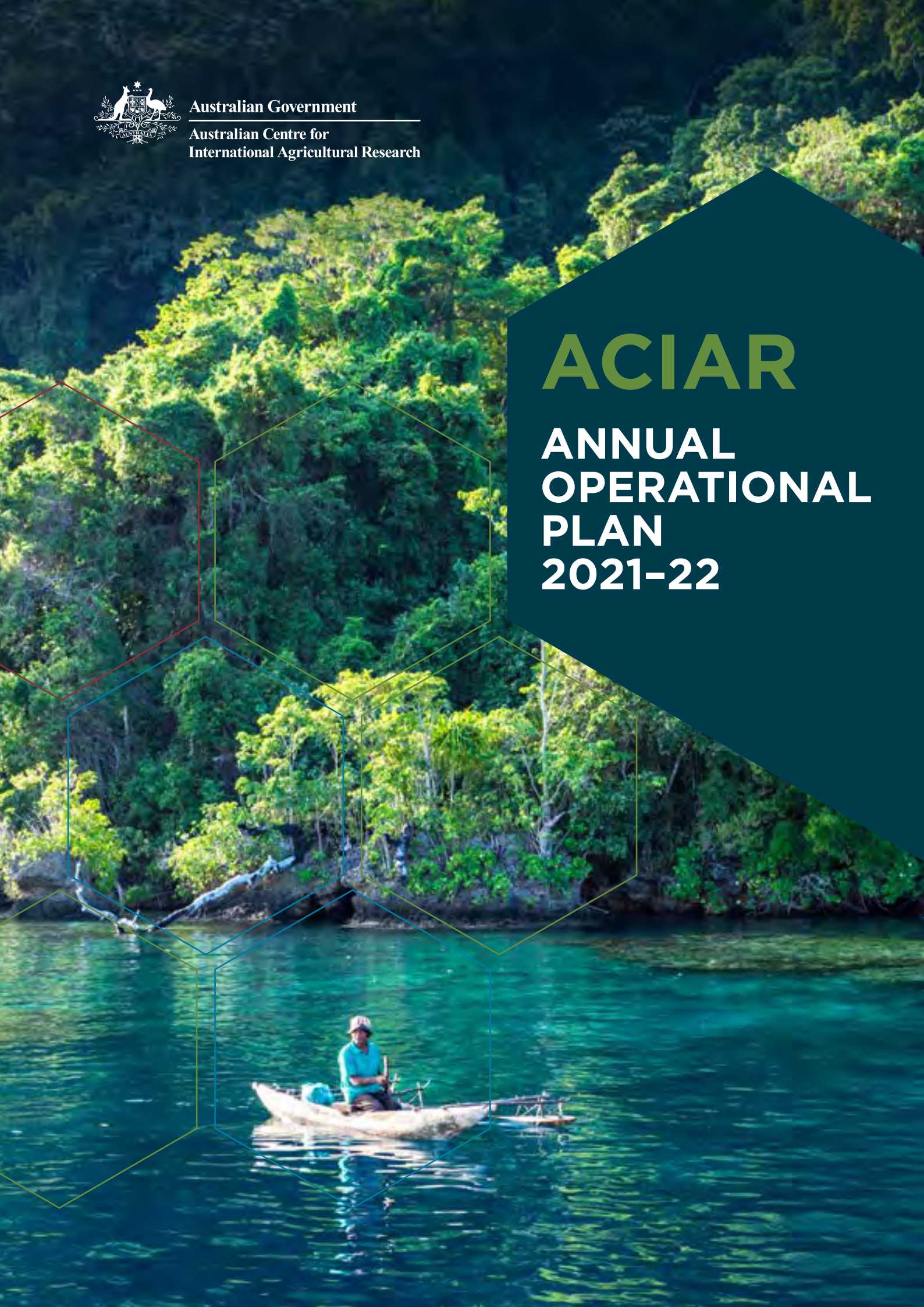

Australian Government

Australian Centre for International Agricultural Research

ACIAR

ANNUAL OPERATIONAL PLAN 2021–22

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.

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 directly to the Minister for Foreign Affairs.

This report should be attributed as the ACIAR Annual Operational Plan 2021–22

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Australian Centre for International Agricultural Research
GPO Box 1571
Canberra ACT 2601
Phone: +61 2 6217 0500
Email: aciar@aciar.gov.au
Website: www.aciar.gov.au

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Cover photo: The ACIAR Annual Operational Plan details programs and projects for 2021–22 that aim to enhance the livelihoods of smallholder farmers, fishers and foresters throughout the Indo-Pacific region, such as the fisherman from Papua New Guinea pictured.

ACIAR

ANNUAL OPERATIONAL PLAN 2021–22

ACIAR

Welcome

Agricultural innovation is a strategic national capability that the Australian Government, through the Australian Centre for International Agricultural Research (ACIAR), mobilises to build international research partnerships that improve food security, food system resilience and the livelihoods of smallholder farmers in the Indo-Pacific region.

40 YEARS | ACIAR EST. 1982

The 2021–22 year will culminate with the 40th anniversary of the establishment of ACIAR. So much has changed in the world since 1982 for smallholder farmers, fishers and foresters. Advances in plant and animal production technologies have enhanced productivity and profitability. The development of smart technologies has assisted efficient use of resources and inputs, improving productivity and sustainability. Access to microfinance and more-inclusive value chains have improved livelihoods throughout our developing partner countries.

While there is improvement and progress to celebrate, the purpose of ACIAR to identify or find solutions to agricultural problems of developing countries remains as relevant now as it was in 1982. More than 10% of the world's population lives in poverty and, of particular relevance to the work of ACIAR, poverty is 3 times higher in rural areas than urban areas. The COVID-19 pandemic has exacerbated rural poverty and food security, as well as impacting livelihoods – for women in particular.

Tackling shared challenges through agricultural research collaboration remains 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 capability for more-productive and sustainable agriculture, fisheries and forestry sectors.

The zoonotic origins of COVID-19 have shone a spotlight on biosecurity and One Health (the intersection of animal, human and environmental health). ACIAR will continue our involvement in partnerships and programs that strive to develop far more effective integration across the human and animal health systems. This is critical if our region and the world is to prevent even more infectious and deadly zoonotic diseases in the future.

The pandemic has transformed our modes of operation and, as we embark on 2021–22, we will continue to revise and adapt our programs. The most notable changes have been in the areas of operation of our Country Network, where our locally based staff and in-country partners have taken a leading role in maintaining and implementing field work. Several of our capacity-building programs are now delivered online and our 600-strong alumni network is more active in-country.

Another global challenge that deeply affects our partner countries in the Indo-Pacific region, through impacts on food systems, livelihoods and environments, is climate change. Recognising that Australia has both a responsibility and the ability to find solutions, ACIAR added the Climate Change Program to our portfolio of research programs. This program commences its first full year of operation in 2021–22. Through this new program ACIAR will participate in the UN Conference of the Parties on Climate Change (COP26) in November 2021. ACIAR represents Australia at the Global Research Alliance on Agricultural Greenhouse Gases (page 27), and will chair the Alliance for one year from March 2021.

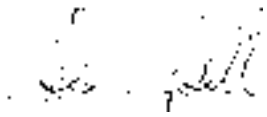
Australia's support of international agricultural research centres was embedded in our enabling legislation, and funding to these centres is managed by ACIAR. During 2021–22, we will continue our involvement with CGIAR, a network of 15 research centres dedicated to reducing rural poverty, increasing food and nutrition security for human health and improving natural resource systems and ecosystem services. As with previous years, this coming year will see our very hands-on involvement in the One CGIAR reform process continue.

On the international arena, ACIAR is a highly respected partner in agricultural research-for-development. We continue our 8-year relationship with our sister organisation in Canada, the International Development Research Centre. The Cultivate Africa's Future program (page 24) continues with projects supporting innovation and the Food Loss Research Program, launched in June 2021, will encompass a number of projects to find ways to reduce losses along the food production value chain (page 8).

We will be participating in the United Nations Food Systems Summit, convened by UN Secretary-General António Guterres in 2021, as part of the Decade of Action to achieve the UN Sustainable Development Goals by 2030 (page 26). While improving food security and reducing poverty are key components of food systems, the transformation to sustainable food systems will support the world in achieving all 17 Sustainable Development Goals.

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 2021–22. It explains the context and priorities of our program areas in the Indo-Pacific region and describes our partnerships and projects. These range from our support and governance role with our largest partner, the CGIAR system, to our brokering and management role of 178 individual bilateral and regional research projects.

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

ACIAR CEO, Andrew Campbell, hosting the council meeting of the Global Research Alliance on Agricultural Greenhouse Gases with ABC Canberra journalist, Lish Feyer. Held in March 2021, the event was conducted as a virtual meeting and connected to delegates from 65 countries.

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
CAADP	Comprehensive Africa Agriculture Development Programme
CABI	Centre for Agricultural Biosciences International
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
IDRC	International Development Research Centre (Canada)
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	The 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

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 the agriculture, fisheries and forestry sectors, while emphasising individual and institutional capacity building and opportunities for development led by the private sector.

Our work reflects Australian Government policy imperatives articulated in the:

- Australian Government's development program
- Sustainable Development Goals of the United Nations (UN) 2030 Agenda for Sustainable Development
- Paris Agreement under the UN 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 6 high-level strategic objectives that guide our partnerships, programs and projects. These objectives are consistent with the purpose stated in our enabling legislation and reflect the policy imperatives of the Australian Government.

Of these objectives, 3 build knowledge to underpin crucial development objectives and 3 ensure that our work is equitable, inclusive and empowering.

ACIAR 10-Year Strategy 2018–2027

ACIAR brokers and invests in research partnerships with developing countries in the Indo-Pacific region to build knowledge to support crucial development objectives

Strategic objectives 1, 2 & 3

1. **Food security and poverty reduction**
   Improving food security and reducing poverty among smallholder farmers and rural communities
2. **Natural resources and climate change**
   Managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change
3. **Human health and nutrition**
   Enhancing human nutrition and reducing risks to human health

ACIAR works to ensure that its research-for-development programs are equitable, inclusive and empowering

Strategic objectives 4, 5 & 6

4. **Gender equity and women's empowerment**
   Improving gender equity and empowerment of women and girls
5. **Inclusive value chains**
   Fostering more inclusive agrifood and forestry value chains, engaging the private sector where possible
6. **Capacity building**
   Building scientific and policy capability within our partner countries

An enduring operational model

Establishment of ACIAR

Australian Centre for International Agricultural Research Act 1982 – an Act to encourage research for the purpose of identifying, or finding solutions to, agricultural problems of developing countries

January 1976

Sir John Crawford proposes an international research assistance foundation in Australia.

July 1981

The Cabinet of the Australian Government approved the establishment of a small statutory body charged with contracting research work to existing Australian institutions in the field of agriculture and related disciplines for the benefit of developing countries (Cabinet Minute – Decision No. 15987).

June 1982

A statutory authority was established under the *Australian Centre for International Agricultural Research Act 1982*, in the Foreign Affairs portfolio and reporting to the Minister for Foreign Affairs.

Responsibility for operations of the centre was assigned to a Board of Management.

A Policy Advisory Council was established to provide advice to the Minister on the agricultural problems of developing countries and research programs and policies that may address understanding and solving of these problems.

June 2007

ACIAR governance was changed under amendment to the ACIAR Act. Principally, the governing Board of Management was replaced by an executive management structure involving a Chief Executive Officer, reporting directly to the Minister for Foreign Affairs, and a 7-member Commission for International Agricultural Research, to advise the Minister on the functioning of the Act. The responsibilities of the Policy Advisory Council were unchanged.

March 2018

The ACIAR 10-Year Strategy 2018–2027 was launched, setting out the high-level direction and priorities of the agency, to achieve its mission of 'more productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships'.

ACIAR celebrates 40 years of operation in June 2022. 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.

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 farmers, researchers, industry and government. Our outstanding track record of building and sustaining deep, trusting partnerships over the last 39 years is now a great strategic asset.

The strength of these partnerships enables us to be flexible and responsive in transforming how we work in response to unprecedented disruption. During 2021–22, we will continue to adapt and refine 'how' we work in challenging times of restricted travel. The 'why' and the 'what' are enduring.

Our operational model is designed to deliver against our enabling legislation, Australia's development program and the UN Sustainable Development Goals, through 6 strategic objectives.

The research portfolio is based on 10 programs that 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.

We have 3 key areas of work.

1. **Global research collaborations:** We develop and foster partnerships and relationships with other international research and development agencies, the most significant being 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 activities:** We identify and establish opportunities for individuals and institutions in partner countries to boost their technical, policy and management skills in agriculture, fisheries, forestry and management of land and water resources.

ACIAR partnership model

2021–22 operating environment

Some of the major influences of our operating environment in the Indo-Pacific region 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. Many of our partner countries also contend with the complex triple burden of nutrition (acute hunger, malnutrition and nutrition-related disease).

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, while also enhancing food security and livelihoods. However, all plans and operations must take into account the continuing impact of the COVID-19 pandemic, which is currently the most significant shaper and disruptor of our operating environment.

The work of ACIAR and our partners will be vital in the next few years. Smallholder farmers in the Indo-Pacific region need the knowledge, skills, technology and frameworks to restore disrupted production systems and value chains across the agriculture, fisheries and forestry sectors. During 2021–22, we will be refining the changes and adaptations we made to our traditional operating models during 2020. Historically, the operations of ACIAR 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 precipitated this remodelling, ACIAR has been presented with new opportunities to experiment with new technologies and new modalities to achieve our purpose more efficiently. We will continue to strengthen our business models so we can continue to work with our partners on ongoing social, economic and environmental challenges.

This new way of working has built closer links with the more than 600 ACIAR alumni across our region, as we seek to maintain on-ground momentum within ACIAR-funded programs and projects. We look forward to maintaining these stronger connections into the future.

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.

Khamphouviong Chanthavorysa (right) and husband Thong OnChanthavong are rice farmers in Khammouane province, Laos, and members of a farmer group that worked with ACIAR-supported researchers to determine the most efficient use of machines for rice farming. Photo: Majken Soegaard. ACIAR project CSE/2012/077

Improving 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.

Many of the projects we commission – across regions, countries and programs – have the core endeavour of improving food security and reducing poverty among smallholder farmers and rural communities. This strategic objective means ACIAR is well placed to be an integral and constructive part of the response to the COVID-19 pandemic in our region, with our ability to harness the strengths of the Australian agricultural innovation system to provide scientific leadership.

The COVID-19 pandemic is a global health and economic crisis that is disrupting the lives and livelihoods of diverse communities around the world, with impacts to be felt for years to come.

One Health

One Health is a framework that recognises that the health of people, animals and the environment is interconnected, and it provides an approach for developing far more effective integration across the human and animal health systems in regards to regulations, surveillance, diagnostics and responses to disease outbreaks.

Globally, approximately 75% of newly emerging infectious diseases are zoonoses (diseases that can transmit from animals to humans). These diseases arise as a result of one or several factors that may be anthropogenic, genetic, ecologic, socioeconomic or 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.

COVID-19 is the most recent zoonotic disease that has 'spilled over' from animals to humans. It follows previous diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola and human immunodeficiency virus (HIV).

