citrus orchards established in the first project using introduced improved planting stock. This project will develop viable and sustainable fruit value chains, enhance the local capacity to support these chains, and gain wider human health impacts by piloting school and community 'healthy eating' gardens.[17]

Vegetable production in the Pacific islands does not match local demand and vegetables are imported for high-value hospitality and food service markets. However, locally grown vegetable crops are susceptible to damage and destruction from extreme weather events, making supply to high-value markets unreliable. A project led by Professor Phil Brown of Central Queensland University will conclude its activities by evaluating and promoting the adoption of protected-cropping systems for improved productivity, climate resilience and higher quality. Value-chain analysis identifying strengths and weaknesses of different markets will be shared and training will be delivered to help farmers to successfully produce and sell into demanding markets.[18]

Sustainable intensification of fruit and vegetable crop production in the Pacific region requires integrated pest and disease management strategies. Dr Michael Furlong of the University of Queensland leads a project to address the threats posed to smallholder livelihoods and their communities by inappropriate use of pesticides, emerging pests and diseases and climate change. During 2020–21, the project will continue to assess pathways for the introduction and potential spread of insects that threaten the region, including fall armyworm, and test biological control strategies against target pests while developing integrated management approaches for selected crops. The project engages with farming communities through local plant health clinics to give growers easier access to expert advice. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.[19]

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. A project led by Mr Yan Diczbalis of the Queensland Department of Agriculture and Fisheries is strengthening cocoa value chains in Pacific island countries, as well as in Australia. In 2020–21, the project will undertake implementation activities to deliver market-oriented strategies for the exchange and dissemination of superior cocoa genetic resources, methods for intensifying production systems to meet market opportunities and systems for improved post-harvest handling.[20]

Coconuts contribute, directly or indirectly, to the livelihoods of coastal communities throughout the Pacific islands. Coconut enterprises in Pacific island countries face economic and environmental challenges; however, diversifying the range of products made from coconuts could offer a path to more-resilient livelihoods. Much of the coconut resource in the Pacific region is ageing or already senile and unproductive. A project led by Dr Carmel Pilotti 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, addressing threats posed by the rhinoceros beetle and Bogia coconut syndrome, and establishing and sustaining a platform for coordinating coconut research-for-development initiatives.[21]

Livestock Systems

Beekeeping offers many opportunities for smallholder farmers, based on strong domestic demand for honey and the potential to export honey and by-products. A project in Fiji and Papua New Guinea, led by Dr David Lloyd of Southern Cross University, aims to increase the productivity and profitability of beekeeping enterprises to complement smallholder incomes and promote an income-earning activity for women. During 2020–21, the project will continue to develop and test appropriate technical and business practices, improve disease control at community and government levels, and build the capacity of extension and development agencies to support beekeeping as a sustainable small enterprise.[22]

The productivity and profitability of sheep and goat production could be improved in Pacific island countries if production was better aligned with market requirements and smallholder farmers could more easily participate in value chains. Dr Frances Cowley of the University of New England leads a four-year project addressing the constraints to production efficiency for smallholder and semi-commercial production systems in Fiji and Samoa. During 2020–21, the project will continue assessments to understand farmer motivation to change practices and test methods to improve husbandry and feeding systems.[23] Supporting this project is a small research activity, led by Dr Rodd Dyer of the University of Queensland, to better understand the current policy environment and undertake cost-benefit analysis to develop recommendations for policy reform to support the Fiji and Samoan small ruminant sectors.[24]

Beekeeping offers many opportunities for smallholder farmers in the Pacific region, based on strong domestic demand for honey and the potential to export honey and by-products. Photo: Cooper Schouten. ACIAR project: LS/2014/042.

Increasing smallholder cattle productivity and income from cattle sales is a priority of the Vanuatu Government. Dr Simon Quigley of the University of Queensland leads a new project to integrate recommendations from previous and new research on cattle production and marketing. A set of best-bet climate-smart options will be formulated, from which smallholder farmers can develop their own cattle farming business plan using the Cattle Farm Planning Tool (a decision-tree framework). Local support agency staff will be trained to mentor farmers in the implementation of cattle farming plans.[25]

Globally, antimicrobial resistance is one of the most urgent emerging threats to human and animal health. It has broader impacts on animal production systems and food security. A previous study identified research, capability and capacity-development needs in Fiji to reduce antimicrobial resistance in humans, animals and the environment. As part of the One Health program (page 48), Dr Paul Debarro of CSIRO Health and Biosecurity leads a follow-on study to increase the knowledge of both antimicrobial resistance and antimicrobial use in Fiji, increase skills of laboratory staff in detecting resistance, increase awareness through project advocacy and campaigns, and make recommendations to update legislation and regulation to strengthen antimicrobial systems.[26]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[27]

Social Sciences

A climate-smart approach can guide adaptation strategies to focus on the long-term stresses and short-term shocks of climate change, which have notable impacts upon agricultural systems in Fiji and Tonga. A participatory action geographic information system will be used as a tool for multi-stakeholder engagement, local spatial knowledge sharing and enabling operational synergy at a landscape scale. With a vision of climate-smart landscapes, Dr Eleanor Bruce of the University of Sydney and Dr Bryan Boruff of the University of Western Australia will lead a project to develop a geospatial platform that will help with ongoing identification of climate impacts and appropriate adaptive responses. The project continues its work with community and high-level stakeholders, helping to improve communication between 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]

Also testing the transferability of an extension model is a new project in Fiji, where a Landcare approach using the Livelihood Improvement through Facilitator Extension (LIFE) model of improved extension will be applied. The LIFE model was developed through research in the Philippines, and rapidly enhanced agricultural livelihoods by improving both farmer-based learning networks and community social capital. This project, led by Dr Mary Johnson of RMIT University in partnership with Filipino collaborators, will make a substantial contribution to understanding the adaptability and adoptability of the Landcare–LIFE combination under different country contexts.[30]

A new soil information system will provide farmers, farm advisers and other stakeholders with spatially explicit guidance for sustainable soil management and increasing resilience to climate change. Photo: Conor Ashleigh. ACIAR project: SMCN/2016/111.

Soil and Land Management

Agriculture in the Pacific region is generally confined to smallholder farms and household gardens. Its sustainability is threatened by nutrient imbalances, erosion, declining soil fertility and carbon, and climate change. Across five Pacific island countries, 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.[31]

Water

Agricultural communities throughout the Pacific region are reliant on expensive imported fertilisers while nutrient-rich domestic wastewaters are discharged into groundwater and coastal lagoons, degrading water quality and risking human health. A small research activity, led by Dr Douglas Tait of Southern Cross University, will determine the feasibility of converting wastewater nutrients into organic fertilisers for crop production. The project will engage with communities and key stakeholders in Vanuatu and Tuvalu to determine need, appropriate scale, available waste streams, acceptability of products, challenges and the agricultural benefits of novel wastewater re-use and nutrient recovery facilities.[32]

Climate Change

ACIAR will add a new research program to its portfolio in September 2020 to focus and strengthen work towards our strategic objective that addresses climate variability and climate change.

Climate change is a major threat to Pacific island countries. Increasing vulnerabilities include food insecurity, health risks, out-migration, disaster management, political instability and economic uncertainty. Communities reliant on agriculture are particularly at risk, with increases in crop failure and pest and disease incursion, alongside shifting international trade balances and increasing reliance on imported foods. At the same time, industry and government strive to better understand greenhouse gas emissions from the agriculture sector and develop practical options for emissions reduction that could result in emissions credits.

Dr Michael Battaglia of CSIRO Agriculture and Food will bring together experts and stakeholders in a small research activity to assess current and required knowledge of long-term impacts of climate change in the Pacific region in the context of agricultural livelihoods and food security. The activity will inform a climate change adaptation R&D strategy for ACIAR, which is systemic in its intent but can be tailored to the needs of individual Pacific countries.[33]

A small research activity during 2020–21, led by Professor Tim Reeves of the University of Melbourne, will undertake a targeted assessment to explore opportunities for the implementation of conservation agriculture and sustainable intensification of smallholder farming systems as a transformational adaptation to climate change in Fiji and Samoa.[34]

Australia is a world leader in greenhouse gas mitigation research in agriculture. A new project provides the opportunity to transfer this knowledge to assist our partner countries to identify and quantify on-farm management options that reduce emissions from farming practices and help establish national greenhouse gas accounting systems to monitor, report and verify emissions reductions to the same high standard used by Australia. Led by Professor Peter Grace of Queensland University of Technology, and co-funded by New Zealand, the project team will work with government and research institutions in Fiji, Vietnam, Indonesia and Kenya to develop expertise to enable those institutions to better support their national governments in meeting current and future nationally determined emissions reduction commitments under the Paris Agreement.[35]

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See page 209 for contact details

ACIAR has added a Climate Change Research Program to its research portfolio to strengthen our work on addressing the challenges that climate variability and climate change present to food security and livelihoods. Photo: Sunayna Nandini.

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. Towards more profitable and sustainable pearl-industry based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
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 and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2018/155)
9. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
10. Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa (FIS/2019/125)
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. Coconut and other non-traditional forest resources for the manufacture of engineered wood products [Fiji] (FST/2019/128)
16. Enhanced fruit production and postharvest handling systems for Fiji, Samoa and Tonga (HORT/2014/077)
17. Enhanced fruit systems for Tonga, Samoa and Fiji (phase 2): community-based citrus production (HORT/2019/165)
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. 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)
21. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
22. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
23. Improving small ruminant production and supply in Fiji and Samoa (LS/2017/033)
24. Sectoral analysis and investment requirements for improving the Fiji and Samoa small ruminant sector (LS/2018/183)
25. Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu (LS/2018/185)
26. Enhancing the management of antimicrobial resistance in Fiji (One Health) (LS/2019/119)
27. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
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. Landcare—an agricultural extension and community development model at district and national scale in Fiji (SSS/2019/140)
31. Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal [Fiji, Kiribati, Samoa, Tonga, Tuvalu] (SMCN/2016/111)
32. Closing the loop between agriculture and wastewater discharge: a novel technique for turning wastewater into fertiliser in the Pacific [Kiribati, Tuvalu, Vanuatu] (WAC/2019/135)
33. Climate change and Pacific food systems: decision-making for transformational change (proof-of-concept) [Samoa, Solomon Islands] (WAC/2019/148)
34. Conservation agriculture and sustainable intensification of smallholder farming systems in Pacific countries as a pathway to transformational climate change adaptation and reducing greenhouse gas emissions [Fiji, Samoa] (CROP/2020/185)
35. Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa [Fiji, Indonesia, Kenya, Vietnam] (WAC/2019/150)

Papua New Guinea

A$8.4 million
Budgeted funding

24
Bilateral and regional research projects

3
Small projects and activities

Australia values its longstanding ties with Papua New Guinea, through a shared history and 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 an economic and strategic partnership. Despite huge resource potential and its close 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. The population is overwhelmingly poor, with 80% living in traditional rural communities.

The development challenges for young people are stark: an estimated 40% of children experience impaired growth and development (stunting), one in five are not enrolled in school and nearly half the population is under the age of 20.

An overview of Australia's aid program in Papua New Guinea is available on the DFAT website.

Papua New Guinea is the largest island nation in the Pacific region. It has about eight million people, of which 85% live in rural communities and rely heavily on subsistence agriculture for food and cash income.

The economy of Papua New Guinea has two main sectors. The agriculture, fisheries and forestry sector involves most of the country's labour force, but the mineral and energy extraction sector contributes significantly to the export earnings of the country.

Agriculture is the most significant economic activity for rural communities. Most of the food consumed by farmers is produced in subsistence farming systems, and cash income for farmers comes from the sale of crops such as coffee, cocoa, copra and palm oil.

ACIAR has worked in partnership with Papua New Guinea for more than 30 years and contributed to the improved productivity and sustainability of agriculture and food systems resilience.

The Papua New Guinea Government has emphasised that, by 2050, renewable sectors (agriculture, fisheries and forestry) are to account for 70% of GDP compared to the current 26%. The government is committed to prioritising the agriculture sector for further development, which includes the main export products of palm oil, coffee, cocoa and copra, as well as fisheries and timber products. However, the high cost of internet in Papua New Guinea remains a major challenge for farmers, and for agencies trying to disseminate information to farmers to improve their understanding of commodity production and markets.

Vision 2050 is a road map that provides overall direction for the long-term development strategy of Papua New Guinea. It was launched in 2010. Following on from Vision 2050, the government developed the Papua New Guinea Development Strategic Plan 2010–2030, which outlines development targets and how the country could achieve these targets by 2030.

In line with the United Nations' Sustainable Development Goals, Vision 2050 and the Development Strategic Plan 2010–2030, the government will develop four medium-term development plans, each for a five-year period. The government is currently implementing the third medium-term development plan (2018–2022), which envisages the future direction of the government, focuses on inclusive economic growth and addresses agriculture, fisheries, forestry, gender, environment and climate change.

While the development plan integrates the Sustainable Development Goals, a major focus remains the promotion of economic growth through sustainable agriculture, fisheries and forest management. The development plan specifically emphasises smallholder rubber production, smallholder and private sector partnerships to grow rice domestically, a commercially viable livestock industry and food security. The Papua New Guinea Government affirmed its commitment to food security by developing the Papua New Guinea Food Security Policy (2018–2027).

In response to the Papua New Guinea Government's development priorities, the Australian Government, through the Pacific Step-up, aims to further improve its support of Pacific island countries, including Papua New Guinea.

Over many years, ACIAR has supported projects in the Autonomous Region of Bougainville, a part of Papua New Guinea with a population of around 300,000. At a referendum held in November 2019, 97% of voters supported independence for the region. During 2020–21, the Autonomous Bougainville Government and the Government of Papua New Guinea will continue working on an independence package.

The COVID-19 pandemic is having a major impact on the food systems and economy of Papua New Guinea. ACIAR is supporting an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This will help identify areas of focus for our research collaboration with Papua New Guinea to increase food-systems resilience in the face of future shocks.

Country priorities

The Government of Papua New Guinea continues to develop its research focus on the agriculture, fisheries and forestry sectors. Specific aims and activities include:

- work in partnership and collaboration with current Australian Government–funded programs such as PHAMA Plus, Market Development Facility, Pacific Women Shaping Pacific Development and the Bougainville Partnership Program
- improve access to good information on agricultural production and land-use planning
- increase returns, particularly for women, through adaptation of new technologies and farming practices
- improve livelihoods of smallholders in marine and inland aquaculture
- improve community forestry and agroforestry systems
- improve germplasm quality for high-value tree species
- contribute to institutional capacity in research and organisational development
- influence policy through communication of research outcomes.

Development of institutional capacity in research in Papua New Guinea remains a crucial priority for the Australian Government. ACIAR will continue to support partner institutions to build the capacity of research personnel through long and short-term courses, informal networking events and hands-on experience working at the project level.

Through this process, ACIAR plays a very significant role in contributing to the human capital of Papua New Guinea to develop skills and knowledge in sustainable agriculture, fisheries and forestry. An excellent example is the flagship Transformative Agriculture and Enterprise Development program (TADEP), a multidisciplinary research program that aims to improve the livelihoods of rural men and women in Papua New Guinea through five component research projects. TADEP is co-funded by DFAT and ACIAR.

Gender equity will always be an integral part of all ACIAR projects in Papua New Guinea. According to FAO (2019), women make up more than 50% of the labour force engaged in agriculture and 35% of women are actively involved in economic agriculture. Women in rural communities play a significant role in subsistence food production, agricultural value chains and rural livelihoods. Women actively participate in grazing livestock, poultry, fish farming and sell surplus produce at local markets to generate income for their families' survival. Only a few women have ventured into small to medium enterprise activities.

Currently in Papua New Guinea, other key initiatives and programs working with ACIAR in the agriculture sector include the International Fund for Agriculture Development—Market Bilong Vilis Famas, which will undertake an independent assessment of the business model of galip nut processing and the World Bank PNG Agriculture Commercialisation Project, which continues its support of farmers in cocoa and coffee.

In 2021, ACIAR will work with key partners including the Papua New Guinea Research, Science and Technology Secretariat to develop a 10-year strategy for research collaboration with Papua New Guinea to align with the Pacific Island Strategy.

2020–21 research program

ACIAR supports 27 projects in Papua New Guinea, 20 of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

Oil palm is a long-term and economically important perennial crop that is grown in large plantations and on smallholder farms in South-East Asia and Pacific island countries. The industry is threatened by basal stem rot, a disease caused by the fungus *Ganoderma boninense*, the incidence of which increases with each successive planting of the crop. A seven-year trial led by Professor Ian Godwin of the University of Queensland is starting to show differences in susceptibility to the disease between lines from 81 breeding families that have been genotyped. The 2020–21 activities will try to identify the genetic basis of resistance and select candidate germplasm for resistant planting material.[1]

The identification and use of tolerant planting material is expected to offer an effective and durable solution for managing basal stem rot in oil palm plantations. In the meantime, a possible sanitation method could be the removal of infected logs. A small research activity led by Dr Agneszka Mudge of the University of Queensland will determine if this sanitation method could be supported by biochar production, using solutions tailored and appropriate for the oil palm industries in Papua New Guinea (and possibly Solomon Islands).[2]

Staff of the National Agriculture Research Institute's research station at Kerevat are cracking galip nuts. ACIAR is partnering with farmers, NARI and the private sector to commercialise galip nut production. Photo: Aaron English. ACIAR project: FST/2017/038.

Fisheries

Mabé pearl jewellery and shell handicraft industries provide income opportunities for both coastal communities and women's social enterprises in the western Pacific. Past project activities have increased the technical skills of communities in the production of juvenile oysters and the farming of half-pearl (mabé) shell in Fiji and Tonga, and in the production of shell-based jewellery in Papua New Guinea. In the final year of a project led by Professor Paul Southgate of the University of the Sunshine Coast, researchers will determine the economic and socioeconomic impacts of pearl- and shell-based livelihood development in Fiji, Tonga and Papua New Guinea[3], and its potential development in Tonga and Vietnam (in another ACIAR-supported project). The development of greater technical capacity and a better understanding of gendered preferences and aspirations sets the basis for a new project in Fiji, Tonga, Papua New Guinea and Samoa. Country-specific interventions are required to ensure uniform mabé pearl jewellery/shellcraft production protocols and standards, improve capacity for sector governance within partner institutions and stakeholders, develop marketing strategies and ensure optimal benefits flow to both men and women across the value chains.[4]

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 generally 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 will conclude in 2021, completing activities that support staff at the Nago Island Marine Research Facility in Kavieng to develop skills in hatchery production of sea cucumber and ornamental fish. This offers potential new income sources from export to international markets.[5]

Aquaculture and capture fisheries are increasingly important for providing livelihoods and meeting the nutritional needs of a rapidly growing population in Papua New Guinea. However, fisheries are challenged by overexploitation, lack of adoption of new technologies and, in some sectors, lack of information. The National Fisheries Authority of Papua New Guinea recognises the need to integrate livelihood goals into fisheries management plans and policies, and to revise and introduce new policies and strategies to sustainably manage aquaculture and capture fisheries. A new project led by Associate Professor Jesmond Sammut of the University of New South Wales will strengthen the research and management capability of the National Fisheries Authority by building core skills to translate scientific findings into policy and management plans for key fisheries sectors.[6]

For 10 years, ACIAR and the National Fisheries Authority of Papua New Guinea have co-invested in inland fish aquaculture R&D. Research has focused on increasing the production efficiency of small-scale fish (tilapia) ponds integrated into household gardens and helping the National Fisheries Authority improve the production capacity of fingerlings at its central hatchery. To aid dissemination and adoption of best-practice techniques and technologies, Associate Professor Jesmond Sammut of the University of New South Wales is leading a new five-year project to support the National Fisheries Authority to develop commercial tilapia businesses in peri-urban areas and reservoirs and to support villages in remote regions gain access to reliable and affordable farming inputs and culturally appropriate training services.[7]

Forestry

A project in the Eastern Highlands province, the Ramu and Markham valleys and the Lae region aims to improve rural livelihoods through family-focused community reforestation and eco-forestry in community-owned natural forests. Led by Mr Grahame Applegate of the University of the Sunshine Coast, the project aims to 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.[8]

Agroforestry systems are well suited to the Pacific region, and provide food, timber, non-wood forestry products and ecosystem services. However, returns from agroforestry trees take several to many years to be realised. Since 2015, Professor Helen Wallace of Griffith University has led a project to enhance the economic, social and environmental benefits of agroforestry in Fiji, Solomon Islands, Vanuatu and Papua New Guinea. Concluding in 2021, the project will complete training and facilitation activities enabling smallholders to participate in value-adding opportunities identified by the project. These include growing short-term crops in the agroforestry systems and processing and marketing products from the system, e.g. nuts, muesli and dried fruit.[9]

In East New Britain, an earlier project focused on value-added processing and developing markets for galip nuts, produced by the canarium or galip tree (*Canarium indicum*). The project, led by Professor Helen Wallace of Griffith University, 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 foster private sector–led development of the galip nut industry, increase value-chain efficiency and establish commercially viable business prospects for private sector investment.[10]

A newly constructed irrigation system on a farm in the Jiwaka province, which is part of research to improve sweetpotato production in the highlands of Papua New Guinea. Photo: Fresh Produce Development Authority. ACIAR project: HORT/2014/097.

Improved germplasm and smallholder-friendly silvicultural systems for teak (Papua New Guinea) and sandalwood (Papua New Guinea and Cape York Peninsula) were successfully developed in an earlier project led by Dr Tony Page of the University of the Sunshine Coast. A follow-on project starts in 2021 to scale out the smallholder forest estate to the point where supporting services like nurseries and contract harvesting can be sustained, leading to an increase in planted area, wood supply and smallholder incomes. Key questions in this research are around social and legal structures to facilitate planting on customary land to allow larger, more commercial woodlots.[11]

Horticulture

Sustainable intensification of fruit and vegetable crop production in the Pacific region requires integrated pest and disease management strategies. Dr Michael Furlong of the University of Queensland leads a project to address the threats posed to smallholder livelihoods and their communities by inappropriate use of pesticides, emerging pests and diseases and climate change. During 2020–21, the project will continue to assess pathways for the introduction and potential spread of insects that threaten the region, including fall armyworm, and test biological control strategies against target pests while developing integrated management approaches for selected crops. The project engages with farming communities through local plant health clinics to give growers easier access to expert advice. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.[12]

Cocoa production directly supports about two-thirds of the population of the Autonomous Region of Bougainville. Many cocoa farmers have formed cohesive communities with clear goals and objectives. Professor David Guest of the University of Sydney leads a project to improve the productivity, profitability and vitality of smallholder cocoa farming families and communities. In its final stages, the project will continue to foster and strengthen public and private sector partnerships, which is giving new enterprises access to premium markets.[13]

Also focused on increased production and profitability and enterprise development, a project in East Sepik, Madang, New Ireland and Simbu (formerly Chimbu) provinces works with communities and extension services to rejuvenate old, overgrown and low-yielding cocoa plantings. A project led by Dr Phil Keane of La Trobe University has helped smallholder farmers adopt new cocoa varieties and plant management methods. The final year of the project will see further development of the village-based extension services, other support services, such as microfinance, and R&D services.[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. During 2020–21, the project will promote the best-bet combinations of integrated pest and disease management methods, while continuing to evaluate the social and economic benefits of these methods and build research capacity.[15] This and other concluded projects provide technical support for a project led by Professor Phil Brown of Central Queensland University. Forming part of TADEP (page 64), the project is in its final year of developing and strengthening sustainable and market-oriented value chains for sweetpotato-based production systems in the Papua New Guinea highlands.[16]

Coconuts contribute, directly or indirectly, to the livelihoods of coastal communities throughout the Pacific region. Coconut enterprises in Pacific island countries face economic and environmental challenges; however, diversifying the range of products made from coconuts could offer a path to more-resilient livelihoods. Much of the coconut resource in the Pacific region is ageing or already senile and unproductive. A project led by Dr Carmel Pilotti 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, addressing threats posed by the rhinoceros beetle and Bogia coconut syndrome, and establishing and sustaining a platform for coordinating coconut research-for-development initiatives.[17]

Coffee is one of the most important crops in Papua New Guinea, providing employment for more than 2.5 million people and a major source of income for approximately 400,000 smallholder farmers, who produce 85% of the coffee. The most serious pest of coffee globally, the coffee berry borer, is a recent incursion to highland coffee production areas. The pest is a major threat to millions of rural families and their communities and poses a significant biosecurity threat to Australia. Dr Ian Newton of the Queensland Department of Agriculture and Fisheries leads a project to limit damage and introduce world best crop protection practices. During 2020–19, a review of local and global management strategies will continue. The review aims to determine a best-bet management package and identify research priorities, with the longer-term aim of finding long-term sustainable integrated pest-management solutions.[18]

Livestock Systems

Beekeeping offers many opportunities for smallholder farmers, based on strong domestic demand for honey and the potential to export honey and by-products. A project in Fiji and Papua New Guinea, led by Dr David Lloyd of Southern Cross University, aims to increase the productivity and profitability of beekeeping enterprises to complement smallholder incomes and promote an income-earning activity for women. During 2020–21, the project will continue to develop and test appropriate technical and business practices, improve disease control at community and government levels, and build the capacity of extension and development agencies to support beekeeping as a sustainable small enterprise.[19]

Two small research activities are underway in Papua New Guinea, as part of the Research for One Health Systems Strengthening program (page 48).

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 small research activity, led 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.[20]

Tuberculosis is a leading cause of death in Papua New Guinea, and a leading cause of death from infectious diseases worldwide. In addition to pulmonary tuberculosis, there is a high burden of suspected extra-pulmonary tuberculosis in the Pacific. This can be a sign that zoonotic and environmental strains of tuberculosis are also circulating, requiring different approaches to management and prevention. Dr Philipp Du Cross of the Burnet Institute is conducting a small research activity to determine the types of bacteria causing tuberculous lymphadenitis, with a particular focus on risk factors associated with exposure to animals. This will be done by assessing consenting patients with suspected tuberculous lymphadenitis.[21]

Social Sciences

The socioeconomic and cultural factors influencing smallholders' farming and livelihood systems, and their capacity to adapt and respond to stress on cocoa and oil palm production systems, were studied in a project led by Associate Professor Gina Koczberski of Curtin University of Technology. In its final year, the 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.[22]

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 aims to increase returns for labour, particularly for women. The project will use combinations of extension methods tested earlier in the project to facilitate the development and adoption of culturally acceptable and nutrient-efficient coffee–vegetable intercropping systems and develop a model for the use of a demucilager by farmer groups.[23]

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.[24]

The successful Family Farm Teams approach will be adapted and applied to develop the capacity of religious institutions in Papua New Guinea to work in a gender-inclusive way when engaging rural agricultural communities in smallholder farm development. The project led by Dr Josephine Caffery of the University of Canberra will also provide pathways for increasing youth involvement in family farm teams and sustainable farming futures.[25]

Soil and Land Management

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, health and productivity of cocoa plantations. The project is evaluating the influence of composts and crop diversification on soil and plant health and nutrient content in cocoa produced in cocoa farming systems, and is developing region-specific soil-management strategies for smallholdings.[26]

Papua New Guinea's Vision 2050 aspires to a vibrant, sustainable and profitable agriculture sector, and requires the contribution of agriculture to GDP to increase from 20% to 70%. A new project supports this by providing useful and targeted information about the natural resource base for better infrastructure, agriculture and forestry planning, development and management. Led by Mr Peter Wilson of CSIRO Agriculture and Food, the project will modernise the Papua New Guinea Resources Information Systems, which was developed by CSIRO with the support of ACIAR in the 1980s and 1990s. The project will deliver a technologically advanced, well-managed soil information system that adheres to FAIR (findable, accessible, interoperable, reusable) data principles and provides valuable information to key decision-makers and a range of stakeholders in agriculture and forestry sectors.[27]

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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 Island (CIM/2012/086)
2. Managing basal stem rot in oil palm by converting infected logs to biochar [Papua New Guinea] (CROP/2019/147)
3. Developing pearl industry-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Tonga] (FIS/2014/060)
4. Towards more profitable and sustainable pearl-industry based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
5. 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)
6. Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management (FIS/2018/151)
7. Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators (FIS/2018/154)
8. Enabling community forestry in Papua New Guinea (FST/2016/153)
9. 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)
10. Enhancing private sector-led development of the Canarium industry in Papua New Guinea – phase 2 (FST/2017/038)
11. Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia (FST/2018/178)
12. Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
13. Developing the cocoa value chain in Bougainville (HORT/2014/094)
14. Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea (HORT/2014/096)
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. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
18. Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia (HORT/2018/194)
19. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
20. A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (One Health) (LS/2018/213)
21. Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in three provinces in Papua New Guinea (One Health) (LS/2018/217)
22. Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea (ASEM/2014/054)
23. Improving livelihoods of smallholder coffee communities in Papua New Guinea (ASEM/2016/100)
24. Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea (ASEM/2017/026)
25. Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea (SSS/2018/137)
26. Optimising soil management and health in Papua New Guinea integrated cocoa farming systems (SMCN/2014/048)
27. Better soil information for improving Papua New Guinea's agricultural production and land use planning—building on PNGRIS and linking to the Pacific Regional Soil Partnership (SLAM/2019/106)

Timor-Leste

A$1.5 million
Budgeted funding

6
Bilateral and regional research projects

2
Small projects and activities

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 if it is 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, and experience an annual 'hungry season' from November to March. Despite significant gains, poverty levels remain high—particularly in rural areas, where most people live. Stunting rates are among the highest in the world. Australia's response to the COVID-19 pandemic places a clear priority on our near neighbours, especially the Pacific, Timor-Leste and Indonesia. In Timor-Leste, Australia has increased monitoring of food security and pricing issues to boost support to poor farmers amidst COVID-19 market downturns and supply chain interruptions.

An overview of Australia's aid program in Timor-Leste is available on the DFAT website.

Before the COVID-19 disruption, food systems in Timor-Leste were under stress from many directions, including seasonally recurring food shortages, input supply challenges, low productivity, pests and diseases and limited access to capital.

The coincidence of the COVID-19 pandemic and the incursion of African swine fever in 2020 has placed added challenges on Timor-Leste. In 2020, about 70% of the population lives in rural areas, where the great majority of people derive incomes from semi-subsistence and seasonal food cropping, mixed with small-scale animal husbandry and varying degrees of foraging for wild crops and game. Despite improvements in a range of essential services, there is a high prevalence of poverty (50% of people live on less than US$2 per day) and accompanying illiteracy, and infant stunting rates are among the highest in the world. The core problem facing most Timor-Leste rural households is their inability to generate reliable income from agriculture and thereby improve the living conditions and livelihood opportunities of their families. Reasons for constrained on-farm crop and animal production and productivity are complex and varied, including highly variable weather conditions affecting crop establishment and subsequent yields, infertile soils, limited availability of and access to agricultural inputs, low capital for investment, pests and insects causing crop losses pre- and post-harvest, labour constraints at critical times and limited market demand for agricultural products beyond local consumption. Lack of access to locally relevant and implementable science-based advice is also a key constraint.

Under the Timor-Leste Strategic Development Plan 2011–2030, the government notes that 'a thriving agriculture sector is needed to reduce poverty, provide food security and promote economic growth in rural areas and our nation as a whole'.

Country priorities

ACIAR is maintaining a program of research collaboration with Timor-Leste characterised by projects with a long-term view and a strong focus on capacity and partnership development. ACIAR does not have a formal agreement with Timor-Leste for research collaboration but aims to develop one in 2020–21. Discussions on future priorities will probably focus on opportunities in coastal fisheries, agroforestry, livestock (especially cattle and poultry) and cropping systems, as well as seeking opportunities for trilateral research collaboration with Indonesia. The COVID-19 pandemic is having a major impact on Timor-Leste food systems and the economy. ACIAR is supporting an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This will help identify areas of focus for our research collaboration with Papua New Guinea to increase food systems resilience in the face of future shocks.

Research is evaluating the nutritional value of fisheries to households and identifying the factors enabling or limiting the consumption of fish. Photo: Joctan Dos Reis Lopes. ACIAR project: FIS/2017/032.

2020–21 research program

ACIAR supports eight projects and programs in Timor-Leste, five of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops and Soil and Land Management

Moving from food security to improved nutrition and rural incomes is a priority for the government of Timor-Leste. Expansion of the government and construction sector in recent decades has created new markets for agricultural products and new opportunities for local farmers. A five-year project that started in 2016 has undertaken research to intensify farming systems sustainably, so that farmers can expand from subsistence to income-generating farming. During 2020–21, the project led by Professor William Erskine of the University of Western Australia will consolidate evaluations of diverse crop variety and management options. This will assist intensification of cropping systems and sustainable use of irrigation water, and support increased plantings of sandalwood with forage tree legumes as hosts.[1]

Fisheries

Globally, growing momentum for nutrition-sensitive agricultural policy and development assistance is yet to have any impact in the small-scale artisanal fishery sector. To address this, the role and contribution of fish to livelihoods and nutrition security must be supported by rigorous data and communicated at global, national and local scales. A project with a geographical focus of the eastern Lesser Sunda Islands, encompassing the independent nation of Timor-Leste and Nusa Tenggara Timur province of Indonesia, aims to identify the livelihood and nutrition benefits of fisheries and test nutrition-sensitive co-management systems for inshore fisheries. Led by Dr David Mills of the WorldFish Center, the project will evaluate the nutritional value of fisheries to households and identify the factors enabling or limiting the consumption of fish. It will highlight the potential of fish to reduce malnutrition, particularly during early childhood. Through a south–south collaboration, lessons learned for sustainable inshore management in Indonesia will be used to guide policy development in Timor-Leste that benefits poor households.[2]

Fish-based livelihoods play a critical role in the economies of coastal communities in Solomon Islands and Timor-Leste, and participation in catching, processing or trading of fish is an important pathway to poverty reduction. A new project led by Dr Hampus Eriksson of the University of Wollongong will identify and support community-identified opportunities to enable innovation within the coastal fisheries post-harvest sector, with a focus on income benefits for both men and women. This new approach addresses the lack of success at the community level of large state-led investments in fisheries sector infrastructure and advanced technologies. It seeks to influence policy on how fisheries institutions can support remote communities through more appropriate infrastructure investments.[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. However, 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, which will 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 small research activity 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 the best use of ACIAR resources.[5]

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 small research activity led by Dr Ben Polkinghorne of Australian National University is conducting pilot research to explore potential linkages between food-borne bacterial enteropathies and malnutrition in Timor-Leste.[6]

Underpinning the Timor-Leste Government's objective of supporting the transition from subsistence farming to commercial farming is the development of an effective veterinary service for livestock production sectors. A 15-month exploratory research activity, led by Dr Paul Hick of the University of Sydney, will help strengthen the passive animal disease surveillance system in Timor-Leste. This will be achieved through capacity-building exercises that span the detection and reporting of pig disease in the field to laboratory diagnostic workflows and reporting, using a case-study approach to the topical and important syndrome of mortality of young pigs.[7]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[8]

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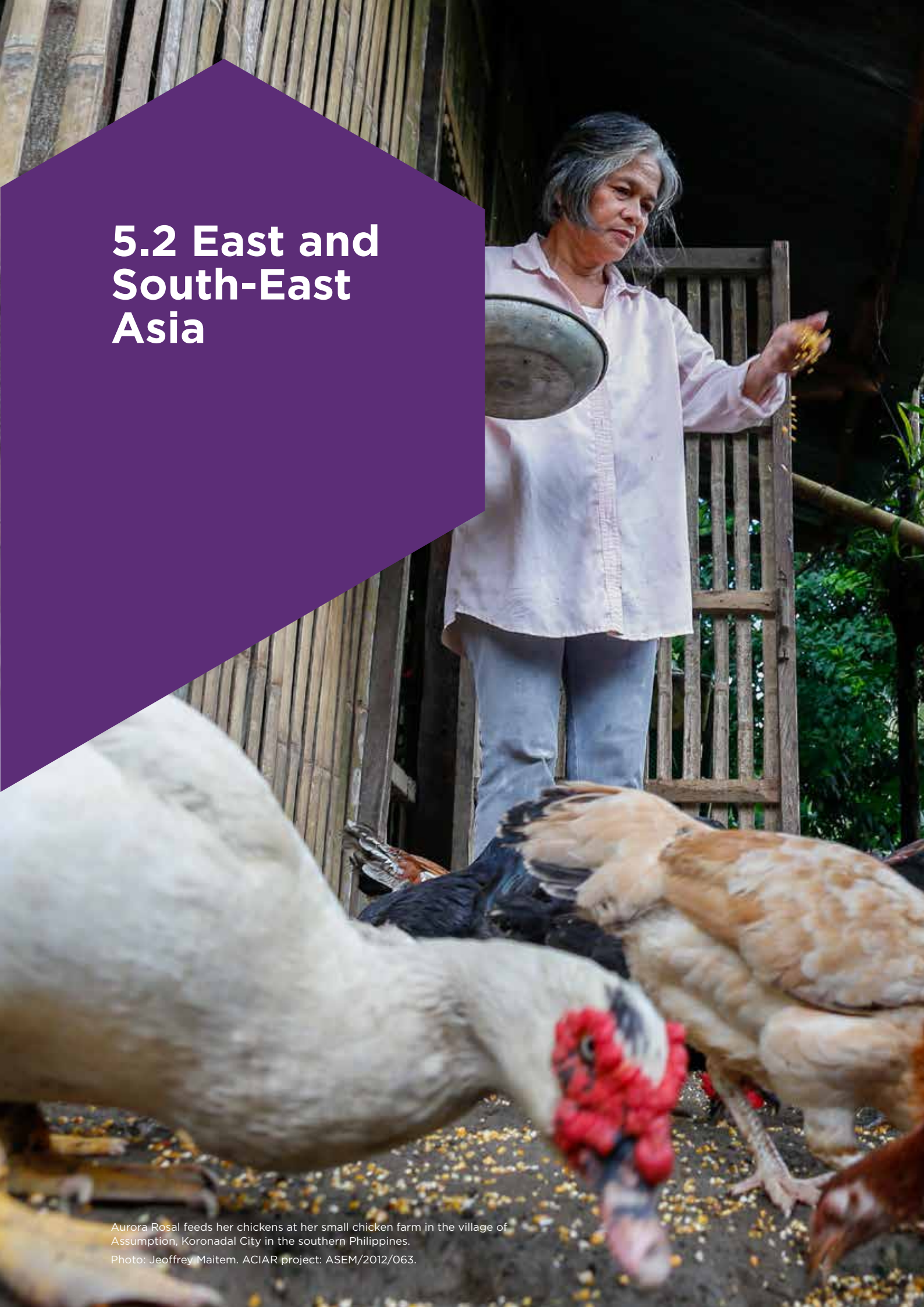
Current and proposed projects

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 [Indonesia, Timor-Leste] (FIS/2017/032)
3. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands [Solomon Islands, Timor-Leste] (FIS/2019/124)
4. Smallholder cattle enterprise development in Timor-Leste [Timor-Leste] (LPS/2014/038)
5. Evaluating the opportunities for smallholder livestock keepers in Timor-Leste [Timor-Leste] (LS/2017/035)
6. Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste [Timor-Leste] (LS/2018/184)
7. Improved animal health surveillance in Timor-Leste [Timor-Leste] (LS/2019/158)
8. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)

5.2 East and South-East Asia



Aurora Rosal feeds her chickens at her small chicken farm in the village of Assumption, Koronadal City in the southern Philippines.