ACIAR continues its involvement in the program, Research for One Health Systems Strengthening. The program is delivered through a partnership between ACIAR and the Indo-Pacific Centre for Health Security within the Department of Foreign Affairs and Trade (DFAT). The program was built on a suite of 9 projects, of which the final 3 will be completed in 2021–22.

The pandemic has exposed and exacerbated existing vulnerabilities in food systems around the region. However, agriculture has played an important role as a 'shock absorber' by sustaining food production, and absorbing significant movements of people and providing useful work.

As partner countries tackle the multifaceted challenge of 'building back better', a key aspect of recovery will be improving the safety and resilience of food systems. 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.

Impacts of COVID-19 on food systems: stage 3

During 2020 ACIAR conducted 2 stages of a 3-stage assessment of impacts of the pandemic on food systems in the Indo-Pacific region. An initial rapid assessment was followed by an in-depth report, *COVID-19 and food systems in the Indo-Pacific: an assessment of vulnerabilities, impacts and opportunities for action* (ACIAR Technical Report 96). The findings of this work will inform ACIAR investments in 2021–22 and beyond.

Stage 3 of our assessment centres on 4 focus areas that are recognised as vulnerabilities in food systems but have not featured in research to date. The projects (listed below) have been commissioned to assess the impact case for investment, potential entry points and modalities of engagement, and potential synergies with other areas of ACIAR and development partner endeavours. Findings will be delivered by the end of 2021.

- Agrifood systems transformation through circular migration between Pacific islands and Australia [Samoa, Tonga, Vanuatu] (CS/2020/212)
- COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
- Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (LS/2020/204)
- Vulnerability in the Anthropocene: a prospective analysis of the need for social protection [Myanmar, Vietnam] (LS/2020/206)

Working in a changing climate

Our second research-based objective, 'managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change', is fundamental to the livelihoods of smallholder farmers, fishers and foresters throughout the Indo-Pacific.

While adaptation to climate change and extreme weather events is intrinsic to all ACIAR research projects, the new ACIAR Climate Change program enables us to focus and strengthen our capacity to work towards this strategic objective.

Commencing its first full year of operation, the 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.

Our enhanced capacity to identify and build new partnerships to facilitate adaptation to climate change in our region also provides opportunities to be involved in the climate change arena at the highest levels. ACIAR will attend events associated with the UN Conference of the Parties on Climate Change (COP26) in November 2021.

Australia is a member of the Global Research Alliance for Agricultural Greenhouse Gases (GRA), an organisation finding ways to grow more food without increasing greenhouse gas emissions. ACIAR is Australia's representative on the GRA and ACIAR CEO Professor Andrew Campbell is Chair of GRA for 2021. Australia's priorities for its year as Chair of the GRA include enhancing GRA engagement with Pacific island countries and developing synergies between mitigation and adaptation research. The GRA and our participation are described in more detail on page 27.

ACIAR projects supporting climate change adaptation and mitigation in 2021–22 include:

- Transformational pathways for Pacific fisheries communities (WAC/2020/178)
- Conservation agriculture and sustainable intensification systems for transformational climate adaptation and greenhouse gas mitigation in Pacific island countries (CLIM/2020/186)
- Mitigation and adaptation co-benefits modelling trial in Bangladesh (CLIM/2020/109)
- Transforming Pacific coastal food production systems (FIS/2020/108)
- Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam (WAC/2019/150)
- Regional networks for large-scale coral and fish habitat restoration in the Philippines (FIS/2019/123)
- Responding to emerging pest and disease threats to horticulture in the Pacific Islands (HORT/2016/185)
- Livestock climate lens Part 1: data landscape analysis (LS/2020/207)
- Resilient and low-carbon livestock systems for trade and food security in the rangelands of eastern and southern Africa (LS/2020/152)
- Climate smart agriculture opportunities for enhanced food production in Papua New Guinea (ASEM/2017/026)
- Reducing uncertainty in greenhouse gas emissions from Indonesian peat fire (SLAM/2020/140)

In Kiribati, the impacts of climate change are disrupting and impeding agricultural production, and in particular, rising sea level is reducing available land available for agriculture. Photo: Roneel Lai.

Building healthier food systems

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.

Leaders in farming, business, science and government recognise that if the UN Sustainable Development Goals are to be achieved by 2030, there must be a global transformation in how food is produced, processed, distributed and consumed.

Many projects in our research portfolio are designed with an element of enhancing human nutrition and reducing risks to human health. During 2021–22, 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.

ACIAR projects supporting healthier food systems in 2021–22 include:

- Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines (AGB/2018/196)
- Transformational pathways for Pacific fisheries communities (WAC/2020/178)
- Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan (CIM/2015/041)
- Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region (FIS/2018/155)
- Improving root crop resilience and biosecurity in Pacific island countries and Australia (HORT/2018/195)
- Safe Pork: market-based approaches to improving the safety of pork in Vietnam (LS/2016/143)
- Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines (SLAM/2020/117)
- Understanding agrichemical use in South-East Asian agriculture (SSS/2020/143)
- Regional foresight for food systems in the Eastern Gangetic Plains (WAC/2020/158)

Improving equity and empowerment

Our fourth strategic objective is to improve gender equity and facilitate empowerment of women and girls. Gender equality is crucial to alleviating poverty in rural communities and a key consideration in all the contexts in which ACIAR operates. All projects, regardless of country, sector or enterprise, will lead to changes in communities and societies that have gender implications.

ACIAR recognises the potential for improved production, income and family nutrition when women play a more visible and equal role in agricultural decision-making. As more than half the world's women are farmers, ACIAR cannot credibly pursue its objectives unless we also promote gender equality vigorously, both internally and externally.

The ACIAR Gender Equity Policy and Strategy 2017–2022 informs the design and implementation of our research activities with partners. 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.

Consistent with the strategy and Australia's aid program targets, we aim for 80% (at a minimum) of ACIAR investments reflecting the principles of gender equity in project design and implementation.

The strategy also guides our internal planning and organisation. The proportion of senior positions occupied by women within ACIAR increased from 11% in 2016 to 55% by June 2021.

ACIAR projects improving equity and empowerment in 2021–22 include:

- Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam (AGB/2012/061)
- Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*) (CROP/2018/132)
- Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific (FIS/2019/122)
- Enhancing private sector-led development of the canarium industry in Papua New Guinea (phase 2) (FST/2017/038)
- Improving smallholder well-being through participation in modern value chains: sustaining future growth in the Pakistan citrus industry (HORT/2020/129)
- Improving agricultural development opportunities for female smallholders in rural Solomon Islands (SSS/2018/136)

Fostering inclusive value chains

Through its strategic objective of 'fostering more inclusive agrifood and forestry value chains and engaging the private sector where possible', ACIAR brokers projects that identify opportunities and improve business outcomes for people all the way along the value chain, from the input providers and smallholder farmers, to their households and communities.

Effective, efficient and inclusive value chains have the power to transform livelihoods of some of the poorest regions of the world. Unlocking the potential for people to participate equitably in markets and benefit from the opportunities provided by business is a proven way to create employment, improve business outcomes for smallholders and communities and increase economic security in developing countries.

The ACIAR Agribusiness Program brokers research-for-development to create new or better business systems and build partnerships to increase the efficiency of supply chains, improve food safety, reduce food losses and promote inclusive value chains. However, right across the ACIAR research portfolio there are opportunities to use best practices in agriculture production, supply-chain management and market-based solutions to build inclusive and profitable value chains.

ACIAR projects fostering inclusive value chains in 2021–22 include:

- Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
- Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com) (CIM/2014/082)
- Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
- Coconut and other non-traditional forest resources for the manufacture of engineered wood products (FST/2019/128)
- Enhanced fruit systems for Tonga and Samoa (phase 2): community based citrus production (HORT/2019/165)
- High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2) (LS/2016/276)
- Improving livelihoods of smallholder coffee communities in Papua New Guinea (ASEM/2016/100)
- Soil management in Pacific Islands (phase 2): investigating nutrient dynamics and the utility of soil information for better soil and crop management (SLAM/2020/139)

New program to reduce food loss

About one-third of global food production is lost or wasted each year. In developing countries, up to 83% of food loss occurs during production, processing, storage and transportation – before it reaches the consumer. In industrialised countries, food waste is the main problem and occurs in people's kitchens, restaurants or supermarkets.

During 2021, ACIAR and Canada's International Development Research Centre (IDRC) launched the Food Loss Research Program, which will work with partners in developing countries to address food loss through innovative, locally driven solutions.

Curtailing food loss and waste is highlighted as a major opportunity for reducing the environmental impacts of food production.

A key focus of the new program is to gain a deeper understanding of the drivers of food loss at a systemic level, to uncover new approaches to prevent food loss in developing countries. The program aims to share and extend these learnings to help find more solutions to this global problem.

The program marks an important evolution in looking at food from a systems perspective. In some countries in which ACIAR research teams operate, there is a general lack of post-harvest infrastructure for reducing food loss. While there are many potential technology solutions, they have not been adopted or implemented at scale.

The Food Loss Research Program comprises a suite of projects that have been developed and planned to provide useful information for the development of locally relevant solutions.

Food Loss Research Program projects

- Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific [Fiji, Samoa, Solomon Islands, Tonga] (CS/2020/191)
- Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (CS/2020/193)
- Food loss in the catfish value chain of the Mekong River Basin [Cambodia, Laos, Vietnam] (CS/2020/209)
- Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) [Malawi, Zambia] (CS/2020/210)

Building capability

Building capacity in partner countries is a strategic objective for ACIAR. Innovation in agriculture is a key pathway to poverty reduction, increased food security and economic growth. Building the capacity of agricultural researchers, their networks and institutions contributes to innovation potential and supports partners to deploy relevant and effective agricultural practices and policies to reduce poverty.

The ACIAR 10-Year Strategy 2018–2027 committed ACIAR to building its investment in postgraduate research training for individual scientists, as well as value-added training in management and leadership. The strategy also identified the value in developing ongoing relationships with the network of ACIAR collaborators.

In 2021–22, ACIAR will continue formal and informal programs of capacity building. Our formal activities of fellowships and alumni programs will be delivered in modified and adapted ways to ensure success within the restrictions of placed on Australia and partner countries due to the COVID-19 pandemic (see Chapter 6).

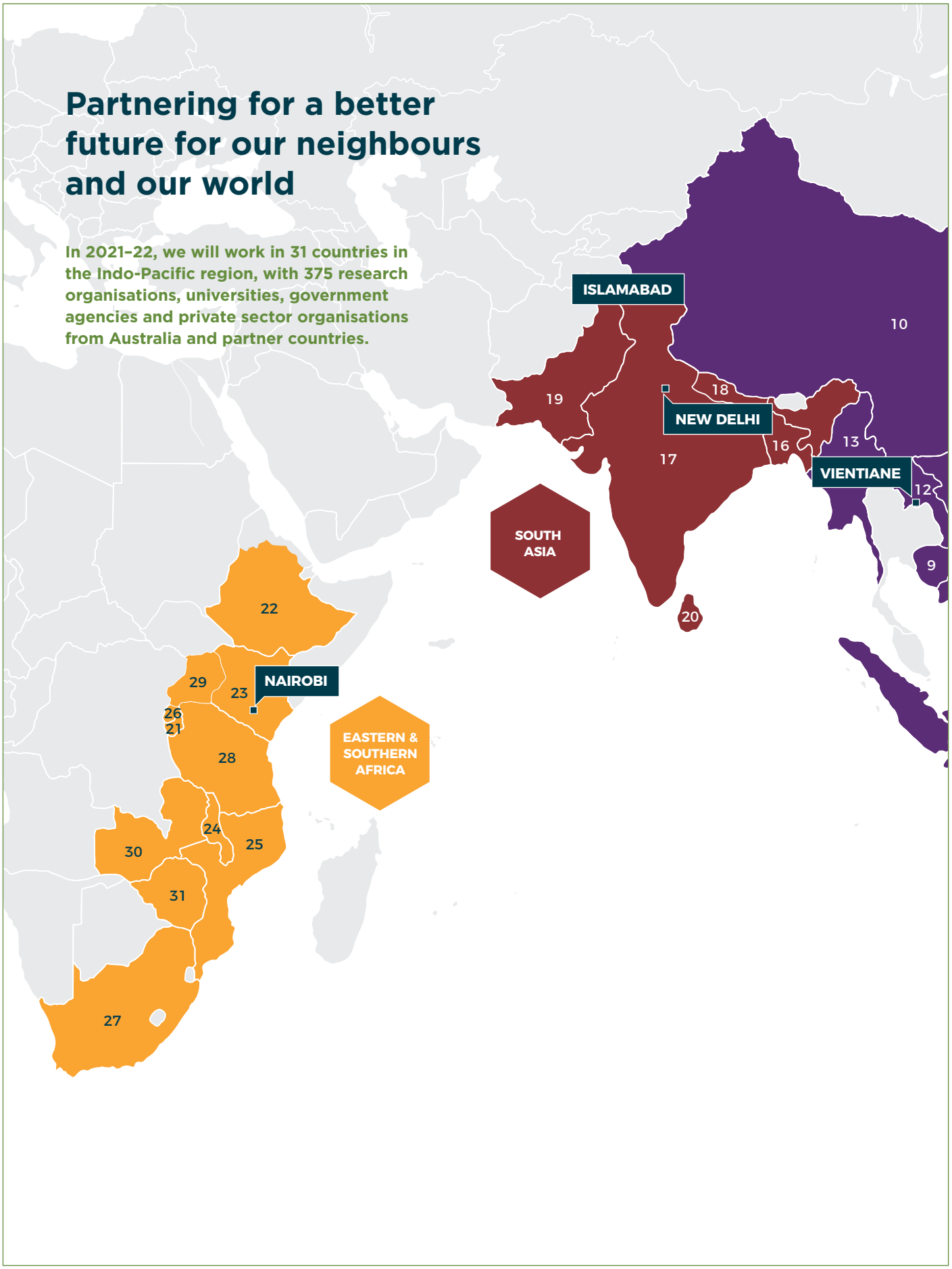
Capacity building is an intrinsic factor in many of the research projects we broker. It ensures that the people we work with have the skills, resources and knowledge to sustain new initiatives, systems and approaches, so our investment leads to lasting change.

ACIAR programs and projects building capability in 2021–22 include:

- Meryl Williams Fellowship Program for female agricultural researchers
- ACIAR Alumni 360 – a platform to support a virtual alumni network
- ACIAR Learn – bespoke online learning for agricultural researchers
- Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia (AGB/2012/099)
- Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (CSE/2012/108)
- Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
- Building effective forest health and biosecurity networks in South-East Asia (FST/2020/123)
- Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
- Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea (SSS/2018/137)
- Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa (TISA) (LWR/2016/137)

The John Allwright Fellowship provides scientists from partner countries, who are currently or recently involved in ACIAR research projects, an opportunity to obtain postgraduate qualifications at an Australian tertiary institution. Pictured here is John Allwright fellow from Bangladesh, Apurbo Kumar Chaki, participating in a soil judging competition at the 2021 Soil Science Society Conference in Queensland. Photo: James Walsh.

ACIAR regions and partner countries




KEY
Pacific
1 Fiji
2 Kiribati
3 Papua New Guinea
4 Samoa
5 Solomon Islands
6 Timor-Leste
7 Tonga
8 Vanuatu
East and South-East Asia
9 Cambodia
10 China
11 Indonesia
12 Laos
13 Myanmar
14 Philippines
15 Vietnam
South Asia
16 Bangladesh
17 India
18 Nepal
19 Pakistan
20 Sri Lanka
Eastern and Southern Africa
21 Burundi
22 Ethiopia
23 Kenya
24 Malawi
25 Mozambique
26 Rwanda
27 South Africa
28 Tanzania
29 Uganda
30 Zambia
31 Zimbabwe
ACIAR Country Office
BEIJING
EAST & SOUTH-EAST ASIA
HANOI
MANILA
PACIFIC
JAKARTA
PORT MORESBY
SUVA
CANBERRA

Operating structure

ACIAR is established by the *Australian Centre for International Agricultural Research Act 1982* (ACIAR Act), as amended, and it is an agency of the Australian Government Foreign Affairs and Trade portfolio.

ACIAR 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.

The CEO is supported by an Audit Committee, which provides independent assurance to the CEO on financial, performance and risk management of ACIAR.

Also established under the ACIAR Act is the Commission for International Agricultural Research (the Commission), which provides collective decision-making and expert strategic advice to the Minister on the operations of ACIAR; and the Policy Advisory Council, which provides advice to the Minister on strategic aspects of national and regional development.

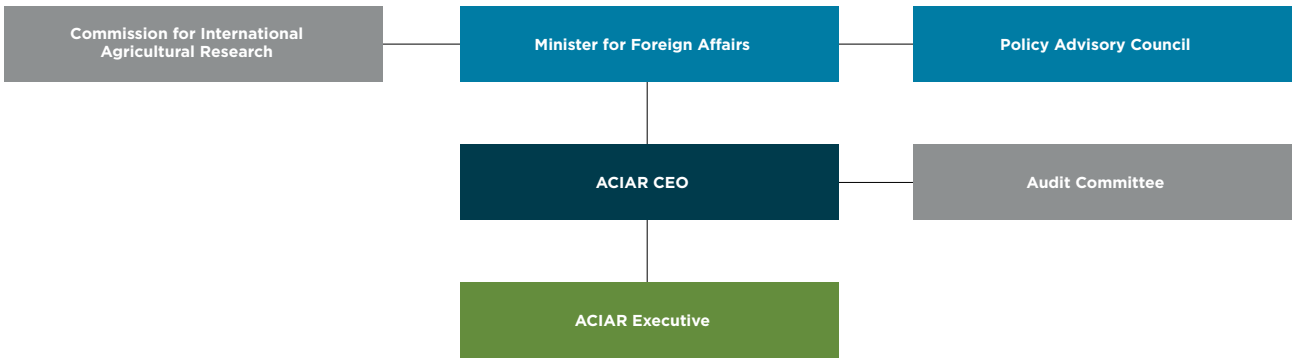
ACIAR CEO

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 was appointed to the role of CEO on 31 July 2016. He was reappointed to the role for another 2 years by the Minister for Foreign Affairs, Senator the Hon Marise Payne, in June 2021. 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 the Victorian School of Forestry, 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.

Governance structure of ACIAR



ACIAR executive

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 more than 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 more than 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 10 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 overseeing the strategic directions of ACIAR in-country 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.

Organisational structure 2021–22

ACIAR is a small government agency with 78 staff (full and part-time).

- 57 people are located at ACIAR House in Canberra, Australia
- 21 people are locally engaged staff at missions and embassies of the Australian Government, throughout the Indo-Pacific region.

Staff are organised into 4 lines of management:

- Country Partnerships
- Research Programs
- Outreach and Capacity Building
- Corporate Services.

The organisation of executive and management staff is shown in the diagram.

Commission for International Agricultural Research

The Commission for International Agricultural Research (the Commission) has a critical governance role under the ACIAR Act to provide strategic advice to the Minister and the 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.

Commissioner	
Mrs Fiona Simson GAICD BA (Chair)	Grazier, northern New South Wales President, National Farmers' Federation
Professor Andrew Campbell FTSE FAICD	CEO, ACIAR
Dr Sasha Courville	Executive, Social Impact, National Australia Bank
Emeritus Professor Lindsay Falvey FTSE, FAIAS	University of Melbourne
Ms Su McCluskey	Cattle farmer, southern New South Wales Non-executive director and commissioner
Dr Beth Woods OAM FTSE	Recently retired Director-General of the Department of Agriculture and Fisheries, Queensland
Mr Tony York	Farmer, central wheatbelt, Western Australia Director, National Farmers' Federation

Policy Advisory Council

The role of the Policy Advisory Council under the ACIAR Act is to advise the Minister on the agricultural problems of developing countries, providing rich contextual detail and insight on how Australia supports international agricultural research and development. The Act requires that council members are predominantly residents of countries other than Australia. The Policy Advisory Council provided important feedback on the early phases of our rapid assessment of food system risks and resilience, in response to the COVID-19 pandemic. It will be a valuable source of advice as we design intervention options in response to the assessment during 2021–22.

Council member	
Prof Wendy Umberger (President)	Executive Director, Centre for Global Food and Resources, and Professor of Agricultural Economics and Food Policy, University of Adelaide, South Australia
Dr Audrey Aumua	CEO, Fred Hollows Foundation, New Zealand
Prof Ramesh Chand	Member, Union Minister of State National Institute of Transforming India (NITI Aayog)
Dr Sar Chetra	Deputy Director, Ministry of Agriculture, Forestry, and Fisheries, Cambodia
Dr Reynaldo Ebora	Executive Director of the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)
Dr Segenet Kelemu	Director General and CEO of the International Centre of Insect Physiology and Ecology (icipe), Kenya
Prof Achmad Suryana	Senior researcher, Indonesian Center for Agriculture Socio Economic and Policy Studies Professor, Bogor Agricultural University specialising in food and agribusiness policy
Prof Teatulohi Matainaho	Chairman, PNG Science and Technology Council Chief Science Advisor to the Papua New Guinea Government
Dr Nguyen Van Bo	Member, Vietnam Panel on Climate Change Vice Chairman of Vietnam Rural Development Science Association
Dr Su Su Win	Deputy Director General (Technology), Department of Agricultural Research, Ministry of Agriculture, Livestock and Irrigation, Myanmar
Ex-officio member	Secretary of the Department of Foreign Affairs and Trade, or nominee of the Secretary

Funding and expenditure

Table 1.1 Overview of planned funding and expenditure, 2021–22

Budget estimate		
Funding		**A$ million**
Administered	Administered appropriation	91.19
	Special accounts	3.14
	Total administered funding	**94.33**
Departmental	Departmental appropriation	9.36
	s 74 Retained revenue receipts[a]	0.37
	Expenses not requiring appropriation[b]	1.48
	Total departmental funding	**11.21**
Total funding		**105.54**
Expenditure		
Administered	Bilateral and regional research projects[c]	64.16
	Global research collaborations[d]	18.79
	Scientific and policy capacity building activities[e]	9.35
	Outreach	2.03
	Total administered costs	**94.33**
Departmental	**Total departmental costs**[f]	**11.21**
Total expenditure		**105.54**

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, 2021–22

Activity area	Funder or partner	Expenditure
		A$ million
Regional and country projects	Department of Foreign Affairs and Trade	5.29
Postgraduate Scholarships	Department of Foreign Affairs and Trade	2.73
Cultivate Africa's Future Fund	International Development Research Centre (Canada)	1.00
Food Futures Research Program	International Development Research Centre (Canada)	0.35
Total		**9.36**

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, 2021–22

	Unrestricted	Restricted (project specific)	Total
	A$ million	A$ million	A$ million
CGIAR	17.30	5.70	23.00
Other centres	1.49	—	1.49
Total	**18.79**	**5.70**	**24.49**

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

Table 1.4 **Planned project expenditure by country, 2021–22**

Region and country	Target appropriation budget allocations	ACIAR base appropriation	DFAT and other external funding	Total allocation
	%	A$ million	A$ million	A$ million
Pacific region	**35**	**18.93**	**3.13**	**22.06**
Fiji	—	4.17	0.78	4.95
Kiribati	—	0.31	0.28	0.59
Samoa	—	0.26	—	1.26
Solomon Islands	—	1.18	0.36	1.54
Tonga	—	1.08	—	1.08
Vanuatu	—	1.26	0.28	1.54
Pacific region – general	—	0.50	0.28	0.78
Papua New Guinea	—	7.48	1.15	8.63
Timor-Leste	—	1.69	—	1.69
East and South-East Asia	**42**	**22.40**	**2.16**	**24.56**
Cambodia	—	2.91	0.35	3.26
China	—	0.12	—	0.12
Indonesia	—	5.50	0.97	6.47
Laos	—	3.63	0.18	3.81
Malaysia	—	0.04	—	0.04
Myanmar	—	1.69	—	1.69
Philippines	—	3.91	0.46	4.37
Thailand	—	0.04	—	0.04
Vietnam	—	4.56	0.20	4.76
South Asia	**13**	**6.90**	**—**	**6.90**
Bangladesh	—	1.82	—	1.82
India	—	0.73	—	0.73
Nepal	—	0.72	—	0.72
Pakistan	—	3.14	—	3.14
Sri Lanka	—	0.49	—	0.49
Eastern and Southern Africa	**10**	**5.11**	**1.00**	**6.11**
Burundi	—	0.05	—	0.05
Ethiopia	—	1.22	0.25	1.47
Kenya	—	1.17	0.17	1.34
Malawi	—	0.31	0.07	0.38
Mozambique	—	0.54	0.23	0.77
Rwanda	—	0.10	—	0.10
South Africa	—	0.34	—	0.34
Tanzania	—	0.36	—	0.36
Uganda	—	0.35	0.14	0.49
Zambia	—	0.12	0.07	0.19
Zimbabwe	—	0.55	0.07	0.62
Total project expenditure	**100**	**53.34**	**6.29**	**59.63**

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

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, we can continue to influence and promote more productive and sustainable agricultural systems for the benefit of low-income 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. We foster and maintain 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 CGIAR, a network of 15 research centres dedicated to reducing rural poverty, increasing food and nutrition security for human health, and improving natural resource systems and ecosystem services.

In addition to CGIAR, we establish and foster partnerships with other international research centres and networks relevant to our mission. A snapshot of these is provided on pages 22–23.

We also develop and manage co-investment alliances and partnerships with like-minded organisations and donors (pages 24–25). 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 2021–22, we will seek to strengthen multilateral collaborations by serving the international research community in 3 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 Multilateral Collaborations contribute to Australia's soft diplomacy 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-income and lower-middle-income countries. The location of these centres is shown in Figure 2.1. The CGIAR research 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 celebrates 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 Board with guidance from the CGIAR System Council. The CEO of ACIAR represents Australia on the System Council. 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 2021–22, CGIAR will continue to 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 has been deeply engaged in the reform process, as this will involve profound change across CGIAR, its culture, values, people, policies and systems. We have actively contributed to the reform to ensure CGIAR is well-placed to deliver against both the United Nations (UN) Sustainable Development Goals (SDGs) and the Paris Agreement, as well as to attract new funder contributions.

ACIAR has been a regular and significant funder of and research partner to CGIAR since 1982, as mandated by the ACIAR Act. Accordingly, Australia has high-level representation on CGIAR governance bodies.

Australia contributes to CGIAR alongside the World Bank, United States of America (USA), Bill & 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.

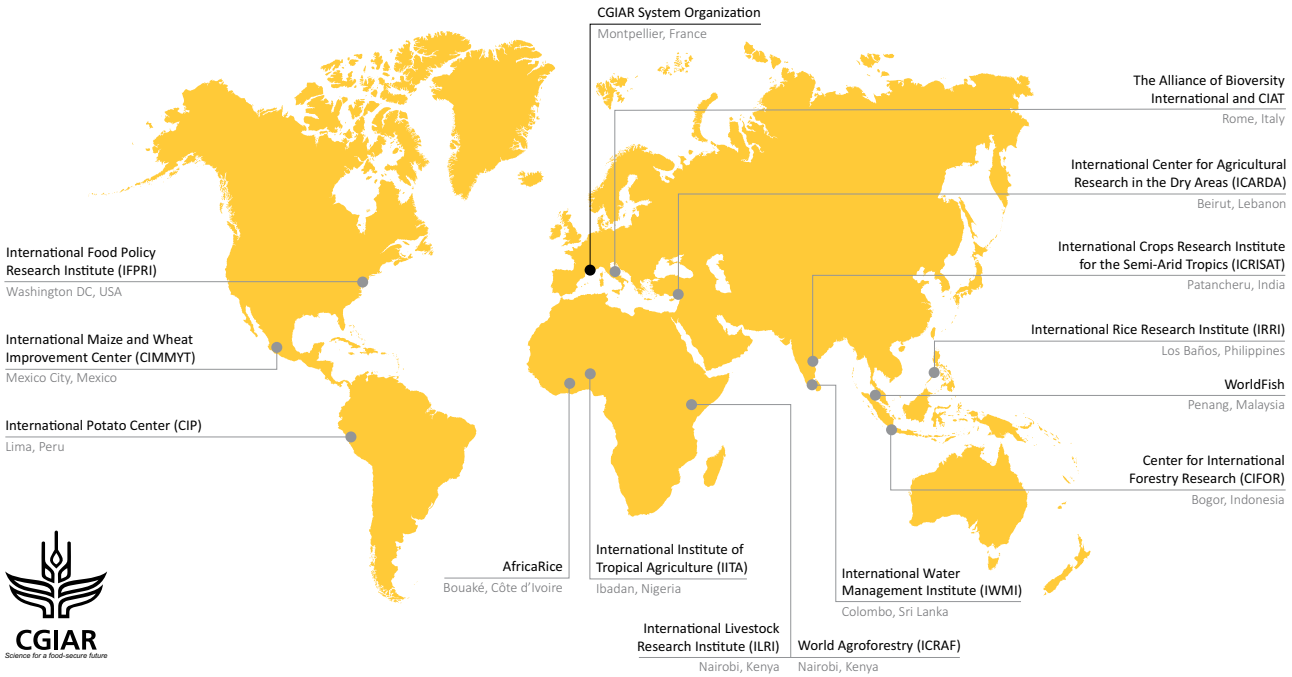


Figure 2.1 **Agricultural research centres of the CGIAR system**

CGIAR investment 2021–22

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 2021–22, through ACIAR, is forecast to be A$23 million (Table 1.3).

During 2021–22, CGIAR will transition to a new research portfolio that strives for global and regional impact by organising its work around 3 action areas:

- Systems Transformation
- Resilient Agrifood Systems
- Genetic Innovation.

This will fit the newly designed 2030 Research and Innovation Strategy, which aims to ensure that research provides real solutions for development. This is a substantial shift in the way CGIAR works, and will be achieved following 7 new implementation approaches:

1. embracing a systems transformation approach
2. leveraging ambitious partnerships for change
3. positioning regions, countries and landscapes as central dimensions of partnership, worldview and impact
4. generating scientific evidence on multiple transformation pathways
5. targeting risk-management and resilience as critical qualities for food, land and water systems
6. harnessing innovative finance to leverage and deliver research through new investment and funding models
7. making the digital revolution central to our way of working.