Photo: Jeoffrey Maitem. ACIAR project: ASEM/2012/063.

East and South-East Asia

Regional summary

The culturally and ethnically diverse region of East and South-East Asia is the most populous in the world and an economic powerhouse. Ten of the 11 states of South-East Asia are members of the Association of Southeast Asian Nations (ASEAN) and engage closely in terms of trade and investment with East Asian countries such as China and South Korea.

For the past decade, the region has shown a sustained decline in the incidence of poverty and income inequality, along with improvements in the Human Development Index for countries in the region. The ASEAN economy has consistently outperformed the global economy. Growth of the region's GDP has remained close to 5.0% since 2011, while global GDP stayed below 4.0% over the same period.

ASEAN remains the fifth largest economy in the world, with a combined GDP of A$4.8 trillion in 2018. However, during 2019–20 the region experienced negative impacts from United States–China trade tensions. Based on the most recent Asian Development Bank data, ASEAN nations demonstrated less growth than anticipated (4.8%) leading in to 2020. Despite growing uncertainties in the global economy, ASEAN's total trade was A$4.5 trillion in 2018 and the region attracted A$250 billion of investment. Economic integration continues to contribute towards the region's emerging position as a global growth driver. In 2018, intra-ASEAN trade made up the largest share of ASEAN's total trade at 23.0%, and foreign direct investment inflows accounted for 15.9%.

Although agriculture only contributes around 105 of total ASEAN GDP, it is the main sector for employment in most member states, accounting for approximately one-third of total ASEAN employment. The development of the food, agriculture and forestry sector is vital to ensuring equitable and inclusive growth in the region.

Food security, food safety and better nutrition remain priority concerns for ASEAN and are included among the association's goals of agricultural cooperation. More recently, there is increasing support for women's economic empowerment, which has become a prominent approach to addressing gender gaps in economic spheres, including agriculture.

Investment in the agriculture sector is increasing in the region, growing from US$0.4 billion in 2010 to US$5.5 billion in 2018. South-East Asia is now the largest single focus of China's Belt and Road Initiative. Agriculture is also an important trade sector within some member states. For instance, Myanmar has the largest share of agricultural products in the country's total exports at 28.0% in 2018, followed by Indonesia (19.3%) and Laos (18.4%). The share of agricultural products in total imports in 2018 were highest in Myanmar (13.3%), followed by Laos (12.5%), Brunei Darussalam (12.3%) and the Philippines (11.6%).

Countries in the ACIAR East and South-East Asia region

- Cambodia
- China
- Indonesia
- Laos
- Mongolia
- Myanmar
- Philippines
- Thailand
- Vietnam

Drivers of regional collaboration

ASEAN has more than 50 years of experience on regional collaboration to address shared challenges and engage with trade and development partners, including Australia and China. More recently, regional collaboration has been marked by critical factors such as geopolitics and transboundary concerns.

Even though trade and investment are the major drivers of economic growth, development assistance is still a critical factor for development and regional cooperation for ASEAN nations. Recently, official development assistance (ODA) to ASEAN countries has increased, with the most prominent of these being China's Belt and Road Initiative. This initiative aims to integrate ASEAN and other Asian economies with China by financing extensive interconnecting infrastructure in the region. The ASEAN countries are now the single largest regional focus of the Belt and Road initiative.

Cross-border challenges such as plant and animal biosecurity remain prominent and also drive regional integration. In the Mekong Region alone, plant diseases have recently spread across borders, destroying crops of cassava (cassava mosaic disease and cassava witches' broom) and banana (*Fusarium* wilt).

In the midst of these plant diseases, the ASEAN region has experienced African swine fever, which has destroyed large populations of pigs, caused serious production losses and taken a tremendous economic toll on countries like Vietnam, the Philippines, Laos and Cambodia. During 2020–21, biosecurity will be an increased priority for ASEAN nations.

Shared concerns about imminent and increasing threats posed by climate change has resulted in ASEAN creating a 'framework of ASEAN community building, with strategies and actions to enhance regional and international cooperation in supporting adaptation'. In the field of agricultural research and development, regional cooperation plays a significant role, particularly in regard to increasing resilience and adaptation to climate change, natural disasters and other shocks.

The South-East Asia region is one of the most natural disaster-prone in the world, threatening food security and rural livelihoods. Natural disasters can cause economic consequences for the whole region, so disaster mitigation is a common interest among neighbouring countries. ASEAN leaders signed the ASEAN Declaration on One ASEAN One Response, which aims to increase the speed, scale and solidarity of disaster response in the region.

The rapid spread of COVID-19 in the region in 2020 has further driven the imperative for regional cooperation in health and trade. Australia's *Partnerships for Recovery: Australia's COVID-19 Development Response* notes:

> South-East Asian countries face crises on multiple fronts. Mega-cities in the region are particularly vulnerable to the spread of the disease. The International Monetary Fund predicts growth in Asia will stall in 2020, resulting in a recession far worse than the 1997–98 Asian Financial Crisis. A region characterised by rapid growth before the pandemic, and where Australia has been building economic and strategic partnerships, is facing a significant setback. Unemployment is rising. Government revenues are falling precipitously just as demands for expenditure on health and social protection programs are rising steeply. The already fragile social contract could be tested in a number of countries, with risks of political upheaval that could threaten regional stability.

In response to the COVID-19 pandemic, ACIAR is supporting an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This assessment is monitoring, documenting and analysing food systems vulnerabilities resulting from the COVID-19 crisis and their impacts on smallholder farmers. It will identify possible actions that could be taken by governments and other food systems stakeholders to increase food systems resilience in the face of future shocks. While the assessment includes the whole region, there is a particular focus on Indonesia and Philippines as case studies. This assessment may influence future ACIAR investments in the region.

ACIAR program in the region

The ACIAR program in East and South-East Asia remains the largest of the four regions in which ACIAR operates. It is characterised by strong bilateral collaboration based on robust national research systems, longstanding diplomatic connections and sustained development collaboration with Australia.

While the nature of ACIAR engagement within the region is strongly bilateral, there is a growing trend towards regional collaboration between countries facing shared challenges (as described in the previous section). This is consistent with the research partnerships under ASEAN, which acknowledge that collaboration among member states is a sensible path towards addressing common challenges in the region.

The ASEAN drive towards regional economic integration and connectivity will increase demand from individual countries and regional bodies for research support that harmonises approaches in some agricultural issues across countries, including biosecurity, food safety and climate resilience. ACIAR contributes to this by funding regional research collaboration and through its support and chairmanship of APAARI.

Among newer regional collaborations are efforts to identify efficient biosecurity risk-management systems in the region to respond to prominent outbreaks affecting plant and animal health. For example, Indonesia, the Philippines and Laos are all involved in regional research focusing on an integrated system to manage *Fusarium* wilt (Panama disease) in banana crops, with components of biosecurity and disease management. The uncontrolled transboundary exchanges of banana planting material (in vitro plants) led to a rapid spread of *Fusarium* Tropical Race 4, the strain affecting Cavendish bananas. The disease has made thousands of hectares of land unsuitable for Cavendish banana cultivation and negatively impacted rural livelihoods.

Another research collaboration focusing on plant biosecurity engages the whole of the Mekong Region (Cambodia, Laos, Myanmar, Thailand and Vietnam), and includes China. Cassava production in the Mekong Region is a commercial activity. The crop is cultivated to meet the rapidly growing regional and global demand for animal feed, starch-based products, ethanol and biofuel, and there is significant cross-border trade in planting and raw materials. Two serious diseases are spreading in the region through the movement of infected stems, with secondary infection via invertebrate vectors. The ACIAR project consists of a multipronged strategy involving breeding, surveillance, agronomy and seed systems interventions, coupled with engagement with government institutions and agribusiness.

Biosecurity is a significant cross-border challenge and drives regional collaboration. In the Mekong region, plant diseases such as cassava mosaic disease and cassava witches' broom have spread across borders, causing regional economical impact. An ACIAR-supported project in Cambodia, Laos, Myanmar and Vietnam works to establish sustainable solutions to cassava diseases. Photo: Majken Søgaard.
ACIAR project: AGB/2018/172.

The incursion of African swine fever to the region in 2019 has also provided a strong context for regional collaboration in One Health. An ACIAR regional research collaboration that involves Cambodia, Vietnam and Laos seeks to understand how veterinary service markets might be better managed and governed by agents of government interested in human health, in cooperation with agents interested in agriculture and animal health. In Indonesia, a new project focuses on sustainable agricultural development by addressing the direct association between agricultural activities and zoonotic malaria transmission. This work also aligns with the ACIAR strategic objectives of enhancing human nutrition and reducing risks to human health.

Trilateral collaboration and new partnership models are emerging for ACIAR in the East and South-East Asia region. Driving these new partnership models are greater capacities that can be achieved when resources are pooled. This is translating into substantial co-investment from partners such as China, Vietnam and the Philippines. While bilateral relationships remain the predominant model for development cooperation in the region, trilateral collaboration has increased with each partner country bringing in funds, expertise and other resources into joint initiatives.

Opportunities for trilateral research collaboration with Australia in the region 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. A serious biosecurity issue in the citrus industry (citrus greening disease) is being addressed through trilateral collaboration involving China, Indonesia and Australia. This collaboration is identifying management strategies to better protect the citrus industries in China and Indonesia, and helping the Australian citrus industry to be prepared in the event of an incursion.

During 2020–21, 100 ACIAR-supported projects will be active in the East and South-East Asia region (Table 5.2).

Research for One Health Systems Strengthening

One Health is an approach that recognises that the health of people, animals and the environment are interconnected. Approximately 75% of newly emerging infectious diseases are zoonoses (diseases that can transmit from animals to humans) that arise as a result of one or several factors that are anthropogenic, genetic, ecologic, socioeconomic and climatic in origin. Across the Indo-Pacific region, animal production systems are changing rapidly; however, local and regional capacity to diagnose, treat and control diseases is generally weak and under-resourced.

Projects in the Pacific region

- 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)
- Enhancing the management of antimicrobial resistance in Fiji (LS/2019/119)

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)
- Collaboration on One Health economic research for systems in Cambodia (LS/2019/118)

Table 5.2 **Current and proposed projects in the East and South-East Asia region, 2020–21**

Project title	Project code	Country
Agribusiness		
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	China, Pakistan
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	Indonesia
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	Bangladesh, China, Indonesia, Pakistan
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	Indonesia
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Vietnam
Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia	AGB/2012/078	Indonesia, Vietnam
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	Indonesia
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	Myanmar, Vietnam
Inclusive agriculture value chain financing	AGB/2016/163	Indonesia, Myanmar, Vietnam
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	AGB/2017/036	Indonesia, Vietnam
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	Philippines
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	Vietnam
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	AGB/2018/172	Cambodia, Laos, Myanmar, Vietnam
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam.	AGB/2018/175	Vietnam
Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines	AGB/2018/196	Philippines
Off-farm: strategic review and planning for 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	Vietnam
A theory of change for inclusive value chains in the Philippines	AGB/2019/100	Philippines
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	Vietnam
Market and opportunity analysis to guide market-led development of the Myanmar pulse sector	AGB/2019/154	Myanmar
Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam	AGB/2019/185	Vietnam
Philippines smallholder dairy: landscape analysis and research priorities	AGB/2020/120	Philippines
Agriculture for tourism – advancing a synergistic development pathway for both local agribusiness value chains and tourism in Bali, Indonesia	AGB/2020/121	Indonesia

Project title	Project code	Country
Crops		
Establishing the International Mungbean Improvement Network	CIM/2014/079	Bangladesh, India, Myanmar
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	Bangladesh, Myanmar, Pakistan
Plant health—a major challenge to achieving sustainable "green" agriculture in Myanmar	CROP/2019/103	Myanmar
International Mungbean Improvement Network – phase 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos	CROP/2019/145	Cambodia, Laos
Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC)	CROP/2020/144	Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	Cambodia
Fisheries		
Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar	FIS/2014/041	Laos, Myanmar
Restoring damaged coral reefs using mass coral larval reseeding	FIS/2014/063	Philippines
Improving seaweed production and processing opportunities in Indonesia	FIS/2015/038	Indonesia
Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	FIS/2015/046	Myanmar
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	Indonesia
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	Philippines, Vietnam
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	Tonga, Vietnam
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	Cambodia, Indonesia
Development of rice–fish systems in the Ayeyarwady Delta, Myanmar	FIS/2016/135	Myanmar
Assessing upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	Laos
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	Indonesia, Timor-Leste
Evaluating processes and outcomes in south-south research collaboration—finfish mariculture development in Cambodia through cooperation with Indonesia	FIS/2018/115	Cambodia, Indonesia
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Philippines
Translating fish passage research outcomes into policy and legislation across South-East Asia	FIS/2018/153	Cambodia, Indonesia, Laos, Myanmar
Regional networks for large-scale coral and fish habitat restoration in the Philippines	FIS/2019/123	Philippines
Forestry		
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	Indonesia
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	Indonesia
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	Indonesia
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	Laos

Project title	Project code	Country
Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam	FST/2016/152	Vietnam
Managing risk in South-East Asian forest biosecurity	FST/2018/179	Indonesia, Vietnam
Policy analysis for forest plantations in Laos and Vietnam	FST/2019/121	Laos, Vietnam
Scoping for a forest biosecurity network in South-East Asia	FST/2020/102	Cambodia, Laos, Vietnam
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	Laos
Building effective forest health and biosecurity networks in South-East Asia	FST/2020/123	Cambodia, Laos, Vietnam
Horticulture		
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	Regional
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	Indonesia, Philippines
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Philippines
Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards	HORT/2016/190	Cambodia, Philippines
An integrated management response to the spread of fusarium wilt of banana in South-East Asia	HORT/2018/192	Laos, Philippines
Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	Indonesia, China
Livestock Systems		
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	China, Mongolia
Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	Indonesia
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	Vietnam
Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos	LS/2014/055	Laos, Vietnam
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	Myanmar
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	Myanmar
Safe pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	Vietnam
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	Laos, Vietnam
Smallholder livestock futures in South-East Asia	LS/2018/107	Indonesia
Forages—taking stock and identifying research needs	LS/2018/186	Cambodia, Laos, Vietnam
Zoonotic malaria in Indonesia (One Health)	LS/2018/214	Indonesia
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (One Health)	LS/2019/116	Indonesia
Collaboration on One Health economic research for systems (One Health)	LS/2019/118	Cambodia
Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia	LS/2019/142	Cambodia, Myanmar, Vietnam
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia

Project title	Project code	Country
Soil and Land Management		
Land management of diverse rubber-based systems in the southern Philippines	SLAM/2017/040	Philippines
Mainstreaming research in Myanmar's agricultural and veterinary universities	SLAM/2017/041	Myanmar
Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact	SLAM/2018/127	Cambodia
Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam	SLAM/2018/144	Vietnam
Crop health and nutrient management of shallot–chilli–rice cropping systems in coastal Indonesia	SLAM/2018/145	Indonesia
Soil-based challenges for cropping in Shan State (nutrient acquisition)	SLAM/2018/190	Myanmar
Assessing and monitoring peatland restoration in Indonesia	SLAM/2020/118	Indonesia
State of land and water assessment framework	SLAM/2020/138	Philippines
Management practices for profitable crop–livestock systems for Cambodia and Laos	SMCN/2012/075	Cambodia, Laos
Improving maize-based farming systems on sloping lands in Vietnam and Laos	SMCN/2014/049	Laos, Vietnam
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Cambodia
Social Sciences		
Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines	ASEM/2012/063	Philippines
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	ASEM/2012/073	Laos
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	Cambodia
Action ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines	ASEM/2014/051	Philippines
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	ASEM/2014/053	Cambodia, Laos
Enhancing livelihoods through forest and landscape restoration	ASEM/2016/103	Philippines
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	Myanmar
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Vietnam
Next generation agricultural extension: social networks for practice change	SSS/2019/138	Cambodia
A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches	SSS/2019/186	Cambodia, Laos, Myanmar, Thailand, Vietnam
Policy impact in Laos: from research to practice	SSS/2020/142	Laos
Water		
Expanding opportunities to use groundwater for poverty alleviation and climate change adaptation in Laos	WAC/2018/167	Laos
Climate Change		
Emissions avoidance of soil carbon from lands undergoing practice change	WAC/2019/149	Indonesia
Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa	WAC/2019/150	Fiji, Indonesia, Kenya, Vietnam

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled during July 2020. Additional projects, not listed in this table, may be commissioned during 2020–21.

Cambodia

A$3.1 million
Budgeted funding

16
Bilateral and regional research projects

5
Small projects and activities

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 decline has slowed significantly.

The United Nations 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 the poverty line and are vulnerable to falling back into poverty if 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.

An overview of Australia's aid program in Cambodia is available on the DFAT website.

The Kingdom of Cambodia has more than 16 million people and accounts for 2% of the total population of the ASEAN region, placing it seventh (out of 10) among ASEAN member states. In 2018, Cambodia experienced accelerated growth of 7.5% but the economy is expected to register a return to its long-term potential of about 7% for 2019.

According to the World Bank, Cambodia was the fastest growing country in East Asia and was among the few countries that performed better than forecast in 2018. Exports are the mainstay of Cambodia's economy, buoyed by stronger external demand. Foreign direct investment inflows grew by 24.8%, reaching a record high of more than A$4.8 billion, or 13.4% of GDP, in 2018.

Around 80% of Cambodia's population lives in rural areas and agriculture remains the main source of employment. Poor rural households, which include most of the country's female-headed households, generally have little land and livestock, and food insecurity is a day-to-day reality. Weather conditions were again unfavourable in 2019–20, and agricultural production was affected by midseason drought and floods in some parts of the country.

Rice production, which accounts for about half of agricultural GDP, increased by 3.5%, which is lower than the 5.7% growth rate in 2017. Government statistics indicate that Cambodia's paddy rice surplus reached 5.8 million tonnes (or 3.7 million tonnes milled rice equivalent). Cambodia exports its rice surplus mostly in the form of paddy rice, while milled rice exports accounted for 0.6 million tonnes (or 16.7% of total surplus). In 2019, China increased its import quota for Cambodia's rice to 400,000 tonnes, up from 300,000 tonnes in 2018.

Given its location in the neighbourhood of agricultural commodity giants (Thailand and Vietnam), Cambodia has been strategically working towards quality differentiation (rice, pepper) while advancing agroprocessing capability (cashews, starch). At the same time, Cambodia is establishing its credentials for sustainability (green) and improved food safety (clean).

Women in Cambodia still dominate the secondary farm labour sector. Programs targeting women primarily focus on increasing their access to resources such as natural assets, technology, skills training and credit-based loans but to date have had little impact in promoting women's influence in changing land use and adoption of new technologies.

In 2019, the Ministry of Agriculture, Forestry and Fisheries launched its new five-year strategic plan (2019–2023) to develop farming and encourage the agriculture sector to modernise, become more competitive and more resilient to climate change, and to improve labour-intensive traditional practices. The strategic plan urges the creation of agricultural cooperatives and encourages farmers to cooperate with the private sector under an agricultural public–private partnership involving contract farming to ensure sufficient supplies, available markets and stable prices.

According to its new plan, the ministry will be supporting and encouraging the private sector, small- and medium-sized enterprises and development partners to invest in the processing sector to ensure sustainable, local productivity, stable markets and value-added products while promoting quality, sanitation and safety standards that comply with the demands of domestic and international markets. Around 95% of small- and medium-sized enterprises in Cambodia work directly with agriculture-related products.

Country priorities

In November 2019, ACIAR and the Royal Government of Cambodia (represented by the Ministry of Agriculture, Forestry and Fisheries) signed a new 10-year agreement on the strategic priorities of its research collaboration. From 2019 to 2029, ACIAR and its Cambodian partners will focus research collaborations on three domains to support the development of Cambodian agriculture:

- sustainable intensification and diversification of agriculture, focusing on non-rice crops in traditional crop-rice system and alternative cropping systems
- sustainable intensification of market-oriented smallholder livestock production systems
- sustainable intensification of freshwater aquaculture production systems for nutrition-rich species.

Research priorities over this time will also take into consideration cross-cutting themes that address challenges across the agriculture sector. These are:

- gender equity, women's empowerment and nutrition—these are particularly important in the context of increasing labour migration that impacts women and children in rural Cambodia, and high rates of stunting and poor nutrition among women and children
- climate variability mitigation and adaptation to climate change—taking into consideration climate variability and enabling climate-resilient farming systems
- food safety and standards.

2020–21 research program

ACIAR supports 21 projects in Cambodia, six of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. During 2020–21, the project will test and evaluate methods to slow the diseases, such as virus-free planting material and resistant varieties, and strengthen capacity and regional networks to reduce new pest and disease incursions.[1]

Crops

Sustainable intensification and diversification of rainfed lowland rice production systems in north-western Cambodia has the potential to increase farm income and business resilience. Associate Professor Daniel Tan of the University of Sydney leads a project that has evaluated innovative crop management practices and high-value crops. Machine planting of direct-seeded rice using high-quality seed at lower seed rates that potentially leads to better crop establishment and production. It will give growers confidence to purchase more expensive but high quality seed. During 2020–21, the project will investigate scale-up and scale-out models for adoption at village and community level. Capacity-building activities with farming communities and tertiary agricultural education institutions will ensure implementation of new technologies beyond the life of the project.[2]

New crop establishment practices for rice, such as broadcasting and direct seeding (manually or mechanically), offer significant labour savings for growers. However, changed field conditions compared with traditional crop establishment methods, such as transplanting, increase the risk of weed infestations. A project in Cambodia and Laos, led by Dr Jaquie Mitchell of the University of Queensland, aims to develop weed management packages to address labour constraints and reduce the reliance on chemical control. New weed control options will enable rice farmers to adopt and benefit from mechanisation and sustainable intensification and conservation agriculture practices. Appropriate weed management will also improve grain quality and enable growers to participate in high-value markets.[3]

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices. A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[4]

Fisheries

In Cambodia, about 80% of animal protein consumed originates from freshwater fisheries, which provides full-time and part-time work for about two million people. The development of finfish mariculture in Cambodia has been accelerated through a south–south cooperative research partnership with Indonesia in a project led by Professor Nicholas Paul and Dr Mike Rimmer of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. Experienced researchers from Indonesia are training Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health to support marine finfish aquaculture development in Cambodia.[5]

The south–south cooperative approach to capacity building in the previous project will be assessed for its potential application to other ACIAR projects. Professor Janelle Allison of the University of Tasmania is advising, facilitating and evaluating teaching approaches for achieving innovative and effective south–south collaboration, which could be applied to future agricultural research and development in the Indo-Pacific region and elsewhere.[6]

Across South-East Asia, as floodplains are developed for irrigation and river flows are regulated, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects showed that fishways, which facilitate passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University is leading a project to develop a platform for sound decision-making on fish passage construction programs across South-East Asia, a targeted capacity-building program to address institutional needs for the integration of fish passages into irrigation infrastructure and guidelines for the development of fish passage policy and legislation in Cambodia, Laos, Myanmar and Indonesia.[7]

Poultry enterprises are a way to improve the nutrition of poor households, while economically empowering women, who are the key custodians of poultry. Photo: Majken Søgaard.
ACIAR project: LS/2019/142.

Forestry

A small research activity, headed by Dr Madaline Healey of the University of the Sunshine Coast, has gathered data from the ASEAN countries around priorities, capacities and perceived risk pathways in forest biosecurity. Biosecurity investment and biosecurity regulations within the region are being reviewed. These analyses will underpin initiation of a regional biosecurity network that will link the agriculture and forestry agencies of the national partners.[8]

Regional collaboration in South-East Asia is urgently needed to create a unified network capable of a coordinated response to forest pest and disease incursions. This new project, led by Professor Simon Lawson of the University of the Sunshine Coast, aims to foster such a network. The project will reduce the risk of forest pest and disease incursion and the impacts of established pests and diseases by developing enhanced techniques and capacities in pest risk analysis, surveillance and diagnostics and deploying these through the regional network. Research results will support evidence-based forest biosecurity policy for the region.[9]

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 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 high quality and value, and provide smallholder growers with a better return on investment.[10]

Livestock Systems

A stocktake of the potential of forage production by smallholders in Cambodia, Laos and Vietnam is the focus of a small research activity that concludes in 2020. Dr Lava Yadav of the University of Queensland has analysed factors that contribute to, and constrain, forage production and development of related enterprises. The work will report on the constraints and opportunities for more effective uptake and use of forages and identify potential business models for more demand-driven development.[11]

Several issues threaten regional, and potentially global, health security in the Mekong region: economic growth rates among the fastest in the world, marked climate and other environmental disruptions, and shifting human and animal geographies. Recent zoonotic disease outbreaks such as severe acute respiratory syndrome (SARS) and highly pathogenic avian influenza can be attributed to these converging issues. A major constraint to the development of the One Health agenda in the region is the capacity of veterinary systems. Professor Barbara McPake of the Nossal Institute for Global Health leads a project to understand the opportunities to improve collaboration between human and animal health sectors and use incentive-based regulation to intervene in veterinary markets in Cambodia to improve health security outcomes.[12]

Poultry enterprises are increasingly recognised as a way to improve the nutrition of poor households, while economically empowering women, who are the key custodians of smallholder poultry. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute will lead a new project that aims to test and make available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project will also strengthen the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems to benefit smallholder farmers in their countries.[13]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[14]

Social Sciences

A farmer's decision to adopt an agricultural technology or practice involves technical, local, financial, contextual and personal factors. Efforts to encourage adoption must therefore prioritise analysis of problems and solutions. A project led by Dr Brian Cook of the University of Melbourne has determined problem-solution pathways, which emphasise the everyday influences that ultimately determine adoption. The project is investigating the adoption of technologies and best practice for sustainable cassava production in north-western Cambodia, where the crop area is rapidly expanding and market returns are high. During 2020–21, the project will measure the adoption of agricultural technologies to explain why some groups adopt, and identify barriers specific to poor, marginalised and female-headed households.[15]

A project starting in 2021, also led by Dr Brian Cook of the University of Melbourne, will build on the findings from the previous project that extension does not overcome powerful social relations, especially credit and debit. This project will analyse the social relations that farmers actively avoid, wish to avoid, or prefer and wish to strengthen as part of self-determined efforts to improve their livelihoods. Ultimately, the project seeks to define pathways that support farmers to benefit from agricultural development.[16]

With the rapid growth of the cassava sector across South-East Asia, various arrangements emerged between industry and smallholder farmers, varying from large estates to smallholder-oriented models. There are considerable opportunities to increase the productivity, profitability and sustainability of the cassava industry. Dr Dominic Smith of the University of Queensland will complete a project in 2020 that has identified the socioeconomic conditions under which improved technology and market booms in commercial crops, such as cassava, can be harnessed to increase the profitability and sustainability of smallholder farming systems.[17]

Previous ACIAR work reported that turning research into practical innovation is increasingly challenging in an era of accelerating global resource demand and climate change, creating an imperative for transformational change across farms, landscapes, markets, institutions and populations. A small research activity will generate practical insights and actionable recommendations for ACIAR programs to better integrate agricultural practice change and community engagement. Dr Mary Johnson of RMIT University will lead a literature study from the Mekong region, comparing and contrasting public health promotion approaches and agricultural extension to find practical lessons and areas for cross-disciplinary learning and innovation. A diagnostic framework and supporting resources will be produced for use by ACIAR to assess project proposals to ensure that agricultural practice change and community engagement are at, or redefining, the cutting edge of agricultural extension.[18]

Soil and Land Management

Practices to increase the overall productivity of crop–livestock systems in rice-growing areas of Cambodia and Laos were investigated in a project led by Dr Matthew Denton of the University of Adelaide. The project will report on soil and water management practices to improve sustainability, 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.[19]

Continued expansion of cultivation into unused or degraded land has been recognised as environmentally unsustainable by the Royal Government of Cambodia. Sustainable intensification, improved yields and diversification of cropping is a priority in areas where upland farming is being developed. A project led by Dr Wendy Vance of Murdoch University focuses on understanding indigenous soil knowledge and suitable land use to determine site-specific soil management. The project concludes in 2021 with the delivery of simple tools to help farmers identify soil types and constraints, and soil data to be added to the Cambodian Agronomic Soils Classification system and FAO World Reference Base for Soil Resources.[20]

A small research activity will consolidate findings from ACIAR investments in sustainable intensification of agriculture in Cambodia at the program and cross-program level. Dr Davina Boyd of Murdoch University leads the project that will produce a synthesis of the major insights from ACIAR investment in sustainable intensification in Cambodia, and facilitate multidisciplinary cross-project research and capacity-building activities that build on, develop or combine project insights, tools and approaches relating to sustainable intensification of agriculture.[21]

Regional Manager, East and South-East Asia
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See page 209 for contact details

ACIAR supports research to enable farmers to grow profitable crops with less water. Cambodian rice farmer, Phoun Phall, discusses his experience of growing forages instead of rice on his land, with Lim Vanndy from CARDI. Photo: Majken Søgaard.
ACIAR project: SMCN/2012/075.

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 Northwest Cambodia (CSE/2015/044)
3. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
4. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
5. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
6. Evaluating processes and outcomes in south-south research collaboration—finfish mariculture development in Cambodia through cooperation with Indonesia (FIS/2018/115)
7. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos, Myanmar] (FIS/2018/153)
8. Scoping for a forest biosecurity network in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/102)
9. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/123)
10. Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (HORT/2016/190)
11. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
12. Collaboration on One Health economic research for systems (One Health) [Cambodia] (LS/2019/118)
13. Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
14. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Ethiopia, Indonesia, Laos, Myanmar, Pakistan, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
15. Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia (ASEM/2013/003)
16. Next generation agricultural extension: social networks for practice change [Cambodia] (SSS/2019/138)
17. Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos (ASEM/2014/053)
18. A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches [Australia, Cambodia, Laos, Myanmar, Thailand, Vietnam] (SSS/2019/186)
19. Management practices for profitable crop–livestock systems for Cambodia and Laos (SMCN/2012/075)
20. Land suitability assessment and site-specific soil management for Cambodian uplands (SMCN/2016/237)
21. Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact (SLAM/2018/127)

China

A$0.2 million
Budgeted funding

4
Bilateral and regional research projects

The Australia–China bilateral relationship is based on strong economic and trade complementarities, a comprehensive program of high-level visits and wide-ranging cooperation. In 2014, the Australian Prime Minister and Chinese President agreed to describe the relationship as a 'comprehensive strategic partnership'. Australia has largely phased out bilateral aid to China. In recognition of China's growing role as an aid donor, Australia and China signed a memorandum of understanding on development cooperation in 2013, which was renewed in 2017. The memorandum of understanding facilitates cooperation in shared development objectives on issues of regional or global importance, such as the first project, which targeted the management of malaria in Papua New Guinea.

An overview of Australia's relationship with China is available on the DFAT website.

In early 2020, China reaffirmed that the development of agriculture, rural areas and farmers' issues remained at the very top of China's domestic priorities for the seventeenth consecutive year.

This first policy statement for the year emphasised a focus on the dual tasks of fighting poverty and strengthening areas of weakness in relation to agriculture, rural areas and farmers. In particular, China will focus on improving infrastructure and public services in rural areas, ensuring supplies of key agricultural products, promoting an increase in farmers' income and strengthening grassroots governance in rural areas. Even though the COVID-19 pandemic has impacted all sectors of the economy, the Chinese Government has reaffirmed its goal of eradicating absolute poverty by the end of 2020.

Soil degradation, excessive use of groundwater and soil contamination are among the major issues in the main grain-production regions, especially in north-eastern China. To address these problems, the Ministry of Agriculture and Rural Affairs and the Ministry of Finance jointly released the Black Soil Conservation Tillage Action Plan in north-eastern China 2020–2025 in March 2020. The plan announced that the total area adopting conservation tillage in north-eastern China will reach 140 million mu (93 million hectares) in north-eastern China by the end of 2025. According to the plan, the government will support the development of high-performance conservation agriculture machinery, while expert groups at the ministry and provincial levels will be established to provide technical guidance. ACIAR invested in two conservation tillage projects between 1992 and 2003, and with government support the technology now has been widely adopted in China.

In light of substantial achievements by China in the development of its society and economy, changes are in place to foster a relationship between ACIAR and China that is substantially or totally focused on trilateral collaboration.

Country priorities

In August 2019, ACIAR signed a memorandum of understanding with the Chinese Academy of Tropical Agricultural Sciences (CATAS). CATAS is China's national institution for tropical agricultural research, which employs nearly 4,000 scientists across a range of fields and disciplines. The memorandum of understanding will see greater collaboration between ACIAR and CATAS in contributing to the United Nations' Sustainable Development Goals through brokering trilateral partnerships across South-East Asia and the Pacific region.

A detailed study of horticultural markets in China is part of a broader project to design practical horticulture marketing policy reforms in Pakistan. Photo: ACIAR. ACIAR project: ADP/2014/043.

Fusarium wilt (Panama disease) has affected banana crops in many countries in the world and is a potential theme for trilateral collaboration between Australia, China and another partner country. CATAS, together with Guangdong Academy of Agricultural Sciences and the International Tropical Fruits Network, is planning to host an international workshop on *Fusarium* wilt in late 2020 or early 2021. At this time, ACIAR will take the opportunity to discuss potential cooperation on *Fusarium* wilt with CATAS and Guangdong Academy of Agricultural Sciences.

During 2020–21, ACIAR will continue developing opportunities for trilateral collaboration with other Chinese research organisations, including the Chinese Academy of Agricultural Sciences (CAAS). This includes joint work with Indonesia and the CAAS Citrus Research Institute on citrus greening disease, which will bring China's expertise in the management of the disease to the Indonesian context. We are also developing opportunities for trilateral collaboration with Pakistan on citrus and forages.

ACIAR is also exploring opportunities to work with the CAAS Center of International Agricultural Research, which in 2019 hosted a number of events including an international workshop on women's empowerment that attracted many participants from Asia. These events aligned well with the ACIAR gender equity policy and strategy, and we believe great impacts will be delivered if we can work together in this field. In 2020, ACIAR will seek to develop a collaborative arrangement with the CAAS Center of International Agricultural Research.

2020–21 research program

ACIAR supports four projects in China, all of which 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 China. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

The China–Pakistan Economic Corridor will provide Pakistan with preferential access to the world's fastest growing horticulture market. Understanding this market and China's experience in market reform is valuable for increasing growth, employment and productivity in Pakistan's horticultural markets. A project led by Professor Jeffrey LaFrance of Monash University has undertaken a detailed study of horticultural markets in China as part of a broader project to design practical horticulture marketing policy reforms in Pakistan. This will help improve producer and consumer welfare, with attention to gender and poverty dimensions. The study finishes in 2020, and its outputs will support the development of commodity market models and provide an analysis of domestic and export market potential.[1]

Success in rural transformation is not only measured by income growth of the rural population, but also by the degree of inclusiveness in society. A 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 in order to provide better policy advice to underpin the success of transformation. In 2020–21, the project will select study regions and collect data to understand the components of success.[2]

Horticulture

Huánglóngbìng, or citrus greening disease, is a destructive bacterial disease of citrus. It is spread mainly by the Asian citrus psyllid and infected propagation material. All commercially cultivated citrus varieties are susceptible to the disease and currently there is no cure. Effective management is considered the largest challenge ever faced by citrus industries worldwide. A new project led by Dr Jianhua Mo of the NSW Department of Primary Industries will leverage international expertise to tackle the deficiencies in current huánglóngbìng management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huánglóngbìng and the Asian citrus psyllid in Indonesia and China, and increase the preparedness of the Australian citrus industry for an incursion of both the disease and the vector.[3]

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, seeks to address concerns over the condition of these grasslands and the livelihoods of herders in China and Mongolia. The project will conclude at the end of 2020. Having identified the incentives that will drive improved management of grassland grazing systems in previous years, the project will deliver a suite of incentive-based policies that are designed to improve grassland management practices and pastoral livestock systems, for the consideration of stakeholders.[4]

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See page 209 for contact details

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. Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)
4. Strengthening incentives for improved grassland management in China and Mongolia (ADP/2015/107)

Indonesia

A$6.5 million
Budgeted funding

24
Bilateral and regional research projects

7
Small projects and activities

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 poverty line of $3.20 (PPP) per day. 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.

An overview of Australia's aid program in Indonesia is available on the DFAT website.

With a population of 270 million people, Indonesia is the world's fourth most populous nation, the world's tenth largest economy and a member of the G20. Indonesia has significantly reduced its level of poverty to 9.4% in 2019. By maintaining political stability, the country is now a middle-income country. Indonesia is on track to become the world's sixth largest economy by 2030.

Indonesia is in the final stage of a 20-year economic development plan (2005–25). The plan is segmented into five-year medium-term plans, called the Rencana Pembangunan Jangka Menengah Nasional, with different development priorities in each phase. The current plan—the last phase of the long-term plan—focuses on infrastructure development, human resource development, ease of investment, bureaucratic reform and better-targeted spending of the national budget toward health care and education.