To ensure research excellence and value for investment in CGIAR for Australia, during 2021–22 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, Investment Advisory Groups and Initiative Design Teams
- continue our collaboration with other donors to CGIAR through participation in multi-funder activities that align with ACIAR strategy and Australian interests
- lead coordinated Australian engagement with CGIAR, including consultation with the Department of Foreign Affairs and Trade (DFAT) and other Australian organisations, primarily through the CGIAR Australian Leadership Group, established by ACIAR in 2015
- involve ACIAR Research Program Managers in the technical oversight of CGIAR Research Programs.

Impressive return on investment

CGIAR delivers impressive economic, social and environmental returns on research investment. Over the past 5 decades, the benefits of CGIAR investment are tenfold for each dollar invested.

A 2020 study calculated a benefit-cost ratio of 10:1 for CGIAR investment since 1961, which is primarily due to enhancing the yields of staple food crops in developing countries. There are, however, additional less-easily measured payoffs such as greater food abundance, cheaper food, reduced rates of hunger and poverty, and a smaller geographical footprint of agriculture.

The outcomes of CGIAR investment advance progress towards the UN Sustainable Development Goals.

Not considered in the study are the benefits to developed countries. CGIAR 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 germplasm, 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.

Source: The payoff to investing in CGIAR research (2020)

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 2021–22, we will support global research collaborations with:

- The Pacific Community
- Asia–Pacific Association of Agricultural Research Institutions
- World Vegetable Center
- Centre for Agricultural Biosciences International

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.

SPC provides a regional specialist technical expertise to strengthen or, in some cases, supplement regional and national capacity. Of SPC's core functions, some are of particular interest to ACIAR:

- to strengthen sustainable management of natural resources (fisheries, forestry, land use, agriculture, minerals, water)
- to improve pathways to international markets
- to improve multi-sectoral responses to climate change and disasters
- to advance social development through the promotion of human rights, gender equality, cultural diversity and opportunities for young people
- to improve multi-sectoral responses to non-communicable diseases and food security.

SPC and ACIAR have worked in partnership for more than 30 years and SPC is a key partner of both ACIAR and DFAT. SPC helps deliver Australia's strategies to support the production of strategic regional public goods with strong benefits for the region's agriculture, fisheries, forestry and biosecurity sectors. ACIAR currently provides 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 the production and maintenance of scientific, technical and management capacities, and activities in agriculture and fisheries that provide shared benefits for agricultural development activities of Pacific island countries and territories. Our funding is also aimed at building stronger strategic relationships between our organisations, enhancing strategic management capacity in the Land Resources Division and strengthening capacity for coastal fisheries development in Fisheries Aquaculture and Marine Ecosystems Division.

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 2021–22, 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. We will also engage with SPC to consider the nature of the strategic partnership beyond 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. We provide 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 represent Australia in chairing the APAARI Executive Council.

ACIAR and SPC have provided groups such as Nadroumai Women's Club in Fiji with training in tree nursery techniques, as part of a project empowering local women to improve community livelihoods and protect their environment through agroforestry. Here, Mrs Suliana Delana is adding coconut husk to the compost mixture used in the nursery. Photo: Sunayna Nandini.
ACIAR project FST/2014/067

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-income 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 WorldVegdisseminates 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. We have a strategic partnership arrangement with WorldVeg (2019–22), which supports breeding activities and capacity building in low-income 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:

- better conservation of vegetable crop biodiversity and development of more resilient crops to address current and future biotic and abiotic constraints to vegetable production in the context of climate change
- 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 UN 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 4-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-income 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 a 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 in research as a form of strategic official development assistance.

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 156, and CA$5 million is allocated to the exploratory Food Futures Research Program. In 2021–22, ACIAR and IDRC will co-design new research investments that share the vision of both organisations.

The Food Loss Research Program seeks to identify and explore new ideas to address the challenge of reducing food loss in value chains in low-income and lower-middle-income countries. Photo: Andrew Munuwa.

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. Together, ACIAR and IDRC have committed A$5 million to the program, which we manage 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 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, ACIAR and IDRC began co-design of innovative agricultural research to identify and explore new ideas to address the challenge of reducing food loss in low-income and lower-middle-income country value chains. The Food Loss Research Program (see page 8) will begin in 2021–22 and will address value-chain inefficiencies, poor communication systems and overall structural inequalities. Research within the program will:

- examine agricultural value chains within food systems at a provincial or local level in 2 or more countries in which ACIAR and/or IDRC work
- conduct foresight exercises until 2050, stipulating how value chains are likely to change given trends in labour, technology, mechanisation, climate change, urban and rural density, and nutritional requirements
- engage private agribusinesses along the value chain to document their experiences of food loss and explore models of innovation to mitigate food loss in the long term
- assess interventions that are currently being used at a local scale across the value chain
- assess factors that enable or prevent the transfer of intervention strategies from one location to another.

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 (SFSA) and the Crawford Fund.

Alliance partners undertake complementary activities and/or 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 Africa' (FSC/2013/019) (see page 152), which engages with plant-breeding and university sectors in many countries in southern and eastern Africa.

The Syngenta Foundation for Sustainable Agriculture and the Crawford Fund have activities complementary to the 'Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia' project and the 'Mung bean development for improved nutrition, incomes and sustainability' project.

Farmer hubs

In 2020 the Alliance initiated a co-funded study of the farmer hubs initiative of the Syngenta Foundation for Sustainable Agriculture in Bangladesh. Farmer hubs deliver solutions and services to farming communities. This is a short study, concluding in 2021, that aims to understand how farmer hubs are being used to improve the adoption and scaling of new agricultural technologies, and identify opportunities for them to be used more effectively.

In 2021–22 the Alliance will continue to co-design a portfolio of new research projects and other activities aligned with the vision of all Alliance members.

Demand-led plant variety design enables smallholder farmers to better participate in local and regional markets, by increasing the availability and adoption of high-performing plant varieties that meet market demands. Pictured are beans displayed at an open market in Uganda.
Photo: Emmie Wachira. ACIAR project FSC/2013/019

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 where she 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 PhD in ecology, evolution and genetics from the Australian National University.

Engagement in multilateral forums

ACIAR drives innovative international agricultural research and development through our strong engagement in multilateral forums, demonstrating Australia's commitment to global action to achieve the Sustainable Development Goals (SDGs).

The ACIAR partnership model involves building and nurturing relationships with governments, international research centres and multilateral organisations. During 2021 and into 2022, there are many forums where we can engage with global partners and opportunities for us to join new global alliances. These forums support agricultural innovation and action at scale.

UN Food Systems Summit

Australia will participate in events associated with the United Nations Food Systems Summit, convened by UN Secretary-General António Guterres in 2021 as part of the Decade of Action to achieve the SDGs by 2030. While improving food security and reducing poverty are key components of healthy and productive food systems, the complete transformation to sustainable food systems will require widespread international support to achieve all 17 SDGs by 2030.

ACIAR has already contributed to the Summit process, leading 2 dialogues in the first half of 2021:

- May 2021 – ACIAR and DFAT co-convened an Australian member-state Dialogue on 'Multi-stakeholder Partnerships for Scaling Innovation'
- June 2021 – ACIAR and Canada's IDRC co-convened a Dialogue about Food Loss Research with key global stakeholders and research leaders. The convenors also launched the joint Food Loss Research Program at this event (see page 8).

ACIAR will continue to support these events, bringing together diverse stakeholders, while also contributing to cross-cutting alliances focused on innovation and support for nature-positive solutions (solutions that work with and enhance the environment).

COVID-19 impacts

ACIAR and IDRC will partner to convene a Dialogue on COVID-19 impacts, which will focus on building resilience in food systems by drawing on lessons from communities affected by COVID-19. This conversation will explore priority actions to address informality and gender dynamics, in order to respond to food security challenges emerging from the pandemic in an equitable and sustainable way. This Dialogue builds on ACIAR research on COVID-19 impacts: *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action.*

Innovation lever

ACIAR will participate in the Innovation Lever, which is an initiative within the Summit to support the scaling of game-changing propositions, submitted from all over the world. This initiative brings together diverse stakeholders from research, civil society and private sector in the hope of inspiring collective support and action to transform food systems with new and existing solutions, at scale. In this forum ACIAR will form partnerships that will further enhance Australia's support of our regional neighbours while also creating domestic benefits for Australian food systems.

Global repository of nature-positive solutions

The Summit process will result in a global repository of game-changing propositions that can transform global food systems while at the same time reverse the impacts of human activity on nature. Innovations developed through ACIAR investments will feature in this repository, representing Australia's commitment to nature-positive production.

COP26

Through its new Climate Change Program, ACIAR will engage in events connected to the UN Conference of the Parties on Climate Change (COP26). A strong focus of COP26 will be locally led adaptation and resilience in climate research and this action aligns well with all ACIAR strategic objectives.

Adaptation Research Alliance

ACIAR has been collaborating with more than 30 organisations around the world to scope and develop a new global research alliance, the Adaptation Research Alliance. These efforts will continue in 2021 to bring together researchers, research funders and development funders to catalyse and scale investment in action-orientated, locally led climate change research, with a particular focus on sustainable development. To date, the alliance involves existing partners such as IDRC and CGIAR, as well as potential new partners like the Least Developed Countries Universities Consortium on Climate Change. The alliance is expected to formally launch at COP26.

Nutrition for Growth Summit

Nutrition for Growth is a global effort to bring together governments, donors, businesses and NGOs to ensure individuals and families have the nutrition necessary for healthy and productive lives and that countries have the human capital they need to fuel health, social and economic development. The 2021 Nutrition for Growth Summit will be held in Japan in December. ACIAR will engage in events associated with the Summit, drawing on our highly relevant research portfolio and partnerships.

ACIAR joins global effort to reduce emissions from agriculture

The Global Research Alliance on Agricultural Greenhouse Gases (GRA) is an organisation bringing together 65 member countries and 24 partner organisations. ACIAR is Australia's representative on the GRA Council.

The aim of the GRA is to share knowledge and increase cooperation on addressing 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 charter of the GRA provides a framework for voluntary action to increase cooperation and investment in research activities that will help reduce the emissions intensity of agricultural production systems and increase their potential for soil carbon sequestration. Activities will also improve the efficiency, productivity, resilience and adaptive capacity of agricultural systems, thereby contributing in a sustainable way to overall mitigation efforts, while still helping meet food security objectives.

Members of the GRA work together to deepen and broaden mitigation research efforts across the agricultural sub-sectors of paddy rice, cropping and livestock, and to coordinate cross-cutting activities across these areas, including promoting synergies between adaptation and mitigation efforts. Research groups have been set up to address these areas of work, through work plans that bring countries and partners together in research collaborations, knowledge sharing, use of best practices, and capacity building among scientists and other practitioners. The aim is to develop breakthrough solutions in addressing agricultural greenhouse gas emissions.

The GRA partners with organisations that share common goals, such as the UN Food and Agriculture Organization (FAO) and the World Bank, and collaborates with other government and non-government organisations and scientists from around the world.

The GRA was initiated by New Zealand with strong support from Australia and the United States in 2009. It operates as an administratively lean, independent multilateral collaboration, with each member funding its own participation. This structure enables the robust exchange of ideas among scientists, and between scientists and policymakers, and provides an international vehicle for building technical capacity within member countries and globally.

ACIAR, on behalf of Australia, became Chair of the GRA Council at the 2021 Council Meeting, hosted by ACIAR in March 2021. In early 2021, ACIAR also chaired the working group developing the second GRA Strategic Plan and was Co-Chair of the GRA Integrative Research Group, with Canada and France. Australian scientists have played active roles in the GRA Livestock and Cropping research groups.

During this term, Australia's priorities will include increasing the involvement of Pacific island countries in the alliance, finding synergies between climate change adaptation research and efforts to reduce agricultural emissions, and improving linkages between the work of the GRA and the new research portfolio of CGIAR.

Australian technologies and methodologies for quantifying, measuring and reducing emissions on-farm are relevant for many other countries, but there remain significant research challenges, including but not limited to:

- effective greenhouse gas mitigation options that are profitable and workable for farmers
- efficient ways to identify mitigation options that also have adaptation co-benefits
- building technical capacity at national institutional levels to develop and implement robust national inventories as well as monitoring, reporting and verification systems (both essential to deliver on Nationally Determined Contributions under the Paris Agreement)
- understanding how to develop and manage circular food systems for more significant step-changes in mitigation, adaptation and sustainability benefits.

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 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 of our 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 our 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 2021–22, and for the duration of the pandemic, the network will continue to monitor and manage 3 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. The pandemic is surging through second, third and fourth waves in some countries. Our Country Network has upskilled 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.

At a broader scale, Australia's development support to the Indo-Pacific has pivoted to address the urgent and emerging challenges of COVID-19. DFAT's *Partnerships for recovery: Australia's COVID-19 development response* outlines 3 areas of core action:

- health security
- stability
- economic recovery.

The work of ACIAR falls primarily into the third action area. During 2020, we examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. Our findings were reported in *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*. Food systems assessments were undertaken at 5 locations: Pacific island countries, Papua New Guinea, Timor-Leste, Indonesia and the Philippines. The information will be used to inform future research and development to support food systems resilience in the Indo-Pacific region.

Depending on ongoing restrictions and responsibilities of partner agencies in response to the COVID-19 pandemic, during 2021–22 we plan to confirm new long-term partnership strategies with Papua New Guinea, Indonesia, Timor-Leste, Laos 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 Mai (Gay Maureen) Alagcan
Regional Manager, Pacific and Papua New Guinea

Ms Mai Alagcan, formerly ACIAR Country Manager in the Philippines, will move to Fiji to take up the role of Regional Manager, Pacific and Papua New Guinea. Before joining ACIAR, Mai was 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 and has 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 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 6 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 UN 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 2 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 30 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.

Position vacant
Country Manager, the Philippines

This position will be filled in the second half of 2021, following Ms Mai Alagcan's move to take up the role of Regional Manager, Pacific and Papua New Guinea.

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 more than 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 8 years. Previously, she 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 Kazmi
Country Manager, Pakistan

Dr Munawar 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 at 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 more than 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.

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 4 regions is determined through extensive dialogue and consultation between ACIAR, research partners and in-country partners. ACIAR-supported research addresses the specific challenges and opportunities arising in local environments and builds on established relationships.

Our research portfolio is organised into 10 programs:

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

The development of projects within and across programs is guided by the objectives of the ACIAR 10-Year Strategy 2018–2027.

We identify research priorities collaboratively with partner countries, and broker research partnerships and projects to tackle those priorities. Once projects are established, we manage and monitor 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. We work 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 has been with our portfolio partner DFAT. A new partnership agreement (Record of Understanding) was established during 2019–20, under which ACIAR currently manages 11 activities and an investment of almost $11 million.

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 2021–22, we are developing areas of activity addressing:

- links between human, livestock and ecosystem health
- opportunities to address food loss in horticulture and aquaculture value chains
- food system adaptation to the impacts of climate change
- new approaches to forest restoration.

Project and partners

178
Research projects and small research activities

31
Countries where projects are located

58
Commissioned organisations

375
Collaborating institutions

Note: An organisation or institution may partner with ACIAR on more than one project. In this data, a partner is only counted once for its role as a commissioned organisation and/or collaborator. This data was compiled in June 2021 and may change during 2021–22.

Research portfolio

21
Agribusiness projects

5
Climate Change projects

17
Crops projects

27
Fisheries projects

14
Forestry projects

21
Horticulture projects

26
Livestock Systems projects

16
Social Systems projects

15
Soil and Land Management projects

11
Water projects

5
CultiAF projects

This data was compiled in June 2021. Additional projects may be commissioned during 2021–22.

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.

Successful Agribusiness projects catalyse innovation and adaptation throughout the agrifood chain; facilitate adoption and impact among participating smallholder households, their communities and their chain partners; empower participants to continue the learning process after the project has completed; leverage and source funds for further adoption and impact beyond participant communities and chains; and leave a legacy of 'how to' guides and recommendations to foster greater uptake of innovations and adaptations wider than the project participants and beyond the life of the project.

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. He worked 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.

Climate Change

The Climate Change Program progresses the science and practice of how to transform food systems and livelihoods that are under the most pressure to adapt or to reduce greenhouse gas emissions.

Systems transformation requires a strong focus on social and institutional change, supported by technical analyses, to create fundamentally new ways in which livelihoods are sustained and food is produced. The research strategy aims to progress the science and practice of 3 pillars that support transformation:

- co-governance of adaptation pathways – formal and informal ways to align and sequence the actions of governments, businesses and communities to collectively shift food and livelihood systems
- adaptive learning – equipping governments, businesses and communities with the tools and skills to rapidly adjust plans and actions in response to shifting baseline conditions
- institutional mechanisms – development and use of global and national market mechanisms to provide key levers for systems change, ensuring they also benefit small-scale producers.

Across the program there is an emphasis on locally led approaches, interdisciplinary research, gender and social equity, and building the capacity of Australian and partner country researchers and stakeholders to engage in systems thinking. The program aims to translate sciences that often seem conceptual into tangible projects and pathways for change. The program also contributes to global, multilateral collaborations and dialogues on climate change – emphasising knowledge sharing to accelerate climate response.

Dr Veronica Doerr is the Research Program Manager for Climate Change. Her career has been characterised by integration of social and biophysical sciences to achieve sustainability goals, including research co-design with land managers and policymakers. Before joining ACIAR, Veronica spent 15 years at CSIRO researching multi-functional landscapes and how to support collaboration and learning in climate adaptation. She also managed research groups and external partnerships for climate adaptation and transition. She built and led the Climate Risks and Resilience Group, and was Research Director for the Sustainability Pathways Program and a core member of the Land and Water Leadership Team. She has a Bachelor of Arts from Yale University and a PhD from the University of Nevada – Reno.

Crops

The Crops Program aims to increase the productivity, sustainability and use of major crops by applying genetic and agronomic innovations to cropping systems important for partner countries and relevant to ACIAR strategic goals. The program is built on 2 complementary and integrated themes of genetic improvement and sustainable intensification and diversification.

Projects within the genetic improvement 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.

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. Before ACIAR, he worked for more than 20 years in private companies, including founding a start-up plant genetic analysis service company. Eric has also managed public–private research initiatives in both Australia and France. Eric was a founding partner and director of Australia's Cooperative Research Centre for Plant Science and a member of the Australian Biotechnology Advisory Council. He is a graduate of France's leading agricultural science school, Institut National Agronomique (AgroParisTech), and was a postdoctoral fellow at the Chinese Academy of Science in 1987.

Fisheries

The Fisheries Program brokers research partnerships that improve fishers' livelihoods from productive aquatic farming systems and sustainable wild-catch fisheries. The program's focus is on small-scale artisanal fisheries and low-technology aquaculture methods that benefit both women and men, 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 environmental, economic and social benefits through research on viable fisheries management policies and practices, both for artisanal fishery communities and for national or export fisheries sectors.

Across the program there is a focus on improving gender equality, women's empowerment and household income through research on small businesses and collective enterprises to meet market demand for aquatic products. The program also strives to strengthen the capacity of fisheries researchers (both Australian and partners) and fisheries managers, through better knowledge of practice-based education and training.

Prof Ann Fleming is the Research Program Manager for Fisheries. Ann came to ACIAR from Monash University, where she was a research development specialist for 2 years. Before that, Ann was Manager of Aquaculture in Northern Territory Fisheries for 5 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 holds an Adjunct Professor position at James Cook University and is currently undertaking a part-time 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 Forestry Program portfolio includes projects that span the value chain from seedlings to processed timber products. During the period 2020 to 2025, 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 on Ecosystem Restoration (2021–2030) with research examining management actions to channel natural processes towards 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.

Research projects cover a broad scope. The program works along the whole 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 market development and linking production improvement with improvements to nutrition and health.

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 smallholders in the countries where ACIAR works.

The challenge for horticulture research is to improve livelihoods in rural areas and deliver the 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 served on the board of the Australian College of Tropical Agriculture before she joined the Department of Primary Industries in Queensland as an extension horticulturist in tropical fruits, particularly mango and avocado. In 2003, Irene transferred to research management as the Director of Tropical Fruit and Value Chain Research Development and Extension, adding the post-harvest and market access research portfolios to her work in tropical fruit production systems.

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 3 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 Systems

The Social Systems Program takes a people-centred approach to agricultural research-for-development to reduce poverty. The 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 5 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 greater and better 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 Clemens Grünbühel is the Research Program Manager for Social Systems. Clemens is an ecological anthropologist with expertise in sustainable resource use and agricultural development. Before ACIAR, he was Research Leader with the Stockholm Environment Institute, based in Bangkok. He has 20 years experience in environmental public policy, participatory natural resources management, social impact assessment, institutional analysis and climate adaptation. His work has included stakeholder engagement and teaching and training. Clemens has worked in Australia, Myanmar, Laos, Thailand, Vietnam, Cambodia and Indonesia. His research expertise and publishing include climate adaptation, rural innovation, agroecological analysis and resource use systems.

Soil and Land Management

The Soil and Land Management Program aims to help smallholders boost productivity and resilience. At the same time, it strives to ensure that 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 and cultural factors, it develops technologies that enable farmers to sustainably use resources and improve the productivity of their farming systems.

In some regions, research is focused on improving soil security and the resilience and sustainability of farming systems, in the context of climate change and changing socioeconomic circumstances. The focus is to improve 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 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 3 main themes:

- improving access to, and outcomes from, irrigation for smallholders
- sustainable use of groundwater in agriculture
- risks and opportunities for safe productive use of low-quality water, including adapting to and managing the impacts of salinity.

Projects brokered by the Water Program, across all themes, share the broad aims of supporting sustainable diversification and intensification of food production, working towards equitable access to and equitable returns from water within and between communities and regions, and working with decision-makers to inform policy development at local, regional and national levels.

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 7 years. 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. 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.

Dr Robyn Johnston is the Research Program Manager for Water. Before joining ACIAR, Robyn was Principal Researcher with the International Water Management Institute, including 3 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.

Our economics and policy activities focus on research and initiatives that support sustainable and inclusive economic development. Photo: Fiji National University.

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. Markets 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 Economics and Policy team 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.

Dr Todd Sanderson is the Research Manager, Economics and Policy. Before joining ACIAR, Todd was a CSIRO research scientist working in the area of agriculture, digital economics and markets. Prior to this he was a lecturer in economics at the University of Sydney, with research covering agricultural trade, 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 collaborative relationships with in-country research partners. He has a PhD in agricultural economics from the University of Sydney.

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 we have 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 2 key areas of focus during 2020–21:

- systematic portfolio planning, monitoring and reporting
- commissioning evaluation studies.

Systematic portfolio planning, monitoring and reporting

The systematic portfolio planning, monitoring and reporting 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 evaluation studies

We will continue to commission 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 5 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 of International Development from RMIT.

5

ACIAR in the Indo-Pacific

ACIAR in the Indo-Pacific

Through longstanding partnerships with many countries in the Indo-Pacific region, ACIAR supports collaborative research on productivity, resilience, sustainability and equity in agriculture, forestry and fisheries systems to reduce poverty and improve livelihoods.

This work is dominated by bilateral and regional research projects underpinned by longstanding country partnerships. During 2021–22, 178 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 over several years to develop new knowledge, technology or methodology, through to small research activities where an individual agency or specialist may conduct a desktop or scoping study over 12 months.

When establishing research projects, our research program managers work closely with the ACIAR Country Network to ensure that the research aligns with in-country priorities, and to build connections and relationships with in-country organisations and institutions.

This chapter describes our research collaborations with each region and country in 2020–21. Our work is organised in 4 regions of operation in the Indo-Pacific, with 31 partner countries and guided by locally engaged staff in 10 Country Offices throughout the regions.

Within each region, we facilitate a varied program of research, reflecting the challenges and opportunities of a region and individual countries. In addition to bilateral and regional projects, we also conduct global research collaborations (Chapter 2) and scientific and policy capacity building (Chapter 6).

Pacific

62

projects

East and South-East Asia

79

projects

South Asia

25

projects

Eastern and Southern Africa

22

projects

This data was compiled in June 2021 and may change during 2021–22. Some projects occur in more than one region, therefore the total of projects in each region will exceed the total number of individual projects as listed on page 36.

5.1

Pacific

Pacific

The countries of the western Pacific, including Timor-Leste, are set apart from the rest of the world. Many are small and geographically isolated, and have limited land mass and arable land, fragile natural environments and fewer resources. Increasingly, they are more vulnerable to natural disasters and climate change than many other regions of the world.

Each country in this region faces specific development and agricultural challenges including small formal economies, long distances from major markets, high costs and rapidly growing populations that hamper economic growth. Governance and capacity constraints in some countries also limit their ability to deliver services. These challenges make it difficult to respond to natural disasters and climate change effects, which are prominent in the region.

While many of the constraints are common to more than one country, they can affect each country or even islands within countries differently, depending on local context. These constraints and uncertainties have limited the development of commercially oriented agriculture, fisheries and forestry sectors, and left some Pacific region countries heavily dependent on imported food and other commodities. Many of these countries have increased vulnerability due to the remoteness of their location.

Pacific countries also face the consequences of a triple burden of malnutrition – a situation where undernutrition, micronutrient deficiencies and obesity coexist. Unhealthy diets, lifestyles and environment are key risk factors contributing to these non-communicable diseases.

The COVID-19 pandemic has had devastating effects globally. Cities have been locked down, borders have closed, limiting international travel, and supply chains have been disrupted, upending economies. The Pacific region has been equally affected.

With the threat of inadequate health care to cope with COVID-19, Pacific countries were quick to close borders, establish isolation strategies and roll out protocols of social distancing. Currently, several Pacific countries have received support for vaccines, with Australia being a leading donor.

Domestically, agriculture, fisheries and aquaculture were hit hard by the pandemic, through loss of access to markets and difficulty securing labour for harvest and production. Losses of jobs and incomes resulted from a decline in tourism, remittances and general household and business spending. In the tourism sector alone, which in 2019 brought in about US$4 billion and represented about 7.8% of the region's gross domestic product (GDP), international arrivals fell by 73% in the first 10 months of 2020.

During 2020, we examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. This information, published in our report *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*, will be used to inform future research and development to support food systems resilience in the Indo-Pacific region. Food systems assessments were undertaken at 5 locations, including Pacific island countries, Papua New Guinea and Timor-Leste.

To reduce and mitigate impacts of COVID-19 on economies, Pacific countries adopted a variety of measures, including economic stimulus packages, home gardening programs through seed distribution, farm support packages and backyard aquaculture farms.

Partner countries in the ACIAR Pacific region

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

Drivers of regional collaboration

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

The ACIAR program with the Pacific region has a strong focus on enabling regional collaboration, especially through our close relationship with The Pacific Community (SPC), which plays a key role in communicating research outcomes of relevance 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.

Papua New Guinea is a significant partner within our Pacific region program, and we have a specific strategy that highlights enabling collaboration with the small island states of the region on issues of common interest.

Timor-Leste is also a partner in our Pacific region program. Given the small nation's unique geographic, cultural and biophysical circumstances, our program in Timor-Leste is largely independent of programs from other countries in the region; however, opportunities to collaborate are optimised.

ACIAR Pacific region program

The Pacific Step-up is one of Australia's most important foreign policy priorities, highlighted in the Australian Government's *2017 Foreign Policy White Paper*. The policy elevates Australia's partnerships with the Pacific region to a new level and focuses on strategically secure and economically stable support for the region.

In 2021–22, we will continue to build on our long engagement with the Pacific region, through our regional office in Fiji. We will develop new 10-year strategies with the Pacific island states and Papua New Guinea.

We are developing our medium-term priorities under both 10-year strategies through consultation with national government partners and regional research and development agencies as a response to COVID-19 to boost pandemic-resilient agriculture. We will continue to implement our business continuity plans, maintain formal and informal communication through the response, re-engagement and recovery phases, and reassure all major partners of our ongoing commitment to collaboration.

We are supporting our alumni to work hand-in-hand with Australian researchers to provide insights into how the pandemic is affecting local food security and to ensure the food secure future of the Pacific region. We also support the scaling up of new opportunities in COVID-19 relevant research areas such as One Health (the interface between human, animal and environmental health), biosecurity and improving resilience in food supply chains, both within partner countries and between Australia and partner countries.

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

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

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.

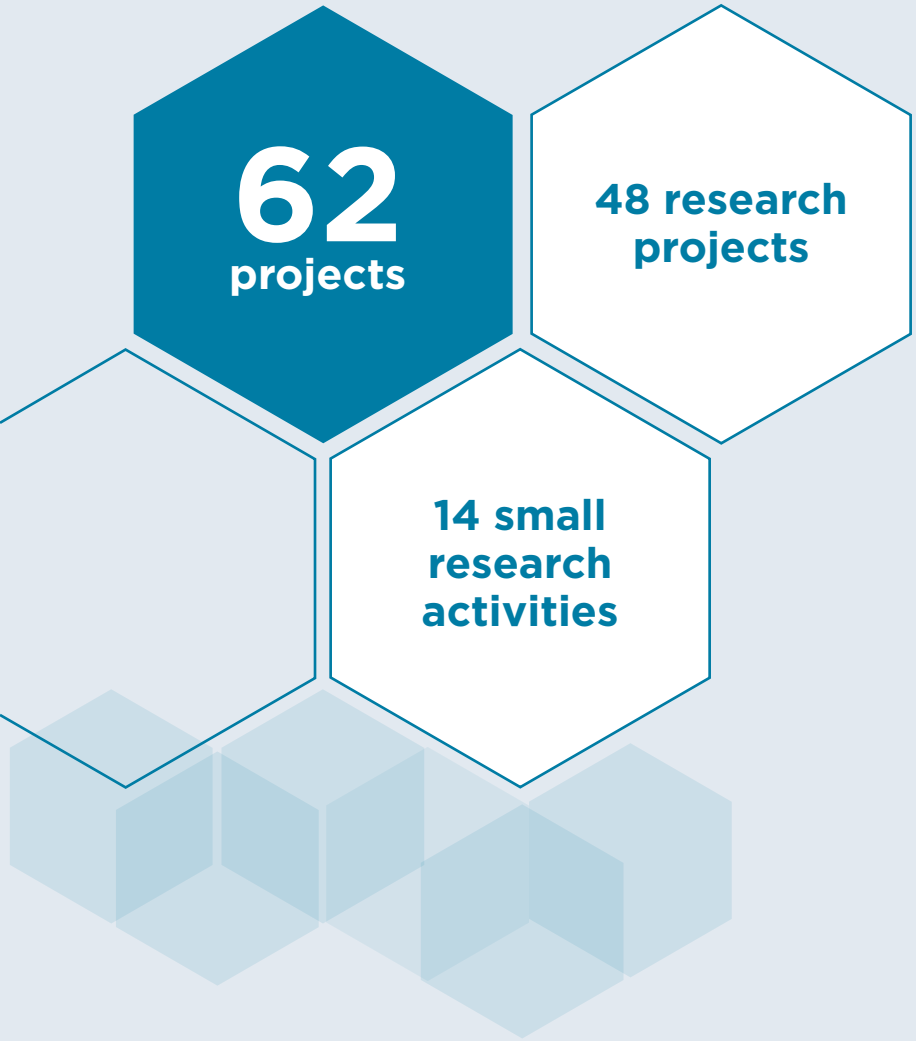
During 2021–22, ACIAR, DFAT and the International Coconut Community will continue their collaboration to reinvigorate and sustain the Coconut Genetic Resources Network (COGENT). The program will focus on better coconut science, through a global coconut strategy to address the challenges outlined above. 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

Pacific region program 2021–22

Partner country	No. projects
Pacific island countries	37
Fiji	18
Kiribati	5
Samoa	15
Solomon Islands	14
Tonga	12
Vanuatu	13
Papua New Guinea	25
Timor-Leste	6

Note that a project may be conducted in several countries, therefore the total number of projects in this table will be greater than the number of projects in the region.