Of particular focus for ACIAR is the strong encouragement from Indonesia to support deep functional capacity building for both individuals and institutions. The agriculture sector contributed approximately 13% to GDP in 2019 but it employs around one-third of the workforce and remains a vital source of income for rural households. Despite considerable challenges, Indonesia's large areas of arable land and extensive marine resources, combined with a thriving tech innovation ecosystem, offer significant potential for long-term, value-added expansion.

Indonesia's large and distributed agricultural research system, including the provincial Institutes for Assessment of Agricultural Technologies, is vital for the development of the agriculture sector and its contribution to the country's economy. The research system is complex. A new agency, Badan Riset dan Inovasi Nasional (National Research and Innovation Agency), has been established. It falls under the authority of the Ministry of Research and Technology and aims to amalgamate basic research activities previously conducted by several ministries. Consequently, the landscape of Indonesia's national agricultural research system will change substantially and the model for ACIAR partnerships in Indonesia will require significant calibration or wholesale adjustment in the near future, when the changes in the Indonesian national research system are fully established and the consequences for collaboration become clear.

Country priorities

Feeding a nation, especially in the context of the COVID-19 pandemic, has been reasserted as a critical priority for the Government of Indonesia. Under the second term of President Joko Widodo's administration (2019–24), agriculture has attained a higher strategic position, with line agencies tasked to achieve an advanced, modern and independent agricultural system. This has strong implications for ACIAR, as it is the first major reorientation of agricultural research priorities for a decade. Short- and medium-term priorities of the government include:

- establishing the Kostra Tani (strategic command of agriculture development) through human resources development (vocational education and training) and the development of an Agriculture War Room—a single and integrated data system at district level
- strengthening agricultural financing facilities, infrastructure and mechanisation
- improving corporate-based food crop production
- strengthening the competitiveness of horticultural zones
- improving production, value-add and competitiveness of estate crops (especially export-oriented commodities such as cocoa, coffee, rubber, palm oil and tea)
- improving population, productivity and genetic quality of livestock (including poultry)
- improving seed systems innovation and technology
- alleviating poverty through family farming, reducing stunting and food diversification
- enhancing food distribution and price stability on staple crops (rice, maize, soybeans, as well as sugar and beef)
- strengthening biosecurity and quarantine.

In addition to strengthening human resources across all sectors, the Government of Indonesia also has a vision to improve marine and fisheries infrastructure, including fishing ports. This involves strengthening fisheries aquaculture; developing integrated fisheries centres, cold chains and processing facilities; modernising fish markets; and rehabilitating coastal zones.

Cross-cutting priorities between agriculture and forestry sectors include:

- reforming agrarian and community forestry
- improving water quantity, quality and accessibility in relation to forest management, conservation and its ecosystems (including peatland restoration and waste management).

During 2020–21, there will be continued focus and participation on regional and trilateral collaboration. Regional research partnerships with the Philippines, Laos, Cambodia, Timor-Leste and Pakistan and trilateral collaboration with Australia and China provide opportunities to tackle shared challenges. These include developing policy and legislation for fish passages, rural regional transformation, an integrated management response to *Fusarium* wilt in bananas, and the control and prevention of citrus greening disease. There also is an emerging opportunity for trilateral collaboration with Pacific island countries in the aquaculture sector, as part of south–south cooperation.

Aligning with Australian and Indonesian priorities, ACIAR has facilitated a new research collaboration focusing on human health in Indonesia during 2020. It is a new partnership with leading research institutions, such as the Eijkman Institute of Molecular Biology, the University of Sumatera Utara and the University of Gajahmada, focusing on zoonotic malaria in Indonesia.

The COVID-19 pandemic is having a major impact on the food systems and economy of Indonesia. ACIAR is supporting an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19, which will help identify areas of focus for our research collaboration with Indonesia to increase food systems resilience in the face of future shocks.

Securing the future of coconut

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 decline from pest and disease, 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, particularly in the Asia-Pacific region.

During 2020–21, ACIAR, DFAT and the International Coconut Community will continue their collaboration to reinvigorate and sustain the Coconut Genetic Resources Network (COGENT). The program will focus on better coconut science, through a global coconut strategy to address the challenges outlined above. The program will work with other organisations to ensure a viable COGENT secretariat to safeguard coconut genetic resources and better address disease threats.

The network is active throughout the Asia-Pacific region and led by Dr Jelfina Alouw, Executive Director of the International Coconut Community, who is based in Jakarta, Indonesia.

ACIAR project GP/2018/193

2020–21 research program

ACIAR supports 31 projects in Indonesia, 16 of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Success in rural transformation is not only measured by income growth of the rural population, but also by the degree of inclusiveness in society. A 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 in order to provide better policy advice to underpin the success of transformation. In 2020–21, the project will select study regions and collect data to understand the components of success.[1]

In Indonesia, some 48 million people live in and around forest boundaries, and most rely on upland landscapes for their livelihoods and economic development. Existing policies and land allocation procedures accelerate agricultural expansion into forested catchments, which is reducing agricultural productivity and ecosystem services and leading to increased poverty and food insecurity. Based on analysis of existing policies and procedures, Professor Randy Stringer of the University of Adelaide is leading a project that will provide information and data for land use planning by local and national government, which enhances socioeconomic wellbeing and environmental outcomes.[2]

Coffee and cocoa are Indonesia's third and fourth most important sources of agricultural export earnings. Smallholder farmers are the main producers of these crops, with around two million households involved. While many value-chain approaches to development have been applied to the industry, there has been little research on the effectiveness of these approaches for improving rural livelihoods, achieving broader development goals and encouraging sustainability. A project led by Dr Jeff Neilson of the University of Sydney will report on 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 throughout South-East Asia 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. The project finishes in 2020 with the delivery of policy recommendations and the development of learning alliances.[4]

Domestic demand for milk in Indonesia significantly outstrips supply and growth of the domestic dairy sector. Until recently, most production occurred on Java; however, the Government of Indonesia has identified 12 additional provinces for dairy development. Dr Wendy Umberger of the University of Adelaide leads a four-year project that has conducted a comprehensive analysis of the dairy sector in west Java and north Sumatra. In its final year, the project will encourage development, policy dialogue and industry advocacy to improve the research capacity of lead agencies, and identify profitable management practices and extension models to enhance adoption of technologies and increase on-farm profitability.[5]

Smallholder farmers are the main producers of coffee and cocoa in Indonesia. An ACIAR-supported project is investigating the effectiveness of value-chain development to improve livelihoods. ACIAR project: AGB/2010/099.

ACIAR is supporting a project that is encouraging the development of the dairy sector in west Java and north Sumatra.
Photo: University of Adelaide. ACIAR project: AGB/2012/099.

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. Based on evaluation of agricultural value-chain financing models, the project will work with project partners to design and implement innovative and inclusive models.[6]

A small research activity, led by Dr Chris Chilcott of CSIRO Land and Water, evaluated opportunities to reduce logistics costs to small-scale farmers to 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]

The rapid growth of tourism in Bali and consequent demand for large quantities of safe, high-quality food are not matched by capacity and capability of local agricultural production and agribusiness. This threatens the social and natural values of the island. Additionally, the unprecedented impact of COVID-19 on agriculture, tourism and the local economy demonstrates the urgent need for a measured and collaborative agribusiness growth plan. Mr Jeremy Badgery-Parker of Primary Principles will conduct a small research activity to prepare a strategic plan to guide engagement and investment in collaborative agribusiness value chains that support livelihoods and reliably and sustainably deliver safe, high-quality products to target markets.[8]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through an ACIAR-supported project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development work in Bangladesh, India, Myanmar and Australia. Phase 2 of the network commences in July 2020, continuing variety development for another five years and extending the network to Kenya and Indonesia, providing access to new genetic material and improved cropping options for smallholder farmers in eastern Africa and South-East Asia.[9]

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices. A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[10]

Fisheries

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. Employing a whole-of-value-chain approach, Associate Professor Nicholas Paul of the University of the Sunshine Coast leads a project that aims to provide a scientific basis to transform and modernise the seaweed industry. The project concludes in 2021 and will consolidate research to improve the quality of seaweeds produced at the farm level and identify opportunities to create innovative products from seaweeds and processing waste streams.[11]

Indonesia is the world's largest producer of tuna. 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.[12]

In Cambodia, about 80% of animal protein consumed originates from freshwater fisheries, which provides full-time and part-time work for about two million people. The development of finfish mariculture in Cambodia has been accelerated through a south–south cooperative research partnership with Indonesia in a project led by Professor Nicholas Paul and Dr Mike Rimmer of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. Experienced researchers from Indonesia are training Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health to support marine finfish aquaculture development in Cambodia.[13]

The south–south cooperative approach to capacity building in the previous project will be assessed for its potential application to other ACIAR projects. Professor Janelle Allison of the University of Tasmania is advising, facilitating and evaluating teaching approaches for achieving innovative and effective south–south collaboration, which could be applied to future agricultural research and development in the Indo-Pacific region and elsewhere.[14]

Globally, growing momentum for nutrition-sensitive agricultural policy and development assistance is yet to have any impact in the small-scale artisanal fishery sector. To address this, the role and contribution of fish to livelihoods and nutrition security must be supported by rigorous data and communicated at global, national and local scales. A project with a geographical focus of the eastern Lesser Sunda Islands, encompassing the independent nation of Timor-Leste and Nusa Tenggara Timur province of Indonesia, aims to identify the livelihood and nutrition benefits of fisheries and test nutrition-sensitive co-management systems for inshore fisheries. Led by Dr David Mills of the WorldFish Center, the project will evaluate the nutritional value of fisheries to households and identify the factors enabling or limiting the consumption of fish. It will highlight the potential of fish to reduce malnutrition, particularly during early childhood. Through a south–south collaboration, lessons learned for sustainable inshore management in Indonesia will be used to guide policy development in Timor-Leste that benefits poor households.[15]

Across South-East Asia, as floodplains are developed for irrigation and river flows are regulated, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects showed that fishways, which facilitate passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University is leading a project to develop a platform for sound decision-making on fish passage construction programs across South-East Asia, a targeted capacity-building program to address institutional needs for the integration of fish passages into irrigation infrastructure and guidelines for the development of fish passage policy and legislation in Cambodia, Laos, Myanmar and Indonesia.[16]

Forestry

Community-based plantation forestry enterprises have the potential to provide social, economic and environmental benefits for the people of Indonesia. Associate Professor Digby Race of the University of the Sunshine Coast leads a project in Gorontalo, Lampung, South Sulawesi, Yogyakarta and Central Java provinces that continues activities to increase the capacity of forest-farmer groups to make better investment decisions. The project is analysing the social and economic dimensions of two community-based commercial forestry systems to produce evidence to support implementation of these systems at national, provincial and local levels.[17]

Smallholder farmers in eastern Indonesia have long based their livelihoods on the production of timber and non-timber forest products. However, constraints ranging from silvicultural practices to lack of market access has limited productivity and profitability. Mr Aulia Perdana of the World Agroforestry Centre leads a project that aims to improve the production and marketing of timber and non-timber forest products and foster better extension and policy approaches. The project enters its final full year and will consolidate results and learnings to increase scientific understanding of smallholder agroforestry and identify policies and regulations that act as disincentives to smallholders. The project will also identify appropriate business models to develop and commercialise bamboo products.[18]

Smoke haze from indiscriminate burning of peatlands has become a major issue in South-East Asia in recent decades, negatively affecting public health and the economy of several countries in the region. 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]

A new project in 2020–21, with activities in Indonesia and Vietnam, will underpin good plant biosecurity practices in forestry. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania, will extend screening approaches from prior *Acacia/Ceratocystis* research to eucalypts that have replaced acacias in the wet tropics; develop remote-sensing software applications for cheap and rapid forest health surveillance; and, through geospatial modelling, deliver establishment (suitability and survival) risk maps under current and future climates at a regional level for the highest priority pests and pathogens.[20]

Horticulture

About 40 species of tropical fruit flies damage horticultural crops and impede trade throughout South-East Asia. A 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 improve pre-harvest and post-harvest practices. The ultimate aim is to improve the yield and quality of crops in order to improve livelihoods and trade opportunities.[21]

Huánglóngbìng, or citrus greening disease, is a destructive bacterial disease of citrus. It is spread mainly by the Asian citrus psyllid and infected propagation material. All commercially cultivated citrus varieties are susceptible to the disease and currently there is no cure. Effective management is considered the largest challenge ever faced by citrus industries worldwide. A new project led by Dr Jianhua Mo of the NSW Department of Primary Industries will leverage international expertise to tackle the deficiencies in current huánglóngbìng management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huánglóngbìng and the Asian citrus psyllid in Indonesia and China, and increase the preparedness of the Australian citrus industry for an incursion of both the disease and the vector.[22]

Livestock Systems

The Government of Indonesia has placed a high priority on self-sufficiency in beef production, but improvements in reproductive efficiency and growth rates of cattle are required to achieve this. Dr Karen Harper of the University of Queensland leads a project to develop simple, low-cost feed rations for cow–calf and cattle-fattening operations. This has the potential to 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.[23]

Dr Mario Herrero of CSIRO Agriculture and Food completes a small research activity in 2020 that reports on the likely competitiveness, resilience and adaptability of smallholder livestock production systems in the future. The study will identify development pathways and review findings, in consultation with key stakeholders, to understand how these production systems can remain an engine of agricultural and human development in the region.[24]

Substantial gains have been made towards eliminating two major parasites (*Plasmodium* spp.) that cause malaria in humans in South-East Asia. At the same time, however, 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 77), a small research activity, led by Professor Nicholas Anstey of the Menzies School of Health Research, will establish surveillance for zoonotic *Plasmodium* species of public health importance in Kalimantan and Sumatra, Indonesia.[25] This leads into a research project to evaluate zoonotic malaria transmission and agricultural land use in Indonesia.[26]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[27]

A trilateral project with partners from Australia, Indonesia and China will investigate sustainable management of huánglóngbìng (citrus greening disease). Photo: ACIAR. ACIAR project: HORT/2019/164.

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.[28]

Peatland restoration efforts in Indonesia are progressing rapidly, but the success of these efforts is often low or undocumented. Two techniques trialled in previous ACIAR projects, eddy covariance flux towers and chameleon sensors, demonstrated strong potential as tools to empower government and communities to monitor the success of peatland restoration. These techniques monitor changes to peat moisture levels and carbon flux from the ecosystem and integrate this environmental data with local decision-making. This small research activity, led by Dr Samantha Grover of RMIT University, will collect a full 12-month cycle of data from each technique. Stakeholder engagement, which has already commenced, will be a major focus of this project.[29]

Climate Change

ACIAR will add a new research program to its portfolio in September 2020 to focus and strengthen work towards our strategic objective that addresses climate variability and climate change.

Indonesia is home to 36% of the world's tropical peatlands, which can hold up to 20 times more carbon than most other types of mineral soil. However, from 2000 to 2015, around half a million hectares of forest were cleared each year for the cultivation of palm oil. A small research activity led by Professor Deli Chen of the University of Melbourne will analyse information from a range of sources to understand and document the factors affecting the loss of soil carbon from tropical peatlands and identify potential management options to prevent or reduce this loss. The project is a collaboration between Australia, New Zealand and Indonesia to develop recommendations for land managers.[30]

Australia is a world leader in greenhouse gas mitigation research in agriculture. A new project provides the opportunity to transfer this knowledge to assist our partner countries to identify and quantify on-farm management options that reduce emissions from farming practices and help establish national greenhouse gas accounting systems to monitor, report and verify emissions reductions to the same high standard used by Australia. This project, led by Professor Peter Grace of Queensland University of Technology, and co-funded by New Zealand, will work with government and research institutions in Fiji, Vietnam, Indonesia and Kenya to develop expertise to enable those institutions to better support their national governments in meeting current and future nationally determined emissions reduction commitments (NDCs) under the Paris Agreement.[31]

Safe and sustainable production and intensification of high-value vegetable cropping options (particularly shallot and chilli) for sensitive coastal agroecosystems are being investigated. Photo: ACIAR. ACIAR project: SLAM/2018/145.

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Livestock Systems: Dr Anna Okello
Soil and Land Management: Dr James Quilty
Climate Change: Dr Veronica Doerr

See page 209 for contact details

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. Agricultural policy research to support natural resource management in Indonesia's upland landscapes (ADP/2015/043)
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/2017/036)
8. Agriculture for tourism – advancing a synergistic development pathway for both local agribusiness value chains and tourism in Bali, Indonesia (AGB/2020/121)
9. International Mungbean Improvement Network – phase 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
10. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
11. Improving seaweed production and processing opportunities in Indonesia (FIS/2015/038)
12. Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits [Indonesia] (FIS/2016/116)
13. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
14. Evaluating processes and outcomes in south-south research collaboration—finfish mariculture development in Cambodia through cooperation with Indonesia (FIS/2018/115)
15. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
16. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos, Myanmar] (FIS/2018/153)
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 (Kanoppi2) (FST/2016/141)
19. Improving community fire management and peatland restoration in Indonesia (FST/2016/144)
20. Managing risk in South-East Asian forest biosecurity [Indonesia, Vietnam] (FST/2018/179)
21. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
22. Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)
23. Profitable feeding strategies for smallholder cattle in Indonesia (LPS/2013/021)
24. Smallholder livestock futures in South-East Asia [Indonesia] (LS/2018/107)
25. Zoonotic malaria in Indonesia (One Health) (LS/2018/214)
26. Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (One Health) (LS/2019/116)
27. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
28. Crop health and nutrient management of shallot–chilli–rice cropping systems in coastal Indonesia (SLAM/2018/145)
29. Assessing and monitoring peatland restoration in Indonesia (SLAM/2020/118)
30. Emissions avoidance of soil carbon from lands undergoing practice change [Indonesia] (WAC/2019/149)
31. Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa [Fiji, Indonesia, Kenya, Vietnam] (WAC/2019/150)

Laos

A$3.4 million
Budgeted funding

16
Bilateral and regional research projects

7
Small projects and activities

Laos is a Least Developed Country, and one of the poorest countries in South-East Asia. Approximately 23% of its population lived under the national poverty line in 2012, and poverty is almost three times higher in rural areas than urban areas. Key development challenges include limited access to high-quality education services, skills shortages and constraints to the development of the private sector. Australia's official development assistance (ODA) to Laos aims to help the Government of Lao PDR lift its people out of poverty, and develop as a prosperous and stable neighbour that can contribute constructively to the region. This objective is consistent with the themes of the Australian Foreign Policy White Paper—contributing to global efforts to reduce poverty, alleviate suffering and promote sustainable development—and building our influence through education, including scholarships.

An overview of Australia's aid program in Laos is available on the DFAT website.

Laos is a small landlocked country, but it has had substantial economic growth of more than 6% each year since 2015. The growth is driven mainly by the construction sector (due to investments in large infrastructure projects) and a resilient services sector (wholesale and retail trade growth).

Other factors that contribute to the economic growth of Laos include increased power generation, growing opportunities in the non-resource sectors from closer regional integration, and reforms to improve the business environment.

While Laos has one of the fastest economic growth rates in ASEAN, its agriculture sector has grown at a rate of only 3% over the past two decades. This is despite the fact that Laos remains primarily an agricultural economy with around 70% of the population working in the agriculture sector. Subsistence farming is still the norm and traditional production methods do not produce enough to meet market demand. Many rural families struggle to meet their own household food requirements, making malnutrition a critical issue.

According to a report by the Japan International Cooperation Agency, inefficiencies in farm production mean the agriculture sector contributed only 17% to the country's GDP in 2018. While foreign direct investment to Laos increased from A$538 million in 2010 to A$2.7 billion in 2017, it mostly went to infrastructure (primarily electricity generation). Agriculture attracted A$297 million of investment, around 10% of total foreign direct investment in 2017. Based on FAO and Asian Development Bank reports, climate change and the risk of natural disasters such as floods and drought has discouraged investors.

Apart from rice, which is half of the country's agricultural output, the main traded crops in Laos include livestock, rubber, maize, coffee, bananas and citrus fruits. Lao agriculture is characterised by a relatively narrow range of productive outputs that involve small, fragmented production volumes, extremely short and seasonal market chains, and a high cost of freight. The lack of downstream enterprises is also a major barrier to growth in the sector.

In 2019, the Ministry of Agriculture and Forestry outlined plans to ensure the country is on track to meet the goals of its agriculture development strategy. The five-year development plan aims to support growth in the agriculture and forestry sector of greater than 3%, which means it will contribute 19% to the national economy. Targets include a national yield of at least five million tonnes of paddy rice, production of meat and eggs to rise to greater than 400,000 tonnes, fish and aquatic animal production to rise to 300,000 tonnes a year, and export of meat products to rise to 15,000 tonnes as production and processing operations are modernised.

A major policy development in Laos came in the form of the newly amended Forestry Law. Laos has the highest percentage of forest to land area in South-East Asia (68%). The Lao Government is committed to protecting its forest cover while making the forestry sector able to support livelihoods of its people.

The National Green Growth Strategy 2030 is the basis for actions of the Ministry of Agriculture and Forestry to increase forest cover by up to 70%. It also frames policy priorities to focus on environmental friendliness, sustainability and socially inclusive growth. The plan stresses the need to use the natural resources of Laos more efficiently, while taking a development path that is more resilient to risks such as climate change and also protects people's health. To deliver on this policy commitment, the ministry is drafting the Strategic Framework for Green and Sustainable Agriculture in Lao PDR.

Also guiding the strategic priorities of the Ministry of Agriculture and Forestry is the Lao Government's National Nutrition Strategy (2015–2025), which aims at reducing chronic malnutrition (stunting) in children under five from the current rate of 33% to 25% by 2025.

Country priorities

In 2020–21, the ACIAR Country Program for Laos plans to develop new long-term strategic program priorities based on outcomes of dialogue with the Lao Government. In the meantime, current strategic priority outcomes that guide ACIAR investments in Laos 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, through mechanisation, diversification and intensification, along with better crop quality, quarantine standards and value-adding for domestic and export markets
- improved natural resource management that benefits livelihoods and food security by delivering land-use options to smallholders, with attention to both water and nutrient management within climate-change adaptation
- improved institutional training and communication frameworks that enable smallholders to adopt and adapt new technologies, and increase the capacity development of researchers and educators.

2020–21 research program

ACIAR supports 23 projects in Laos, six of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. During 2020–21, the project will test and evaluate methods to slow the spread of the diseases, such as virus-free planting material and resistant varieties, and strengthen capacity and regional networks to reduce new pest and disease incursions.[1]

New weed control options will enable rice farmers to adopt and benefit from mechanisation, and sustainable intensification and conservation agriculture practices. Photo: Massimo Municchi. ACIAR project: CROP/2019/145.

Crops

New crop establishment practices for rice, such as broadcasting and direct seeding (manually or mechanically), offer significant labour savings for growers. However, changed field conditions compared with traditional crop establishment methods, such as transplanting, increase the risk of weed infestations. A project in Cambodia and Laos, led by Dr Jaquie Mitchell of the University of Queensland, aims to develop weed management packages to address labour constraints and reduce the reliance on chemical control. New weed control options will enable rice farmers to adopt and benefit from mechanisation, and sustainable intensification and conservation agriculture practices. Appropriate weed management will also improve grain quality and enable growers to participate in high-value markets.[2]

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices. A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[3]

Fisheries

Rice and fish are two essential components of nutritious diets in the Lower Mekong Basin, with fish from the Mekong River system providing the main source of animal protein. Thousands of low-level irrigation barriers have been installed in the Lower Mekong Basin to regulate water flow for rice cultivation and control flooding. These structures create barriers to fish attempting to migrate to and from floodplains, which are vital breeding and nursery habitats. Fish ladders for upstream fish passage, based on designs used in the Murray–Darling Basin in Australia, have been applied successfully in the Mekong system. To complement this work, Professor Lee Baumgartner of Charles Sturt University and teams are developing fish-friendly downstream regulators. These new designs improve fish survival as they allow fish to pass without injury.[4]

The Xayaburi Power Company, responsible for the design and construction of the Xayaburi hydroelectric dam across the Mekong River in Laos, built a complex fishway system designed to enable the upstream passage of migratory fish. It is anticipated that the design will allow over 100 species of fish to pass. The fish vary in size from a few centimetres to more than one metre. A project team led by Professor Lee Baumgartner of Charles Sturt University is working with the company to develop robust techniques to assess the performance and effectiveness of the Xayaburi Dam fish passage facilities, and provide a standard for other hydroelectric dams planned for the mainstem Mekong River.[5]

Across South-East Asia, as floodplains are developed for irrigation and river flows are regulated, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects showed that fishways, which facilitate passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University is leading a project to develop a platform for sound decision-making on fish passage construction programs across South-East Asia, a targeted capacity-building program to address institutional needs for the integration of fish passages into irrigation infrastructure and guidelines for the development of fish passage policy and legislation in Cambodia, Laos, Myanmar and Indonesia.[6]

Forestry

Lao wood manufacturing industries are yet to adopt contemporary processing technologies used in neighbouring countries. Research led by Dr Hilary Smith of the University of Melbourne continues to develop new processing capability and engineered wood products from small-diameter timbers. Analyses to identify and remove policy, governance and administrative constraints to value-chain efficiencies have been highly effective, supporting investment in new processing facilities. This research is benefiting 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.[7]

Forest plantations in Laos and Vietnam are key to achieving the development aims of both countries through building human capacity, developing industry and sustaining the environment. A small research activity led by Professor Rod Keenan of the University of Melbourne extends the impact of previous project findings. The project will engage policymakers and stakeholders to contribute to the development of new laws, decrees and regulations for forest plantations, consider new policy options for forest plantations and share information on regional and national economic impacts of forest plantations.[8]

The Lao Government has set ambitious targets to restore forest cover in the country. Agroforestry will be fundamental to this process, allowing joint cultivation of trees and agricultural crops across the landscape, reducing logging pressure on residual natural forests and not adversely affecting food security. A small research activity led by Associate Professor Mark Dieters of the University of Queensland will build on achievements of previous ACIAR projects. The project will provide genetically improved planting materials of teak through clonal propagation and development of improved seed sources. Provenance stands will be established for Mai Tae Kha and Mai Du.[9]

A small research activity, headed by Dr Madaline Healey of the University of the Sunshine Coast, has gathered data from the ASEAN countries around priorities, capacities and perceived risk pathways in forest biosecurity. Biosecurity investment and biosecurity regulations within the region are being reviewed. These analyses will underpin initiation of a regional biosecurity network that will link the agriculture and forestry agencies of the national partners.[10]

Regional collaboration in South-East Asia is urgently needed to create a unified network to respond to forest pest and disease incursions. This new project, led by Professor Simon Lawson of the University of the Sunshine Coast, aims to foster such a network. The project will reduce the risk of forest pest and disease incursion and the impacts of established pests and diseases by developing enhanced techniques and capacities in pest risk analysis, surveillance and diagnostics and deploying these through the regional network. Research results will support evidence-based forest biosecurity policy for the region.[11]

Horticulture

Fusarium wilt (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 project led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries aims to develop an integrated management response to the spread of the disease. 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

Laos is a comparatively small 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 food-borne parasites in pigs, adding value to cross-border pig trade between northern Laos and Vietnam.[13]

Goat production in Laos has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Expanded goat production using traditional extensive goat-raising methods has the potential to result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock. A project led by Dr Stephen Walkden-Brown of the University of New England is developing new practices that are sustainable and productive.[14]

A stocktake of the potential of forage production by smallholders in Cambodia, Laos and Vietnam is the focus of a small research activity that concludes in 2020. Dr Lava Yadav of the University of Queensland has analysed factors that contribute to, and constrain, forage production and development of related enterprises. The work will report on the constraints and opportunities for more effective uptake and use of forages and identify potential business models for more demand-driven development.[15]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions (NDCs) of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[16]

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 in vulnerable households. In the final year of the project, pilot interventions to improve food security will be implemented and evaluated.[17]

With the rapid growth of the cassava sector across South-East Asia, various arrangements emerged between industry and smallholder farmers, varying from large estates to smallholder-oriented models. There are considerable opportunities to increase the productivity, profitability and sustainability of the cassava industry. Dr Dominic Smith of the University of Queensland will complete a project in 2020 that has identified the socioeconomic conditions under which improved technology and market booms in commercial crops, such as cassava, can be harnessed to increase the profitability and sustainability of smallholder farming systems.[18]

Previous ACIAR work reported that turning research into practical innovation is increasingly challenging in an era of accelerating global resource demand and climate change, creating an imperative for transformational change across farms, landscapes, markets, institutions and populations.

A small research activity will generate practical insights and actionable recommendations for ACIAR programs to better integrate agricultural practice change and community engagement. Dr Mary Johnson of RMIT University will lead a literature study from the Mekong region, comparing and contrasting public health promotion approaches and agricultural extension to find practical lessons and areas for cross-disciplinary learning and innovation. A diagnostic framework and supporting resources will be produced for use by ACIAR to assess project proposals to ensure that agricultural practice change and community engagement are at, or redefining, the cutting edge of agricultural extension.[19]

The Government of Lao PDR increasingly demands evidence to support policy development. The relationship between research-for-development and policy has not been clear-cut and there is an identified need for ACIAR projects to adopt more effective research-to-policy approaches in the Lao context. A small research activity will examine ACIAR-commissioned research projects in relation to the processes of Lao policymaking, through analysis of case studies and in-depth interviews with key stakeholders. Through the Australian National University, Dr Hilary Smith and Dr Holly High will investigate the processes, practices and circumstances that facilitate or hinder the influence and uptake of ACIAR-commissioned research within Lao policy contexts.[20]

Enterprise diversification is a benefit of increased mechanisation of rice farming. Photo: Massimo Municchi.

Soil and Land Management

Practices to increase the overall productivity of crop–livestock systems in rice-growing areas of Cambodia and Laos were investigated in a project led by Dr Matthew Denton of the University of Adelaide. The project will report on soil and water management practices to improve sustainability, 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.[21]

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 reduce soil degradation and improve smallholder livelihoods and economic viability. The project concludes in 2020, with the delivery of outreach models to support the adoption of more diversified maize-based farming systems and bioeconomic frameworks to structure the assessment of different crop and forage options.[22]

Water

Previous research in ACIAR-funded projects found substantial promise for groundwater development in Laos; however, further work is needed to better understand how groundwater irrigation can support agricultural development in drought-prone southern Laos. A small research activity 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. The project will conduct 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.[23]

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See page 209 for contact details

Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
3. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
4. Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar (FIS/2014/041)
5. Assessing upstream fish migration measures at Xayaburi Dam in Laos (FIS/2017/017)
6. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos, Myanmar] (FIS/2018/153)
7. Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)
8. Policy analysis for forest plantations in Laos and Vietnam (FST/2019/121)
9. Supporting agroforestry through tree improvement and gene conservation in Laos (FST/2020/119)
10. Scoping for a forest biosecurity network in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/102)
11. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/123)
12. An integrated management response to the spread of fusarium wilt of banana in South-East Asia [Laos, Philippines] (HORT/2018/192)
13. Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos [Laos, Vietnam] (LS/2014/055)
14. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
15. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
16. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Ethiopia, Indonesia, Laos, Myanmar, Pakistan, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
17. Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers (ASEM/2012/073)
18. Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos (ASEM/2014/053)
19. A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches [Australia, Cambodia, Laos, Myanmar, Thailand, Vietnam] (SSS/2019/186)
20. Policy impact in Laos: from research to practice (SSS/2020/142)
21. Management practices for profitable crop–livestock systems for Cambodia and Laos (SMCN/2012/075)
22. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
23. Expanding opportunities to use groundwater for poverty alleviation and climate-change adaptation in Laos (WAC/2018/167)

Myanmar

A$4.4 million
Budgeted funding

16
Bilateral and regional research projects

5
Small projects and activities

Despite recent positive economic growth, Myanmar is developing from a very low base. Myanmar still has the second lowest GDP per capita in South-East Asia, and most development indicators lag behind regional neighbours. The Myanmar economy is undergoing complex reforms, including improving the transparency of the government budget, establishing a more independent central bank, improving the tax system and enacting foreign investment laws. Australian aid is helping to create a legislative and policy environment that incentivises inclusive investment, trade and economic reform. We also promote women's economic empowerment and support partners to facilitate increased engagement between government, the private sector and civil society. In rural development, Australia is committed to increasing incomes and access to finance for rural households.

An overview of Australia's aid program in Myanmar is available on the DFAT website.

Despite its past isolation, Myanmar is steadily catching up economically with its ASEAN neighbours. As global growth weakened, Myanmar's economy has grown at around 6% per annum in recent years.

Myanmar's service sector remains the main driver of growth, followed by the industrial and agriculture sectors. While Myanmar registers among the top 10 global growth performers, more than one-third of its population remains in poverty, with 6.2% in extreme poverty.

Myanmar is strongly reliant on intra-ASEAN trade of agricultural products. In 2018, within the ASEAN region, Myanmar exported the largest share of agricultural products (28%) and imported the largest share of agricultural products in total imports (13%). While ASEAN neighbours are among its top investors in recent years, China has the largest economic footprint in the country.

Parliamentary elections are scheduled for November 2020, but this will depend on the situation of the COVID-19 pandemic in Myanmar at the time. In the light of the pandemic and the poor state of the country's healthcare system, GDP growth forecasts are being lowered.

Despite the economic shift away from agriculture, the sector remains a high priority for the Government of Myanmar. Agriculture contributes about 30% of the GDP. Almost 70% of Myanmar's 54 million people live in rural areas and rely on crop husbandry and livestock for their livelihoods and incomes. The fishery and livestock sectors are considered the most important, after agriculture, to meet the protein needs of the population, enhance food security and provide employment for rural communities.

Foreign investment has played a key role in the mechanisation of agriculture and the extension of agricultural value chains. In 2019, foreign investments in agriculture, livestock and fisheries rose to 6.4% of foreign direct investment. However, local credit growth in agriculture declined in 2018–19 from 13% to 11%. According to the World Bank, increased foreign and domestic investment in higher-quality seeds, mechanisation and improved irrigation could boost agricultural production. The World Bank also stated that the expanded use of digital technologies could increase agricultural productivity and household revenue in the rural sector by providing better information to farmers and broadening market access.

Myanmar is vulnerable to natural hazards, including cyclones, storms, floods and earthquakes. In addition to limited investment in disaster risk reduction, much of the state's farmland is poorly adapted to these challenges. The FAO stated that the promotion of water management and conservation practices to help rebuild productive infrastructure, improve water storage, rehabilitate agricultural land and reduce the impact of potential disasters remains critical.

The main policy document guiding the agriculture sector in Myanmar is the Agricultural Development Strategy and Investment Plan (2018–2023) which has three pillars: governance, productivity, and market linkages and competitiveness. The long-term plan is intended to be a guide towards inclusive development of agriculture in Myanmar that is based on cooperation between government, farmers and private businesses.

Country priorities

Myanmar is an important partner for Australia. Australia's engagement with Myanmar aligns with the *Australian Government 2017 Foreign Policy White Paper* priorities, including the promotion of a prosperous and stable Indo-Pacific region, liberal democratic principles and rules-based norms. Australia's aid program in Myanmar helps support inclusive economic growth and increased trade by strengthening government capacity, promoting peace and stability, and supporting the development of an educated and competitive workforce.

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 finalised in 2019–20 will guide the ACIAR program during 2020–21. Research priorities for the ACIAR program in Myanmar will 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.

2020–21 research program

ACIAR supports 21 projects in Myanmar, nine of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Improving the agricultural value chain and developing trade models are ways of improving the livelihoods of farmers across many industries. A project in Myanmar and Vietnam, 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 its final stages, the project will document and publish a scalable model for production, marketing and supply of high-quality vegetables in Myanmar. The model is informed by experience and protocols developed previously for smallholder vegetable growers in Northwest Vietnam.[1]

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. Based on evaluation of agricultural value-chain financing models, the project will work with project partners to design and implement innovative and inclusive models.[2]

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. During 2020–21, the project will test and evaluate methods to slow the spread of the diseases, such as virus-free planting material and resistant varieties, and strengthen capacity and regional networks to reduce new pest and disease incursions.[3]

Pulses are one of Myanmar's most important crop groups in terms of production and exports. A significant proportion of smallholder farmers grow pulses, with the area harvested second only to rice. Export markets rely heavily on India and China; however, as these countries make concerted efforts towards self-sufficiency, the pulses and broader agriculture sectors in Myanmar need greater resilience. Ms Deb Doan of Business for Millennium Development will conduct a pulses market development analysis to understand Myanmar's export/domestic market opportunities, identify areas across the value chain that require investment and identify potential partners who can help drive the required value-chain changes.[4]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through an ACIAR-supported project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development work in Bangladesh, India, Myanmar and Australia.[5] Phase 2 of the network commences in July 2020, continuing variety development for another five years and extending the network to Kenya and Indonesia, providing access to new genetic material and improved cropping options for smallholder farmers in eastern Africa and South-East Asia.[6]

High labour costs and labour shortages at harvest time constrain mungbean production in Bangladesh, Myanmar and Pakistan. A project led by Dr Ramakrishnan Nair aims to establish and validate a practical and economically viable system for smallholders to mechanically harvest mungbean. During 2020–21, final evaluations of combine harvesters adapted for local conditions and farming systems will occur, as well as final research to understand the current role of women in mungbean harvesting and the likely impacts of mechanical harvesting on their livelihoods.[7]

Appropriate use of pesticide contributes to food security but misuse, or use of particular products, can compromise food safety, human health, water and soil quality, and non-target organisms, including pollinators. While pesticide use (and misuse) have been comparatively low in Myanmar, increasing suspected pesticide-related poisoning in rural communities is a national concern. Benchmarking current pest-management practices and pesticide use/misuse in food crops was the first step of a small research activity led by Dr Sivapragasam Annamalai of the Centre for Agriculture and Bioscience International. By the end of 2020, the project will develop practical recommendations and actions to address current and potential future problems.[8]

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices. A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[9]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network established through an ACIAR-supported project works to improve cropping system productivity and livelihoods. Photo: Conor Ashleigh. ACIAR project: CROP/2019/144.

Fisheries and irrigation experts in the field, assessing river barriers and speaking with fisherfolk about changes in fish populations and other observations due to barriers in waterways. The survey precedes the installation of fishways (ladders) to restore migratory fish communities. Photo: Candice Bartlett. ACIAR project: FIS/2014/041.