Research portfolio

1 Agribusiness project

4 Climate Change projects

3 Crops projects

14 Fisheries projects

6 Forestry projects

12 Horticulture projects

10 Livestock Systems projects

7 Social Systems projects

5 Soil and Land Management projects

0 Water projects

Table 5.1 **Current and proposed projects in the Pacific region, 2021–22**

Project title	Project code	Country
Agribusiness		
Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2)	AGB/2014/057	Fiji, Tonga, Vanuatu
Climate Change		
Transforming Pacific coastal food production systems	FIS/2020/108	South Pacific general
Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam	WAC/2019/150	Fiji, Vietnam
Transformational pathways for Pacific fisheries communities	WAC/2020/178	Kiribati, Solomon Islands
Conservation agriculture and sustainable intensification systems for transformational climate adaptation and greenhouse gas mitigation in Pacific island countries	CLIM/2020/186	Samoa, Tonga
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
Managing basal stem rot in oil palm by converting infected logs to biochar	CROP/2019/147	Papua New Guinea
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	Timor-Leste
Fisheries		
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 agrifood system analyses for the Pacific region	FIS/2018/155	Kiribati, Solomon Islands, South Pacific general, Vanuatu
Towards more profitable and sustainable mabé pearl and shell-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
Developing alternative small-scale fishery models in the Fly River, Western Province, Papua New Guinea	FIS/2020/110	Papua New Guinea
Spatially integrated approach to support a portfolio of livelihoods	FIS/2020/111	Solomon Islands, South Pacific general
Coalitions for change in sustainable national community-based fisheries management programs in the Pacific	FIS/2020/172	Kiribati, Solomon Islands, South Pacific general, Vanuatu
Strengthening agricultural resilience in Western Province: methods for place-based livelihoods approach	FIS/2021/113	Papua New Guinea
Strengthening agricultural resilience in Western Province: mapping place-based strength and assets	FIS/2021/122	Papua New Guinea

Project title	Project code	Country
Forestry		
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
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
Livelihoods in forest ecosystem recovery	FST/2020/135	Solomon Islands
Horticulture		
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
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 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
Improving root crop resilience and biosecurity in Pacific island countries and Australia	HORT/2018/195	Fiji, Samoa, Solomon Islands, Tonga
Enhanced fruit systems for Tonga and Samoa (phase 2): community-based citrus production	HORT/2019/165	Samoa, Tonga
Building a business case for investment in a coconut industry in the Pacific	HORT/2020/190	Fiji, Samoa, Vanuatu
Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific (Food Loss Research Program)	CS/2020/191	Fiji, Samoa, Solomon Islands, 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
Sectoral analysis and investment requirements for improving Fiji and Samoa small ruminant sector	LS/2018/183	Fiji, Samoa
A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu	LS/2018/185	Vanuatu
Enhancing the management of antimicrobial resistance in Fiji	LS/2019/119	Fiji
Improved animal health surveillance in Timor-Leste	LS/2019/158	Timor-Leste
Assessing the potential of a high value 'sustainable beef' brand within the Vanuatu tourism sector to improve beef production and increase the market share for smallholders	LS/2020/155	Vanuatu
COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program)	LS/2020/203	Myanmar, Papua New Guinea, Philippines
Livestock climate lens Part 1: data landscape analysis	LS/2020/207	Myanmar, Vanuatu

Project title	Project code	Country
Social Systems		
Agrifood systems transformation through circular migration between Pacific islands and Australia (COVID-19 impacts program)	CS/2020/212	Samoa, Tonga, Vanuatu
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		
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	SMCN/2012/105	Papua New Guinea
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 (phase 2)	SLAM/2019/109	Papua New Guinea
Soil management in Pacific islands (phase 2): investigating nutrient dynamics and the utility of soil information for better soil and crop management	SLAM/2020/139	Fiji, Samoa, Tonga, Vanuatu
Understanding tradition and fostering appropriate innovation in soil management to improve farmers productivity and livelihood in Timor-Leste	SLAM/2020/141	Timor-Leste

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled in June 2021. Additional projects not listed in this table may be commissioned during 2021–22.

Pacific island countries

A$11.7 million
Budgeted funding

29
Bilateral and regional research projects

8
Small projects and research activities

Agriculture is an important sector for Pacific island countries, particularly for its contributions to the livelihoods of the population, GDP and food security. According to the FAO, three-quarters of the Pacific population live in rural areas and rely largely on agriculture and fishing for their livelihoods.

These populations are vulnerable to the long-term impact of climate change and the devastation caused by frequent natural disasters. Long-term declines in agricultural productivity are undermining the sustainability of livelihoods and contributing to the increased incidence of diet-related non-communicable diseases. Globally, 10 countries with the highest obesity rate are Pacific island nations. Populations suffer from the triple burden of malnutrition – a situation where undernutrition, micronutrient deficiencies and obesity coexist. Non-communicable diseases are the leading cause of death and morbidity, as islanders have mostly moved away from eating fresh seafood and traditional crops in favour of imported, processed foods that are high in energy, sugar, salt and fat.

According to the FAO, common challenges point to increasing vulnerability to economic shocks and natural disasters across the region. While many of the challenges are common throughout Pacific island countries, the impacts in each country and island may differ, depending on local context. Such constraints and uncertainties have limited the development of commercially oriented agriculture, fisheries and forestry sectors, and left many Pacific island countries heavily dependent on imports of food and other commodities.

COVID-19 has worsened these challenges, as structural impacts of the pandemic emanating from decisions and responses in other countries affect the Pacific region's food security and nutrition. Pacific island countries rely heavily on imported foods. Lockdowns, border closures and port closures have led to slowdowns in the shipping industry, disrupting the logistics of global and local supply chains. Food systems in the region have been disrupted and prices have risen for non-controlled foods such as fruits and vegetables.

Agriculture has been disrupted by the inability to import fertiliser and livestock feed. Revenue from the licensing of tuna fishing vessels has fallen. Measures including airport and port closures and quarantining of crews have delayed operations, costing fishing companies $50,000 to $60,000 per day per vessel, and island nations $130,000 per day per vessel in lost revenue. Tourism-dependant economies have suffered a major shock, leading to increased rates of unemployment.

A widespread vulnerability of agriculture in Pacific island countries is invasive pests and diseases, such as coconut rhinoceros beetle (Guam biotype) and Bogia coconut syndrome. Island environments inherently have limited natural resilience in the face of aggressive invasive species, due to the limited local diversity of natural enemies. Climate change is a major contributor to the increased threats of transboundary plant and animal pests, diseases and invasive species. Recent years have been marked with rapidly spreading outbreaks of several devastating invasive pest species of crops. Emerging diseases of livestock (and potentially fisheries) might be equally destructive. Heightened interest across the region in stopping the spread of African swine fever shows that a regional approach to research is vital for improving agricultural and biosecurity approaches towards building a more resilient Pacific region.

Leaders of Pacific island nations have identified concerns about the uncertain impact of climate change. All these nations are concerned about the potential effects of rising sea levels, given that much of the population and most of the productive agriculture occurs in coastal areas and plains. Climate models suggest that, over the longer term, some Pacific islands will become drier, on average, and others wetter. In the meantime, stronger periods of drought and wet weather (in some cases causing destructive flooding) are expected, associated with El Niño cycles. Cyclones have become more severe in the region, and recent tropical cyclones Harold, Yasa and Ana caused widespread devastation in Fiji and Vanuatu.

Enterprises based on beekeeping offer many opportunities for smallholder farmers. In Fiji there is strong domestic demand for honey with potential for the export of honey and beeswax. In Nasinu, tilapia farmer, Ms Katalina Baleisuva, has ventured into beekeeping and says this has improved her finances. Photo: Lorima Vueti. ACIAR project LS/2014/042

Country priorities

Australia's Pacific Step-up, foreshadowed in the *2017 Foreign Policy White Paper*, committed Australia to an intensified engagement in the Pacific region to support a more resilient region. The Pacific Step-up emphasises the importance of our ongoing and diverse program with the region, involving all research programs. Protecting the fragile natural resource base of the Pacific islands is closely linked to the priority of ensuring the resilience of agrifood systems. Our regional partner SPC emphasises integrated approaches to increasing resilience, including:

- deploying a diversity of species and products in trees, crops, livestock and aquaculture to increasing resilience in the face of uncertainty
- growing a greater number and diversity of trees in forestry, agroforestry and horticulture systems to contribute to more sustainable and resilient agricultural landscapes
- diversifying crops to contribute to greater food security, nutrition and health
- better managing coastal fisheries and aquaculture to underpin healthier nutrition and more resilient livelihoods
- strengthening market chains for greater equity and inclusion to contribute to improved and more resilient livelihoods.

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

The COVID-19 pandemic has highlighted the opportunity to rebuild and improve food systems and livelihoods in a sustainable way. The importance of land and ocean resources has never been clearer. ACIAR will continue supporting the Pacific islands countries to strengthen their food systems by:

- supporting local food production
- linking coastal communities with livelihood opportunities
- understanding and addressing the impacts of climate change on food systems resilience and livelihood security
- strengthening regional biosecurity
- enabling intercountry collaboration through regional projects, capacity building and supporting a stronger forum for exchange of ideas and experiences.

2021–22 research program

- **37 ACIAR-supported projects in Pacific island countries**
- **28 projects are specific to one or more of these countries**
- **9 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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 Pacific Agribusiness Research and Development Initiative (PARDI) has been a significant program of work supported by ACIAR and DFAT. Starting in 2010, it promoted 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. Phase 2, led by Professor Steven Underhill of the University of the Sunshine Coast, studied benefits to community livelihoods from successful agribusiness developments and ways to make economic benefits more inclusive and sustainable. During 2021–22, the program will identify opportunities and barriers in value and supply chains for primary products in Pacific island countries. There will be a new and particular focus on the development of capacity and networks, supporting agritourism in Fiji and Vanuatu, smallholder honey production and inland aquaculture supply chains in Fiji, and, more broadly across the region, development of agribusiness capacity.[1]

Climate Change

The impacts of climate change and population growth are projected to lead to the collapse of coastal livelihoods currently dependent on coral-reef-based fish and nearshore fish throughout Pacific island countries. These impacts on fisheries will exacerbate existing nutritional and health problems in the region. A small research activity, led by Dr James Butler of CSIRO, will apply a systems approach to identify where these declines will be significant enough that new, transformational approaches to food production and livelihoods will be needed soon. The project is scoping options for transformational change and designing a locally led approach for communities to combine their own knowledge with scientific feasibility assessments to design and implement transformational climate adaptation action on the ground.[2]

In order to protect fish-based livelihoods throughout Pacific island countries, very different food and livelihood options need to be progressed in ways that are owned by communities, facilitated by provincial governments and civil society groups, and supported by national governments. A project led by Dr James Butler of CSIRO will tailor adaptation pathways methods to this context – combining scientific analysis and local knowledge, and designing and beginning to scale the collaborative planning processes needed across these different actors to create actionable pathways towards new climate-adapted food and livelihood systems.[3]

Smallholder farmers in Pacific island countries are vulnerable to reductions in availability of fresh water under climate change, as well as increasing demands from growing populations. Co-led by Professor Timothy Reeves and Dr Dorin Gupta of the University of Melbourne, a project will explore opportunities for the implementation of conservation agriculture and sustainable intensification (CASI) in smallholder farming systems in Samoa and Tonga. In other parts of the world, by integrating multiple management changes in a farming systems approach, CASI has been successful in intensifying agricultural production while providing climate adaptation and mitigation benefits. This project will experiment with integrated management changes that may help Pacific island countries to improve productivity, profitability, efficiency, management of greenhouse gas emissions, and resilience to climatic and economic risks.[4]

Australia is a world leader in greenhouse gas mitigation research in agriculture. This project provides the opportunity to assist partner countries to strengthen their national greenhouse gas accounting systems toward the same high standard used by Australia, and to use these systems to identify, quantify and implement on-farm management options that reduce emissions. Led by Professor Peter Grace of Queensland University of Technology, the project team will work with government institutions in Fiji and Vietnam, and will help grow capability in the data management, analyses and reporting needed to support current and future emissions reduction commitments under the Paris Agreement. The team will also collaborate with a sister project, led by the New Zealand Agricultural Greenhouse Gas Research Centre, which is pursuing the same approach in Kenya and Indonesia.[5]

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 long-term 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 2021–22 activities will explore the genetic basis of resistance and select candidate germplasm for resistant planting material.[6]

Fisheries

Unique among Pacific island countries is the production of half-pearls, or mabé, in Tonga from the winged pearl oyster. Although half-pearls are generally less valuable than round pearls, an individual oyster can produce multiple half-pearls (unlike round pearls). With appropriate training, pearl production can be accomplished by community members over a 10-month culture period, compared to approximately 2 years for round pearls. Professor Paul Southgate of the University of the Sunshine Coast completes a project in 2021 that is supporting further expansion of community-based pearl farming and handicraft production in Tonga and demonstrating the feasibility of similar development in Vietnam.[7]

Mabé (half-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 mabé shell in Fiji and Tonga, and in the production of shell-based jewellery in Papua New Guinea. 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, led by Professor Paul Southgate of the University of the Sunshine Coast. 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 women and men across the value chains.[8]

A 4-year project working with SPC supports implementation of the 2015 regional framework, 'A new song for coastal fisheries – pathways to change'. 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. Led by Professor Neil Andrew of the University of Wollongong, the project will complete its work in 2021, bringing together communities and fisheries agencies to develop culturally suitable co-management practices that support sustainable coastal fisheries, and associated food security and wellbeing.[9]