Fisheries

Rice and fish are two essential components of nutritious diets in the Lower Mekong Basin, with fish from the Mekong River system providing the main source of animal protein. Thousands of low-level irrigation barriers have been installed in the Lower Mekong Basin to regulate water flow for rice cultivation and control flooding. These structures create barriers to fish attempting to migrate to and from floodplains, which are vital breeding and nursery habitats. Fish ladders for upstream fish passage, based on designs used in the Murray–Darling Basin in Australia, have been applied successfully in the Mekong system. To complement this work, Professor Lee Baumgartner of Charles Sturt University and teams are developing fish-friendly downstream regulators. These new designs improve fish survival as they allow fish to pass without injury.[10]

Despite the importance of small-scale fisheries to the Myanmar economy and people's livelihoods, there is scope to strengthen fishery management in Myanmar. Poor management has put important fish-production areas at risk, and the people who rely upon them are increasingly vulnerable. A project led by Dr Michael Akester of the WorldFish Center is assisting 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.[11]

Rice and fish are key elements of diets in Myanmar, as well as major agriculture sectors. Rice–fish systems encompass a spectrum of farming and fishing practices from traditional capture of fish in rice-dominated landscapes to controlled farming of fish in rice fields. With recent policy shifts in Myanmar, farmers are encouraged to diversify farming systems in agriculture, livestock and fisheries, presenting an opportunity for more productive rice–fish systems. A project led by Dr Michael Phillips of the WorldFish Center is findings ways to improve rice–fish systems in the Ayeyarwady Delta to enhance production and management and optimise income, food and nutritional outcomes for households. The project will also support policymakers develop enabling policy for land use, rice production and fisheries.[12]

Across South-East Asia, as floodplains are developed for irrigation and river flows are regulated, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects showed that fishways, which facilitate passage of migratory fish up and down regulated rivers, can have lasting economic and social benefits for river communities. Professor Lee Baumgartner of Charles Sturt University is leading a project to develop a platform for sound decision-making on fish passage construction programs across South-East Asia, a targeted capacity-building program to address institutional needs for the integration of fish passages into irrigation infrastructure and guidelines for the development of fish passage policy and legislation in Cambodia, Laos, Myanmar and Indonesia.[13]

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. Cattle are often kept for draught power, but small ruminants are a source of income and food for many households. A project, led by Dr Angus Campbell of the University of Melbourne, will help farmers in Myanmar improve goat and sheep production, transforming their herd from an opportunistic, low-input/low-output activity to a profitable market-focused enterprise, through more efficient management of animal production and health.[14]

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. Mechanisation is expected to quickly reduce the need for draught animals over the next decade. This provides a unique opportunity for smallholder farmers to move from keeping draught animals to producing beef cattle. Dr Dianne Mayberry of CSIRO Agriculture and Food leads a project to 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.[15]

Poultry enterprises are increasingly recognised as a way to improve the nutrition of poor households, while economically empowering women, who are the key custodians of smallholder poultry. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute will lead a new project that aims to test and make available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project will also strengthen the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems to benefit smallholder farmers in their countries.[16]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions (NDCs) of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[17]

Socially inclusive and technically appropriate institutional arrangements are being developed and tested to restore artesian groundwater pressure in the Central Dry Zone of Myanmar. Photo: ACIAR. ACIAR project: SSS/2018/135.

Social Sciences

About 300,000 people derive their livelihoods within artesian groundwater zones of the Central Dry Zone of Myanmar. However, both the pressure and flow rate of this naturally pressurised 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 and Mr Sanjiv de Silva 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.[18]

Previous ACIAR work reported that turning research into practical innovation is increasingly challenging in an era of accelerating global resource demand and climate change, creating an imperative for transformational change across farms, landscapes, markets, institutions and populations. A small research activity will generate practical insights and actionable recommendations for ACIAR programs to better integrate agricultural practice change and community engagement. Dr Mary Johnson of RMIT University will lead a literature study from the Mekong region, comparing and contrasting public health promotion approaches and agricultural extension to find practical lessons and areas for cross-disciplinary learning and innovation. A diagnostic framework and supporting resources will be produced for use by ACIAR to assess project proposals to ensure that agricultural practice change and community engagement are at, or redefining, the cutting edge of agricultural extension.[19]

Soil and Land Management

Agriculture is a dominant economic sector of Myanmar, but it is currently characterised by some of the lowest levels of productivity in the Asian region, and is growing at a lower rate than the Myanmar economy in general. 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 the low productivity of agriculture 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 develop pragmatic solutions.[20]

Agriculture in Shan State, Myanmar, has enormous potential to help people out of poverty, but productivity and efficiency are constrained by many factors. Soil-based challenges include poor nutrient acquisition by plants, infertile soil due to removal of nutrients in residues and continual erosion of topsoil. Dr Terry Rose of Southern Cross University leads a project that will assess variety and nutrition interactions in upland rice to increase yields, demonstrate hedgerows and legume-based pasture to reduce erosion on sloping lands, and understand, through farmer survey, potential barriers to adoption of legume-based pastures, livestock in farming systems and uptake of new rice varieties.[21]

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See page 209 for contact details

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. Market and opportunity analysis to guide market-led development of the Myanmar pulse sector (AGB/2019/154)
5. Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar] (CIM/2014/079)
6. International Mungbean Improvement Network – phase 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
7. Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan (CIM/2016/174)
8. Plant health – a major challenge to achieving sustainable "green" agriculture in Myanmar (CROP/2019/103)
9. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
10. Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar (FIS/2014/041)
11. Improving fishery management in support of better governance of Myanmar's inland and delta fisheries (FIS/2015/046)
12. Development of rice–fish systems in the Ayeyarwady Delta, Myanmar (FIS/2016/135)
13. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos, Myanmar] (FIS/2018/153)
14. Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar (LS/2014/056)
15. Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management (LS/2016/132)
16. Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
17. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
18. Building institutions for the sustainable management of artesian groundwater in Myanmar (SSS/2018/135)
19. A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches [Australia, Cambodia, Laos, Myanmar, Thailand, Vietnam] (SSS/2019/186)
20. Mainstreaming research in Myanmar's agricultural and veterinary universities (SLAM/2017/041)
21. Soil-based challenges for cropping in Shan State, Myanmar (SLAM/2018/190)

Philippines

A$3.2 million
Budgeted funding

13
Bilateral and regional research projects

5
Small projects and activities

The Philippines is one of Australia's longest-standing bilateral relationships and is supported by strong people-to-people links. Australia delivers targeted advice and technical assistance that aims to have a catalytic effect on reform efforts and capacity development of the Philippine Government. Australia's Philippines program is designed to meet the key objectives of inclusive economic growth, effective governance and peace and stability. This reflects a transition from a traditional donor–recipient partnership to an economic partnership, with an emphasis on investments that are targeted and catalytic, leverage the Philippine Government's own resources and are based on the Philippines' own commitments in the Filipino Development Plan.

An overview of Australia's aid program in the Philippines is available on the DFAT website.

The Philippines has maintained good economic growth in recent years. Robust domestic consumption, low inflation, improving labour market conditions, strong remittances and ongoing public investment continue to drive the country's economy.

However, this growth has not resulted in commensurate reductions in poverty and broader social inclusion, especially for smallholder farmers and fisherfolks, who are among the poorest of the poor.

To address these economic and welfare disparities, the Philippine Development Plan 2017–2022 outlined the country's pathway to a 'more inclusive growth, high-trust and resilient society, and globally-competitive knowledge economy'. In the medium term, the targets are for the economy to grow by 6–7% annually, and for poverty to be reduced to 14% by 2022.

Central to achieving these targets is harnessing the growth potential of the agriculture sector by creating opportunities, facilitating access and ensuring inclusivity. Achievement of targets also requires sustainable intensification of production practices.

Although its contribution to GDP is modest (10%), the agriculture sector employs almost one-third of the labour force (about 11 million annually), most of whom are from the rural countryside. Agriculture is also the major supplier of raw materials for the manufacturing sector, and a food source for over 100 million people.

Despite its economic importance and food security role, the agriculture sector continues to be weighed down by low productivity and limited diversification, natural resource degradation, high incidence of poverty and vulnerability to external shocks (e.g. disaster and climate risks).

To address these constraints, the Philippine Government is working to revitalise and modernise the sector, increase productivity, ensure food security and, most importantly, improve the welfare of the millions of farmers and fisherfolk who depend on it. Moreover, there is a need to identify investment areas that will enhance the sector's competitiveness, profitability and resilience. Agricultural transformation also requires significant and sustained investments in science, technology and innovation.

In recent years, the Philippine government invested substantially in agriculture R&D with the aim of reducing production and post-harvest losses, maintaining quality and food safety, increasing the market value of agricultural and fishery products along the supply chain, building a critical mass of human resources in science and technology and improving research infrastructure.

Our main government partner, the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) identifies a future focus on the 'use of advanced and emerging technologies such as biotechnology, genomics, bioinformatics, nanotechnology, and information and community technology as tools to find science and technology solutions to agricultural, fishery and forestry problems and to develop new products with significant impact to the sector'.

Country priorities

For more than 30 years, ACIAR has been an active partner of the Philippine Government in agricultural research-for-development. Since 1984, we have invested more than A$150 million in more than 220 projects across agribusiness, crops, fisheries, forestry, horticulture, livestock, impact evaluation, social sciences, soil and land management, water and climate management.

In December 2018, ACIAR and PCAARRD signed a partnering agreement that aims to further strengthen the Australia–Philippines scientific and technical cooperation for agriculture, aquatic and natural resources. This relationship continues to grow and pursue innovations and new models of cooperation, particularly on co-investment on research and capacity building. ACIAR currently works with over 34 partners in the Philippines from government, research and academic institutions, private sector and civil society. These partnerships drive ACIAR-supported research-for-development work in the Philippines.

ACIAR support to the Philippines will continue to focus on research to enhance agricultural productivity and ensure food safety, improve the marketability and competitiveness of agricultural products, and protect rural households, especially the poor, from negative impacts of natural disasters, climate change and other external shocks. Higher-value products and market competitiveness would improve food security by enabling smallholder farmers and traders to increase their income and their access to other basic services and economic opportunities.

Our portfolio of work in the Philippines covers all aspects of agriculture, fisheries and forestry, with the common theme of improving livelihoods and opportunities for smallholder farmers. During 2020–21, ACIAR research initiatives in the Philippines will include:

- working with PCAARRD to build the skills and knowledge of Philippine researchers and agribusiness specialists to analyse and improve processes along agriculture value chains so that they better respond to industry and market needs
- supporting the development and improvement of technologies for the culture and grow-out of high-value marine species and consolidating approaches and technology for the restoration of damaged coral reefs, which has more importantly, improved fish catch and enhanced coastal biodiversity in northern Philippines
- supporting action research to develop a transferable methodology for socioeconomic and livelihood impact analysis of African swine fever to inform future investments by governments and donors in addressing this biosecurity in Australia and South-East Asia. To test and refine the approach, the Philippines and Timor-Leste will be among the pilot areas.
- supporting research to understand how agricultural development can draw on lessons from disaster risk reduction to minimise climate-related damage and build more climate-resilient farming systems.

The COVID-19 pandemic is having a major impact on Philippine food systems and the economy. ACIAR is supporting an Assessment of Food System Security, Resilience and Emerging Risks in the Indo-Pacific in the context of COVID-19 which will help identify areas of focus for our research collaboration with the Philippines that might increase food systems resilience in the face of future shocks.

Improving the performance of smallholder value chains for fruit and vegetables and building community capacity through learning alliances is the focus of a project in the southern Philippines. Photo: ACIAR. ACIAR project: AGB/2017/039.

2020–21 research program

ACIAR supports 18 projects and programs in the Philippines, 13 of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Fruit and vegetable production are important economic activities in the southern Philippines but are 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. During 2020–21, there will be ongoing facilitation of learning alliances with private sector and grower groups, and community, government and research stakeholders to improve smallholders' income, livelihoods and community wellbeing through the value-chain improvements implemented.[1]

Research in the southern Philippines shows that integrating vegetable value-chain development and community engagement leads to improved innovation, competitiveness, quality and value. However, success has occurred at very local scales and, in general, the majority of smallholder horticulture growers in the Philippines are often not able to compete in higher-value, more-demanding markets. Supporting the design of a new project, Dr Oleg Nicetic of the University of Queensland is investigating agribusiness-led development in inclusive value chains to develop a theory of change for inclusive agribusiness models for market-oriented value chains in the Philippines.[2] This will inform a project starting in 2021 to identify opportunities for inclusive agribusiness-led market development, evaluate opportunities for digital technologies to increase competitiveness and farm-to-market linkages, and evaluate models for public–private learning alliances and innovative co-investment with agribusiness firms. Led by Dr Lilly Lim-Camacho of CSIRO Agriculture and Food, the project will work with producers of high-value fruits and vegetables in the southern Philippines. This project aligns directly with two research priorities of PCAARRD.[3]

Despite persistent poverty and malnutrition in the Philippines, there is also economic growth and a growing middle class, which has a rapidly increasing demand for dairy-based products. The increase in domestic consumption presents an opportunity for significant growth in the Philippines dairy farming sector, particularly for smallholder dairy farmers, but there are many barriers to growth. The same barriers have been observed in Indonesia, Pakistan, Thailand and Bhutan. Professor Wendy Umberger of the University of Adelaide will undertake a small research activity to identify and analyse constraints along the dairy value chain. The project will identify key research priorities and potential partnerships for the development of the smallholder dairy sector in the Philippines, with an emphasis on the commercial sector.[4]

Crops

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices. A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[5]

Fisheries

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 the severe decline of sea cucumber stocks and even fishery closures. This has reduced 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.[6]

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. Having determined requirements for survival and growth of juvenile branching and massive corals, this project finishes in 2020–21 with stakeholder training and an evaluation of the socioeconomic benefits of reef restoration to coastal communities. Formulation of policy advice on alternative reef management strategies in the Philippines, and potentially in Australia, will be finalised.[7]

The successful restoration of coral in experimental plots has led to notable increases in reef fish abundance and fish species richness, compared with control plots where coral was not restored. This project, led by Professor Harrison of the Southern Cross University, has established rigorous protocols and long-term monitoring and evaluation of the impacts on fish communities and other reef resources from coral restoration in the northern Luzon region. The project provides globally significant advances in understanding the impacts of active coral restoration on fish communities, and will enhance capacity of communities to better manage reef fish resources and reef restoration activities in the future.[8]

Building on the success of previous ACIAR project partnerships in demonstrating rapid coral population recovery, re-establishment of breeding populations and increased fish abundance from larval coral restoration interventions, Professor Peter Harrison of the Southern Cross University will lead a new five-year project to significantly increase the scale, efficiency, resilience and sustainability of restoration interventions. The project will establish coral restoration networks with communities and local government units and apply an innovative multidisciplinary strategy to rapidly reverse declining coral and fish assemblages and restore essential reef ecosystem services in four regions of the Philippines.[9]

Horticulture

About 40 species of tropical fruit flies damage horticultural crops and impede trade throughout South-East Asia. A 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 improve pre-harvest and post-harvest practices. The ultimate aim is to improve the yield and quality of crops in order to improve livelihoods and trade opportunities.[10]

Vegetable consumption is low in the Philippines for several reasons, including the perception of poor quality and safety of vegetables. Vegetable farmers are not well trained in the appropriate use of pesticides, resulting in pesticide residues above permissible limits in harvested crops, exposure of farm workers to pesticide poisoning and contamination of soil and water. Dr Gordon Rogers of Applied Horticultural Research leads a project to improve the capacity of selected vegetable supply chains to deliver vegetables that better meet consumer expectations in terms of quality, food safety, nutritional value and price.[11]

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 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, and provide smallholder growers with a better return on investment.[12]

Fusarium wilt (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 project led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries aims to develop an integrated management response to the spread of the disease. The research will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance to *Fusarium* wilt.[13]

Social Sciences

Previous ACIAR investment in Mindanao highlighted how 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. The project team continues its specialist mentoring and support to PCAARRD in their research to validate the LIFE Extension Model (developed by the project), and to understand the potential for scaling up the model to the national government level.[14]

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. The project will consolidate its research findings during 2020 and pilot communication material and scale up the project findings to other local government units and community-based organisations.[15]

Improving livelihoods of low-income 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 focuses on forest landscape restoration to enhance livelihoods. During 2020–21, assessment and data collection will continue in field trials that are 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.[16]

Vidal Moreno, Mindanao, has participated in a project that is validating a community-based extension model to improve agricultural livelihoods. Photo: Jeoffrey Maitem. ACIAR project ASEM/2012/063.

Soil and Land Management

Rubber is the fourth largest crop in Agusan del Sur in the southern Philippines, but only 50% of the total rubber area planted is productive or tappable, and average yield in the province is much lower than the national average. The province is considered the poorest in the southern Philippines. By introducing improved profitable rubber intercropping systems and sustainable management regimes, a project led by Professor Chengrong Chen of Griffith University aims to boost household incomes for Indigenous smallholder farmers, who have poor access to technology and are totally dependent on subsistence farming on their small piece of land. The project is identifying economic opportunities, characterising key soil constraints and identifying the most suitable lands for rubber-based cropping systems.[17]

ACIAR is supporting a small research activity, led by Associate Professor Anik Bhaduri of Griffith University, that will bring together expertise from across Australia and internationally to develop a comprehensive framework of response assessment by which interventions and responses to degradation of land and water resources can be assessed and valued considering future climate scenarios. The project will be a fast-track and intensive synthesis, based on existing work on the social, economic and environmental costs of land, water and soil degradation. The project will contribute to the second edition of the State of the World's Land and Water Resources for Food and Agriculture, which is currently under development and led by FAO.[18]

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See page 209 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. Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines (AGB/2018/196)
4. Philippines smallholder dairy: landscape analysis and research priorities (AGB/2020/120)
5. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
6. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
7. Restoring damaged coral reefs using mass coral larval reseeding [Philippines] (FIS/2014/063)
8. Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [Philippines] (FIS/2018/128)
9. Regional networks for large-scale coral and fish habitat restoration in the Philippines (FIS/2019/123)
10. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
11. Developing vegetable value chains to meet evolving market expectations in the Philippines (HORT/2016/188)
12. Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (HORT/2016/190)
13. An integrated management response to the spread of fusarium wilt of banana in South-East Asia [Laos, Philippines] (HORT/2018/192)
14. Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines (ASEM/2012/063)
15. Action ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines (ASEM/2014/051)
16. Enhancing livelihoods through forest and landscape restoration [Philippines] (ASEM/2016/103)
17. Land management of diverse rubber-based systems in the southern Philippines (SLAM/2017/040)
18. State of land and water assessment framework [Philippines] (SLAM/2020/138)

Thailand

A$0.2 million
Budgeted funding

1
Bilateral and regional research projects

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, counterterrorism, education, security, migration and tourism. The bilateral relationship is supported by mutual membership of international and regional organisations. Thailand moved from being an aid recipient to an aid donor in 2003.

An overview of Australia's relationship with Thailand is available on the DFAT website.

Thailand is one of five original members of ASEAN and has nurtured close ties with other member states over the years. As the second-biggest economy in ASEAN, Thailand actively promotes integration efforts under the ASEAN Economic Community.

Over the last four decades, Thailand has made significant progress in social and economic development and moved from a low-income to an upper-middle-income country.

The agriculture sector of Thailand contributes only 8% to the national GDP but agriculture plays two essential roles in Thai society. First, as a major source of food supply, not only for its own people but also globally; and second, as a major source of employment. About 30% of the population is engaged in agricultural production. In 2018, agricultural products made up approximately 17% of total exports. Many of these, such as natural rubber, rice, cassava, sugar and canned pineapple, are ranked first or in the top 10 of market share in the world market.

Just like its neighbours, Thailand's agriculture sector faces problems such as fluctuating prices of agricultural products, inappropriate use of farm inputs, lack of water, depleted natural resources and ageing farmers. Thailand is also facing the effect of climate change and natural disasters such as floods and droughts. In early 2020, Thailand was hit with possibly its worst drought in 40 years.

To lay a foundation for long-term development leading to systematic growth and solutions to these problems, the Ministry of Agriculture and Cooperatives is implementing a 20-year Agriculture and Cooperatives Strategy (2017–2036). The development plan envisions to secure farmers' livelihoods, grow the agriculture sector and sustain agricultural resources. Last year, the Bangkok Bank of Agriculture and Agricultural Cooperatives announced plans to allocate as much as A$5.4 billion to boost the Thai agriculture sector. The organisation plans to introduce and implement smart farming to 4,500 Thai communities nationwide, starting in 2020.

Country priorities

Since transitioning from aid recipient to aid donor in 2003, 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 its technical expertise with neighbouring countries and support regional economic growth.

2020–21 research program

ACIAR works with Thailand on one regional-scale project that 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. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Social Sciences

Previous ACIAR work reported that turning research into practical innovation is increasingly challenging in an era of accelerating global resource demand and climate change, creating an imperative for transformational change across farms, landscapes, markets, institutions and populations. A small research activity will generate practical insights and actionable recommendations for ACIAR programs to better integrate agricultural practice change and community engagement. Dr Mary Johnson of RMIT University will lead a literature study from the Mekong region, comparing and contrasting public health promotion approaches and agricultural extension to find practical lessons and areas for cross-disciplinary learning and innovation. A diagnostic framework and supporting resources will be produced for use by ACIAR to assess project proposals to ensure that agricultural practice change and community engagement are at, or redefining, the cutting edge of agricultural extension.[1]

Current project

1. A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches [Australia, Cambodia, Laos, Myanmar, Thailand, Vietnam] (SSS/2019/186)

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See page 209 for contact details

Vietnam

A$4.5 million
Budgeted funding

22
Bilateral and regional research projects

9
Small projects and activities

While Vietnam has experienced remarkably rapid economic growth in past decades, there are risks to the medium-term economic outlook. Businesses are constrained by the lack of a skilled workforce, and investments in infrastructure and deeper economic reforms are needed to sustain private sector growth. Inequality is a continuing challenge, with 10% of the population living below the poverty line.

Vietnam is one of few countries in which the gender pay gap has widened over the last decade. Ethnic minorities have still not benefited equally from economic growth; although they comprise 15% of the population, they account for around half of those living in poverty. Australia's commitment to development cooperation with Vietnam is ongoing. Reflecting our maturing economic partnership, we will continue to leverage Vietnam's significant domestic resources and foreign investment, and support Vietnam's efforts to enter a new phase of economic development. By helping to stimulate the private sector, upskill the workforce and support inclusive growth, we will contribute to achieving our shared, overarching goal of promoting prosperity and reducing poverty in Vietnam.

An overview of Australia's relationship with Vietnam is available on the DFAT website.

During 2019, Vietnam became more deeply integrated in international markets as a result of two new free trade agreements: the Comprehensive and Progressive Agreement for Trans-Pacific Partnership and the EU–Vietnam Free Trade Agreement.

Vietnam achieved impressive economic growth in 2019 with GDP increasing 7%. Agriculture, fisheries and forestry accounted for 14% of GDP and exported products were valued at US$41.3 billion. However, these sectors face a number of challenges. Three key examples are:

- climate change that is leading to more extreme weather events such as severe drought, flood, saline intrusion and forest fire that affect large areas of agricultural land
- pest and disease outbreaks in crops and animals that remain unresolved in 2020, especially yellow leaf and root rot on coffee, quick wilt and slow decline on black pepper, cassava mosaic disease, fall armyworm on maize and African swine fever (causing losses of at least 20% of the total pig herd)
- post-farm issues such as weak linkages of value chains, lagging agricultural processing and a high rate of post-harvest losses.

In addition, the most recent COVID-19 pandemic has affected all sectors, including agriculture, both in production and commercialisation.

Vietnam's five-year Socio-Economic Development Plan 2016–2020 is in its last year of implementation. For 2020, science and technology were identified as key to increasing productivity, quality, efficiency and competitiveness in the sector. Focal points of research include product quality improvement throughout supply and added-value chains; seeds and breeds for high quality, disease resistance and climate-change adaptation; post-harvest management, processing and storage technologies; and ongoing productivity improvement.

Vietnam is the ASEAN chair in 2020, and therefore has an opportunity to enhance regional collaboration by sharing expertise and disseminating research results within the ASEAN countries.

The Ministry of Agriculture and Rural Development is expected to continue to focus on developing higher-quality and value products in the coming years, targeting an increase of 3% in the agricultural GDP with US$43 billion of exporting value in 2020.

Country priorities

Bilateral cooperation between Australia and Vietnam to achieve agricultural development has been carried out through trade and joint research and innovation programs. ACIAR has managed agricultural research and development activities for the past 27 years.

The strategy for research collaboration between Vietnam and ACIAR from 2017 to 2027 was developed on the basis of mutual acknowledgment that the relationship between ACIAR and Vietnam has evolved from donor–recipient to partnership, co-investment and, possibly, through this period, to trilateral collaboration. The strategy confirms the desire of both parties to join with the private sector, wherever possible, to create opportunities for poorer residents in rural and urban areas through inclusive agribusiness systems. It also focuses on transformational opportunities for women in research and agribusiness systems and on farms.

The strategy's 10-year goals are to:

- establish and sustain long-term international partnerships in research and technology development
- improve the capacity of Vietnamese 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 Central Highland (Tay Nguyen) and North West (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 the 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 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 analysis
- increasing value from forests
- increasing value from aquaculture.

Research collaborations focus on the Mekong River Delta, Central Highlands and Northwest. While the Mekong River Delta and Central Highlands have export capacity, they face climate-change challenges and share similar developmental challenges. These include land conservation, generating better livelihoods for ethnic minorities and economically empowering women.

In early 2020, ACIAR and its Vietnam partners reviewed the strategy implementation and priorities for the coming period. The Ministry of Agriculture and Rural Development, the Ministry of Science Technology, the Ministry of Planning and Investment and ACIAR affirmed that the strategy is current and agreed to focus on the following elements:

- achievement of the shared goal that 75% of projects will be co-funded by Australia and Vietnam during the 10-year period
- research into climate change, especially drought-tolerant cropping systems (in the Mekong River Delta and the Central Highlands) and saline-cropping systems for the Mekong River Delta (i.e. to continue the work on rice–shrimp systems)
- research into the development of fruits from the Northwest region, especially farming systems on sloping lands, storage and post-harvest management, processing and market access for the region's popular produce, which includes mango, avocado and longan
- continued research into mariculture and improve chemical and antibiotic residue control in aquaculture produce
- development of local forest tree species, value chains of non-timber forest products and forest tree pests and diseases
- biosecurity research (especially cattle and chicken), disease forecasting and disease management—taking advantage of Australian expertise
- improvement of information exchange through a taskforce to support project development, approval and implementation
- improvement of project outcome communication and involve alumni in research and partnership activities.

2020–21 research program

ACIAR supports 31 projects and programs in Vietnam, 11 of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Mango production makes a significant contribution to Vietnam's economy, with nearly half of the crop produced in the Mekong River Delta region. New opportunities in the fresh and processed mango value chain will be identified to improve net income and livelihoods of smallholder mango growers in southern Vietnam in a project led by Dr Robin Roberts of Griffith University. The research has focused on roles and opportunities for women in the industry. The project will conclude in 2020–21, reporting on options to overcome barriers to competitiveness and ways to improve capacity, industry stakeholder linkages and knowledge sharing.[1]

Cassava is an increasingly important crop throughout South-East Asia 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. The project finishes in 2020 with the delivery of policy recommendations and the development of learning alliances.[2]

Improving the agricultural value chain and developing trade models are ways of improving the livelihoods of farmers across many industries. A project in Myanmar and Vietnam, 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 its final stages, the project will document and publish a scalable model for production, marketing and supply of high-quality vegetables in Myanmar. The model is informed by experience and protocols developed previously for smallholder vegetable growers in Northwest Vietnam.[3]

Nguyen Thi Mien is an active member of Tu Nhien safe vegetables cooperative in Son La province. Her family income has increased up to seven times per hectares by participating in safe vegetable production. Photo: Khanh Long. ACIAR project: AGB/2014/035.

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. Based on evaluation of agricultural value-chain financing models, the project will work with project partners to design and implement innovative and inclusive models.[4]

A small research activity, led by Dr Chris Chilcott of CSIRO Land and Water, evaluated opportunities to reduce logistics costs to small-scale farmers to 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.[5]

The most important constraint to 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 small research activity, led by Mr Oleg Nicetic of the University of Queensland, is strengthening leadership, coordination and economic development of the industry by forming and developing a professional and inclusive multi-stakeholder industry association.[6]

Cassava witches' broom disease and Sri Lanka cassava mosaic virus are spreading rapidly in South-East Asia. A project led by Dr Jonathan Newby of the International Center for Tropical Agriculture is developing technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains in Cambodia, Laos, Myanmar and Vietnam. During 2020–21, the project will test and evaluate methods to slow the spread of the diseases, such as virus-free planting material and resistant varieties, and strengthen capacity and regional networks to reduce new pest and disease incursions.[7]

Vietnam is the world's top producer (by volume) of robusta coffee and black pepper. Production is concentrated in the Central Highlands, and both crops are often grown on the same farm and plots by smallholder farmers. A small research activity, led by Dr Estelle Biénabe of the World Agroforestry Centre, will collect baseline information and analyse the agribusiness contexts for the two crops to identify opportunities and bottlenecks affecting the value chains.[8]

A four-year project commencing in 2020 aims to enhance smallholder livelihoods, including vulnerable populations, through improving the sustainability of coffee and black pepper farming systems and value chains. Research will commence with an investigation of soil-borne pests and diseases, on-farm and in nurseries; and the use of bio-inoculants with soil remediation strategies.[9]

Over 50% of Vietnam's rice is produced in the Mekong River Delta, of which 90% is exported. About 1.5 million smallholder farmers rely on rice for their livelihood, and rice is grown on small farms, with two or three crops produced each year. A number of issues face the industry: reduced returns to farmers, soil degradation, environmental pollution and declining seed purity and grain quality. Recognising these issues, the Government of Vietnam developed a policy in 2017 to encourage a reduction in total rice production and a focus on high-quality rice, with the aim of exporting to premium markets. A new four-year project, led by Dr Jaquie Mitchell of the University of Queensland, aims to establish a highly productive, sustainable, traceable, quality-assured value chain for tropical medium-grain rice in the Mekong River Delta, benefiting rice-farming households and meeting established market requirements of the project partner, SunRice.[10]

Vietnam has experienced excellent growth in agriculture, value-added agriculture and farm incomes over recent decades. Despite this, the sector faces a number of challenges, including outdated technologies, inadequate food safety and fragmented supply chains. A small research activity led by Associate Professor Tiho Ancev of the University of Sydney will support the Ministry of Planning and Investment and the Vietnamese Government to set up an adequate framework for the Agricultural and Rural Development Strategy and formulate concrete strategic directions for the sector.[11]

Crops

A new species of armyworm, the fall armyworm (*Spodoptera frugiperda*), has caused serious damage to rice, sugarcane, sorghum, beet, tomato, potato and cotton crops throughout the Indo-Pacific region, and individuals have been recorded in northern Australia. The species poses a serious challenge to smallholder farmers in terms of sustainable management practices.

A small research activity, led by Dr Wee Tek Tay of CSIRO and co-funded with the Australian Grains Research and Development Corporation, will investigate current successful management options for the pest and determine genetic differences between populations of the pest in South-East Asia and Australia—particularly to understand existing levels of insecticide resistance. The knowledge generated will be useful for future integrated pest-management approaches and the development of a draft resistance management plan.[12]

Fisheries

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 the severe decline of sea cucumber stocks and even fishery closures. This has reduced 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, is assessing 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

The development of market-based agroforestry in Northwest Vietnam provides an opportunity for farmers to diversify, achieve higher incomes and reduce erosion of mountainous landscapes. 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 the rehabilitation of degraded forests. 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.[15]

A new project in 2020–21, with activities in Indonesia and Vietnam, will underpin good plant biosecurity practices in forestry. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania, will extend screening approaches from prior *Acacia/Ceratocystis* research to eucalypts that have replaced acacias in the wet tropics; develop remote-sensing software applications for cheap and rapid forest health surveillance; and, through geospatial modelling, deliver establishment (suitability and survival) risk maps under current and future climates at a regional level for the highest priority pests and pathogens.[16]

A project in Vietnam and the Philippines aims to increase technical skills in culture methods of sea cucumbers to increase production capacity and expand community-based sea cucumber farming. Photo: ACIAR. ACIAR project: FIS/2016/122.

A small research activity, headed by Dr Madaline Healey of the University of the Sunshine Coast, has gathered data from the ASEAN countries around priorities, capacities and perceived risk pathways in forest biosecurity. Biosecurity investment and biosecurity regulations within the region are being reviewed. These analyses will underpin initiation of a regional biosecurity network that will link the agriculture and forestry agencies of the national partners.[17]

Regional collaboration in South-East Asia is urgently needed to create a unified network capable of a coordinated response to forest pest and disease incursions. This new project, led by Professor Simon Lawson of the University of the Sunshine Coast, aims to foster such a network. The project will reduce the risk of forest pest and disease incursion and the impacts of established pests and diseases by developing enhanced techniques and capacities in pest risk analysis, surveillance and diagnostics and deploying these through the regional network. Research results will support evidence-based forest biosecurity policy for the region.[18]

Forest plantations in Laos and Vietnam are key to achieving the development aims of both countries through building human capacity, developing industry and sustaining the environment. A small research activity led by Professor Rod Keenan of the University of Melbourne extends the impact of previous project findings. The project will engage policymakers and stakeholders to contribute to the development of new laws, decrees and regulations for forest plantations, consider new policy options for forest plantations and share information on regional and national economic impacts of forest plantations.[19]

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 they can meet market specifications, increase market linkages and improve profitability.[20]

Laos is a comparatively small 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 food-borne parasites in pigs, adding value to cross-border pig trade between northern Laos and Vietnam.[21]

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 food-borne disease across various markets in Vietnam.[22]

Goat production in Laos has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Expanded goat production using traditional extensive goat-raising methods has the potential to result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock. A project led by Dr Stephen Walkden-Brown of the University of New England is developing new goat production practices that are sustainable and productive.[23]

A stocktake of the potential of forage production by smallholders in Cambodia, Laos and Vietnam is the focus of a small research activity that concludes in 2020. Dr Lava Yadav of the University of Queensland has analysed factors that contribute to, and constrain, forage production and development of related enterprises. The work will report on the constraints and opportunities for more effective uptake and use of forages, and identify potential business models for more demand-driven development.[24]

Poultry enterprises are increasingly recognised as a way to improve the nutrition of poor households, while economically empowering women, who are the key custodians of smallholder poultry. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute will lead a new project that aims to test and make available high-producing, farmer-preferred genotypes of chickens to increase smallholder productivity as a pathway out of poverty in Cambodia, Myanmar and Vietnam. The project will also strengthen the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems to benefit smallholder farmers in their countries.[25]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[26]

Social Sciences

A small research activity will analyse gender transformative tools designed to support 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 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.[27]

Previous ACIAR work reported that turning research into practical innovation is increasingly challenging in an era of accelerating global resource demand and climate change, creating an imperative for transformational change across farms, landscapes, markets, institutions and populations. A small research activity will generate practical insights and actionable recommendations for ACIAR programs to better integrate agricultural practice change and community engagement. Dr Mary Johnson of RMIT University will lead a literature study from the Mekong region, comparing and contrasting public health promotion approaches and agricultural extension to find practical lessons and areas for cross-disciplinary learning and innovation. A diagnostic framework and supporting resources will be produced for use by ACIAR to assess project proposals to ensure that agricultural practice change and community engagement are at, or redefining, the cutting edge of agricultural extension.[28]

A project in northern Vietnam and Laos is helping farmers adopt maize-based farming systems that reduce soil degradation on sloping land and improve smallholder livelihoods and economic viability. Photo: Harry Campbell-Ross. ACIAR project: SMCN/2014/049.

Soil and Land Management

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 reduce soil degradation and improve smallholder livelihoods and economic viability. The project concludes in 2020, with the delivery of outreach models to support the adoption of more diversified maize-based farming systems and bioeconomic frameworks to structure the assessment of different crop and forage options.[29]

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 project led by Jason Condon of Charles Sturt University is providing evidence-based options for profitable crop diversification in the rice production areas of the Mekong River Delta. The project aims to increase production and profitability of saline-affected crop production systems and create a capacity legacy to enable these systems to adapt to ongoing climate change.[30]

Climate Change

ACIAR will add a new research program to its portfolio in September 2020 to focus and strengthen work towards our strategic objective that addresses climate variability and climate change.

Australia is a world leader in greenhouse gas mitigation research in agriculture. A new project provides the opportunity to transfer this knowledge to assist our partner countries to identify and quantify on-farm management options that reduce emissions from farming practices and help establish national greenhouse gas accounting systems to monitor, report and verify emissions reductions to the same high standard used by Australia. This project, led by Professor Peter Grace of Queensland University of Technology, and co-funded by New Zealand, will work with government and research institutions in Fiji, Vietnam, Indonesia and Kenya to develop expertise to enable those institutions to better support their national governments in meeting current and future nationally determined emissions reduction commitments (NDCs) under the Paris Agreement.[31]

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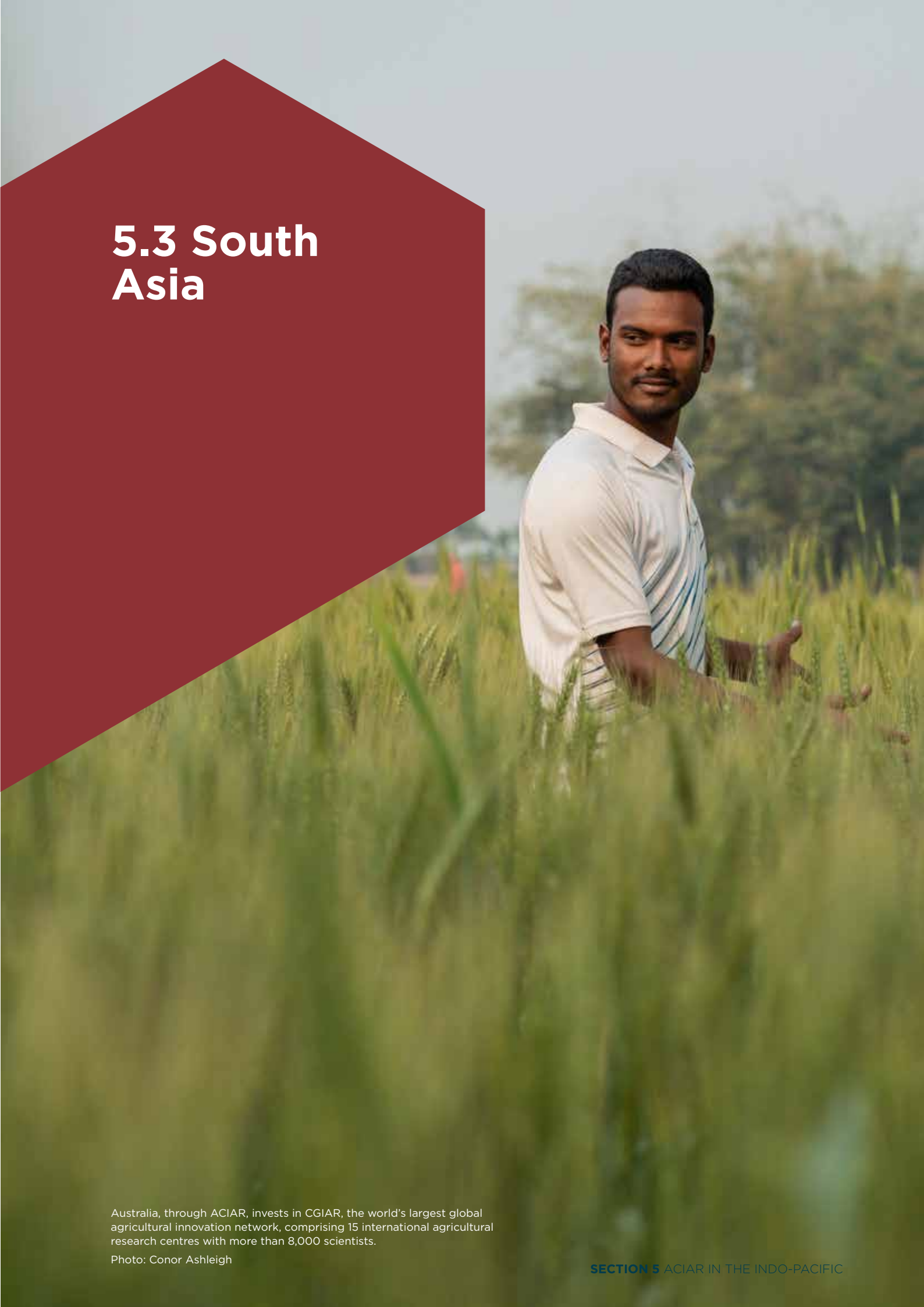
Current and proposed projects

1. Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam (AGB/2012/061)
2. Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia (AGB/2012/078)
3. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
4. Inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
5. Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam] (AGB/2017/036)
6. Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam (AGB/2018/171)
7. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
8. Off-farm: strategic review and planning for 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)
9. Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam (AGB/2018/175)
10. Planning and establishing a sustainable smallholder rice chain in the Mekong Delta [Vietnam] (AGB/2019/153)
11. Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam (AGB/2019/185)
12. Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC) [Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia] (CROP/2020/144)
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. Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam (FST/2016/152)
16. Managing risk in South-East Asian forest biosecurity [Indonesia, Vietnam] (FST/2018/179)
17. Scoping for a forest biosecurity network in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/102)
18. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Laos, Vietnam] (FST/2020/123)
19. Policy analysis for forest plantations in Laos and Vietnam (FST/2019/121)
20. Intensification of beef cattle production in upland cropping systems in Northwest Vietnam (LPS/2015/037)
21. Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos [Laos, Vietnam] (LS/2014/055)
22. Safe pork: market-based approaches to improving the safety of pork in Vietnam (LS/2016/143)
23. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
24. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
25. Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
26. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
27. Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam (SSS/2018/139)
28. A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches [Australia, Cambodia, Laos, Myanmar, Thailand, Vietnam] (SSS/2019/186)
29. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
30. Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam (SLAM/2018/144)
31. Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa [Fiji, Indonesia, Kenya, Vietnam] (WAC/2019/150)

5.3 South Asia



Australia, through ACIAR, invests in CGIAR, the world's largest global agricultural innovation network, comprising 15 international agricultural research centres with more than 8,000 scientists.

Photo: Conor Ashleigh

South Asia

Regional summary

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.

The population of countries in the region ranges from 21.4 million in Sri Lanka to 1.3 billion in India. Land 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 into 15 distinct agroecological zones. Nepal has three distinct topographical zones: the mountainous Himalayan region of the north, the Hill region and the low-lying land of the Terai region in the south. Bangladesh is a small country that is mostly alluvial, with fertile floodplains associated with three major rivers. Pakistan's Indus plains are in sharp contrast to the arid regions of Sindh and the hilly and semi-arid areas of the north-west. Sri Lanka's landscape is clearly defined by its dry and wet zones. The regional variations throughout South Asia must be taken into account when designing a meaningful program for research collaboration to accommodate regional distinctions and varying degrees of vulnerability of the local population.

The Australian Government's Sustainable Development Investment Portfolio (SDIP) and the South Asia Regional Trade Facilitation Program seek to address key region-wide barriers to sustainable economic growth and connectivity. Photo: Conor Ashleigh.
ACIAR projects: see page 132.

South Asia has the highest concentration of poor people in the world. More than 500 million people live 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. Compared with other regions in the world, South Asia 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 accelerating and now provides a sizable 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.

Malnutrition is prevalent in South Asia. The region has among the highest burdens of child undernutrition in the world. Thirty-six per cent of children under age five are stunted, or too short for their age, which is an indicator of chronic undernutrition. Sixteen per cent are wasted, or too thin for their height, an indicator of acute malnutrition. South Asia also has a high prevalence of micronutrient deficiencies, overconsumption and diet-related non-communicable disease.

The frequency of climate-related disasters and the damage they cause is rising in the region, negatively affecting food security and nutrition. Despite these many challenges, South Asia remains the fastest growing region in the world as its economic growth strengthens. However, growth rates vary 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.

The COVID-19 pandemic is an unprecedented challenge for South Asia. Large and dense populations make social distancing difficult. Agriculture is highly dependent on informal labour, which is severely limited during lockdowns and restricted by social-distancing measures. These are all disruptive factors for supply chains and agriculture markets.

Countries in the ACIAR South Asia region

- Bangladesh
- India
- Nepal
- Pakistan
- Sri Lanka

Drivers of regional collaboration

Countries in South Asia share many opportunities and threats that drive the need for regional cooperation, especially in the Eastern Gangetic Plains. Rice and wheat are the region's major staple crops, accounting for about two-thirds of total dietary energy. However, 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, fruits, 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, potentially jeopardising 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 rural people in South Asia 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 of South Asia are prone to natural disasters. Bangladesh and coastal parts of India are threatened frequently by cyclones and floods. Recurring droughts are a common feature in the arid and semi-arid parts of India and Pakistan. The impact of natural calamities is most severe on food insecure households. 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. 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 the 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—that 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 and state level. Overproduction in some areas and unequal distribution networks due to poorly developed supply-chain management are the major issues 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 farmers' livelihoods and climate change
- increase the emphasis on meaningful gender inclusion and empowerment.

During 2020–21, 32 ACIAR-supported projects will be active in the South Asia region (Table 5.3).

Table 5.3 **Current and proposed projects in the South Asia region, 2020–21**

Project title	Project code	Country
Agribusiness		
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	China, Pakistan
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	Pakistan
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	Bangladesh, China, Indonesia, Pakistan
Crops		
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	Bangladesh
Establishing the International Mungbean Improvement Network	CIM/2014/079	Bangladesh, India, Myanmar
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	Ethiopia, India, Nepal, Pakistan
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	Pakistan
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	Bangladesh, Myanmar, Pakistan
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	CIM/2016/219	Bangladesh
Identifying soil constraints in the Eastern Gangetic Plains (SDIP)	CROP/2018/210	Bangladesh, India, Nepal
International Mungbean Improvement Network – phase 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP)	CSE/2011/077	Bangladesh, India, Nepal
Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains	CSE/2012/108	Bangladesh, India, Nepal
Fisheries		
Improved productivity, efficiency and sustainability of the culture-based fishery for finfish and giant freshwater prawn in Sri Lankan reservoirs	FIS/2018/157	Sri Lanka
Enhancing livelihoods through improved forest management in Nepal	FST/2017/037	Nepal
Horticulture		
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	Pakistan
Livestock Systems		
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	Pakistan
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	Pakistan
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia

Project title	Project code	Country
Water		
Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh	LWR/2014/072	Bangladesh, India
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan	LWR/2014/074	Pakistan
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	LWR/2015/036	Pakistan
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	Bangladesh
Adapting to salinity in the southern Indus Basin	LWR/2017/027	Pakistan
Water management for smallholder farmers—outscaling ACIAR research in Andhra Pradesh drought mitigation program	WAC/2018/164	India
Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives—production, farmer profit and sustainability of water use (SDIP)	WAC/2018/169	Bangladesh, India, Nepal
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar (SDIP)	WAC/2018/211	India
Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP)	WAC/2018/220	Nepal
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP)	WAC/2018/221	India, Nepal
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	WAC/2019/134	Bangladesh, India
Regional foresight for food systems in the Eastern Gangetic Plains (SDIP)	WAC/2019/136	Bangladesh, India, Nepal
Food futures for the food systems in the Eastern Gangetic Plains (SDIP)	WAC/2020/158	Bangladesh, India, Nepal

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled during July 2020. Additional projects, not listed in this table, may be commissioned during 2020–21.

Many projects in the South Asia region focus on sustainable intensification and mechanisation of crop management practices.
Photo: Conor Ashleigh

Sustainable Development Investment Portfolio

The SDIP is an Australian Government initiative funded by DFAT that brings together partners in Australia and South Asia to improve 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 co-funded 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 research programs: Crops and Water. Many of these projects are close to completion; however, due to the COVID-19 pandemic, some may extend into the 2020–21 year for a short time.

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 Plains (LWR/2018/104)
- 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)
- Regional foresight for food systems in the Eastern Gangetic Plains (WAC/2019/136)

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)

Bangladesh

A$2.7 million
Budgeted funding

11
Bilateral and regional research projects

4
Small projects and activities

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 greatest 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. Australia's support to Bangladesh aligns with the Bangladesh Government's vision for the country, outlined in the 7th Five-Year Plan 2016–2020, in which the Bangladesh Government has committed to boost economic growth and empower citizens as part of the government's long-term vision for eliminating poverty.

An overview of Australia's aid program in Bangladesh is available on the DFAT website.

Agriculture plays a pivotal role in the Bangladesh 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 in Bangladesh are negatively affected by seasonal climate variability, reduced freshwater river flows and seawater intrusion. The population is projected to grow to about 193 million by 2050, placing further demands on food systems. Climate change has introduced risks from floods, droughts and sea-level rise.

Despite these challenges, Bangladesh has made impressive progress in achieving national food security. Investments in agricultural research have played a pivotal role in driving productivity increases of major crops, which account for more than half of agricultural GDP. Poverty is steadily declining, but many people still live below the poverty line.

Climate change is the most pressing issue, with varying levels of vulnerability 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 and 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 that focuses on developing approaches to sustainable management of water, environment and land resources.

The key challenges identified in the National Agriculture Policy 2018 are:

- diversification of crops including production of high-value crops
- development and promotion of stress-tolerant crop varieties and production technology
- development of modern techniques including biotechnology and disease-resistant and nutritious crop varieties
- improvement of crop production systems for market-oriented agriculture
- emphasising the importance of innovation and extension of technology to increase overall productivity growth and reduce the difference between research farm and field-level yield
- identification of opportunities for improving living standards of coastal population by accumulation of marine resources—in addition to fisheries, there are prospects for seaweed cultivation including production of plankton in the oceans, rivers and wetlands.

The Bangladesh Climate Change Strategy and Action Plan is the de facto policy document that provides strategic direction for work on climate-change related issues. Many elements of climate-change adaptation in the country are also being addressed through specific sectoral policies. Recent consultations with Bangladesh highlighted that the 'consequences of climate change on rural livelihoods' is the most pressing issue facing Bangladesh and is likely to drive thinking about future priorities for research collaboration with ACIAR.

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. With time, the ACIAR program has shifted towards a farming systems approach supporting broader food security aspects, improved production and diversification of the rice-based farming systems and adaptation to climate change. This approach includes research on short duration varieties of pulses to fit the farming system, conservation agriculture-based technologies and related mechanisation, saline land management and adaptation to climate change. ACIAR-supported programs in Bangladesh have focused on the undulating lands of north and north-west and the coastal region (which is the poorest and most vulnerable region in the country). Bangladesh's ability to maintain food security given its high vulnerability to the impacts of climate change underpins the priorities for ACIAR support.

Key agricultural production challenges are common to many countries of South Asia, and 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).

Consultation with key research and development stakeholders in Bangladesh and Australia confirmed the following priorities as the focus of research collaboration between ACIAR and Bangladesh for the 2019–28 period:

- crop improvement, with a focus on wheat, maize and pulses
- improved farming systems, with a focus on cropping systems and diversification
- water management, with a focus on managing both quantity (scarcity, groundwater and waterlogging) and quality (salinity)
- soil fertility and soil management
- markets, diversification and agricultural value chains.

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 capacity building in ACIAR-supported projects. As a major partner and co-investor, ACIAR will seek to refresh and then renew the partnership in 2020–21.

Projects in the Sustainable Development Investment Portfolio (SDIP) program have a common theme of optimising the management of natural resources and adopting new practices to increase productivity and sustainability on the Eastern Gangetic Plains in Bangladesh, India and Nepal. Photo: Conor Ashleigh. ACIAR projects: see page 132.

2020–21 research program

ACIAR supports 15 projects in Bangladesh, three of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Success in rural transformation is not only measured by income growth of the rural population, but also by the degree of inclusiveness in society. A 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 in order to provide better policy advice to underpin the success of transformation. In 2020–21, the project will select study regions and collect data to understand the components of success.[1]

Crops

The Sustainable and Resilient Farming Systems Intensification project is a large collaborative venture between ACIAR, the International Maize and Wheat Improvement Center (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. Dr Brendan Brown of CIMMYT will lead the project in its final year to consolidate capacity development and credible pathways to scale out and support the widespread adoption of conservation agriculture for sustainable intensification methods, designed and validated by the project over the past six years.[2] This project is part of the SDIP, facilitated in the region by the Australian Government (see page 132).

Supporting the Sustainable and Resilient Farming Systems Intensification project, a small research activity led by Dr Neal Menzies of the University of Queensland, will identify future soil health research needs, 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]

In South Asia, adoption and adaptation of many farming system innovations are variable and low outside project areas, particularly for conservation agriculture-based sustainable intensification. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will complete its research on understanding decision-making behaviour of farm households using a behavioural economics framework. The project will test interventions on agricultural extension, input provision and service delivery, which are designed to encourage smallholder farmers' uptake of innovations. The project, which is also part of SDIP, will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[4]

In the coastal regions of southern Bangladesh, agriculture centres on the annual cropping of rice in the monsoon season and other crops in the dry (rabi) season. While the system is profitable, it is limited by topography, soil salinity and irrigation availability. Salinity varies spatially and temporally and there are opportunities for more profitable dry-season cropping on fallow land between rice crops. In its final year, a project led by Professor William Erskine of the University of Western Australia will identify cropping practices and germplasm for salt-tolerant wheat, pulses and forages, which are adapted to southern Bangladesh and have the potential to lift productivity and profitability.[5]

Wheat blast is a serious threat to smallholder farmers in South Asia, a region where 300 million people are undernourished and the population consumes over 100 million tonnes of wheat each year. Dr Pawan Singh of CIMMYT leads a project to reduce the threat of the disease by identifying new sources of genetic resistance. The project is supporting the operation by Bangladesh Wheat and Maize Research Institute of the wheat blast phenotyping platform, an international public-good facility for screening global germplasm. Ultimately, the project will enable the development and release of agronomically superior wheat blast resistant varieties with appropriate maturity and other traits critical for the Bangladesh environment.[6]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through an ACIAR-supported project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development work in Bangladesh, India, Myanmar and Australia.[7] Phase 2 of the network commences in July 2020, continuing variety development for another five years and extending the network to Kenya and Indonesia, providing access to new genetic material and improved cropping options for smallholder farmers in eastern Africa and South-East Asia.[8]

ACIAR supports a project led by CIMMYT to identify sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh. Photo: Conor Ashleigh. ACIAR project: CIM/2016/219.

High labour costs and labour shortages at harvest time constrain mungbean production in Bangladesh, Myanmar and Pakistan. A project led by Dr Ramakrishnan Nair aims to establish and validate a practical and economically viable system for smallholders to mechanically harvest mungbean. During 2020–21, final evaluations of combine harvesters adapted for local conditions and farming systems will occur, as well as final research to understand the current role of women in mungbean harvesting and the likely impacts of mechanical harvesting on their livelihoods.[9]

Water

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) often do not benefit from agricultural development. A project led by Dr Christian Roth of CSIRO Agriculture and Food has investigated ways to provide more equitable and less-risky development pathways for marginalised communities. During 2020–21, this research will support the design and delivery of agricultural intensification programs that are more socially inclusive.[10]

In the same region, a project conducted over the past five years clearly demonstrated that improved crop, water and salt management strategies can lift agricultural productivity and rural welfare when projects engage with farmers to understand their needs and priorities. A second phase of this work, led by Dr Mohammed Mainuddin of CSIRO Agriculture and Food, will use predictive modelling techniques, field trials and targeted demonstration to identify and implement packages of technologies, such as new cropping systems and improved water management that are tailored to the characteristics of different parts of the Ganges delta region. Key to process will be identification of risks to adoption due to variable climate and variable environments. The outputs of this project will provide information to support implementation of the Bangladesh Delta Plan 2100.[11]

A project underway in the coastal zone of Bangladesh, led by Professor Richard Bell of Murdoch University, aims to increase the profitability and sustainability of intensive and emerging cropping systems through improved nutrient management. During 2020–21, the project will conduct activities to scale out the use of tools developed by the project and inform the development of fertiliser policies to advance practice change, as well as activities to improve the knowledge of soil resources and capability for nutrient management by farmers, research partners and key stakeholders.[12]

A suite of projects with a common theme of optimising the management of natural resources and adopting new practices to increase productivity and sustainability will operate on the Eastern Gangetic Plains in Bangladesh, India and Nepal during 2020–21. These projects ultimately aim to improve the livelihoods of the many and varied communities of the plains and are part of the SDIP program (see page 132).

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 production and overexploitation of regional water resources causes environmental problems. A project led by Dr Donald Gaydon of CSIRO Agriculture and Food will determine if there are feasible alternatives to quantify yield gaps in terms of economics and water use sustainability. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios and some economic variables on food production capacity.[13]

A small project was developed to encourage and support a core team of local partners in Bangladesh, India and Nepal to undertake participatory ‘foresight for food’ exercises in their respective domains using scenario-based approaches and systems thinking. Dr Avinash Kishore of the International Food Policy Research Institute leads the project, which continues to build the capacity of national partner institutions and support young farmers to communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[14] The project will be extended until the end of the 2020–21 year, to allow time to consider the impact of the COVID-19 pandemic on regional food systems.[15]

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Crops: Dr Eric Huttner
Water: Dr Robyn Johnston

See page 209 for contact details

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 systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
3. Identifying soil constraints in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (CROP/2018/210)
4. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (SDIP) [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. International Mungbean Improvement Network – phase 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
9. Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan (CIM/2016/174)
10. Promoting socially inclusive and sustainable agricultural intensification in West Bengal, India and Bangladesh (LWR/2014/072)
11. Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India] (WAC/2019/134)
12. Nutrient management for diversified cropping in Bangladesh (LWR/2016/136)
13. Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives – production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
14. Regional foresight for food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/136)
15. Food futures for the food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2020/158)

India

A$0.8 million
Budgeted funding

8
Bilateral and regional research projects

6
Small projects and activities

Australia and India are strategic partners with strong political, economic and community ties, and these extend to shared values in relation to the challenges and opportunities arising in the Indo-Pacific region. Over the next 20 years, a growing India will need many of Australia's goods and services, including agriculture, education and skills training and healthcare. Australia does not have a bilateral development assistance program with India; however, ACIAR does work with partners in India and South Asia to support programs to facilitate economic growth and improve the livelihoods of the poor and venerable (especially women and girls). Tens of millions of people in India have been lifted out of poverty since the 1990s, but economic growth in the country remains uneven. Australia's engagement with India and its support of India's economic development is guided by *An India Economic Strategy to 2035*, which is available on the DFAT website.

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.

Worth US$2.94 trillion, India is the world's fifth largest economy overtaking the United Kingdom and France. 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 the average size of landholdings being 1.08 hectares. The proportion of the population that is undernourished is declining.

India is emerging as a major agricultural exporter of several key commodities and is currently the largest exporter of rice globally and the second largest of cotton. Owing to a new agriculture export policy, agricultural exports are anticipated to grow in the future. However, the contribution of the agriculture sector to India's GDP has declined from 18% in 2014–15 to 16% in 2019–20. Regardless, agriculture remains a major source of employment, accounting for about 43% of the total national workforce.

Agricultural production has been increasing by an average of 3.6% per year since 2011, due to improved access to inputs such as fertiliser and seed, irrigation and credit facilities. The sector has also diversified from cereal grains to pulses, fruit, vegetables and livestock products, largely driven by evolving demographics, urbanisation and changing consumer demand patterns. However, the 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 events. The country has approximately 126 million small and marginal farmers with 86% of the total land holdings. Of these, 14% of operational landholders are female.

The Indian Government is focusing efforts largely on 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 related to increasing crop and livestock productivity, decreasing cost of production, increasing cropping intensity, diversification and the shift to non-farm operations. Several initiatives have been taken to realise the above goal:

- minimum support prices of several kharif and rabi crops increased by 1.5 times of the all-India weighted average cost of production
- Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Yojana providing INR 6,000 per year to all farmer families across the country in three equal instalments every four months

- formation of Electronic National Agriculture Market (e-Nam), an online trading platform for buyers and sellers without having to share the same geographic location
- formation of 10,000 new farmer producer organisations by 2024
- direct benefit transfer of fertiliser subsidy in the whole country
- creation of a 16-point program to encourage the agriculture sector in the budget 2020–21, which includes creating cold storage facilities, promoting the village storage scheme, creating cold supply chains on trains and aircrafts, promoting horticulture and zero budget natural farming, providing support to two million farmers in setting up stand-alone solar pumps and a further 1.5 million farmers for grid connected pumps.

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

In June 2020, the leaders of both countries participated in the Australia–India Leaders' Virtual Summit. At this meeting, the two Prime Ministers elevated the bilateral Strategic Partnership to a Comprehensive Strategic Partnership. One initiative agreed under the partnership is that India and Australia will boost collaboration on science, technology and research, initially focused on COVID-19 responses. The leaders committed to a new phase of the Australia–India Strategic Research Fund to promote innovative solutions for responding to and treating COVID-19, as well as other jointly determined priorities, to be preceded by a one-off Special COVID-19 Collaboration Round in 2020.

Country priorities

The ACIAR research program with India is delivered totally through a regional collaborative approach involving neighbouring countries with shared issues and opportunities. A report to the Australian Government, *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 on the eastern regions of India and its neighbours will remain the same, with a thematic focus on:

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

Existing collaboration between ACIAR and organisations in India has the potential to evolve into a substantial co-invested partnership providing benefits for both countries. In 2020–21, as part of a partnership refresh and mitigation of COVID-19 pandemic impacts (as highlighted in the new Comprehensive Strategic Partnership between the two countries), we may explore the possibilities of:

- sustainable intensification with a nutrition framework
- diversification into new dry-season crops
- the role of biotechnology (BT chickpea, Omega 3 canola, higher nutritive value feed oil enriched crops (rice and wheat))
- new mechanisation opportunities including farm robotics
- a next phase of mungbean breeding for high yielding varieties
- groundwater management (over- and under-exploitation)
- co-investment and trilateral collaboration.

The International Mungbean Improvement Network has helped realise the potential of mungbean to improve cropping system productivity and livelihoods. Phase 2 of the network commenced in July 2020. ACIAR project: CROP/2019/144.

2020–21 research program

ACIAR supports 14 projects in India, two of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

The Sustainable and Resilient Farming Systems Intensification project is a large collaborative venture between ACIAR, the International Maize and Wheat Improvement Center (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. Dr Brendan Brown of CIMMYT will lead the project in its final year to consolidate capacity development and credible pathways to scale out and support the widespread adoption of conservation agriculture for sustainable intensification methods, designed and validated by the project over the past six years.[1] This project is part of the SDIP, facilitated in the region by the Australian Government (see page 132).

Supporting the Sustainable and Resilient Farming Systems Intensification project, a small research activity led by Dr Neal Menzies of the University of Queensland, will identify future soil health research needs, 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]

In South Asia, adoption and adaptation of many farming system innovations are variable and low outside project areas, particularly for conservation agriculture-based sustainable intensification. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will complete its research on understanding decision-making behaviour of farm households using a behavioural economics framework. The project will test interventions on agricultural extension, input provision and service delivery, which are designed to encourage smallholder farmers' uptake of innovations. The project, which is also part of SDIP, will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[3]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through an ACIAR-supported project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development work in Bangladesh, India, Myanmar and Australia.[4] Phase 2 of the network commences in July 2020, continuing variety development for another five years and extending the network to Kenya and Indonesia, providing access to new genetic material and improved cropping options for smallholder farmers in eastern Africa and South-East Asia.[5]

Stripe rust (also called yellow rust) is a common and important disease of wheat worldwide. While fungicides can be used for in-crop control, genetic resistance is more economically and environmentally sound. A project, led by Professor Robert Park of the University of Sydney, has established and equipped a collaborative network of key wheat improvement centres across South Asia and eastern Africa. In its final year, it will consolidate the knowledge base to enable ongoing research and development at the centres. The project has identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and the development of rapid diagnostic tests. The project, set to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, also benefits wheat production across the globe, including Australia.[6]

Water

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) often do not benefit from agricultural development. A project led by Dr Christian Roth of CSIRO Agriculture and Food has investigated ways to provide more equitable and less-risky development pathways for marginalised communities. During 2020–21, this research will support the design and delivery of agricultural intensification programs that are more socially inclusive.[7]

In the same region, a project conducted over the past five years clearly demonstrated that improved crop, water and salt management strategies can lift agricultural productivity and rural welfare when projects engage with farmers to understand their needs and priorities. A second phase of this work, led by Dr Mohammed Mainuddin of CSIRO Agriculture and Food, will use predictive modelling techniques, field trials and targeted demonstration to identify and implement packages of technologies, such as new cropping systems and improved water management that are tailored to the characteristics of different parts of the Ganges delta region. Key to process will be identification of risks to adoption due to variable climate and variable environments. The outputs of this project will provide information to support implementation of the Bangladesh Delta Plan 2100.[8]

The Andhra Pradesh Drought Mitigation Program was implemented to strengthen the adaptive capacity and productivity of agriculture in the rainfed areas of five districts in the south of Andhra Pradesh. Australian experts are providing technical support to the program, drawing on previous ACIAR-supported projects on climate risk management, participatory groundwater management and social learning for irrigation management and governance. Dr Uday Nidumolu of CSIRO Agriculture and Food leads the project, which will work with Indian counterparts to integrate the research, support out-scaling and then co-learn about out-scaling.[9]

A suite of projects with a common theme of optimising the management of natural resources and adopting new practices to increase productivity and sustainability will operate on the Eastern Gangetic Plains in Bangladesh, India and Nepal during 2020–21. These projects ultimately aim to improve the livelihoods of the many and varied communities of the plains, and are part of the SDIP program (see page 132).

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 production and overexploitation of regional water resources causes environmental problems. A project led by Dr Donald Gaydon of CSIRO Agriculture and Food will determine if there are feasible alternatives to quantify yield gaps in terms of economics and water use sustainability. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios and some economic variables on food production capacity.[10]

A suite of projects in the Sustainable Development Investment Portfolio (SDIP) program has identified technologies and practices, as well as levels of individual and institutional capacity, required to sustainably improve agricultural production and livelihoods. Photo: Conor Ashleigh. ACIAR projects: see page 132.

Aquifer storage and recovery may be effective for storing large volumes of water at relatively low cost, without the need to build large surface reservoirs. Dr Prabhakar Sharma of Nalanda University completes a project during 2020–21 that will report on the technical viability of such systems, based on an indigenously developed system at several sites in South Bihar. The project will deliver a hydrogeological map and an operating manual for long-term monitoring of the system. It will also report on benefits and key social factors that will encourage adoption by smallholder farmers.[11]

There are proven benefits of conservation agriculture-based sustainable intensification systems in the Eastern Gangetic Plains but 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 has documented farmers' knowledge, attitude and practices around weed management under conservation agriculture and sustainable intensification systems, and will report on the gendered implications for equitable and sustainable intensification in the Eastern Gangetic Plains of South Asia.[12]

A small project was developed to encourage and support a core team of local partners in Bangladesh, India and Nepal to undertake participatory 'foresight for food' exercises in their respective domains using scenario-based approaches and systems thinking. Dr Avinash Kishore of the International Food Policy Research Institute leads the project, which continues to build the capacity of national partner institutions and support young farmers to communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[13] The project will be extended until the end of the 2020–21 year, to allow time to consider the impact of the COVID-19 pandemic on regional food systems.[14]

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Managers
Crops: Dr Eric Huttner
Water: Dr Robyn Johnston

See page 209 for contact details

Current and proposed projects

1. Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
2. Identifying soil constraints in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (CROP/2018/210)
3. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (CSE/2012/108)
4. Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar] (CIM/2014/079)
5. International Mungbean Improvement Network – phase 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
6. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
7. Promoting socially inclusive and sustainable agricultural intensification in West Bengal, India and Bangladesh (LWR/2014/072)
8. Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India] (WAC/2019/134)
9. Water management for smallholder farmers – outscaling ACIAR research in Andhra Pradesh drought mitigation program [India] (WAC/2018/164)
10. Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives – production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
11. Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar (SDIP) [India] (WAC/2018/211)
12. The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP) [India, Nepal] (WAC/2018/221)
13. Regional foresight for food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/136)
14. Food futures for the food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)

Nepal

A$1.0 million
Budgeted funding

4
Bilateral and regional research projects

6
Small projects and activities

Australia is a longstanding and committed development partner of Nepal. Australia's aid program focuses on areas where our experience and expertise can make a difference to the lives of the poorest, particularly women and girls, marginalised communities and people with disabilities. Underscoring all investments is support for improved governance and public financial management along with gender equality. The bilateral program is complemented by investments through the South Asia regional program in trade, water, energy and connectivity as well as support through global programs for non-government organisation activities and volunteers. A particular focus of the program is to expand economic opportunities for the poor, particularly women, by promoting enterprise and job creation.

An overview of Australia's aid program in Nepal is available on the DFAT website.

Nepal is among the least developed countries in the world, with about one-quarter of its population living below the poverty line. Its overall development has been slow, and its development indicators are among the lowest in South Asia. It ranks 147 out of 189 countries on the Human Development Index 2019.

Nepal has seen much political change in recent decades. In 2008, the country became a republic, ending 240 years of monarchy. In 2015, after a series of short-term governments, Nepal's new constitution established a secular democratic republic with a federal system of three tiers of government: local, provincial and federal.

Natural disasters also frame the recent history of the country. In 2015, a magnitude 7.8 earthquake struck Nepal. This was the deadliest earthquake in 81 years. Hundreds of aftershocks followed, and then a 7.3 earthquake, 17 days after the first one. The process of recovery continues. In 2017, Nepal was hit by devastating floods, causing US$172 million in losses and damage to the agriculture sector alone.

Agriculture is the largest economic sector of Nepal, supporting the livelihoods of 66% of the population and contributing 36% of national GDP. Farming is largely subsistence in nature and cropping is mostly integrated with livestock production. Agriculture in Nepal is highly diverse due to the wide range of climates and geographies in the country These characteristics provide both opportunities and challenges for agricultural development in Nepal. The challenges facing agriculture in the lowland Terai rice–wheat farming systems (part of the Eastern Gangetic Plains) are vastly different to those in the mixed crop–livestock–tree farming systems of the hill and mountain areas. Broadly, however, the challenges include:

- degradation of natural resources
- underdeveloped agricultural institutions and policies
- declining availability of labour
- lack of productive technologies and mechanisation that limit the improvement of farm household livelihoods.

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 achieving improved governance, higher productivity, profitable commercialisation and increased competitiveness.

The Agriculture Development Strategy also guides policies that include women, and states that all agricultural programs will be designed to benefit women. It promotes women's organisations and agroenterprises led by women through specific programs 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

ACIAR has supported collaborative research with Nepal since the early 1990s, including projects on small ruminants, wheat and legumes. The focus for ACIAR during 2020–21 continues the engagement of Nepal in a regional program to improve integration of soil, water, crop, livestock and tree components of the farming systems. The SDIP, a regional multiagency program in which ACIAR is a partner (see page 132), has a significant component in Nepal, addressing water and energy integration.

Priorities for ACIAR collaboration are identified through consultations with ACIAR senior research staff and stakeholders in Nepal. Increased farm and forest productivity is a core approach to improved food and nutrition security and enhanced livelihoods. In the Middle Hills districts affected by recent earthquakes and floods, the ACIAR program supports the request of the Nepalese Government to focus primarily on research to support increased timber production from community forests. Another area that requires focus is understanding the implications of new federalism on agriculture in Nepal, as this is one of the important factors in the future development of Nepal.

Given the common agricultural production challenges across the alluvial plains of Nepal, eastern India and Bangladesh, cooperative research linkages with neighbouring countries will be explored further during 2020–21. The focus will be 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.

For Nepal, the World Food Program highlights that the agriculture sectors that will be most affected by the COVID-19 pandemic are poultry, dairy, vegetables and livestock production.

2020–21 research program

ACIAR supports 10 projects in Nepal, two of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

A farmer discusses crop management with researchers from CIMMYT, as part of a project building capacity to support mechanisation of conservation agriculture-based sustainable intensification. Photo: Conor Ashleigh. ACIAR project: WAC/2018/220.

Crops

The Sustainable and Resilient Farming Systems Intensification project is a large collaborative venture between ACIAR, the International Maize and Wheat Improvement Center (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. Dr Brendan Brown of CIMMYT will lead the project in its final year to consolidate capacity development and credible pathways to scale out and support the widespread adoption of conservation agriculture for sustainable intensification methods, designed and validated by the project over the past six years.[1] This project is part of the SDIP, facilitated in the region by the Australian Government (see page 132).

Supporting the Sustainable and Resilient Farming Systems Intensification project, a small research activity led by Dr Neal Menzies of the University of Queensland, will identify future soil health research needs, 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]

In South Asia, adoption and adaptation of many farming system innovations are variable and low outside project areas, particularly for conservation agriculture-based sustainable intensification. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will complete its research on understanding decision-making behaviour of farm households using a behavioural economics framework. The project will test interventions on agricultural extension, input provision and service delivery, which are designed to encourage smallholder farmers' uptake of innovations. The project, which is also part of SDIP, will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[3]

Stripe rust (also called yellow rust) is a common and important disease of wheat worldwide. While fungicides can be used for in-crop control, genetic resistance is more economically and environmentally sound. A project, led by Professor Robert Park of the University of Sydney, has established and equipped a collaborative network of key wheat improvement centres across South Asia and eastern Africa. In its final year, it will consolidate the knowledge base to enable ongoing research and development at the centres. The project has identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and the development of rapid diagnostic tests. The project, set to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, also benefits wheat production across the globe, including Australia.[4]

Forestry

The Middle Hills of Nepal are home to 44% of the country's population, where most people gain their livelihoods from a combination of agricultural and forest products. Most forest lands have been handed over to community forest user groups, largely with suboptimal management and very limited timber harvest. Previous work supported by ACIAR demonstrated the effectiveness of a silvicultural management package called Active and Equitable Forest Management to improve livelihoods, social equity and environmental impacts. Dr Ian Nuberg of the University of Adelaide leads a project to facilitate the adoption of the package, in order to improve forest management practices in community forests and on private land in Kahbre Palanchok and Sindhu Palchok districts. The project is working with 15 community forest user groups in each district, focusing 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

A suite of projects with a common theme of optimising the management of natural resources and adopting new practices to increase productivity and sustainability will operate on the Eastern Gangetic Plains in Bangladesh, India and Nepal during 2020–21. These projects ultimately aim to improve the livelihoods of the many and varied communities of the plains, and are part of the SDIP program (see page 132).

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 production and overexploitation of regional water resources causes environmental problems. A project led by Dr Donald Gaydon of CSIRO Agriculture and Food will determine if there are feasible alternatives to quantify yield gaps in terms of economics and water use sustainability. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios and some economic variables on food production capacity.[6]

The benefit of conservation agriculture-based sustainable intensification practices in improving livelihoods in rural areas of the Eastern Gangetic Plains has been demonstrated by considerable work in the region, including projects within SDIP. A small research activity, led by Dr Brendan Brown of CIMMYT, aims to build capacity to support mechanisation of conservation agriculture-based sustainable intensification. The project is studying the institutional landscape to understand the potential for mechanisation at the provincial level, facilitate the development of multi-stakeholder platforms and support the development of a road map to help roll out mechanisation.[7]

There are proven benefits of conservation agriculture-based sustainable intensification systems in the Eastern Gangetic Plains but 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 has documented farmers' knowledge, attitude and practices around weed management under conservation agriculture and sustainable intensification systems, and will report on the gendered implications for equitable and sustainable intensification in the Eastern Gangetic Plains of South Asia.[8]

A small project was developed to encourage and support a core team of local partners in Bangladesh, India and Nepal to undertake participatory 'foresight for food' exercises in their respective domains using scenario-based approaches and systems thinking. Dr Avinash Kishore of the International Food Policy Research Institute leads the project, which continues to build the capacity of national partner institutions and support young farmers to communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[9] The project will be extended until the end of the 2020–21 year, to allow time to consider the impact of the COVID-19 pandemic on regional food systems.[10]

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Forestry: Dr Nora Devoe
Water: Dr Robyn Johnston

See page 209 for contact details

Current and proposed projects

1. Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
2. Identifying soil constraints in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (CROP/2018/210)
3. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (SDIP) [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. Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives – production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
7. Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP) (WAC/2018/220)
8. The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP) [India, Nepal] (WAC/2018/221)
9. Regional foresight for food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/136)
10. Food futures for the food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)

Pakistan

A$3.6 million
Budgeted funding

13
Bilateral and regional research projects

Australia has a 70-year development assistance relationship with Pakistan. Our longstanding cooperation has contributed to building Pakistan's long-term economic prosperity, stability and resilience, and investing in people, especially women and girls. Future areas of assistance will focus on consolidating our shared achievements and centre on a small number of areas where Australia can make the most difference in Pakistan. Generating economic growth is the centrepiece of the Pakistan Vision 2025 statement but economic growth continues to be constrained by energy and infrastructure deficits, skills shortages, regional instability and other barriers to trade. In rural areas, Australia works to help Pakistan increase livelihood opportunities for poor men and women by enhancing agricultural productivity and expanding revenue streams for farmers, including through improved water management practices, adding value to raw agricultural products and improved access to markets for those products. Australia's involvement will also contribute to improving Pakistan's food security and nutrition levels, and women's economic empowerment.