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 has analysed 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. During 2021–22, the results of the analysis will inform regional and national policy. Diagnostic tools developed by the project will be linked to methods that pertain to different nodes of the agrifood system to form an overarching 'agrifood system diagnostic' that can highlight the key challenges and opportunities in the Pacific agrifood system.[10]

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. Nutrition-sensitive agriculture ensures the sustainable production of nutritious, affordable and safe foods to meet the dietary requirements of local communities. Dr Libby Swanepoel of the University of the Sunshine Coast completes a small research activity in 2022 that is designing a framework for equitable empowerment of women and men within seaweed harvester families. This will be achieved by developing and evaluating gender-inclusive activities in Kiribati and Samoa that broaden the focus of seaweed production from an export commodity to one that provides direct benefits to the health and wellbeing of communities.[11]

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 for innovation within the coastal fisheries post-harvest sector, with a focus on income benefits for both women and men. This new approach addresses the historic 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 community-led infrastructure and skill development investments.[12]

Livelihood improvement projects for small-scale fishing communities are increasingly promoted in the Pacific region to build resilience to global change and dwindling fisheries resources. Often these projects focus on a single sector and focus on individual communities and households, failing to acknowledge the complexity of people's livelihoods. Such projects also risk obscuring broader-scale economic development trends, such as the establishment of extractive industries or technological innovations. Dr Amy Diedrich of James Cook University leads a small research activity to establish an integrated livelihoods approach to guide scientists, practitioners and decision-makers engaged in livelihood improvement project planning and assessment. The improved approach aims to achieve 3 desired outcomes in Pacific coastal communities: a fair and just society, sustainable natural resource use and resilient livelihoods.[13]

Securing the sustainable supply of coastal fish is a development priority for Pacific countries and regional organisations, as coastal fisheries are important for food and nutrition security and economic development. A new project in 2021 aims to scale up the proven approach of community-based fisheries management in Kiribati, Solomon Islands and Vanuatu to self-sustaining national programs that support resilient coastal communities. The project also aims to drive the spread of community-based fisheries management throughout in the Pacific region. The project contributes to Australia's Pacific Regional development program and the Pacific Step Up, and is an important component of Australia's COVID-19 response to build more resilient communities in our region. Professor Neil Andrew of the University of Wollongong leads the project, which starts with developing and disseminating information about inclusive community-based fisheries management principles and implementing an awareness raising strategy for delivery to 100% of coastal communities. Early project activity will strengthen national communication to accelerate uptake of management principles.[14]

Forestry

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 the 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]

Agroforestry is the key element supporting the Decade of Reforestation initiated by the Vanuatu Government. Smallholder farmers are enthusiastic about engaging in small-scale commercial planted forestry, but progress can be restricted by a lack of awareness of technologies to optimise efficiencies. Dr Tony Page of the University of the Sunshine Coast leads a project to investigate the applicability and effectiveness of peer-mediated learning (farmer-led extension) in Vanuatu to overcome constraints to government and institutional extension services. The project supports smallholder farmers to adopt 3 high-value forestry species – *Canarium* nut, sandalwood and whitewood – by identifying genetically superior planting material and refining silvicultural techniques for increased productivity in Vanuatu.[16]

Although primary forest reduction is significant, Solomon Islands remains dependent on forests. Logging royalties account for 60% of government revenue and 92% of the population are subsistence cultivators who supplement their material economy with forest-derived building materials, food, fuel, medicines, tools and household items. Professor Helen Wallace of Griffith University leads a new project that has the central aim of learning how to efficiently restore forests to meet critical needs of rural Solomon Islanders, accelerating and channelling forest development to support livelihoods. The project also strives to support positive leadership in forest governance to secure remaining forests and those restored. Starting in 2021 are activities to foster community ownership and enhance women's participation, as well as a review of restoration methods for logged forests and establishment of field sites to measure the impact of interventions.[17]

The Master Tree Growers teaches smallholder farmers how to improve tree management through a market-focused and community-driven approach. A course was held in Vanuatu where an ACIAR-supported project is investigating farmer-led extension to introduce new technologies. ACIAR project FST/2016/154

Horticulture

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 complete activities that 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.[18]

Coconuts contribute, directly and indirectly, to the livelihoods of coastal communities throughout the Pacific region. Coconut enterprises in Pacific island countries face economic and environmental challenges –diversifying the range of products made from coconuts could offer a path to more-resilient livelihoods. 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.[19]

While global demand for coconut is strong, well over 50% of the 1.3 million coconut trees in the Pacific region are senile or unproductive. The future of the industry and associated livelihoods depends on the replanting of the coconut estate. This provides the opportunity to not only sustain production, but also increase it through the introduction of higher-yielding hybrids. While there are immense technical challenges to solve (for example, eradicating or reducing the impact of key pests, producing and distributing high-quality planting material and offsetting the effects of climate change), distinctly human and behavioural challenges also need addressing. A small research activity in 2021, led by Mr Cameron Turner of the University of Queensland, will develop a strong evidence base on the viability (or otherwise) of future ACIAR investment in the coconut industry in the Pacific region, and build in-country capability in ethnographic research methodology.[20]

Vegetable production in the Pacific islands does not match local demand, and locally grown vegetable crops are susceptible to damage and destruction from extreme weather events, making supply to high-value markets unreliable. As a result, vegetables are imported for high-value hospitality and food service markets. A project led by Professor Phil Brown of Central Queensland University, concluding in 2021, evaluates and promotes 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.[21]

ACIAR-supported plant health doctors are engaging with local farmers at the grassroots level. The farmers bring their suspected diseased plants for diagnosis, and the plant health doctors provide recommended treatments. The plant health doctors work closely with the local agricultural ministries. Photo: Pacific Way. ACIAR project HORT/2016/185

Fruit industry development in the Pacific region enhances food security, rural economies and healthy eating initiatives. A previous project in Fiji, Samoa and Tonga worked towards these benefits by supporting the development of resilient value chains for 5 regionally significant fruit crops: papaya, pineapple, mango, breadfruit and citrus. A new project led by Professor Steven Underhill of the University of the Sunshine Coast 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.[22]

Sweetpotato is a necessary component of food, nutritional security and disaster reduction strategies in Pacific island countries. Rapid production of planting material, ease of planting, quick maturation and high nutrition makes sweetpotato an ideal option in disaster recovery. However, yields of sweetpotato are low in the Pacific region compared with developed countries, as farmers do not have access to pathogen-free planting material. In times of high demand, under government assistance schemes following natural disasters, quality cuttings are not available, and those distributed are invariably infested with pests and diseases. Dr Julie O'Halloran of the Queensland Department of Agriculture and Fisheries leads a new project that has the overall aim of building capacity in the provision of high-quality, pathogen-tested sweetpotato planting material to support a larger program for resilient root cropping systems that are responsive to the challenges of pests and diseases and climate change.[23]

The development of safe, high-value fruit and vegetable industries is a priority for many Pacific island countries. Dr Michael Furlong of the University of Queensland leads a project to develop integrated pest and disease management strategies for the sustainable intensification of fruit and vegetable crop production, addressing the threats posed by the inappropriate use of pesticides, emerging pests and diseases and climate change. During 2021–22, the project will continue to assess pathways for the introduction and potential spread of insects and test biological control strategies, while developing integrated management approaches for selected crops. The project continues to build surveillance and diagnostic capacity for the management of emerging pests and diseases, including fall armyworm. 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.[24]

In the Pacific region, vulnerability of horticultural produce to postharvest losses often is more dependent on where and how a product is grown, transported and sold, rather than commodity-type. A new project in Samoa, Fiji, Solomon Islands, Tonga and Vanuatu aims to reduce food losses through a market-based and gender inclusive approach to identify where food loss is greatest. Dr Seeseei Molimau-Samasoni of the Scientific Research Organisation of Samoa will lead a project team to identify value chains of fruits, vegetables and root crops that are most critical to improving nutrition and livelihoods of farmers and vendors. The team will then engage with farmers and vendors to trial interventions to address these drivers of food loss, with the ultimate goal of reducing food losses. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).[25]

Livestock Systems

Strong domestic demand for honey and the potential to export honey and by-products offers an opportunity to smallholder farmers in Fiji and Papua New Guinea. A project, 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 2021–22, the project will complete spatial and temporal mapping of floral resources and develop best-practice pest and disease management programs in readiness for incursions of varroa and tropilaelaps mites. Capacity building of extension and development agencies to support beekeeping as a sustainable small enterprise will continue.[26]

The productivity and profitability of sheep and goat production in Pacific island countries could be improved if domestic production was better aligned with national market requirements and smallholder farmers could more easily participate in value chains. Dr Frances Cowley of the University of New England leads a project addressing the constraints to production efficiency for smallholder and semi-commercial sheep and goat production systems in Fiji and Samoa. During 2021–22, the project will continue assessments to understand farmer motivation to change practices, and test innovations to improve management of feed gaps, reduce mortality and improve turn-off rates.[27]

Supporting the previous 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.[28]

Increasing smallholder cattle productivity and income from cattle sales is a priority of the Vanuatu Government. A project led by Dr Simon Quigley of the University of Queensland aims to integrate recommendations from previous and new research on cattle production and marketing. A set of best-bet production 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.[29]

In Vanuatu, meat exports are processed through 3 vertically integrated abattoirs. Smallholder beef producers in Vanuatu are largely excluded from these high-value export markets because of poor quality, insufficient quantity, poor organisation and high transport costs. Dr Cherise Addinsall of Southern Cross University will undertake a feasibility analysis to determine if greater equity and inclusivity between smallholders and large cattle producers could occur through an agritourism approach, linking a high-value, sustainable beef brand to Vanuatu's tourism industry.[30]

Globally, antimicrobial resistance is one of the most urgent emerging threats to human and animal health. It has broad impacts on animal production systems and food security. Dr Walter Okelo of CSIRO leads a project 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.[31]

The Australian and New Zealand governments share a common interest in investing and assisting partner countries to improve livestock production and productivity, including the potential to reduce greenhouse emissions from livestock production systems. A small research activity led by Dr Paul Cheng of the University of Melbourne is assessing what data exists for calculation of greenhouse gas emissions for selected smallholder livestock projects supported by ACIAR and the New Zealand Ministry of Foreign Affairs and Trade. The study will focus on livestock systems in Vanuatu and Myanmar. It will provide an understanding of the opportunities and challenges for incorporating livestock monitoring, reporting and verification data collection and/or analysis in development projects in the longer term. The study will also provide an understanding of the attitudes and interest of project partners to participate in such activities into the future.[32]

A project led by CSIRO aims to enhance the integrated management of antimicrobial resistance through existing national structures in Fiji, to achieve sustainable and improved health outcomes across human, animal and environmental sectors. Pictured are vets monitoring cattle at the Koronvia Research Station in Suva. Photo: Dave Lavaki. ACIAR project LS/2019/119

Social Systems

The agriculture sector has been identified as a sector for growth to support economic development and poverty alleviation in Fiji and Tonga. Livelihoods and landscapes in these countries are highly interconnected, so the populations are acutely vulnerable to the impacts of climate change and variability as well as the impacts of policy-driven intervention. 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 lead a team to develop a collaborative geospatial platform that will identify response to climate-smart landscape adaptation. During 2021–22, the researchers will evaluate the effectiveness of the platform for promoting community and multi-stakeholder exchange and engagement with landscape knowledge. The project will also identify adaptation objectives for communities within the landscape to foster climate resilience and enhance environmental livelihood security.[33]

Family Farm Teams is a peer education model of agricultural extension that has benefited the economic development of women smallholders in 9 areas of Papua New Guinea. Dr Deborah Hill of the University of Canberra leads a new project to improve agricultural development opportunities for women 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.[34]

The Livelihood Improvement through Facilitator Extension (LIFE) model of improved extension, based on a Landcare approach, was developed through research in the Philippines. It rapidly enhanced agricultural livelihoods by improving both farmer-based learning networks and community social capital. 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 by trialling the LIFE model for livelihood improvement within a Fijian smallholder farmer context. The project will broker an escalation of the Landcare approach to deliver sustainable land management outcomes with government and civic partners.[35]

Pacific labour mobility is a major component of the Australian Government Pacific Step-up and closely connected to initiatives among Pacific island countries that have re-prioritised agricultural production and food security as a COVID-19 recovery strategy. A largely underexplored opportunity exists for understanding how farm workers involved in labour mobility programs between Australia and the Pacific region develop innovative agricultural skills and new agricultural knowledge through their engagement on Australian farms. A small research activity led by Dr Federico Davila of the University of Technology Sydney aims to understand barriers and enablers for the exchange of agricultural skills and knowledge between Pacific island and Australian farmers. This research will analyse skills and knowledge acquired in different agrifood systems across selected value chains. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[36]

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. A previous project (SMCN/2016/111) developed a soil information system and identified appropriate technologies for improved soil health and efficient water and nutrient use. A new project in 2021 builds on this research to build farming systems resilience in Fiji, Samoa, Tonga and Vanuatu. Led by Dr Ben Macdonald of CSIRO, the project will address knowledge gaps in understanding soil organic carbon and nutrition management, and develop the next generation of agronomic advisors and appropriate networks for collaboration. The project will continue the development and extend the reach of the Pacific Soils Portal. Cost-effective in-field technologies for rapid soil and plant analysis and real-time data capture will be introduced to agricultural extension services. The project seeks to improve the linkages along the export value chain through the development of information pathways between the grower and exporter, with a focus on nutrient management.[37]

Regional Manager, Pacific and Papua New Guinea
Ms Mai Alagcan

Research Program Managers
Agribusiness: Mr Howard Hall
Climate Change: Dr Veronica Doerr
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu] (AGB/2014/057)
2. Transforming Pacific coastal food production systems [South Pacific general] (FIS/2020/108)
3. Transformational pathways for Pacific fisheries communities [Kiribati, Solomon Islands, Tonga, Vanuatu] (WAC/2020/178)
4. Conservation agriculture and sustainable intensification systems for transformational climate adaptation and greenhouse gas mitigation in Pacific island countries [Samoa, Tonga] (CLIM/2020/186)
5. Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam (WAC/2019/150)
6. 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)
7. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
8. Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
9. Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song [Kiribati, Solomon Islands, Vanuatu] (FIS/2016/300)
10. Agriculture and fisheries for improved nutrition: integrated agrifood system analyses for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2018/155)
11. Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa (FIS/2019/125)
12. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
13. Spatially integrated approach to support a portfolio of livelihoods [Solomon Islands, South Pacific general] (FIS/2020/111)
14. Coalitions for change in sustainable national community-based fisheries management programs in the Pacific [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2020/172)
15. Coconut and other non-traditional forest resources for the manufacture of engineered wood products [Fiji] (FST/2019/128)
16. Enhancing returns from high-value agroforestry species in Vanuatu (FST/2016/154)
17. Livelihoods in forest ecosystem recovery [Solomon Islands] (FST/2020/135)
18. 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)
19. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
20. Building a business case for investment in a coconut industry in the Pacific [Fiji, Samoa, Vanuatu] (HORT/2020/190)
21. Integrating protected cropping systems into high value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga] (HORT/2014/080)
22. Enhanced fruit systems for Tonga and Samoa (phase 2): community-based citrus production (HORT/2019/165)
23. Improving root crop resilience and biosecurity in Pacific island countries and Australia [Fiji, Samoa, Solomon Islands, Tonga] (HORT/2018/195)
24. Responding to emerging pest and disease threats to horticulture in Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
25. Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific (Food Loss Research Program) [Fiji, Samoa, Solomon Islands, Tonga] (CS/2020/191)
26. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
27. Improving small ruminant production and supply in Fiji and Samoa (LS/2017/033)
28. Sectoral analysis and investment requirements for improving Fiji and Samoa small ruminant sector (LS/2018/183)
29. Assessing the potential of a high value 'sustainable beef' brand within the Vanuatu tourism sector to improve beef production and increase the market share for smallholders (LS/2020/155)
30. Enhancing the management of antimicrobial resistance in Fiji (LS/2019/119)
31. A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu (LS/2018/185)
32. Livestock climate lens Part 1: data landscape analysis [Myanmar, Vanuatu] (LS/2020/207)
33. Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems [Fiji, Tonga] (ASEM/2016/101)
34. Improving agricultural development opportunities for female smallholders in rural Solomon Islands (SSS/2018/136)
35. Landcare - an agricultural extension and community development model at district and national scale in Fiji (SSS/2019/140)
36. Agrifood systems transformation through circular migration between Pacific islands and Australia (COVID-19 impacts program) [Samoa, Tonga, Vanuatu] (CS/2020/212)
37. Soil management in Pacific islands (phase 2): investigating nutrient dynamics and the utility of soil information for better soil and crop management [Fiji, Samoa, Tonga, Vanuatu] (SLAM/2020/139)

Papua New Guinea

A$8.6 million
Budgeted funding

20
Bilateral and regional research projects

5
Small projects and research activities

Papua New Guinea is the largest country in the Pacific region. It has more than 8 million people, of which 85% live in rural communities and rely heavily on subsistence agriculture for food and cash income. The country's economy is made up of 2 main sectors: the labour-intensive agriculture, fisheries and forestry sector, and the mineral and energy extraction sector, which accounts for most of the country's export earnings.