An overview of Australia's relationship with Pakistan is available on the DFAT website.

Despite its contribution to GDP halving over the last decades, agriculture is still 18% of Pakistan's GDP and remains key to economic stability. With two-thirds of the population living in rural areas, the agriculture sector engages around 67% women while overall employment is 38% of the national labour force. The sector constitutes 53% of total exports of the country.

Food insecurity remains a major driver of public policy in Pakistan, with over 23% of households suffering from moderate to severe food insecurity. Four out of 10 children under five years of age are stunted, which impacts their cognitive ability. The impacts of malnutrition including on labour, productivity and healthcare expenses were estimated to cost Pakistan US$7.6 billion, or 3% of GDP, every year. Women's empowerment is recognised as crucial for improving nutrition outcomes. Women are often the primary caregivers and can influence children's nutrition directly through child-care practices and indirectly by improving the family nutrition status.

Increasing the focus of all action on gendered approaches to livelihood improvement has been a priority for the Government of Pakistan, emphasising its commitment to the United Nations' Sustainable Development Goal 5 (Achieve gender equality and empower all women and girls). The Government has pledged to increase women's participation in decision-making and will focus on opportunities to enhance development, adoption and growth of best-practice technologies; and support for trialling small-and-medium enterprise development and village community centres for the mobilisation and innovation of rural communities. This will provide an enabling environment and equal opportunities to women for development of their full potential.

The demand for and pressure on surface and groundwater resources is a major and complex problem for Pakistan, requiring effective management from farm to national scales. Agricultural intensification and competing demands for urban and industrial uses is exerting pressure on the availability of surface and groundwater water. Added to this are problems of low agricultural productivity and poor irrigation management practices, increasing waterlogging and salinity. Pakistan has a strong research sector addressing these challenges, with a particular focus on low productivity, lack of diversification in cropping, low adoption of efficient management practices, inefficient use and increased demand for water and, above all, climate change.

The Government of Pakistan aims to boost the agriculture sector by encouraging international investment. There has been significant investment from Saudi Arabia and Malaysia, in addition to China. The first phase of the China–Pakistan Economic Corridor covering infrastructure, energy capacity and economic growth in Pakistan has ended. It entered a second phase where agriculture has been main driver. Phase 2 is focusing on technology transfer, skill development and agricultural cooperation.

Declining subsidies on agricultural inputs as a condition of the ongoing International Monetary Fund reform program means that the cost of production for farmers is expected to increase in the near future. There has also been a significant reduction (60%) in government investment in agriculture in the post-devolution period (since 2010). Recognising the impact of reduced investment on the performance of the agriculture sector, the current government announced an Agriculture Emergency Program with a focus on agricultural production, water conservation and market-driven policy alignment. The program aims to overcome the stagnant growth and inequity that typifies much of Pakistan's agriculture sector. The policy revolves around three pillars:

- building an innovation-based sustainable agriculture sector
- using public investment to improve the profitability of agriculture
- ensuring food security and freedom from hunger.

Currently, ACIAR investments are well-aligned with this policy, through ongoing policy discussions at the national and provincial levels.

Country priorities

Australia is a key research partner for Pakistan due to its deep expertise in agriculture, livestock production and water management, which is directly relevant to the challenges faced by Pakistan agriculture. ACIAR works closely with the Pakistan Federal Government, provincial departments, NGOs, academia, the Pakistani private sector, DFAT and other donor partners to provide research and development and capacity building. Technical support and carefully targeted research and development interventions, such as those supported by ACIAR, typically underpin larger development programs in Pakistan. Pakistan invests in the research relationship with Australia, with a history of substantial in-kind contributions and aligned projects designed to take research results to scale.

The ACIAR program with Pakistan is based on:

- the recognition that water and food security are critical to Pakistan's long-term stability
- Australia's global expertise in areas that are high priority concerns for Pakistan
- Pakistan's strong network of researchers that can collaborate with Australian researchers on water, food security and rural poverty alleviation
- a platform of a long research collaboration, which is highly valued by both countries.

The ongoing focus of our research collaboration will be water and salinity management and profitable smallholder cropping and livestock systems. This supports the realignment in thinking of the Government of Pakistan towards rural transformation and ensuring food and nutrition security through agriculture. The emphasis is on strengthening the national agriculture research system to support crop diversification (high-value horticulture, pulses), mitigation and adaptation to climate change, and the promotion of livestock, fisheries and small ruminants. Empowering women and focusing on enhancement of farm incomes will cut across all future collaboration.

The dairy sector, including small ruminant development, is a high priority of the Pakistan Government. This is the only sector that can generate daily cash income, serve as a safety net and provide self-employment opportunities for more than 12 million rural families, especially women and youth. Ongoing ACIAR projects are focused on the dairy beef value chain and the small ruminant sector.

Unregulated extraction of underground water is increasing soil salinity in Pakistan, and both national and provincial irrigation agencies have identified this as major threat. ACIAR has recently commissioned a detailed analysis of the current scenario.

Rapid rural transformation has led to a quick decline of poverty in many countries, but success varies between countries, and between regions within countries. The rural transformation of China has been rapid and comes with major benefits and some costs. The Pakistan Government is keen to learn from the Chinese model, facilitated through ACIAR.

During 2020–21, ACIAR plans to engage Chinese research agencies in trilateral collaboration focused on the horticulture sector. Long-term ACIAR support in this sector is now fully integrated with a large horticultural development program in Punjab, with CABI leading both ACIAR-supported research projects and the Punjab development projects. Also in 2020–21, ACIAR and the Pakistan Agriculture Research Council will develop a new partnership arrangement focused on co-investment and joint development of longer-term agricultural research-for-development projects.

2020–21 research program

ACIAR supports 13 projects in Pakistan, eight of which are specific to this country. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

The China–Pakistan Economic Corridor will provide Pakistan with preferential access to the world's fastest growing horticulture market. Understanding this market and China's experience in market reform is valuable for increasing growth, employment and productivity in Pakistan's horticultural markets. A project led by Professor Jeffrey LaFrance of Monash University has undertaken a detailed study of horticultural markets in China as part of a broader project to design practical horticulture marketing policy reforms in Pakistan. This will help improve producer and consumer welfare, with attention to gender and poverty dimensions. The study finishes in 2020, and its outputs will support the development of commodity market models and provide an analysis of domestic and export market potential.[1]

The whole-family extension approach is being assessed by researchers as a way to improve on-farm profitability and marketing of dairy products. In the process, practices to improve on-farm efficiency and new value-chain opportunities will also be identified.
Photo: Conor Ashleigh. ACIAR project: LPS/2016/011.

Pulses, mainly chickpeas, lentils and mungbeans, are well suited to smallholder farming by both men and women and important in the agrifood systems of Pakistan. A project, led by Dr Rajendra Adhikari of the University of Tasmania, is developing 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]

Success in rural transformation is not only measured by income growth of the rural population, but also by the degree of inclusiveness in society. A 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 in order to provide better policy advice to underpin the success of transformation. In 2020–21, the project will select study regions and collect data to understand the components of success.[3]

Crops

Stripe rust (also called yellow rust) is a common and important disease of wheat worldwide. While fungicides can be used for in-crop control, genetic resistance is more economically and environmentally sound. A project, led by Professor Robert Park of the University of Sydney, has established and equipped a collaborative network of key wheat improvement centres across South Asia and eastern Africa. In its final year, it will consolidate the knowledge base to enable ongoing research and development at the centres. The project has identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and the development of rapid diagnostic tests. The project, set to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, also benefits wheat production across the globe, including Australia.[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 into existing 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, is facilitating farmer-led research and demonstrations of improved varieties, agronomic practices and seed production to increase the production and profitability of pulses.[5]

High labour costs and labour shortages at harvest time constrain mungbean production in Bangladesh, Myanmar and Pakistan. A project led by Dr Ramakrishnan Nair aims to establish and validate a practical and economically viable system for smallholders to mechanically harvest mungbean. During 2020–21, final evaluations of combine harvesters adapted for local conditions and farming systems will occur, as well as final research to understand the current role of women in mungbean harvesting and the likely impacts of mechanical harvesting on their livelihoods.[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, and exploring the prospects for developing heat-tolerant varieties of vegetables. A project led by Dr Babar Bajwa of CABI is strengthening selected vegetable value chains in Punjab and Sindh provinces, as part of the Agriculture Value Chain Collaborative Research Program. Focusing on potatoes, chillies, tomatoes and onions, the project has identified opportunities for engagement and entrepreneurship, and small-scale production, post-harvest processing and trading. During 2020–21, the project will be testing and developing technical innovations and scaling out improvements to increase the capacity and incomes of farming families, traders and intermediaries.[7]

Livestock Systems

Despite the good genetic potential of dairy livestock in Pakistan, production is very low due to poor nutrition, management and marketing. Additionally, research efforts and livestock extension support services are fragmented. At the same time, demand and prices for beef are rising strongly, presenting new 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. A project in its final year, led by Dr David McGill of the University of Melbourne, will determine the effectiveness of the whole-family extension approach to improving on-farm profitability and marketing. Alongside this, practices to improve on-farm efficiency and new value-chain opportunities will be identified.[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. During 2020–21, the project will deliver strategies for higher and more sustainable production and value-chain engagement to improve the livelihoods and wellbeing of small-ruminant farming families.[9]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions (NDCs) of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[10]

Water

Irrigation is critical to food security, poverty reduction and economic development in Pakistan, 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, has increased the irrigation management skills of farmers and identified successful modes of extension. In the final stages of the project, scale-out models and plans will be developed for extension services for ongoing transfer of the tools and technologies beyond the project area.[11]

Groundwater use is extensive in Pakistan. Some areas are completely reliant on groundwater, while others use groundwater in conjunction with surface water. Greater use of groundwater could potentially reduce large areas of waterlogging in the Sindh province. In its final stages, a project led by Dr Michael Mitchell of Charles Sturt University will test economic and hydrogeological models, developed or customised during the project, to manage groundwater quantity and quality. Institutional arrangements will be identified for post-project adoption of tools and options.[12]

Salinisation and sodification of surface soils and waterlogging threaten agricultural production and livelihoods in the southern Indus Basin, resulting in higher rates of poverty for communities living in areas affected by salinity. 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. The research team will work with a broad network of local partners to develop adaptation options for living with salinity.[13]

Country Manager, Pakistan
Dr Munawar Raza Kazmi

Research Program Managers
Agribusiness: Mr Howard Hall
Crops: Dr Eric Huttner
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Water: Dr Robyn Johnston

See page 209 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. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Ethiopia, Indonesia, Laos, Myanmar, Pakistan, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
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. Adapting to salinity in the southern Indus Basin [Pakistan] (LWR/2017/027)

Sri Lanka

A$0.7 million
Budgeted funding

1
Bilateral and regional research projects

In line with the foreign policy White Paper, Australia's aid program assists Sri Lanka's progress as a secure, stable and prosperous partner in the Indian Ocean region. We have embedded an economic partnership approach, with the aim of maximising the number of Sri Lankans who benefit from economic growth. Australian assistance aims to catalyse reform and leverage additional resources from the Sri Lankan government, the private sector and the community sector. The program will continue support transition from post-conflict reconstruction to supporting economic growth and improving governance.

An overview of Australia's aid program in Sri Lanka is available on the DFAT website.

Economic and development growth in Sri Lanka has been strong over the past two decades, resulting in significant poverty reduction across the country. The country has overcome significant challenges in this time.

A 26-year civil war scarred the nation and a tsunami in 2004 left tens of thousands of people dead, injured or homeless. Today, Sri Lanka has achieved most of the United Nations' Millennium Development Goals and has achieved middleincome country status. But growth has not been uniform, and significant pockets of poverty exist in the former conflict districts of Mullaitivu, Manar and Kilinochchi in the Northern Province, as well as Batticaloa in the Eastern Province and Moneragala in the Uva Province.

Australia has a strong interest in ensuring Sri Lanka continues its development as a secure, stable and prosperous partner of Australia in the Indian Ocean region, underpinned by an effective postconflict reconciliation process.

ACIAR had a broad collaborative research program with Sri Lanka from 1980 to the early 2000s, which covered fisheries, agriculture policy, forestry, animal health and crops. In 2016, Australia's Commission for International Agricultural Research requested an assessment of re-establishing a collaborative research program with Sri Lanka. A scoping study by ACIAR concluded that there was a conducive environment to re-establish a collaborative research program with Sri Lanka, and that it should start with a multidisciplinary project in aquaculture for freshwater shrimp, focused on communities in the Northern Province. Given Sri Lanka's middle-income status, this re-engagement with Sri Lanka 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-sized enterprises, is constrained by issues such as lack of access to finance, markets, market linkages and technology, skills gaps in the workforce and lack of effectively coordinated and inclusive policy reform.

Australia will identify several target sectors and value chains that offer the highest potential to benefit the poor, and women in particular. We will work closely with the private sector and government to enhance the business-enabling environment by improving the relevance, quality and effectiveness of skills, technology, regulations and policies. The objective is for more poor Sri Lankans to receive higher wages, more stable income and rising wealth as a result of equitable engagement with the private sector.

2020–21 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 Sri Lanka partners.

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 product quality. The project also aims to better understand the market chains, to enable further improvements in the value of the fishery and to benefit both men and women fishers and traders.[1]

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Manager
Fisheries: Dr Ann Fleming

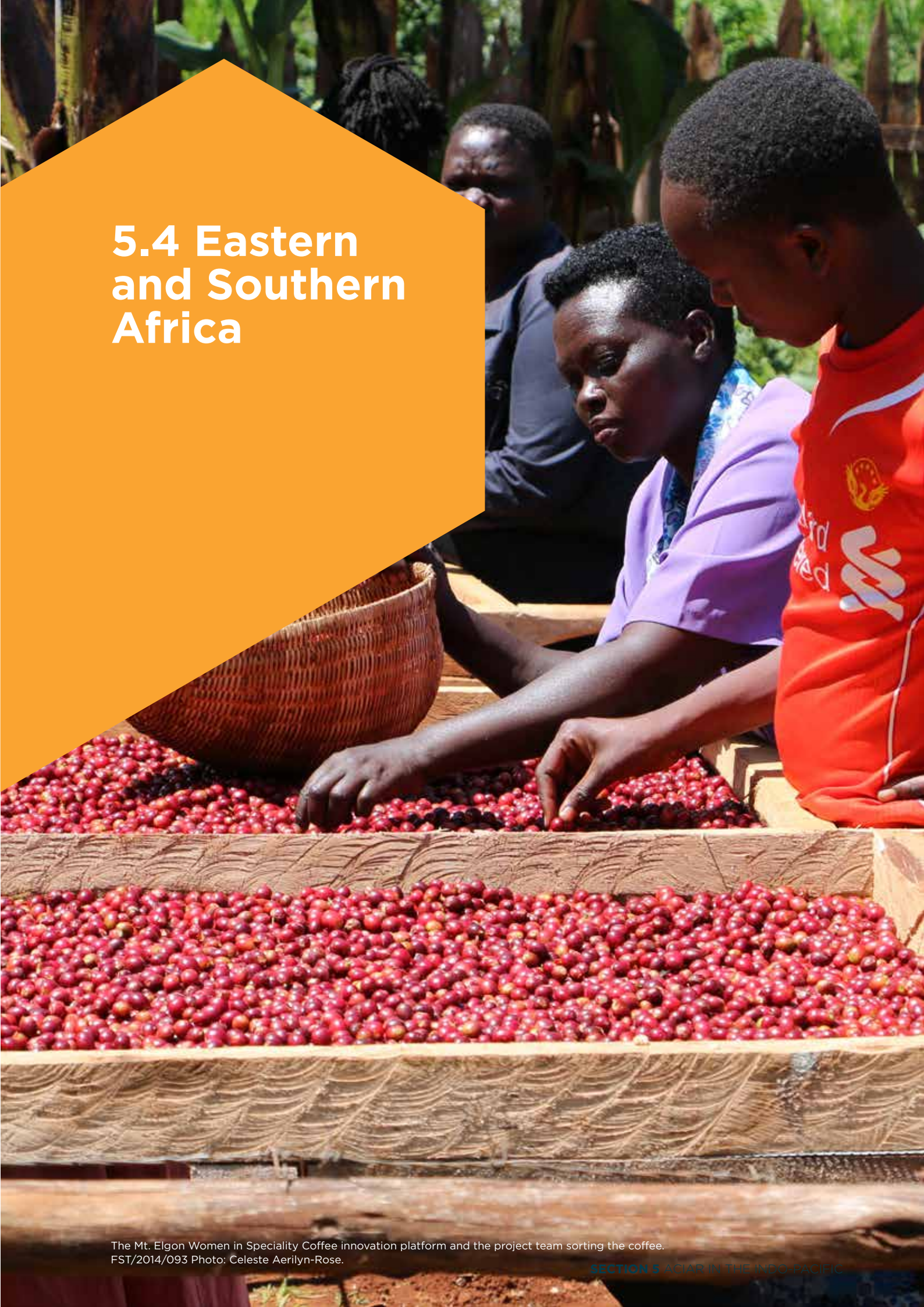
See page 209 for contact details

Current project

1. Improved productivity, efficiency and sustainability of the culture-based fishery for finfish and giant freshwater prawn in Sri Lankan reservoirs (FIS/2018/157)

A new project is investigating stocking, monitoring and harvesting practices to optimise fish and prawn productivity and product quality, in inland fisheries in the Northern Province of Sri Lanka. Photo: Clive Jones. ACIAR project: FIS/2018/157.

5.4 Eastern and Southern Africa



The Mt. Elgon Women in Speciality Coffee innovation platform and the project team sorting the coffee. FST/2014/093 Photo: Celeste Aerilyn-Rose.

Eastern and Southern Africa

Regional summary

Africa's economic performance continues to grow. In 2019, economic growth was estimated at 3.4%, similar to 2018. Rwanda, Ethiopia and Tanzania were among the 10 fastest growing economies in the world. Eastern Africa maintained its lead as the continent's fastest growing region, with average growth estimated at 5.0% in 2019. The slower than expected growth for the whole continent is partly attributed to the moderate expansion of the continent's 'big five'—Algeria, Egypt, Morocco, Nigeria and South Africa—which jointly grew at an average rate of 3.1%. The African Development Bank Group has projected that growth will accelerate to 3.9% in 2020 and 4.1% in 2021.

Despite its incredible diversity at a macro level, Africa has a greater proportion of poor people on average than any other region in the world, and the region is characterised by high levels of food insecurity and very low Human Development Index rankings. If the current trend continues, Africa will need to double its efforts to meet the United Nations' Sustainable Development Goals, including Goal 1 of eradicating extreme poverty by 2030.

Africa's urban population has been growing at a very high rate and is projected to reach 56% of the total population (currently 43.8% of 1.34 billion) by 2050. Africa's demand for food is expected 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. This is compounded by increases in temperature and rainfall reduction associated with climate change, which continue to reduce agricultural production and increase the demand for more land and water. In addition, rural demographics continue to change: growing rural populations, many farms getting smaller and rural youth looking for more lucrative livelihoods in urban areas rather than in traditional farming.

These changes are helping create new opportunities for Africa's smallholder farmers, whose small farms are transforming to be more like business operations, which in turn brings about new challenges to the agricultural systems.

Agriculture typically accounts for 30–40% of the GDP of African countries and more than 70% of the continent's poor live in rural areas. 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 and in research to provide the knowledge that underpins growth in agricultural productivity, especially for commercialising smallholder farming.

Countries in the ACIAR Eastern and Southern Africa region

- Burundi
- Ethiopia
- Kenya
- Malawi
- Mozambique
- Rwanda
- South Africa
- Tanzania
- Uganda
- Zambia
- Zimbabwe

Rukaya Hasani Mtambo fetching water with her daughter Mwanamisi Hai in Tanzania. Rukaya was a participating farmer in the recently ended Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project. At the end of 2017, over 230,000 farmers had adopted sustainable intensification technologies. Photo: Peter Lowe/CIMMYT. ACIAR project: CSE/2013/008.

Drivers of regional collaboration

The Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union in collaboration with the Regional Economic Communities has been at the helm of mobilising the interest and commitment of African Member States and their stakeholders for the transformation of the African agriculture sector.

A major milestone was the adoption of the 2014 Malabo Declaration on Accelerated African Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods, in which the heads of states agreed to spend a minimum of 10% of their total expenditure on agriculture and pursue a target of 6% annual growth. Subsequently, the leaders noted the need for monitoring, tracking and reporting on the implementation of the declaration using the CAADP Results Framework.

In response to this, the African Union has introduced a bi-annual review, the Africa Agriculture Transformation Scorecard, which tracks and reports each country's progress towards achieving the goals and targets of the Malabo Declaration. This important mechanism ensures that there is political will, backed by appropriate actions, to achieve agricultural growth and transformation in Africa.

The scorecard is presented at the African Green Revolution Forum, a key annual pan-African forum with a goal of accelerating progress on agriculture's contribution to economic growth and transformation, in line with delivering on the Malabo commitments. The forum has become a premier platform for leaders from across Africa and around the world to advance concrete action plans and share knowledge to tap the enormous potential of agriculture in driving equitable and sustainable economic growth across the continent. Alliance for a Green Revolution in Africa, in collaboration with several investors, coordinates the forum and produces a report on the forum, the Africa Agriculture Status Report (the AGRA report).

Regional collaboration is crucial to achieving economic development in Africa, and the role of regional and sub-regional organisations is key, including the promotion and protection of foreign investment. The main regional organisations that ACIAR will liaise with include:

- Forum for Agricultural Research in Africa (FARA)
- African Union Development Agency–New partnership for Africa Development (AUDA-NePAD).

ACIAR also liaises with a number of sub-regional organisations, which are mainly coordination bodies for research, policy and markets. These include:

- Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
- Food, Agriculture, and Natural Resources Policy Analysis Network (FANRPAN)
- Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA)
- Common Market for Eastern and Southern Africa (COMESA).

Eastern and Southern Africa

A$6.7 million
Budgeted funding

20
Bilateral and regional research projects

3
Small projects and activities

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. African countries are important in global economic and political terms, including in relation to addressing economic growth, trade liberalisation, agricultural productivity and food security. Sub-Saharan Africa is a diverse region: the development context and challenges faced differ dramatically between the 49 countries. Australia's support to the agriculture 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. These investments focus on areas where Australia has comparative technical, research and agribusiness expertise, supporting practical solutions to enhanced agricultural productivity and growth.

An overview of Australia's aid program in Sub-Saharan Africa is available on the DFAT website.

The agricultural environments of eastern and southern Africa and those in 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.

Australian agricultural science has expertise that is directly relevant to the African context. For more than three decades, ACIAR has supported projects that 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.

The ACIAR program with eastern and southern Africa fills a niche not addressed by many donors: agricultural research-for-development. The work of ACIAR is highly regarded and remains as relevant now as it was 30 years ago because of its focus on brokering research partnerships between Africa and Australia and its long-term commitment to addressing specific constraints in agricultural production with multiyear projects.

ACIAR currently invests 10% of its annual budget in eastern and southern Africa and directly funds projects in partnership with 11 African countries. However, the ACIAR footprint is much broader considering 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.

Our ongoing portfolio of projects covers a diverse range of priorities including:

- improving sustainable productivity in farming systems, including water and natural resource management, food crops, livestock production and disease management
- investigating the role of trees in farming systems and what constraints are preventing agroforestry from being reintroduced in some of our focus countries
- improving social inclusion and greater 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.

ACIAR also has a substantial collaboration with the Canadian International Development Research Centre (IDRC focused on Africa—the Cultivate Africa's Future Fund (CultiAF). CultiAF is in its second phase, supporting nine projects across seven countries.

This program harnesses the complementary interests and skill sets of both organisations to deliver innovative projects researching:

- the potential of insects as feed for poultry, fish and pig production
- harnessing under-utilised fish and fish-based products
- scaling up the supply and utilisation of pre-cooked beans
- gender-inclusive financing for improved fish processing technologies and youth entrepreneurship
- climate-smart interventions for smallholder farmers
- user-driven smallholder irrigation approaches.

A large proportion of ACIAR projects in eastern and southern Africa are regional, operating in more than one country. Additionally, the core of our portfolio is delivered through bilateral country research partnerships (linked to regional impact pathways) and regional collaborations coordinated with sub-regional organisations.

During 2020–21, there are 23 ACIAR-supported projects and programs active in the eastern and southern Africa region.

Table 5.4 Current and proposed projects in the eastern and southern Africa region, 2020–21

Project title	Project code	Country
Crops		
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	Ethiopia, India, Nepal, Pakistan
Faba bean in Ethiopia—mitigating disease constraints to improve productivity and sustainability	CIM/2017/030	Ethiopia
Protection of stored grains against insect pests	CIM/2017/031	Tanzania
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*)	CROP/2018/132	Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda
International Mungbean Improvement Network – phase 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Demand-led plant variety design for emerging markets in Africa	FSC/2013/019	Ghana, Kenya, South Africa, Tanzania
Forestry		
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa (Trees for Food Security phase 2)	FST/2015/039	Ethiopia, Rwanda, Uganda
Livestock Systems		
High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2)	LS/2016/276	South Africa
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	LS/2018/202	Kenya
Scoping livestock research opportunities in Africa	LS/2018/205	Ethiopia
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia

Project title	Project code	Country
Water		
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa	LWR/2016/137	Malawi, Mozambique, South Africa, Tanzania, Zimbabwe
Virtual Irrigation Academy phase 2: from water monitoring to learning to governance	WAC/2018/162	Malawi, Mozambique, South Africa, Zimbabwe
Climate Change		
Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa	WAC/2019/150	Fiji, Indonesia, Kenya, Vietnam
CultiAF projects		
Scale-up supply of precooked beans for food and nutrition security by leveraging on public–private partnerships in Kenya and Uganda (CultiAf 108855)	GP/2019/115	Kenya, Uganda
Business models for scaling improved fish processing technologies in Malawi (CultiAF 108865)	GP/2019/170	Malawi
Insect feed for poultry, fish and pig production in Sub-Saharan Africa (CultiAf 108866)	GP/2019/171	Kenya, Uganda
The effectiveness of the Metro Agri-Food Living Lab for gender inclusive youth entrepreneurship development in Kenya (CultiAf 108867)	GP/2019/172	Kenya
Climate-smart interventions for smallholder farmers in Ethiopia (CultiAf 109038)	GP/2019/173	Ethiopia
User driven approaches to make government and farmer-led smallholder irrigation in Mozambique more productive (CultiAf 109039)	GP/2019/174	Mozambique
Alien invasive fruit flies in southern Africa: implementation of a sustainable IPM program to combat their menaces (CultiAf 109040)	GP/2019/175	Malawi, Mozambique, Zambia, Zimbabwe
Harnessing dietary nutrients of under-utilised fish and fish-based products in Uganda (CultiAf 109041)	GP/2019/176	Uganda
Improving agricultural productivity and resilience with satellite and cellphone imagery to scale climate-smart crop insurance (CultiAf 109076)	GP/2019/177	Kenya

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled during July 2020. Additional projects, not listed in this table, may be commissioned during 2020–21.

2020–21 research program

ACIAR supports 23 projects and programs in eastern and southern Africa. 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. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

Demand-led plant variety design has the potential to transform plant breeding for small-scale agriculture and food security. A project facilitated by the Alliance for Agricultural Research and Development for Food Security (see page 21), 'Demand-led plant variety design for emerging markets in Sub-Saharan Africa', engages with plant-breeding and university sectors in many countries. Professor Kaye Basford of the University of Queensland leads the project, which in phase 1 identified skills and processes needed for breeders to obtain high-performing plant varieties that meet market demands. Phase 2 of the project provides more plant breeders with access to the program and focuses on implementation of best practice in demand-led plant-breeding programs, using beans (*Phaseolus* sp.) and tomatoes. The project will also build capacity in demand-led variety design, by strengthening education and training programs for plant breeders across Africa.[1]

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

A newly established disease, faba bean gall, threatens the ongoing cultivation, viability and existence of faba bean crops in highland areas of Ethiopia. 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 has defined the conditions and practices driving the spread and impact of faba bean gall. During 2020–21, the project continues evaluation of integrated pest-management packages and the identification of sources of genetic resistance for developing resistant varieties. The project will also investigate the presence and relevance of other diseases in faba bean.[3]

A new project aims to deliver genotypes of the common bean that have 30% shorter cooking time, higher zinc and iron content than current varieties, better resistance to *Bruchid* and *Pythium* root rot, and adapted 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. Led by Professor Wallace Cowling of the University of Western Australia, the project adopts recent developments in genetic data collection and analysis to speed up breeding, while maintaining genetic diversity in lines under selection.[4]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through an ACIAR-supported project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development work in Bangladesh, India, Myanmar and Australia. Phase 2 of the network commences in July 2020, continuing variety development for another five years and extending the network to Kenya and Indonesia, providing access to new genetic material and improved cropping options for smallholder farmers in eastern Africa and South-East Asia.[5]

Insect pests cause significant damage to grains stored on-farm in many ACIAR partner countries. Inert dusts are used by smallholders to protect stored grains, but their effectiveness is generally limited. Previous ACIAR research in Timor-Leste and Tanzania established the potential of synthetic amorphous silica as a new pest-control technology. Now, a small project in Tanzania, co-funded by Davren Global and ACIAR and led by Dr David Eagling, is investigating how this technology could be deployed. The project will use results from its laboratory study to understand the various insect pests controlled by the silica and to inform the design of equipment to apply the silica, suitable for smallholders in Tanzania.[6]

Forestry

Locally appropriate agroforestry systems can lift crop yields, and diversify and provide additional income for smallholder farmers. The 'Trees for food security' project built on previous research to integrate tree management with value-chain development, better water management and new livestock management. The project led by Dr Catherine Muthuri of World Agroforestry Centre is in its final year. During 2020–21, the project will consolidate and deliver sound scientific information about tree–crop interactions across different climates, soil types and farming systems in Ethiopia, Rwanda and Uganda. The information will guide policies and extension programs and enable farmers to choose the best agroforestry system for their circumstances. The project will also establish cross-sector communities of practice and develop capacity in tertiary educational institutions to enhance adoption of systems. [7]

A research team installing a sap flow meter and collecting tree meta data from an Albizia tree growing in a coffee plantation. Photo: Joel Buyinza. ACIAR project: FST/2015/039.

Livestock Systems

Livestock management is an important source of farm-level diversification for smallholder farmers in eastern and southern Africa. Improved linkages between farmers and the private sector provide opportunities for smallholder farmers to improve production system sustainability, product quality and human nutrition. A project led by Dr Heather Burrow of the University of New England builds on previous research in South Africa that helped small-scale farmers to supply pasture-fed beef for sale at selected supermarket outlets. During 2020–21, the project will continue to work with local stakeholders to establish commercially viable value chains, and improve the competitiveness of small-scale beef cattle farmers.[8]

The operational capacity of the 'System for land-based emissions estimation for Kenya' program will be expanded to incorporate full AFOLU accounting (agriculture, forestry and other land use). A project led by Dr Geoff Roberts of the Mullion Group will link an operational livestock model to the existing integrated system to estimate greenhouse gas emissions from forests and agriculture. The knowledge and tools gained from the project supports greenhouse gas estimation work in Kenya, and provides a generic framework and operational example to apply to other countries.[9]

Livestock management is one of seven priority areas in Ethiopia's Climate Resilient Green Economy Strategy, in terms of adaptation, resilience building and greenhouse mitigation. The Climate Change and Food Security program 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, ACIAR will conduct a small research project, led by Dr Dawit Solomon of the Climate Change and Food Security program of CGIAR, to foster improvements in availability and quality of administrative data on livestock production and performance.[10]

There is an urgent need to consolidate existing evidence and identify gaps in global research to demonstrate the scale of reductions in greenhouse gas emissions that occur with more efficient livestock production systems. Using the expertise and capabilities of Australian and New Zealand climate science, Dr Paul (Long) Chen of the University of Melbourne will lead a new project developing methods and models that apply to livestock development projects to quantify real and potential reductions in emissions and determine the opportunities and trade-offs between productivity gain and economic returns. The results will help determine if greenhouse gas offsets can be captured and linked with nationally determined contributions of partner countries, and if there is potential for voluntary carbon-credit trading to diversify smallholders' income.[11]

Water

Irrigation has significant potential to contribute to food security in Sub-Saharan Africa, but many irrigation schemes are under-performing and returns on investment in irrigation infrastructure are low. An ACIAR-supported project in southern Africa, led by Professor Jamie Pittock of the Australian National University, works with irrigation schemes supporting more than 15,000 farmers in Mozambique, Zimbabwe and Tanzania to increase the productivity and incomes of farmers and make the schemes more self-sustaining. The project will finish in 2021, reporting on the best methods for dissemination of soil and water management technologies and identifying the factors leading to inequity among farmers in water supply and financial benefit from irrigation schemes.[12]

Smallholder farmers in southern Africa require new irrigation management skills to realise the benefits and potential of available irrigation infrastructure. Phase 1 of 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. Dr Richard Stirzaker of CSIRO Land and Water leads phase 2 of the project, which will develop the Virtual Irrigation Academy system into a water learning and governance platform to support smallholder farmers and address the information deficits at scheme to national levels. In phase 2, the project will also support activities with irrigation schemes in Mozambique and Zimbabwe, through the project described in the previous paragraph.[13]

Climate Change

ACIAR will add a new research program to its portfolio in September 2020 to focus and strengthen work towards our strategic objective that addresses climate variability and climate change.

Australia is a world leader in greenhouse gas mitigation research in agriculture. A new project provides the opportunity to transfer this knowledge to assist our partner countries to identify and quantify on-farm management options that reduce emissions from farming practices and help establish national greenhouse gas accounting systems to monitor, report and verify emissions reductions to the same high standard used by Australia. This project, led by Professor Peter Grace of Queensland University of Technology, and co-funded by New Zealand, will work with government and research institutions in Fiji, Vietnam, Indonesia and Kenya to develop expertise to enable those institutions to better support their national governments in meeting current and future nationally determined emissions reduction commitments under the Paris Agreement.[14]

CultiAF projects

Cultivate Africa's Future (CultiAF) is a partnership between ACIAR and the International Development Research Centre (IDRC) of Canada that addresses post-harvest management, food processing, nutrition, business opportunities and value chains. The program is one of several established in a longstanding relationship between the two international agencies (see page 21). Phase 1 of CultiAF (CultiAF1) began in 2013 and supported eight projects across five countries in eastern and southern Africa. Phase 2 (CultiAF2) was launched in May 2019. During 2020–21, four projects rolled from CultiAF1 into CultiAF 2 will be completed. Five projects new to CultiAF2 start their second year in 2020–21.

Pre-cooked beans improve food and nutrition security, generate income for smallholder farmers and reduce demand for cooking fuel. However, the supply of beans for processing is limited. Dr Michael Ugen of the National Agricultural Research Organization, Uganda, leads a project that rolls over from CultiAF1, to understand the impacts of scaling up the supply of pre-cooked beans, in terms of gender empowerment, household income, employment, fuel use, household consumption patterns and nutrition. The project has also investigated financially inclusive production, supply and business models to produce public–private partnership management models.[15]

Successful processing technologies were identified for fisheries in Malawi in CultiAF1. Improved smoking kilns for small fish species and solar tent dryers for larger fish species were found to be environmentally friendly, effective and economically viable fish-processing technologies. However, efforts to scale up these technologies were not successful. In CultiAF2, research led by Dr Levison Chiwaula of the Ministry of Agriculture, Irrigation and Water Development, Malawi, will complete the design and testing of scaling-up strategies that will target women and youth, enhancing their links to formal markets and access to capital.[16]

Insects present an alternative and sustainable protein source for animal feed in eastern and southern Africa. The scientific basis, technical feasibility and profitability of using insects in animal feed was established in CultiAF1. In CultiAF2, Dr Chrysantus Tanga of the International Centre of Insect Physiology and Ecology, Kenya, leads a project analysing and comparing different approaches to scaling up insect-producing businesses. The research involves 11,070 households and is training 60 small- and medium-size enterprises in mass insect rearing and processing for animal feed.[17]

Pigs at Talash Huijbers' Insectipro neighbour farm, where pigs are fed the larvae of the black soldier fly in a feed ration that also includes soy and fish meal. The feed regime is being tested by the INSFEED project, which is part of the CultiAF program. Photo: Emmie Wachira. ACIAR project: C2016-367.

Effective training and business counselling interventions were tested during CultiAF1 to support youth-led agribusinesses. During CultiAF2, the scope of the project will be expanded and Professor Francis Wambalaba of the United States International University-Africa, Kenya, will test three components of the Metro AgriFood Living Lab's youth entrepreneurship model (training, mentoring and funding). The project strives to define what is required to build a successful youth-led business in the agriculture sector and what benefits are derived from training, mentoring and funding.[18]

Climate change is causing a higher frequency of drought and crop failures in Ethiopia's dry lowlands, exposing farmers to food shortages and livestock losses due to a lack of feed. Dr Taye Mindaye of the Ethiopian Institute of Agricultural Research leads a project, which started with CultiAF2, to develop and implement technologies that reduce the risk of crop failure, increase crop productivity and create new business opportunities for women. The focus is on technologies associated with sorghum production, and include, for example, drought-tolerant varieties and small-scale threshers.[19]

Inefficiency contrains the performance of government and farmer-led smallholder irrigation schemes in Mozambique. A CultiAF2 project led by Dr Mario Chilundo of University of Eduardo Mondlane, Mozambique, aims to equip farmers with the resources and skills to sustain such schemes and identify institutional strategies to support government rehabilitation and expansion programs. The project will combine technical (soil and water management practices), social (business plans and market linkages) and institutional (innovation platforms and water-user associations) innovations and compare changes in their management, productivity and profitability for farmers. Gender analysis and scenario planning will be conducted to inform the design of user-driven, equitable and gender-responsive approaches for schemes that are inclusive of all users.[20]

High-value horticultural crops are key drivers of economic development in Sub-Saharan Africa. Fruit crops can return higher income than staple crops, and they provide more employment opportunities for smallholders both on and off the farm, especially women. Fruit-fly infestations reduce quality and quantity of fruit, curtailing lucrative export opportunities and increasing the use of synthetic insecticides. Dr Samira Mohamed of the International Centre of Insect Physiology and Ecology, Kenya, will lead a project to adapt and promote the widescale adoption of integrated pest-management interventions in Malawi, Mozambique, Zambia and Zimbabwe.[21]

Nutritional deficiencies are widespread in Uganda's poor rural and urban communities, particularly in women of reproductive age and children under five years, due to limited access to animal protein and micronutrient-rich foods, especially fish. Dr Jackson Efitre of Makerere University, Uganda, will lead the NutriFish project and work with the fish sector and its associated value chains to address the nutritional needs of vulnerable groups. NutriFish aims to increase the availability, accessibility and consumption of underused fish to improve sustainable food and nutrition security and better the livelihoods of vulnerable groups. It also aims to increase by-product processing through public–private partnerships.[22]

Crop insurance is an option for farmers to protect their livelihoods against losses, as climate changes and extreme weather events are more frequent. However, very few insurance schemes are suitable for smallholder farmers. The high monitoring and verification costs of traditional insurance, the low demand for index-based insurance and the lack of complementary risk-management options (such as irrigation and drought-tolerant cultivars) are constraints for farmers in Kenya. Mr Amos Tabalia of Agriculture and Climate Risk Enterprise Limited leads a project to rigorously evaluate insurance packages and promote technologies to make farming systems more resilient. The project will also focus on technologies such as satellite and cell phone imagery to verify crop losses and observe management practices.[23]

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Dr Leah Ndungu

Research Program Managers
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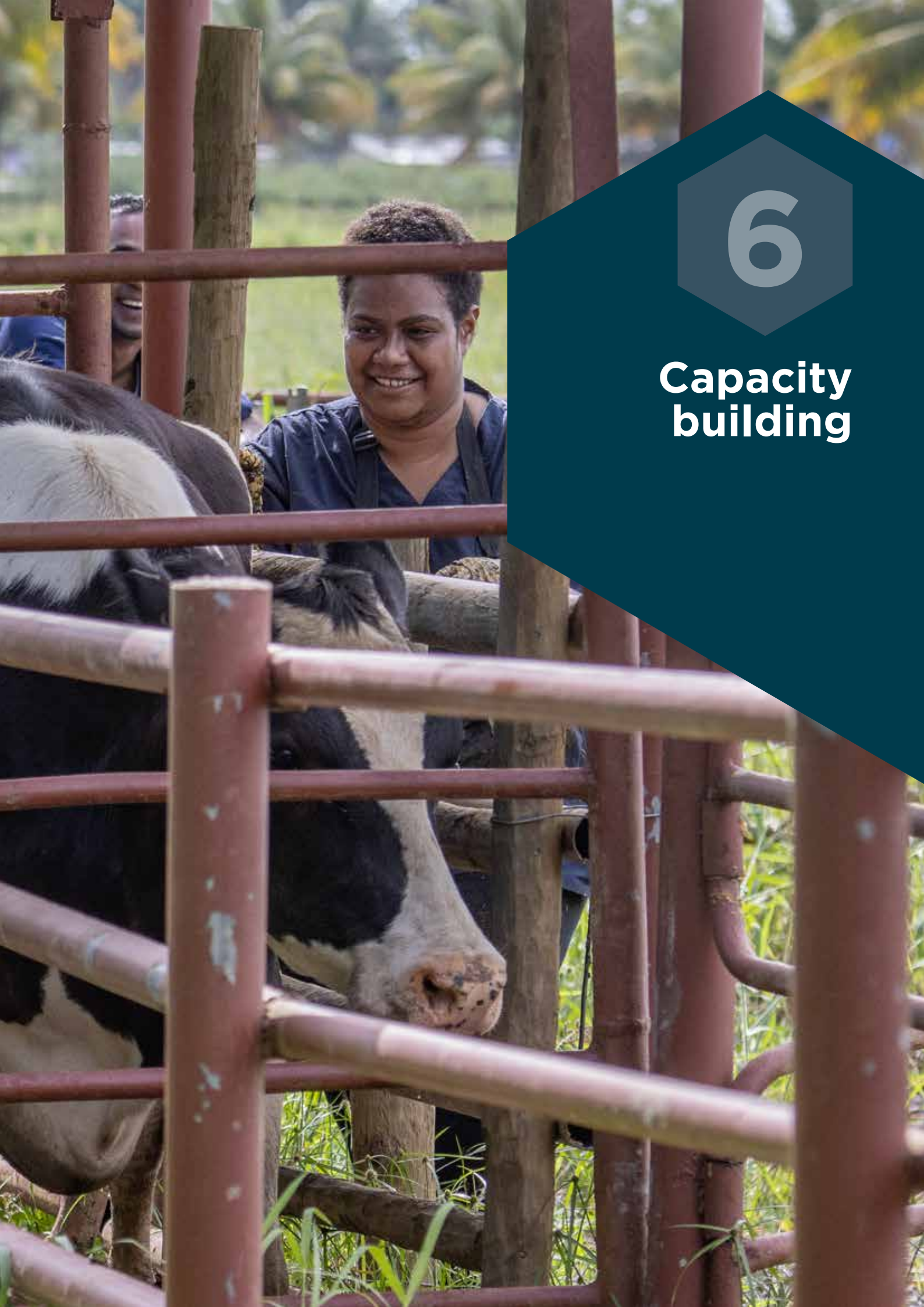
Forestry: Dr Nora Devoe
Livestock Systems: Dr Anna Okello
Water: Dr Robyn Johnston
Climate Change: Dr Veronica Doerr
CultiAF projects: Dr Anna Okello

See page 209 for contact details

Current and proposed projects

1. Demand-led plant variety design for emerging markets in Africa [Ghana, Kenya, South Africa, Tanzania] (FSC/2013/019)
2. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
3. Faba bean in Ethiopia – mitigating disease constraints to improve productivity and sustainability (CIM/2017/030)
4. Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (Phaseolus vulgaris) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda] (CROP/2018/132)
5. International Mungbean Improvement Network – phase 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
6. Protection of stored grains against insect pests [Tanzania] (CIM/2017/031)
7. Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa (Trees for Food Security phase 2) [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. Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development [Cambodia, Indonesia, Kenya, Laos, Myanmar, Pakistan, South Africa, Tanzania, Timor-Leste, Vanuatu, Vietnam, Zambia] (LS/2019/159)
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: from water monitoring to learning to governance [Malawi, Mozambique, South Africa, Zimbabwe] (WAC/2018/162)
14. Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa [Fiji, Indonesia, Kenya, Vietnam] (WAC/2019/150)
15. Scale-up supply of precooked beans for food and nutrition security by leveraging on public–private partnerships in Kenya and Uganda (CultiAf 108855) (GP/2019/115)
16. Business models for scaling improved fish processing technologies in Malawi (CultiAf 108865) (GP/2019/170)
17. Insect feed for poultry, fish and pig production in Sub-Saharan Africa (CultiAf 108866) [Kenya, Uganda] (GP/2019/171)
18. The effectiveness of the Metro Agri-Food Living Lab for gender inclusive youth entrepreneurship development in Kenya (CultiAf 108867) (GP/2019/172)
19. Climate-smart interventions for smallholder farmers in Ethiopia (CultiAf 109038) (GP/2019/173)
20. User driven approaches to make government and farmer-led smallholder irrigation in Mozambique more productive (CultiAf 109039) (GP/2019/174)
21. Alien invasive fruit flies in southern Africa: implementation of a sustainable IPM program to combat their menaces (CultiAf 109040) [Malawi, Mozambique, Zambia, Zimbabwe] (GP/2019/175)
22. Harnessing dietary nutrients of under-utilised fish and fish-based products in Uganda (CultiAf 109041) (GP/2019/176)
23. Improving agricultural productivity and resilience with satellite and cell phone imagery to scale climate-smart crop insurance (CultiAf 109076) [Kenya] (GP/2019/177)

Vets at the Fijian Ministry of Agriculture carry out pregnancy testing through the use of a ultrasound machine at the Koronivia Research Station in Suva. Photo: Dave Lavaki.



6

Capacity building

Capacity building

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

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. We facilitate programs in scientific research, leadership, management, policy and governance with our partners in the Indo-Pacific region.

Building capacity in partner countries is a key priority for ACIAR to extend and maximise the adoption of new knowledge and technologies.

In 2020–21, the program has been significantly disrupted due to travel restrictions, both in Australia and internationally as a consequence of the COVID-19 pandemic. This means a number of our usual activities will be postponed while others are delivered remotely using digital platforms. During this time, we are increasing our engagement with ACIAR alumni through a number of mechanisms including the Alumni Research Support Facility—a one-off round of funding for small COVID-19-related research projects.

Meryl Williams Fellowship

The first cohort of the Meryl Williams Fellowship is now part-way through the 15-month program, delivered by the University of New England. Fellows have completed the first three-week workshop in Australia and engaged in online learning modules. The fellowship works with female agricultural researchers, providing them with the skills and knowledge to take on greater leadership roles in their employing institutions. The up-to-three-month internships in Australia, which are a key part of the program, are now postponed until travel to Australia resumes. Recruitment for the second cohort of women from Timor-Leste, Vanuatu, Tonga, Samoa, Kiribati, Tuvalu, Solomon Islands, Myanmar, Philippines, Nepal and Mongolia is underway, with a view to starting the fellowship in 2021.

John Dillon Fellowship

In the first half of 2020–21, a selection process for a new provider to deliver the John Dillon Fellowship will be completed and plans put in place to deliver a new six-week program that will incorporate recommendations from a review undertaken last year. This follows an evaluation of the fellowship, including its aims and target participants. The next round of the fellowship, providing leadership and management training for 15 mid-career researchers, including two Australians, is scheduled to occur early in 2021, with the mode of delivery depending on the level of travel restrictions in place at the time.

John Allwright Fellowship

The 75 John Allwright fellows undertaking postgraduate study in Australia continue to be significantly impacted by COVID-19. Fellows selected in 2019–20 and 2020–21 will commence their study in Australia when travel restrictions ease. Some current fellows have not been able to return to Australia after the 2019–20 summer break, while others have had difficulty completing field and/or lab work. The ACIAR capacity-building team will continue to support and monitor the welfare of John Allwright fellows during this time, through regular contact and by linking them with other Fellows in their institutions to strengthen their networks.

A support panel has been introduced this year to provide support, advice and direction to John Allwright Fellowship scholars and ACIAR. Panel members will regularly check in with fellows during in their higher degree research program, and escalate issues to universities and/or the capacity-building team when fellows are not making sufficient progress or are not receiving adequate pastoral support. The panel will primarily act as an advisory board to provide advice and hands-on assistance to help the fellows achieve their qualifications, and advise ACIAR on how it can improve management of the fellowship.

A tracer study of past John Allwright fellows will be completed during the year. This is a key activity under our monitoring, evaluation and learning framework and will provide us with information about the impact of these scholarships on the individual, their institution and the broader research environment in their home countries.

The second cohort of the John Allwright Fellowship Executive Leadership program will finish in 2019–20. The program, delivered by the University of New England, equips the fellows with leadership and management skills designed to support their return to the workplace. The current participants have completed the initial two-week workshop and are currently undertaking a program of online learning. The program will finish with a four-day workshop.

Pacific scholarships

We are implementing a new agricultural research scholarship program in the Pacific in 2020–23. The new program builds on two phases of the ACIAR–University of the South Pacific Post-Graduate Scholarship Scheme delivered since 2008. Following a review, a new expanded Pacific Agriculture Scholarship Support Program has been designed. New contracts with the University of South Pacific for 10 postgraduate scholarships, and Fiji National University for five postgraduate scholarships, have been signed. These include two places for Fiji National University faculty members to upgrade their qualifications and include both the University of South Pacific Marine Studies (Fiji) and the School of Agriculture and Food Technology (Samoa).

An academic support program will complete the new Pacific Agriculture Scholarship Support Program. Support will focus on strengthening student links with an ACIAR research project and building their connections to industry and the workplace, along with professional development, focusing on research supervision and peer-to-peer learning for academic staff from University of the South Pacific and Fiji National University.

The Meryl Williams Fellowship works with female agricultural researchers, providing them with the skills and knowledge to take on greater leadership roles in their employing institutions. Photo: Addison Orme

Alumni program

During 2020–21, there will be an increased focus on ACIAR alumni designed to provide ongoing support and career development opportunities during an uncertain time.

In response to the COVID-19 pandemic, the Alumni Research Support Facility, a one-off activity providing up to A$20,000 for small research activities that build resilience and respond to the emerging challenges that COVID-19 has placed on agricultural systems in our partner countries, was opened for applications. In its first phase, the facility is supporting 40 small research projects led by ACIAR alumni across the Indo-Pacific.

Starting in 2020–21, the research projects focus on one or more of the following themes:

- impact of COVID19 on regional food supplies
- One Health
- food systems resilience
- research-to-policy.

Each project team will be paired with an Australian scientist who will act as a collaborator and mentor. This is designed to ensure high-quality scientific outputs and enhanced international scientific collaboration in addressing the impacts of COVID-19. A second phase of the facility will be implemented in late 2020.

John Dillon Fellowship alumni meet in Vietnam. The ACIAR alumni program is designed to provide ongoing support and career development opportunities. Photo: ACIAR

All alumni will be invited to engage and participate in a new social media-style platform, known as ACIAR Alumni 360. The platform is designed to be the central mechanism for alumni to interact with ACIAR and the greater alumni network. Country Office staff will facilitate country chapter pages with links to information about events, research collaborations and discussion forums. ACIAR Alumni 360 will also include information on the Capacity Building Program including calls for applications to our fellowships, funding opportunities and publications and other resources.

Three-year Alumni Engagement Strategies will be developed by each Country Office and Regional Office. These will identify the priorities and interests of each country's alumni. From these, an annual plan will identify a program of activities to be implemented at the country and regional level, which could include training workshops and networking events.

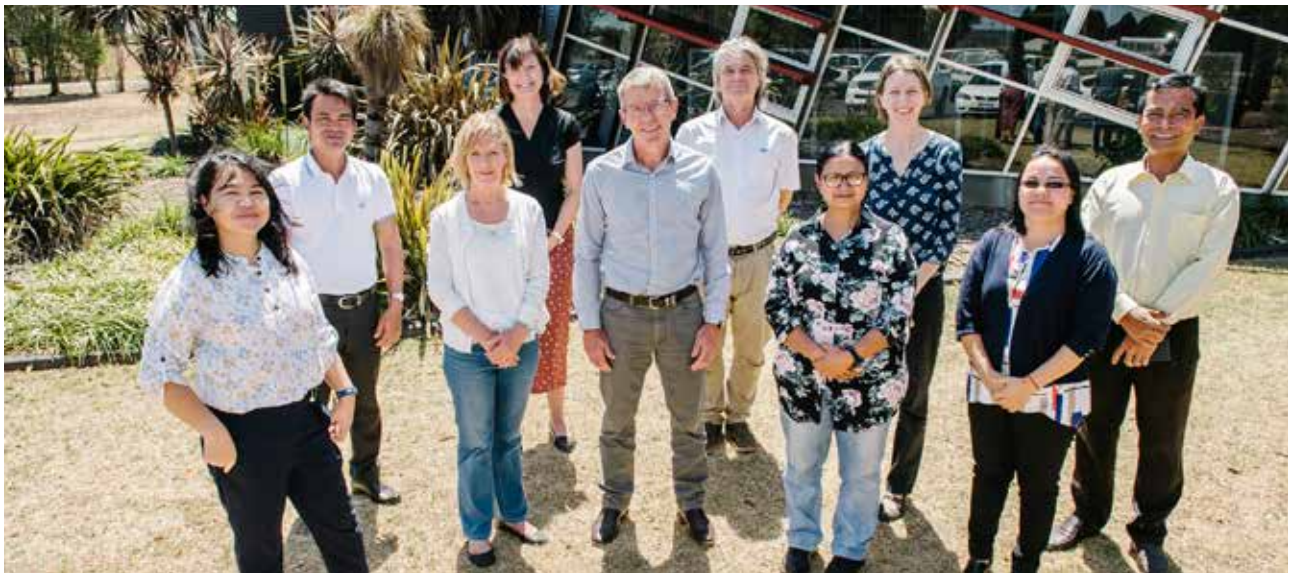
Online resources

In response to global travel restrictions, a learning management system for ACIAR will be established in 2020–21. This system will allow ACIAR to continue existing capacity-building activities delivered through both research projects and programs, as well as expand the reach of our training.

Capacity building in projects

A key outcome from all ACIAR projects is building the capacity of researchers in our partner countries. Following a review of 20 past projects where capacity building was a key objective, a tool kit has been created to assist project leaders to better describe capacity-building activities within projects. The toolkit guides project leaders to clarify project partner needs, plan appropriate activities and identify indicators of change. The toolkit is incorporated into the ACIAR project development cycle. This will allow ACIAR to more effectively capture and integrate the lessons learned from 40 years of capacity building and ensure best practices are applied across our investments.

At the same time, we are reviewing past work to strengthen institutional capacity through our research projects. ACIAR has long-term relationships with overseas agricultural research organisations. The ongoing nature of our research partnerships makes it important to understand the enablers, constraints and impacts that research project capacity building has on strengthening institutions. This work will identify approaches that have been successful in enhancing our research partners' organisational effectiveness for improved agricultural research. This body of work will be used to inform a new program of work to enhance institutional awareness in research projects for more sustainable research outcomes.



The ACIAR launch fund supported the attendance of project team members from Cambodia, Laos and Australia to a conference and workshops on soil and water management held at the University of Southern Queensland in December 2019. Photo: Alice Melland

Other training activities

The ACIAR Launch Fund provides financial assistance to organisations or individuals wishing to conduct or attend events or training that directly benefit 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.

The Pacific Plant Biosecurity Program aims to strengthen plant biosecurity capacity in the Pacific island countries, including Papua New Guinea and Timor-Leste. In order to maintain cohort momentum during the pandemic, tailored interactive online learning modules are being delivered. The modules complement the face-to-face learning, and have the advantage of being available to a wider audience.

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See page 209 for contact details

Table 6.1 **Participation in ACIAR capacity-building programs, 2015–20**

Programs	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21 (est)
John Allwright Fellowship						
No. active in year	130	140	97	85	75	70
No. awarded in year	24	22	7	12	10	10
John Dillon Fellowship						
No. active in year	10	10	10	28	28	15
Alumni training						
No. participants	—	—	—	75	90	300
Meryl Williams Fellowship						
No. active and awarded in year	—	—	—	—	20	40
Launch fund						
No. events supported	—	—	—	11	15	10

Salvador Rosal works at his farm in the mountains near Koronadal City in the southern Philippines. Photo: Jeoffrey Maitem.

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 2020–21, comprehensive and coordinated strategies and plans, programs and projects will be developed and/or implemented to achieve these objectives. This work will include:

- developing an integrated campaign-orientated content strategy, including segmenting our messaging to key target audiences
- identifying opportunities to engage with stakeholders, including leveraging the profile and networks of the members of the Commission for International Agricultural Research
- continuing to improve the user experience of the ACIAR website, including the roll out of a research knowledge hub on the Research Portal component of the website
- incorporating a new digital platform for signature ACIAR publications to expand the reach to our scientific and research partners
- partnering with domestic and international media organisations to raise our profile with a wide audience
- expanding our In-Country Communication Officer Network to increase our reach and continue to communicate actively and effectively in-country and in our regions.

Website redevelopment

The ACIAR website has undergone significant redevelopment in the past two years, at both the front and back ends. User experience is now much improved on project, program, country and regional pages, and the search function is also much improved. During 2020–21, there will be further development of the website to increase usability, provide richer content and improve reach to our audiences. New infographic and data visualisation content will be produced, on a continual basis, to tell our stories in various creative formats.

At the same time, search engine optimisation of the website content is being reviewed and audited, to ensure it improves our site visibility and increases our organic traffic.

A more dynamic news-style blog page will developed, along with a digital publications page for signature publications. The digital publications page will transform PDF documents into fluid html content to improve the user experience for both desktop and mobile formats.

Social media

Growing from 20,000 followers in 2017 to an audience of nearly 80,000 in 2020, ACIAR social media channels are key communication tools. Through Facebook, Twitter, Instagram and LinkedIn, ACIAR can reinforce the impact of ACIAR-funded research to an engaged audience. In 2020–21, we will conduct an audit of our social media channels to develop a deeper understanding of the different audiences following ACIAR on each platform. We will use this knowledge to create more targeted content and segment our messaging to key audiences.

Digital content production will continue with an emphasis on short-form video, photography and infographics.

In addition, a network of science, agriculture and development sector digital influencers will also be developed to amplify our voice and increase reach and engagement with our digital content.

Media partnerships

ACIAR will continue to partner with media organisations, both domestically and internationally, to raise the profile of our work with a wider audience. In 2020–21, we will engage with journalists in our region online to allow for COVID-19 travel restrictions. ACIAR will also work closely with the Crawford Fund to generate positive media coverage, especially in regional and agriculture-based media in Australia.

Stakeholder engagement

Work will continue on developing a comprehensive domestic stakeholder engagement strategy to ensure we take a strategic approach to improving awareness and detailed understanding of ACIAR among specific domestic stakeholder groups.

In 2020–21, the stakeholder engagement strategy will aim to:

- increase engagement with Australian stakeholders, including their awareness and understanding of the ACIAR value proposition with information specifically targeted to a domestic audience
- strengthen relationships with select stakeholder organisations to establish productive partnerships, collaborations and co-delivered initiatives
- identify opportunities to leverage the profile and networks of members of the Commission for International Agricultural Research to raise awareness of and advocate for ACIAR
- position ACIAR to help deliver on its 10-year strategy.

While COVID-19 has seen many events cancelled or postponed, ACIAR will continue to participate in key sector events online to share the results of ACIAR research with a highly targeted audience.

A significant event for ACIAR in 2021 will be hosting an online Annual Council Meeting of the Global Research Alliance on Agricultural Greenhouse Gases. It is anticipated that the event will be attended by more than 100 delegates. ACIAR will take up a term as the Council Chair of the alliance when it hosts the meeting in March 2021. The council meeting is an opportunity to increase the presence and involvement of the Pacific region on the Global Research Alliance, as well as assist in building partnerships to grow climate change action in agriculture around the world.

We will also continue to create opportunities to host online webinar events involving keynote speakers from ACIAR and partner organisations and agencies, along with participating and sponsoring key sector events where appropriate.

ACIAR has a network of in-country communication officers to identify and develop content for ACIAR outreach activities. Here, Australian Ambassador to the Philippines, Steven Robinson AO (centre), visits a giant grouper hatchery. A strong partnership between Australian and Philippine research institutions, facilitated by ACIAR, has contributed to substantial development in the fisheries sector. Photo: Jaclyn Grey.

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 2020–21, we will develop a new digital design on the website for signature publications to enhance the user experience. We will also 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. This will also include a new digital format for 2020–21.

In-country communication

In 2020–21, we will continue the scale-out of a network of communication professionals to our country offices in Laos, India and Indonesia (in consultation with relevant posts and their COVID-19 protocols).

Currently, there are communication officers in five country offices: Fiji, Papua New Guinea, Vietnam, the Philippines and Kenya. Communication plans and activities will continue to 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

Integrated and themed communication campaigns will be delivered during 2020–21. This will 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.

General Manager, Outreach and Capacity Building

Ms Eleanor Dean

See page 209 for contact details

Carlos Kamoto plants maize with his wife Margret in Kasangu, Malawi. Carlos was a participating farmer in the recently ended Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project. Photo: Peter Lowe.

8

Appendixes

Appendix 1

Details of current and proposed projects and short research activities, 2020–21

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Agribusiness						
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	1/01/2016	31/12/2020	Prof Jeffrey LaFrance	Monash University	The University of Queensland, Macquarie University, Pakistan Agricultural Research Council, Pakistan Agricultural Coalition, Sindh Agriculture University, School of Economics, Quaid-e-Azam University, University of Agriculture, Faisalabad Arid Agriculture University, Rawalpindi School of Advanced Agricultural Sciences, Peking University
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
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	1/09/2018	31/12/2021	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, University of Tasmania
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	1/01/2020	31/12/2023	Dr Chunlai Chen	Australian National University	Bangladesh Academy for Rural Development, Bangladesh Agricultural University, Bogor Agricultural University, Indonesian Centre for Agriculture Socio Economic and Policy Studies, Pakistan Institute of Development Economics, Planning Commission
Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach	ADP/2018/131	26/06/2018	28/02/2021	Dr Christine Jacobson	University of the Sunshine Coast	—
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	1/03/2014	31/12/2020	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 Postharvest Technology, The University of Adelaide
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	30/09/2020	Dr Dominic Smith	The University of Queensland	International Center for Tropical Agriculture, Northern Mountainous Agriculture and Forestry Science Institute, Indonesian Legume and Tuber Crops Research Institute, Tay Nguyen University, Brawijaya University

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	13/06/2016	30/06/2021	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 S Rogers	Applied Horticultural Research	Centre international pour la recherche agronomique pour le développement, 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)	AGB/2014/057	12/06/2017	31/05/2021	Dr Lex Thomson	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, The University of Queensland, University of the South Pacific
Inclusive agriculture value chain financing	AGB/2016/163	25/06/2018	31/01/2023	Dr Alan de Brauw	International Food Policy Research Institute	Abdul Latif Jameel Poverty Action Lab, South East Asia (J-PAL SEA), Indonesian Centre for Agriculture Socio Economic and Policy Studies, Innovations for Poverty Action (IPA) Myanmar, Institute of Policy and Strategy for Agriculture and Rural Development, Myanmar Economics Association, The University of Sydney
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	AGB/2017/036	12/03/2019	31/12/2020	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	30/06/2021	Dr Gomathy Palaniappan	The University of Queensland	—
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	6/03/2019	31/07/2021	Mr Oleg Nicetic	The University of Queensland	—
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	AGB/2018/172	23/08/2019	30/06/2023	Dr Jonathan Newby	International Center for Tropical Agriculture	Agricultural Genetics Institute, General Directorate of Agriculture, Hung Loc Agricultural Research Centre, Kasetsart University, National Agriculture and Forestry Research Institute, Plant Protection Center, Department of Agriculture, Plant Protection Research Institute, Thai Tapioca Development Institute, The Chinese Academy of Tropical Agricultural Sciences, The University of Queensland
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam.	AGB/2018/175	1/10/2020	30/06/2024	Dr Estelle Bienabe	World Agroforestry Centre	The University of Sydney, International Center for Tropical Agriculture, Deakin University, Institute of Policy and Strategy for Agriculture and Rural Development, Nong Lam University, Tay Nguyen University, Western Highlands Agriculture and Forestry Science Institute, National Institute of Agricultural Planning and Projection, Plant Protection Research Institute

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Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines	AGB/2018/196	2/03/2021	1/03/2025	Dr Lilly Lim-Camacho	CSIRO Agriculture and Food	—
Off-farm: strategic review and planning for 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	15/06/2019	30/12/2020	Dr Estelle Bienabe	World Agroforestry Centre	—
A theory of change for inclusive value chains in the Philippines	AGB/2019/100	15/06/2019	31/03/2021	Dr Oleg Nicetic	The University of Queensland	—
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	1/01/2021	30/06/2024	Dr Jaquie Mitchell	The University of Queensland	NSW Department of Primary Industries, Ang Giang University, Can Tho University, Cuu Long Rice Research Institute, Australian Grain Storage Pty Ltd, Ricegrowers Vietnam, Rice Research Australia Pty Ltd
Market and opportunity analysis to guide market-led development of the Myanmar pulse sector	AGB/2019/154	30/03/2020	30/06/2021	Ms Deb Doan	Business for Millennium Development Ltd	—
Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam	AGB/2019/185	9/12/2019	31/12/2020	Assoc Prof Tiho Ancev	The University of Sydney	—
Philippines smallholder dairy: landscape analysis and research priorities	AGB/2020/120	15/06/2020	14/06/2021	Prof Wendy Umberger	The University of Adelaide	—
Agriculture for tourism – advancing a synergistic development pathway for both local agribusiness value chains and tourism in Bali, Indonesia	AGB/2020/121	15/06/2020	30/06/2021	Mr Jeremy Badgery-Parker	Primary Principles Pty Ltd	—
Climate Change						
Conservation agriculture and sustainable intensification of smallholder farming systems in Pacific countries as a pathway to transformational climate change adaptation and reducing GHG emissions	CROP/2020/185	22/06/2020	18/06/2021	Prof Timothy Reeves	The University of Melbourne	—
Climate change and Pacific food systems: decision-making for transformational change (proof-of-concept)	WAC/2019/148	20/06/2019	28/02/2021	Dr Michael Battaglia	CSIRO Agriculture and Food	—

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Emissions avoidance of soil carbon from lands undergoing practice change	WAC/2019/149	20/06/2019	30/10/2020	Prof Deli Chen	The University of Melbourne	—
Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa	WAC/2019/150	1/10/2020	30/09/2023	Prof Peter Grace	Queensland University of Technology	—
Food futures for the food systems in the Eastern Gangetic Plains (SDIP)	WAC/2020/158	11/06/2020	30/05/2021	Dr Avinash Kishore	International Food Policy Research Institute	—
Crops						
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	31/08/2021	Prof William Erskine	The University of Western Australia	Bangladesh Agricultural Research Institute, Bangladesh Agricultural University, CSIRO Agriculture Flagship, Department of Agricultural Extension
Establishing the International Mungbean Improvement Network	CIM/2014/079	1/01/2016	31/12/2020	Dr Ramakrishnan Nair	The World Vegetable Center	Department of Agricultural Research, Indian Institute of Pulses Research, Qld Department of Agriculture and Fisheries, Bangladesh Agricultural Research Institute, Kenya Agricultural and Livestock Research Organisation, National Agricultural Research Organization, Tanzania Agricultural Research Institute
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	1/08/2016	30/06/2021	Prof Robert Park	The University of Sydney	NSW Department of Primary Industries, Directorate of Wheat Research, Pakistan Agricultural Research Council, Nepal Agricultural Research Council, Ethiopian Institute of Agricultural Research
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, 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	30/10/2021	Dr Ata-ur Rehman	Charles Sturt University	Muhammad Nawaz Sharif University of Agriculture, Multan, Punjab, Pakistan Agricultural Research Council, Sindh Agriculture University, University of Arid Agricultural Rawalpindi
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

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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
Protection of stored grains against insect pests	CIM/2017/031	1/07/2019	30/06/2021	Dr David Eagling	Davren Global Pty Ltd	Tropical Pesticides Research Institute, Ministry of Agriculture Food Security Cooperative
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*)	CROP/2018/132	1/08/2019	30/06/2024	Prof Wallace Cowling	The University of Western Australia	Ethiopian Institute of Agricultural Research, Institut des Sciences Agronomiques du Burundi, International Center for Tropical Agriculture, Kenya Agricultural and Livestock Research Organisation, Maruku Agricultural Research Institute, National Crops Resources Research Institute, Rwanda Agriculture and Animal Resources Development Board
Identifying soil constraints in the Eastern Gangetic Plains (SDIP)	CROP/2018/210	1/12/2018	31/12/2020	Dr Neal Menzies	The University of Queensland	Uttar Banga Krishi Vishwavidyalaya, 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	1/12/2020	Dr Sivapragasam Annamalai	Centre for Agriculture and Bioscience International	Myanmar Agricultural Service
International Mungbean Improvement Network – phase 2	CROP/2019/144	1/07/2020	30/06/2025	Dr Ramakrishnan Nair	The World Vegetable Center	Qld Department of Agriculture and Fisheries, Bangladesh Agricultural Research Institute, Indian Institute of Pulses Research, Indonesian Legume and Tuber Crops Research Institute, Kenya Agricultural and Livestock Research Organisation, Department of Agricultural Research
Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos	CROP/2019/145	1/09/2020	30/06/2025	Dr Jaquie Mitchell	The University of Queensland	Cambodia Agricultural Research and Development Institute, National Agricultural and Forestry Research Institute, Laos, ROYAL UNIVERSITY OF AGRICULTURE
Managing basal stem rot in oil palm by converting infected logs to biochar	CROP/2019/147	1/07/2020	31/12/2021	Dr Agneszka Mudge	The University of Queensland	PNG Oil Palm Research Association
Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC)	CROP/2020/144	1/06/2020	30/06/2021	Dr Wee Tek Tay	CSIRO Agriculture and Food	University of Gadjah Mada, Plant Protection Research Institute of Vietnam, Department of Agriculture Lao PDR, Department of Agricultural Research Myanmar, Cambodian Agricultural Research and Development Institute, De La Salle University, Centre for Agriculture and Bioscience International
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP)	CSE/2011/077	12/05/2014	30/06/2021	Dr Brendan Brown	International Maize and Wheat Improvement Center	Bangladesh Agricultural Research Council, Bangladesh Agricultural Research Institute, Rangpur Dinajpur Rural Service, Indian Council of Agricultural Research, Nepal Agricultural Research Council, CSIRO Ecosystem Sciences, iDE, Department of Agricultural Extension, Bihar Agricultural University, Uttar Banga Krishi Vishwavidyalaya, JEEViKA, Nepal Department of Agriculture, Curtin University of Technology, University of New England, International Food Policy Research Institute, International Water Management Institute, The University of Queensland

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Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains	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 Northwest 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
Demand-led plant variety design for emerging markets in Africa	FSC/2013/019	26/06/2014	31/12/2021	Prof Kaye Basford	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 (SFSA), University of Nairobi, West Africa Centre for Crop Improvement (WACCI), University of Ghanna, West and Central African Council for Agricultural Research and Development
Fisheries						
Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar	FIS/2014/041	1/01/2016	30/06/2021	Prof Lee Baumgartner	Charles Sturt University	National University of Laos, Living Aquatic Resources Research Centre, University of South Australia
Developing pearl industry-based livelihoods in the western Pacific	FIS/2014/060	1/09/2015	30/06/2021	Prof Paul Southgate	University of the Sunshine Coast	James Cook University, National Fisheries Authority, Ministry of Agriculture and food forests and fisheries, Ministry of Fisheries and Forests
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	31/03/2021	Prof Paul Southgate	University of the Sunshine Coast	National Fisheries Authority, James Cook University
Restoring damaged coral reefs using mass coral larval reseeding	FIS/2014/063	1/07/2015	31/05/2021	Prof Peter Harrison	Southern Cross University	University of the Philippines, Australian National University
Improving seaweed production and processing opportunities in Indonesia	FIS/2015/038	1/08/2016	31/01/2021	Prof Nick Paul	University of the Sunshine Coast	Agency for Marine and Fisheries Research and Human Resources, Hasanuddin University
Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	FIS/2015/046	1/01/2017	31/03/2021	Mr Mike 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	Agency for Research and Human Resources Development Marine and Fisheries, Indonesia

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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	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	University of the Sunshine Coast	Ministry of Agriculture Food and Forests, 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	Prof Nick Paul	University of the Sunshine Coast	Fisheries Administration, Research Institute for Coastal Aquaculture, Institute for Mariculture Research and Development Gondol, NSW Department of Primary Industries
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, International Rice Research Institute, Ministry of Agriculture, Livestock and Irrigation
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	6/09/2017	31/12/2021	Dr 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 upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	1/09/2019	31/08/2022	Prof Lee Baumgartner	Charles Sturt University	Living Aquatic Resources Research Centre, National University of Laos, Xayaburi Power
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	1/09/2020	31/08/2024	Dr David Mills	WorldFish Center	CSIRO, Ministry of Agriculture and Fisheries, Timor-Leste, Research Centre for Marine and Fisheries Socio-economics Indonesia, WorldFish Center
Evaluating processes and outcomes in south-south research collaboration—finfish mariculture development in Cambodia through cooperation with Indonesia	FIS/2018/115	20/06/2018	30/06/2021	Dr Janelle Allison	University of Tasmania	—
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	25/06/2018	30/06/2021	Prof Peter Harrison	Southern Cross University	University of the Philippines, James Cook University
Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	FIS/2018/151	1/09/2020	31/08/2025	Dr Jesmond Sammut	University of New South Wales	Australian Nuclear Science and Technology Organisation, CSIRO National Collections and Marine Infrastructure, James Cook University, National Fisheries Authority, University of Papua New Guinea, University of Tasmania
Translating fish passage research outcomes into policy and legislation across South-East Asia	FIS/2018/153	1/01/2020	31/12/2023	Prof Lee Baumgartner	Charles Sturt University	Charles Sturt University, Ministry of Agriculture, Livestock and Irrigation, Ministry of Marine Affairs and Fisheries, National University of Laos
Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators	FIS/2018/154	1/09/2020	30/08/2025	Dr Jesmond Sammut	University of New South Wales	Australian Nuclear Science and Technology Organisation, Department of Agriculture and Livestock, National Fisheries Authority, University of New South Wales
Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region	FIS/2018/155	1/08/2019	31/12/2022	Dr Neil Andrew	University of Wollongong	CSIRO, Pacific Community Fiji, The University of Sydney, University of Wollongong, WorldFish Center

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Improved productivity, efficiency and sustainability of the culture-based fishery for finfish and giant freshwater prawn in Sri Lankan reservoirs	FIS/2018/157	1/04/2020	31/12/2023	Dr Clive Jones	James Cook University	James Cook University, National Aquaculture Development Authority, University of Ruhuna, Wayamba University of Sri Lanka
Towards more profitable and sustainable pearl-industry based livelihoods in the western Pacific	FIS/2019/122	1/01/2021	31/12/2025	Prof Paul Southgate	University of the Sunshine Coast	The Pacific Community, Ministry of Fisheries and Forests Fiji, Ministry of Agriculture Forests Food and Fisheries Tonga, Ministry of Agriculture and Fisheries Samoa, National Fisheries College Papua New Guinea
Regional networks for large-scale coral and fish habitat restoration in the Philippines	FIS/2019/123	1/10/2020	30/09/2025	Prof Peter Harrison	Southern Cross University	University of the Philippines, Queensland University of Technology, The University of Melbourne, University of Technology Sydney
Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands	FIS/2019/124	1/10/2020	30/06/2024	Dr Hampus Eriksson	University of Wollongong	University of Canberra, WorldFish Center
Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa	FIS/2019/125	1/10/2020	31/30/2022	Dr Libby Swanepoel	University of the Sunshine Coast	—
Forestry						
Building effective forest health and biosecurity networks in SE Asia	FST 2020 123	1/01/2021	30/04/2020	Dr Simon Lawson	University of the Sunshine Coast	University of Tasmania
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	FST/2014/067	1/10/2015	31/03/2021	Prof Helen Wallace	Griffith University	Ministry of Commerce, Industry, Labour and Immigration, Ministry of Trade, Commerce, Industry and Tourism, National Agricultural Research Institute, Southern Cross University, The University of Adelaide
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa (Trees for Food Security phase 2)	FST/2015/039	1/01/2017	31/12/2020	Dr Catherine Muthuri	World Agroforestry Centre	African Network for Agriculture, Agroforestry and Natural Resources Education, CSIRO Ecosystem Sciences, 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 Vision
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	7/04/2016	30/06/2021	Associate Professor Digby Race	University of the Sunshine Coast	Australian Agroforestry Foundation, Forestry Research, Development and Innovation Agency, Gadjah Mada University, Trees 4 Trees, University of Mataram
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	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, Murdoch University, Threads of Life: Indonesia Textile Arts Centre, University of Mataram, 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	Australian National University, Forestry Research, Development and Innovation Agency, RMIT University

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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	Dr Hilary Smith	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 Northwest 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
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, Papua New Guinea 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	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	31/01/2021	Mr David Bush	CSIRO National Research Collections	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 CANBERRA (Research), University of New South Wales
Enhancing private sector–led development of the Canarium industry in Papua New Guinea – phase 2	FST/2017/038	1/12/2019	31/12/2022	Prof Helen Wallace	Griffith University	National Agricultural Research Institute, The University of Adelaide, University of the Sunshine Coast
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	FST/2018/178	1/01/2021	31/12/2024	Dr Tony Page	University of the Sunshine Coast	Papua New Guinea Forest Authority, Papua New Guinea Forest Research Institute, University of Natural Resources & Environment, Organisation for Industrial, Spiritual & Cultural Advancement, Women and Youth in Agriculture
Managing risk in South-East Asian forest biosecurity	FST/2018/179	1/09/2020	31/08/2024	Dr Caroline Mohammed	University of Tasmania	Centre for Forest Biotechnology and Tree Improvement, Forestry Research and Development Agency, NSW Department of Primary Industries, Vietnamese Academy of Forest Sciences, National Agriculture and Forestry Research Institute
Policy analysis for forest plantations Laos and Vietnam	FST/2019/121	26/06/2019	18/12/2020	Prof Rod Keenan	The University of Melbourne	National Agriculture and Forestry Research Institute, Vietnamese Academy of Forest Sciences, National University of Laos

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Coconut and other non-traditional forest resources for the manufacture of engineered wood products	FST/2019/128	1/07/2020	30/06/2025	Dr Rob McGavin	Queensland Department of Agriculture and Fisheries	Fiji Ministry of Forestry, Pacific Community, The University of Queensland, South Pacific University, Griffith University
Scoping for a forest biosecurity network in South-East Asia	FST/2020/102	17/02/2020	16/08/2020	Dr Madaline Healey	University of the Sunshine Coast	University of the Sunshine Coast, University of Tasmania, National Agriculture and Forestry Research Institute
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	18/05/2020	17/10/2021	Associate Professor Mark Dieters	The University of Queensland	National Agriculture and Forestry Research Institute, Souphnavong University, Northern Agriculture and Forestry College
Horticulture						
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	1/01/2020	31/12/2021	Dr Jelfina Alouw	International Coconut Community	—
Enhanced fruit production and postharvest handling systems for Fiji, Samoa and Tonga	HORT/2014/077	1/01/2016	30/12/2020	Prof Steven Underhill	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
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	12/04/2017	30/12/2021	Mr Yan Diczbalis	Queensland Department of Agriculture and Fisheries	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	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, 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

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
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	Queensland Department of Agriculture and Fisheries	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	CABI	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	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
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)	—
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands	HORT/2017/025	1/05/2019	31/12/2024	Dr Carmel Pilotti	Secretariat of the Pacific Community	Kokonas Indastri Koporesen, Ministry of Agriculture, Ministry of Agriculture and Fisheries, Ministry of Agriculture and Livestock, Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity, The University of Queensland
An integrated management response to the spread of fusarium wilt of banana in South-East Asia	HORT/2018/192	1/01/2020	31/12/2024	Mr Anthony Pattison	Queensland Department of Agriculture and Fisheries	Australian Banana Growers Council, Horticultural Research Centre, Plant Protection Center, Department of Agriculture, Provincial Agricultural Office-Rigion XI, Davao Del Norte, The University of Queensland, University of Southeastern Philippines
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	Queensland Department of Agriculture and Fisheries	Queensland Department of Agriculture and Fisheries, PNG Coffee Industry Corporation, University of the Sunshine Coast
Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	1/01/2021	30/12/2025	Dr Jianhua Mo	New South Wales Department of Primary Industries	University of Gadjah Mada

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Enhanced fruit systems for Tonga, Samoa and Fiji (phase 2): community-based citrus production	HORT/2019/165	1/01/2021	30/12/2024	Prof Steven Underhill	University of the Sunshine Coast	The University of Queensland
Livestock Systems						
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	1/09/2015	31/12/2020	Dr Colin Brown	The University of Queensland	Chinese Academy of Agricultural Sciences, Ministry of Food and Agriculture of Mongolia, Mongolia University of Life Sciences, Charles Sturt University, Australian National University, CSIRO
Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	1/01/2017	30/06/2021	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
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	1/02/2016	31/03/2021	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
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
Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos	LS/2014/055	1/09/2020	31/12/2023	Dr Amanda Ash	Murdoch University	CSIRO, National University of Lao, Ministry of Health
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 cattle production in the Myanmar Central Dry Zone 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

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
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
Evaluating the opportunities for smallholder livestock keepers in Timor-Leste	LS/2017/035	1/05/2019	31/12/2020	Dr Dominic Smith	The University of Queensland	Ministry of Agriculture and Fisheries
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	LS/2018/107	12/04/2019	30/09/2020	Dr Mario Herrero	CSIRO Agriculture and Food	—
Sectoral analysis and investment requirements for improving the Fiji and Samoa small ruminant sector	LS/2018/183	1/07/2020	31/12/2021	Dr Rodd Dyer	The University of Queensland	—
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	14/01/2019	30/06/2021	Dr Ben Polkinghorne	Australian National University	—
Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu	LS/2018/185	1/10/2020	30/09/2024	Dr Simon Quigley	The University of Queensland	—
Forages—taking stock and identifying research needs	LS/2018/186	1/06/2019	31/12/2020	Dr Lava Yadav	The University of Queensland	—
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	LS/2018/202	14/01/2019	31/12/2020	Dr Geoff Roberts	The Mullion Group Pty Ltd	—
Scoping livestock research opportunities in Africa	LS/2018/205	19/06/2019	30/12/2020	Dr Dawit Solomon	Climate Change and Food Security program (CGIAR)	—
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	30/06/2021	Dr David Williams	CSIRO Australian Animal Health Laboratory	—

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Zoonotic malaria in Indonesia (One Health)	LS/2018/214	18/03/2019	31/12/2020	Professor Nicholas Anstey	Menzies School of Health Research	—
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in three provinces in Papua New Guinea (One Health)	LS/2018/217	15/04/2019	30/06/2021	Dr Philipp Du Cros	Burnet Institute	—
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (One Health)	LS/2019/116	1/01/2020	30/06/2022	Dr Matthew Grigg	Menzies School of Health Research	Eijkman Institute for Molecular Biology, James Cook University, Menzies School of Health Research, Universitas Sumatera Utara
Collaboration on One Health economic research for systems (One Health)	LS/2019/118	1/01/2020	30/06/2022	Prof Barbara McPake	Nossal Institute Limited	General Directorate of Animal Health and Production, National Institute of Public Health, Nossal Institute Limited
Enhancing the management of antimicrobial resistance in Fiji (One Health)	LS/2019/119	1/01/2020	30/06/2022	Dr Paul Debarro	CSIRO Health & Biosecurity	Fiji National University, Ministry of Health and Medical Services, University of South Australia, University of Technology Sydney
Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia	LS/2019/142	1/07/2020	30/06/2024	Dr Tadelle Dessie	International Livestock Research Institute	—
Improved animal health surveillance in Timor-Leste	LS/2019/158	15/02/2020	30/03/2021	Dr Paul Hick	The University of Sydney	—
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	1/07/2020	30/06/2023	Dr Paul (Long) Chen	The University of Melbourne	Ag Research New Zealand
Social Sciences						
Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines	ASEM/2012/063	1/10/2013	30/06/2021	Dr Mary Johnson	RMIT University	Landcare Foundation of the Philippines Inc, University of the Philippines at Los Banos, University of the Philippines, Mindanao
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	ASEM/2012/073	1/09/2014	22/11/2020	Dr Paulo Santos	Monash University	James Cook University, National University of Laos, The University of Sydney
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	1/04/2017	31/12/2021	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 Agriculture, RMIT University
Action ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines	ASEM/2014/051	10/08/2015	31/12/2020	Dr Peter Hayman	South Australian Research and Development Institute	Charles Sturt University, Philippine Atmospheric, Geophysical and Astronomical Services Administration, Philippines University of Philippines Los Banos, Philippines Department of Agriculture Agricultural Training Institute, Philippine Institute of Development Studies

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	ASEM/2014/053	1/10/2015	30/09/2020	Dr Dominic Smith	The University of Queensland	Cambodia Agricultural Research and Development Institute, International Center for Tropical Agriculture, National Agriculture and Forestry Research Institute
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	1/10/2016	30/03/2021	Assoc Prof Gina Koczberski	Curtin University	Papua New Guinea University of Technology, Papua New Guinea Cocoa and Coconut Institute Ltd, PNG Oil Palm Research Association Inc, PNG Coffee Industry Corporation, CARE International
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	1/10/2017	30/03/2023	Prof George Curry	Curtin University	CSIRO Land and Water, PNG Coffee Industry Corporation
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems	ASEM/2016/101	1/01/2018	30/09/2022	Dr Eleanor Bruce Dr Bryan Boruff	The University of Sydney The University of Western Australia	Ministry of Agriculture and Food, Forests and Fisheries Tonga, 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	ASEM/2016/103	15/12/2017	30/06/2022	Dr John Herbohn	University of the Sunshine Coast	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development, Queensland University of Technology, Southern Cross University, The The University of Queensland, Visca Foundation for Agricultural and Rural Development Inc
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	18/03/2019	30/09/2024	Mr Steven Crimp	Australian National University	Climate Change and Development Authority, CSIRO Agriculture and Food, PNG 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
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	1/01/2020	30/06/2023	Dr Sonali Senaratna-Sellamuttu and Mr Sanjiv de Silva	International Water Management Institute	Aqua Rock Konsultants, CSIRO Land and Water, International Water Management Institute, Irrigation and Water Utilization Management Department , 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	Kastom Gaden Association, Live and Learn Solomon Islands, 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	31/03/2021	Dr Rochelle Spencer	Murdoch University	Murdoch University
Next generation agricultural extension: social networks for practice change	SSS/2019/138	1/01/2021	31/12/2025	Dr Brian Cook	The University of Melbourne	University of Canberra, Macquarie University, The University of Adelaide, University of Battambang, Partners for Rural Development (NGO), Center for Development Oriented Research in Agriculture and Livelihood Systems

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Landcare—an agricultural extension and community development model at district and national scale in Fiji	SSS/2019/140	1/07/2020	30/06/2024	Dr Mary Johnson	RMIT University	Ministry of Agriculture, Tei Tei Farmers , Fiji National University, Landcare Foundation of the Philippines, University of Philippines Mindanao, University of Philippines Los Banos Philippines Council for Agriculture, Aquatic and Natural Resources Research and Development, Australia Landcare International
A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches	SSS/2019/186	4/03/2020	3/03/2021	Dr Mary Johnson	RMIT University	—
Policy impact in Laos: from research to practice	SSS/2020/142	15/07/2020	31/12/2021	Dr Hilary Smith	Australian National University	—
Soil and Land Management						
Land management of diverse rubber-based systems in the 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	30/09/2020	Dr Davina Boyd	Murdoch University	—
Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam	SLAM/2018/144	1/01/2020	31/12/2024	Dr Jason Condon	Charles Sturt University	Can Tho University, Department of Primary Industries, Institute of Agricultural Sciences of Southern Vietnam, Murdoch University, University of New England
Crop health and nutrient management of shallot–chilli–rice cropping systems in coastal Indonesia	SLAM/2018/145	1/08/2020	30/04/2024	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, Queensland Dept of Agriculture & Fisheries, University of Gadjah Mada
Soil-based challenges for cropping in Shan State (nutrient acquisition)	SLAM/2018/190	10/05/2019	30/06/2021	Dr Terry Rose	Southern Cross University	—
Better soil information for improving Papua New Guinea's agricultural production and land use planning—building on PNGRIS and linking to the Pacific Regional Soil Partnership	SLAM/2019/106	1/07/2020	30/06/2024	Mr Peter Wilson	CSIRO Agriculture and Food	Department of Agriculture and Livestock, National Agricultural Research Institute, Fresh Produce Development Agency, University Technology and Coffee Industry Corporation
Assessing and monitoring peatland restoration in Indonesia	SLAM/2020/118	1/07/2020	31/12/2021	Dr Samantha Grover	RMIT University	—
State of land and water assessment framework	SLAM/2020/138	27/04/2020	31/12/2020	Assoc Prof Anik Bhaduri	Griffith University	—

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
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
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	3/10/2016	31/07/2020	Dr 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, University of Tasmania
Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal	SMCN/2016/111	1/10/2017	30/09/2021	Dr Ben Macdonald	CSIRO Agriculture and Food	Landcare Research NZ, Ministry of Agriculture and Food, Forests and Fisheries, Tonga, Ministry of Agriculture and Fisheries, Samoa, Secretariat of the Pacific Community, Fiji, Ministry of Environment, Lands and Agriculture Development, Kiribati, Ministry of Agriculture, Fiji, Ministry of Natural Resources and Development, Tuvalu
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, Department of Agriculture and Food, Western Australia, Royal University of Agriculture
Water						
Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh	LWR/2014/072	1/03/2016	30/06/2021	Dr Christian Roth	CSIRO Agriculture and Food	Australian National University, Bangaldesh Agricultural University, Centre for the Development of Human Initiatives, Edith Cowan University, Indian Institute of Technology, Livelihoods and Natural Resource Management Institute, Professional Assistance for Development Action, Shushilan, YesBank
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan	LWR/2014/074	1/10/2016	30/12/2020	Dr Sandra Heaney-Mustafa	University of Canberra	CSIRO Land and Water, 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 Michael Mitchell	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

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
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	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
Adapting to salinity in the southern Indus Basin	LWR/2017/027	1/07/2020	31/12/2023	Dr Michael Mitchell	Charles Sturt University	CSIRO, Mehran University of Engineering and Technology, International Union for Conservation of Nature, International Centre for Biosaline Agriculture
Virtual Irrigation Academy phase 2: from water monitoring to learning to governance	WAC/2018/162	17/06/2019	30/06/2023	Dr Richard Stirzaker	CSIRO Land and Water	ASARECA, Department of Agricultural Research Services, Department of Irrigation, National Institute of Irrigation
Water management for smallholder farmers—outscaling ACIAR research in Andhra Pradesh drought mitigation program	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 adaptation in Laos	WAC/2018/167	1/06/2019	31/12/2020	Dr Paul Pavelic	International Water Management Institute	Flinders University (South Australia)
Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives—production, farmer profit and sustainability of water use (SDIP)	WAC/2018/169	11/02/2019	31/12/2020	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 (SDIP)	WAC/2018/211	4/02/2019	31/12/2020	Dr Prabhakar Sharma	Nalanda University	—
Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP)	WAC/2018/220	11/02/2019	31/03/2021	Dr Brendan Brown	International Maize and Wheat Improvement Center (CIMMYT)	Department of Agriculture (Nepal), Socioeconomics and Agricultural Research Policy Division (Nepal)
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP)	WAC/2018/221	22/04/2019	31/12/2020	Dr Brendan Brown	International Maize and Wheat Improvement Center (CIMMYT)	—
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	WAC/2019/134	1/11/2020	31/10/2024	Dr Mohammed Mainuddin	CSIRO Agriculture and Food	Murdoch University

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Closing the loop between agriculture and wastewater discharge: a novel technique for turning wastewater into fertiliser in the Pacific	WAC/2019/135	1/07/2020	30/06/2021	Dr Douglas Tait	Southern Cross University	—
Regional foresight for food systems in the Eastern Gangetic Plains (SDIP)	WAC/2019/136	1/09/2019	31/12/2020	Dr Avinash Kishore	International Food Policy Research Institute	—
Cultivate Africa's Future (phase II)						
Scale-up supply of precooked beans for food and nutrition security by leveraging on public–private partnerships in Kenya and Uganda (CultiAf 108855)	GP/2019/115	3/12/2018	30/11/2020	Dr Michael Ugen	National Agricultural Research Organization	—
Business models for scaling improved fish processing technologies in Malawi (CultiAF 108865)	GP/2019/170	1/10/2018	20/09/2020	Dr Levison S Chiwaula	Ministry of Agriculture, Irrigation and Water Development	—
Insect feed for poultry, fish and pig production in Sub-Saharan Africa (CultiAf 108866)	GP/2019/171	1/10/2018	30/09/2020	Dr Chrysantus Tanga	International Centre of Insect Physiology and Ecology	—
The effectiveness of the Metro Agri-Food Living Lab for gender inclusive youth entrepreneurship development in Kenya (CultiAf 108867)	GP/2019/172	1/10/2018	30/09/2020	Prof Francis W Wambalaba	United States International University - Africa	—
Climate-smart interventions for smallholder farmers in Ethiopia (CultiAf 109038)	GP/2019/173	1/04/2019	30/09/2022	Dr Taye Mindaye	Ethiopian Institute of Agricultural Research	—
User driven approaches to make government and farmer-led smallholder irrigation in Mozambique more productive (CultiAf 109039)	GP/2019/174	1/04/2019	30/09/2022	Dr Mario Chilundo	University of Eduardo Mondlane	—
Alien invasive fruit flies in southern Africa: implementation of a sustainable IPM program to combat their menaces (CultiAf 109040)	GP/2019/175	1/04/2019	30/09/2022	Dr Samira Mohamed	International Centre of Insect Physiology and Ecology	—
Harnessing dietary nutrients of under-utilised fish and fish-based products in Uganda (CultiAf 109041)	GP/2019/176	1/04/2019	30/09/2022	Dr Jackson Efitre	Makerere University Uganda	—
Improving agricultural productivity and resilience with satellite and cell phone imagery to scale climate-smart crop insurance (CultiAf 109076)	GP/2019/177	1/04/2019	30/09/2022	Mr Amos Tabalia	Agriculture and Climate Risk Enterprise Limited (ACRE Africa)	—

Appendix 2

Location (Australian state or country) of commissioned organisations for current and proposed projects, 2020–21

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
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	Australian National University
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	Australian National University
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa	LWR/2016/137	Australian National University
Policy impact in Laos: from research to practice	SSS/2020/142	Australian National University
Characterisation of *Spodoptera frugiperda* (fall armyworm) populations in South-East Asia and northern Australia (co-funded with GRDC)	CROP/2020/144	CSIRO Agriculture and Food
Smallholder livestock futures in South-East Asia	LS/2018/107	CSIRO Agriculture and Food
Better soil information for improving Papua New Guinea's agricultural production and land use planning—building on PNGRIS and linking to the Pacific Regional Soil Partnership	SLAM/2019/106	CSIRO Agriculture and Food
Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal	SMCN/2016/111	CSIRO Agriculture and Food
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	WAC/2019/134	CSIRO Agriculture and Food
Virtual Irrigation Academy phase 2: from water monitoring to learning to governance	WAC/2018/162	CSIRO Land and Water
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	CSIRO National Research Collections
Protection of stored grains against insect pests	CIM/2017/031	Davren Global Pty Ltd
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	LS/2018/202	The Mullion Group Pty Ltd
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan	LWR/2014/074	University of Canberra
Improving agricultural development opportunities for female smallholders in rural Solomon Islands	SSS/2018/136	University of Canberra
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	SSS/2018/137	University of Canberra
Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach	ADP/2018/131	University of Sunshine Coast
New South Wales		
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	Applied Horticultural Research
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Applied Horticultural Research
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	Charles Sturt University
Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar	FIS/2014/041	Charles Sturt University
Assessing upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	Charles Sturt University
Translating fish passage research outcomes into policy and legislation across South-East Asia	FIS/2018/153	Charles Sturt University
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	HORT/2014/083	Charles Sturt University
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	LWR/2015/036	Charles Sturt University
Adapting to salinity in the southern Indus Basin	LWR/2017/027	Charles Sturt University

Project title	Project code	Commissioned organisation
Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam	SLAM/2018/144	Charles Sturt University
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	AGB/2017/036	CSIRO Land and Water
Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	New South Wales Department of Primary Industries
Restoring damaged coral reefs using mass coral larval reseeding	FIS/2014/063	Southern Cross University
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Southern Cross University
Regional networks for large-scale coral and fish habitat restoration in the Philippines	FIS/2019/123	Southern Cross University
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	LS/2014/042	Southern Cross University
Soil-based challenges for cropping in Shan State (nutrient acquisition)	SLAM/2018/190	Southern Cross University
Closing the loop between agriculture and wastewater discharge: a novel technique for turning wastewater into fertiliser in the Pacific	WAC/2019/135	Southern Cross University
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
Improving small ruminant production and supply in Fiji and Samoa	LS/2017/033	University of New England
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	University of New England
Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	FIS/2018/151	University of New South Wales
Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators	FIS/2018/154	University of New South Wales
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	The University of Sydney
Research to support agricultural policy and strategic planning: research to assist the Vietnam Government with the formulation of the 2021–2030 Agricultural Development Strategy for Vietnam	AGB/2019/185	The University of Sydney
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	The University of Sydney
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	The University of Sydney
Developing the cocoa value chain in Bougainville	HORT/2014/094	The University of Sydney
Improved animal health surveillance in Timor-Leste	LS/2019/158	The University of Sydney
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	The University of Sydney
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems	ASEM/2016/101	The University of Sydney and University of Western Australia
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	University of Wollongong
Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region	FIS/2018/155	University of Wollongong
Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands	FIS/2019/124	University of Wollongong
Northern Territory		
Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards	HORT/2016/190	Northern Territory Department of Primary Industry and Fisheries
Zoonotic malaria in Indonesia (One Health)	LS/2018/214	Menzies School of Health Research
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (One Health)	LS/2019/116	Menzies School of Health Research
Queensland		
Integrating protected-cropping systems into high value vegetable value chains in the Pacific and Australia	HORT/2014/080	Central Queensland University
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	Central Queensland University

Project title	Project code	Commissioned organisation
Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines	AGB/2018/196	CSIRO Agriculture and Food
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	CSIRO Agriculture and Food
Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh	LWR/2014/072	CSIRO Agriculture and Food
Quantifying crop yield gaps across the Indo-Gangetic Plain from new perspectives—production, farmer profit and sustainability of water use (SDIP)	WAC/2018/169	CSIRO Agriculture and Food
Enhancing the management of antimicrobial resistance in Fiji (One Health)	LS/2019/119	CSIRO Health & Biosecurity
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Griffith University
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	FST/2014/067	Griffith University
Enhancing private sector–led development of the Canarium industry in Papua New Guinea – phase 2	FST/2017/038	Griffith University
Land management of diverse rubber-based systems in the southern Philippines	SLAM/2017/040	Griffith University
State of land and water assessment framework	SLAM/2020/138	Griffith University
Improved productivity, efficiency and sustainability of the culture-based fishery for finfish and giant freshwater prawn in Sri Lankan reservoirs	FIS/2018/157	James Cook University
Coconut and other non-traditional forest resources for the manufacture of engineered wood products	FST/2019/128	Queensland Department of Agriculture and Fisheries
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	Queensland Department of Agriculture and Fisheries
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	Queensland Department of Agriculture and Fisheries
An integrated management response to the spread of fusarium wilt of banana in South-East Asia	HORT/2018/192	Queensland Department of Agriculture and Fisheries
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	Queensland Department of Agriculture and Fisheries
Supporting greenhouse gas mitigation for sustainable farming systems in the Asia-Pacific and East Africa	WAC/2019/150	Queensland University of Technology
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	The University of Queensland
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
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
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	The University of Queensland
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	ASEM/2014/053	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
Identifying soil constraints in the Eastern Gangetic Plains (SDIP)	CROP/2018/210	The University of Queensland
Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos	CROP/2019/145	The University of Queensland
Managing basal stem rot in oil palm by converting infected logs to biochar	CROP/2019/147	The University of Queensland
Demand-led plant variety design for emerging markets in Africa	FSC/2013/019	The University of Queensland
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	The University of Queensland
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	The University of Queensland

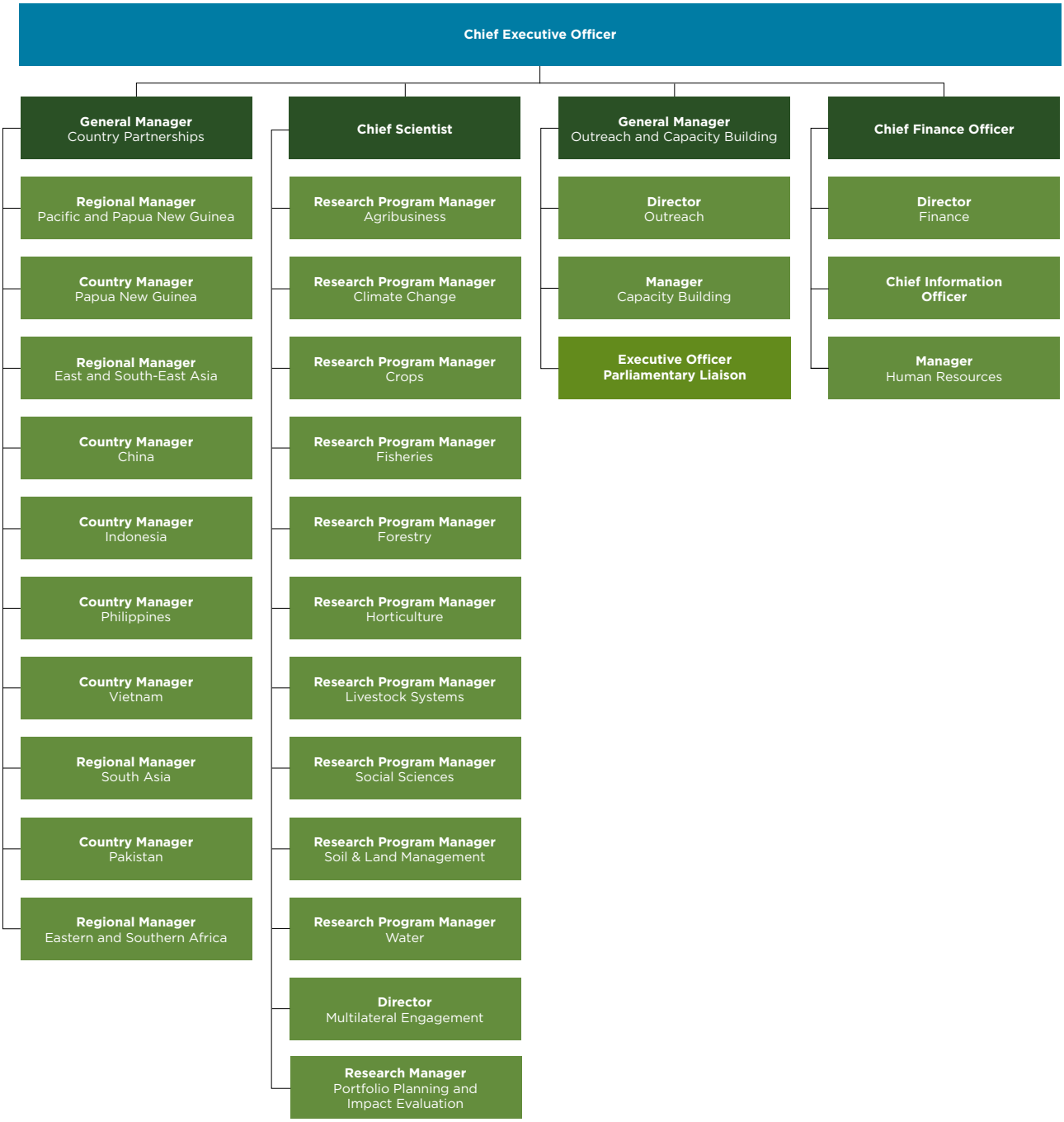
Project title	Project code	Commissioned organisation
Responding to emerging pest and disease threats to horticulture in the Pacific islands	HORT/2016/185	The University of Queensland
Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	The University of Queensland
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	The University of Queensland
Evaluating the opportunities for smallholder livestock keepers in Timor-Leste	LS/2017/035	The University of Queensland
Sectoral analysis and investment requirements for improving the Fiji and Samoa small ruminant sector	LS/2018/183	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
Forages—taking stock and identifying research needs	LS/2018/186	The University of Queensland
Mainstreaming research in Myanmar's agricultural and veterinary universities	SLAM/2017/041	The University of 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
Pacific Agribusiness Research in Development Initiative – phase 2 (PARDI 2)	AGB/2014/057	University of the Sunshine Coast
Enhancing livelihoods through forest and landscape restoration	ASEM/2016/103	University of the Sunshine Coast
Developing pearl industry-based livelihoods in the western Pacific	FIS/2014/060	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	University of the Sunshine Coast
Improving seaweed production and processing opportunities in Indonesia	FIS/2015/038	University of the Sunshine Coast
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	University of the Sunshine Coast
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	University of the Sunshine Coast
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	University of the Sunshine Coast
Towards more profitable and sustainable pearl-industry based livelihoods in the western Pacific	FIS/2019/122	University of the Sunshine Coast
Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa	FIS/2019/125	University of the Sunshine Coast
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	University of the Sunshine Coast
Enabling community forestry in Papua New Guinea	FST/2016/153	University of the Sunshine Coast
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	University of the Sunshine Coast
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	FST/2018/178	University of the Sunshine Coast
Scoping for a forest biosecurity network in South-East Asia	FST/2020/102	University of the Sunshine Coast
Enhanced fruit production and postharvest handling systems for Fiji, Samoa and Tonga	HORT/2014/077	University of the Sunshine Coast
Enhanced fruit systems for Tonga, Samoa and Fiji (phase 2): community-based citrus production	HORT/2019/165	University of the Sunshine Coast
Building effective forest health and biosecurity networks in SE Asia	FST 2020 123	University of the Sunshine Coast
South Australia		
Water management for smallholder farmers—outscaling ACIAR research in Andhra Pradesh drought mitigation program	WAC/2018/164	CSIRO Agriculture and Food
Expanding opportunities to use groundwater for poverty alleviation and climate change adaptation in Laos	WAC/2018/167	International Water Management Institute
Agriculture for tourism – advancing a synergistic development pathway for both local agribusiness value chains and tourism in Bali, Indonesia	AGB/2020/121	Primary Principles Pty Ltd
Action ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines	ASEM/2014/051	South Australian Research and Development Institute
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	The University of Adelaide

Project title	Project code	Commissioned organisation
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	The University of Adelaide
Philippines smallholder dairy: landscape analysis and research priorities	AGB/2020/120	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
Tasmania		
Climate change and Pacific food systems: decision-making for transformational change (proof-of-concept)	WAC/2019/148	CSIRO Agriculture and Food
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	CSIRO Land and Water
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	CSIRO Oceans and Atmosphere
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 cooperation with Indonesia	FIS/2018/115	University of Tasmania
Managing risk in South-East Asian forest biosecurity	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		
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in three provinces in Papua New Guinea (One Health)	LS/2018/217	Burnet Institute
Market and opportunity analysis to guide market-led development of the Myanmar pulse sector	AGB/2019/154	Business for Millennium Development Ltd
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
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
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	Monash University
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	ASEM/2012/073	Monash University
Collaboration on One Health economic research for systems (One Health)	LS/2019/118	Nossal Institute Limited
Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines	ASEM/2012/063	RMIT University
Assessing and monitoring peatland restoration in Indonesia	SLAM/2020/118	RMIT University
Landcare—an agricultural extension and community development model at district and national scale in Fiji	SSS/2019/140	RMIT University
A framework for assessing agricultural extension approaches and an analysis of transferrable public health approaches	SSS/2019/186	RMIT University
Conservation agriculture and sustainable intensification of smallholder farming systems in Pacific countries as a pathway to transformational climate change adaptation and reducing GHG emissions	CROP/2020/185	The University of Melbourne
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	The University of Melbourne
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	The University of Melbourne
Policy analysis for forest plantations Laos and Vietnam	FST/2019/121	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
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	The University of Melbourne
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	The University of Melbourne

Project title	Project code	Commissioned organisation
Value-adding to existing livestock programs to understand and quantify the implications of greenhouse gas emissions, provide options for emissions reduction and inform in-country policy development	LS/2019/159	The University of Melbourne
Next generation agricultural extension: social networks for practice change	SSS/2019/138	The University of Melbourne
Emissions avoidance of soil carbon from lands undergoing practice change	WAC/2019/149	The University of Melbourne
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
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Curtin University
Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos	LS/2014/055	Murdoch University
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	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
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Murdoch University
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	The University of Western Australia
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	The University of Western Australia
Faba bean in Ethiopia—mitigating disease constraints to improve productivity and sustainability	CIM/2017/030	The University of Western Australia
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*)	CROP/2018/132	The University of Western Australia
Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains	CSE/2012/108	The University of Western Australia
International		
Improving agricultural productivity and resilience with satellite and cell phone imagery to scale climate-smart crop insurance (CultiAf 109076)	GP/2019/177	Agriculture and Climate Risk Enterprise Limited (ACRE Africa)
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	Centre for Agriculture and Bioscience International (CABI)
Plant health—a major challenge to achieving sustainable "green" agriculture in Myanmar	CROP/2019/103	Centre for Agriculture and Bioscience International (CABI)
Scoping livestock research opportunities in Africa	LS/2018/205	Climate Change and Food Security program (CGIAR)
Climate-smart interventions for smallholder farmers in Ethiopia (CultiAf 109038)	GP/2019/173	Ethiopian Institute of Agricultural Research
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	AGB/2018/172	International Center for Tropical Agriculture
Insect feed for poultry, fish and pig production in Sub-Saharan Africa (CultiAf 108866)	GP/2019/171	International Centre of Insect Physiology and Ecology
Alien invasive fruit flies in southern Africa: implementation of a sustainable IPM program to combat their menaces (CultiAf 109040)	GP/2019/175	International Centre of Insect Physiology and Ecology
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	International Coconut Community
Inclusive agriculture value chain financing	AGB/2016/163	International Food Policy Research Institute
Regional foresight for food systems in the Eastern Gangetic Plains (SDIP)	WAC/2019/136	International Food Policy Research Institute
Food futures for the food systems in the Eastern Gangetic Plains (SDIP)	WAC/2020/158	International Food Policy Research Institute
Safe pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	International Livestock Research Institute

Project title	Project code	Commissioned organisation
Asian chicken genetic gains: a platform for testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia	LS/2019/142	International Livestock Research Institute
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	CIM/2016/219	International Maize and Wheat Improvement Center
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI) (SDIP)	CSE/2011/077	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
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP)	WAC/2018/221	International Maize and Wheat Improvement Center
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	International Water Management Institute
Harnessing dietary nutrients of under-utilised fish and fish-based products in Uganda (CultiAf 109041)	GP/2019/176	Makerere University Uganda
Business models for scaling improved fish processing technologies in Malawi (CultiAF 108865)	GP/2019/170	Ministry of Agriculture, Irrigation and Water Development
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar (SDIP)	WAC/2018/211	Nalanda University
Scale-up supply of precooked beans for food and nutrition security by leveraging on public–private partnerships in Kenya and Uganda (CultiAf 108855)	GP/2019/115	National Agricultural Research Organization
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands	HORT/2017/025	The Pacific Community (SPC)
Establishing the International Mungbean Improvement Network	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
International Mungbean Improvement Network – phase 2	CROP/2019/144	The World Vegetable Center
The effectiveness of the Metro Agri-Food Living Lab for gender inclusive youth entrepreneurship development in Kenya (CultiAf 108867)	GP/2019/172	United States International University – Africa
User driven approaches to make government and farmer-led smallholder irrigation in Mozambique more productive (CultiAf 109039)	GP/2019/174	University of Eduardo Mondlane
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam.	AGB/2018/175	World Agroforestry Centre
Off-farm: strategic review and planning for 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
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa (Trees for Food Security phase 2)	FST/2015/039	World Agroforestry Centre
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	World Agroforestry Centre
Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam	FST/2016/152	World Agroforestry Centre
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
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	WorldFish Center

Appendix 3 Organisational structure 2020-21



Current at 1 July 2020

Nguyen Thi Xoa working in her cabbage garden in northwest Vietnam, where she has set up a 'safe vegetable cooperative' to engage women and improve their livelihoods. Photo: Khanh Long. ACIAR project: AGB/2014/035.

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