Direction for development in the nation is provided by the Papua New Guinea Vision 2050, Papua New Guinea Development Strategic Plan 2010–2030 and 4 Medium Term Development Plans. In line with the UN Sustainable Development Goals, development aspirations focus on improving health and education outcomes, diversified economic growth (including through improvements to infrastructure and fostering private sector-led development), strengthened resilience for food security and nutrition, institutional strengthening, gender equality and building resilience to climate and disaster risks.

The Papua New Guinea government is emphasising that by 2050, renewable sectors including agriculture, fisheries and forestry must account for 70% of GDP compared with 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.

The Papua New Guinea National Food Security Policy 2018–2027 guides resources to build sustainable food security for all Papua New Guineans. A primary aim of the policy is to foster strong public–private partnerships and leverage agriculture's potential to promote enhanced nutrition and health by bringing together profitable smallholder farming, efficient food value chains, women's income and child nutrition. Australia's development partnership with Papua New Guinea is governed by a comprehensive strategic and economic partnership, which reinforces the strong bonds between the 2 countries and strengthens an ambitious vision for the future. The partnership framework sets out 6 pillars of commitment that Papua New Guinea and Australia will undertake.

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. Following the November 2019 independence referendum, the Autonomous Bougainville Government and the Government of Papua New Guinea will continue to work together to develop an independence package.

The COVID-19 pandemic has exposed challenges in food security and resulted in the loss of commodity export income. Like many countries in the region, Papua New Guinea has responded to the pandemic with border closures and movement restrictions that have disrupted supply chains, affected supply and demand and led to the loss of jobs and income.

In 2020, we assessed the impact of COVID-19 on food systems in the region, including Papua New Guinea. The assessment found that one of the biggest impacts was on the sale of fresh food due to the closure of fresh food and fish markets, which affected the women sellers and urban consumers. The assessment also identified areas of focus for future research to improve food systems resilience.

Country priorities

ACIAR research partnerships with Papua New Guinea will continue to focus on horticulture, livestock, fisheries, forestry and socioeconomics. Ultimately, the research is working to secure improvements in food supply, food access and rural incomes for smallholders through increased productivity and enhanced access to markets and services.

Research partnerships aim to:

- overcome social, cultural and policy obstacles to benefits from agricultural technologies, particularly with respect to gender equity and women
- improve smallholder vegetables and starchy staple systems
- analyse commodity and market chains to guide policy and improve production and marketing for cocoa, coffee, coconut and oil palm crops
- enhance germplasm quality for high-value tree species to improve community forestry and agroforestry systems
- work with private sector partners and farmers to adopt promising agricultural technologies
- monitor and identify options for managing biosecurity threats
- enhance livelihoods from smallholder fisheries, and inland and marine aquaculture
- increase household income through diversifying enterprises.

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-term and short-term courses, informal networking events and hands-on experience at the project level. Through this process, we play 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 5 component research projects. TADEP is co-funded by DFAT and ACIAR.

Gender equity is an integral part of all our projects in Papua New Guinea. In 2019, the FAO reported that 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, raising poultry, fish farming and sell surplus produce at local markets to generate income for the survival of their families. Only a few women have ventured into small to medium enterprise activities.

In 2021–22, we will embark on 2 major activities:

- the development of an ACIAR Papua New Guinea Alumni Engagement Plan, in consultation with more than 80 ACIAR alumni in Papua New Guinea
- the development of a 10-year strategy for research collaboration with Papua New Guinea, in consultation with key Papua New Guinea research organisation and state-owned enterprises, and aligned with the ACIAR 10-Year Strategy 2018–2027 and the Papua New Guinea–Australia Comprehensive Strategic and Economic Partnership.

2021–22 research program

- **25 ACIAR-supported projects in Papua New Guinea**
- **19 projects are specific to this country**
- **6 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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 long-term 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 2021–22 activities will explore the genetic basis of resistance and select candidate germplasm for resistant planting material.[1]

Loss of revenue in oil palm plantations due to basal stem rot is of great concern at both local and national levels for Papua New Guinea and Solomon Islands. The only viable long-term control of the disease is through the use of tolerant planting material, combined with sanitation measures to reduce the carryover of the pathogen from older, infected trees to new plantings. In the short term, a possible sanitation method for plantations could be the removal of infected logs for biochar production. A small research activity led by Dr Agnieszka Mudge of the University of Queensland is investigating biochar production, which is tailored and appropriate for the oil palm industries in Papua New Guinea (and possibly Solomon Islands).[2]

Fisheries

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.[3]

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 leads a new 5-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 to gain access to reliable and affordable farming inputs and culturally appropriate training services.[4]

To aid dissemination and adoption of best-practice techniques and technologies, a new 5-year project is supporting the National Fisheries Authority to develop commercial tilapia businesses in peri-urban areas and reservoirs. ACIAR project FIS/2018/154

Mabé (half-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 mabé shell in Fiji and Tonga, and in the production of shell-based jewellery in Papua New Guinea. 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, led by Professor Paul Southgate of the University of the Sunshine Coast. 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 women and men across the value chains.[5]

In the Fly River area in the Western province of Papua New Guinea, fishers illegally trade high-value marine products, such as shark fin, beche-de-mer and mud crabs, into the growing Asian market. However, returns are low due to a lack of cooperation between fishers and the absence of culturally appropriate business models, and fishing practices are unsustainable due to overexploitation of fisheries. Dr James Butler of CSIRO and Havini Vira of Ok Tedi Development Foundation lead a small research activity that aims to scope and design alternative small-scale fishery business models for Fly River communities with a focus on women's roles in mud crab fisheries, and tilapia processing in mine-affected regions.[6]

The Western province is the largest province in Papua New Guinea. It encompasses great regional diversity in place-based economies, cultures and ecologies. It shares borders, and interacts economically, with Australia and Indonesia. Despite decades of development support, the Western province remains one of the poorest regions in the world. Development interventions to date have been based largely on a deficit approach that identifies the needs and problems to be addressed and offers solutions. This small research activity led by Associate Professor Katharine McKinnon of the University of Canberra offers an alternative, strengths-based approach. It seeks to build on the strengths and assets of individuals, communities and places as a starting point for thinking collectively about solutions. The study aims to identify locally appropriate, strength-based livelihood development practices for the agricultural development sector working across the diverse regions of Western province. It will foster a community of practice among development practitioners working in the Western province to support them trial new approaches.[7]

Another small research activity, led by Professor Katherine Gibson of Western Sydney University, seeks to draw on the lessons learned from the decades of development work in the Western province. It will take a strengths-based approach by building a deeper understanding of local people's current economic (largely artisanal) activities and their diverse livelihood assets across broad geographic and cultural contexts. This new knowledge will allow development practitioners and donors to identify the foundational building blocks (strengths and assets) underpinning people's current artisanal activities that future investments can build upon.[8]

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 ecoforestry in community-owned natural forests. Led by Associate Professor Grahame Applegate of the University of the Sunshine Coast, the project has implemented family-focused community reforestation activities, identified methods for scaling out community-based reforestation to landscape scale and reviewed institutional arrangements and policies that improve access to formal timber markets. The project concludes in 2021 with the delivery of a proposed improved management system for ecoforestry, for inclusion in national ecoforestry policy, and alternative marketing and financial models to evaluate harvesting and marketing operations of small-scale, clan-based operators.[9]

In East New Britain province, an earlier project focused on value-added processing and developing markets for galip nuts, produced by the *Canarium* or galip tree. 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]

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. However, the complexity of cultural, social and land tenure systems in Indigenous communities can be a significant obstacle for investment in the planted forestry sector. 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. The key research questions in this project address social and legal structures to facilitate planting on customary land to allow larger, more commercial woodlots.[11]

Horticulture

Coconuts contribute, directly and indirectly, to the livelihoods of coastal communities throughout the Pacific region. Coconut enterprises in Pacific island countries face economic and environmental challenges –diversifying the range of products made from coconuts could offer a path to more-resilient livelihoods. 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.[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, which include assistance to improve crop profitability. 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. During 2021–22, the project focuses on the establishment of village budwood gardens and nurseries, and demonstration of crop management practices. It will continue the establishment of support networks, research hubs and farmer training for cocoa production and other potential enterprises.[13]

Coffee production in Papua New Guinea provides employment for more than 2.5 million people and is a major source of income for approximately 400,000 smallholder farmers. 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 the livelihoods of rural families and their communities, and a significant threat to biosecurity in 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 2021–22, activities will include evaluation and updating of a best-practice integrated pest management (IPM) package, and testing of biological and chemical control solutions.[14]

Sweetpotato is the major staple food crop of Papua New Guinea. About 90% of the population are semi-subsistence smallholder farmers for whom sweetpotato is a major crop species. Increasingly, the crop is becoming commercialised, especially in the highlands, where it is beginning to rival coffee as a preferred source of cash income. A project led by Professor Geoff Gurr of Charles Sturt University is supporting the intensification of sweetpotato production by developing, testing and promoting sustainable solutions to major pest and disease threats. The project concludes in 2021 with the delivery of information and protocols for best-bet combinations of integrated pest and disease management methods, and the development of the capacity of individuals and organisations to continue the research of integrated management methods.[15]

A project in Papua New Guinea will evaluate and update a best-practice integrated pest management package for cocoa producers.
Photo: Conor Ashleigh. ACIAR project HORT/2014/094

An increase in market-oriented production will create income-generating opportunities for growers as well as enable other groups to enter sweetpotato fresh product and sweetpotato-based food product supply chains. Professor Phil Brown of Central Queensland University has led a 5-year project supporting an expansion in market-oriented sweetpotato value chains by strengthening supply chains to selected high-value markets and promoting enterprise development along supply chains. The project has also improved crop production capacity by introducing a scheme to supply clean, high-performing planting material. The project will conclude in 2021, working with agencies in Papua New Guinea to consolidate the supply of virus-free sweetpotato and enable the scale out of the program to other regions.[16]

The development of safe, high-value fruit and vegetable industries is a priority for many Pacific island countries. Dr Michael Furlong of the University of Queensland leads a project to develop integrated pest and disease management strategies for the sustainable intensification of fruit and vegetable crop production, addressing the threats posed by the inappropriate use of pesticides, emerging pests and diseases and climate change. During 2021–22, the project will continue to assess pathways for the introduction and potential spread of insects and test biological control strategies, while developing integrated management approaches for selected crops. The project continues to build surveillance and diagnostic capacity for the management of emerging pests and diseases, including fall armyworm. 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.[17]

Livestock Systems

Strong domestic demand for honey and the potential to export honey and by-products offers an opportunity to smallholder farmers in Fiji and Papua New Guinea. A project, 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 2021–22, the project will complete spatial and temporal mapping of floral resources and develop best-practice pest and disease management programs in readiness for incursions of varroa and tropilaelaps mites. Capacity building of extension and development agencies to support beekeeping as a sustainable small enterprise will continue.[18]

It is widely reported that the impact of COVID-19 on food systems across the Indo-Pacific is exacerbating gendered inequalities in the region, such as unequal access to productive resources, markets and institutions for women. Professor Sara Davies of Griffith University leads a small research activity to develop an evidence-based approach to identify and understand the specific gendered impacts of COVID-19 responses on food security and socioeconomic outcomes in Myanmar, the Philippines and Papua New Guinea. These insights will be used to outline opportunities and design approaches that will begin to mitigate the harm caused by the COVID-19 disruption at the individual, household and community level. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[19]

A project in Papua New Guinea and Fiji aims to increase the productivity and profitability of beekeeping enterprises to complement smallholder incomes and promote an income-earning activity for women. Photo: Cooper Schouten. ACIAR project LS/2014/042

A project in the highland coffee-growing areas is facilitating the development of a model for the use of a demucilager by farmer groups. ACIAR project: ASEM/2016/100

Social Systems

Coffee is economically important for rural livelihoods in Papua New Guinea. Despite a rapidly growing population in the highland coffee-growing areas, national production is declining. A project led by Professor George Curry of Curtin University aims to increase returns for labour from the crop, particularly for women. Using combinations of extension methods tested earlier in the project, the researchers will 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.[20]

Communities that are reliant on agriculture-based livelihood systems in Papua New Guinea are particularly at risk from climate variability and change. Dr Steven Crimp of the Australian National University leads a project examining ways in which seasonal climate information, with a 3 to 6-month lead time, can be communicated and integrated with existing farm practices. The aim is to increase the adaptive capacity of farmers, to help them reduce risk and secure adaptive opportunities for food production. During 2021–22, activities focused on field sites will continue to demonstrate the potential value of integrating scientific and Indigenous knowledge. The results of social network analysis and trials will be provided to government, industry and non-government organisations to contribute to existing programs and initiatives across Papua New Guinea.[21]

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.[22]

Soil and Land Management

Papua New Guinea's Vision 2050 requires the contribution of renewable sectors including agriculture, fisheries and forestry to GDP to increase from 26% to 70%. A new project, led by Mr Peter Wilson of CSIRO, will provide useful and targeted information about the natural resource base for better infrastructure, agriculture and forestry planning, development and management. The project will modernise the Papua New Guinea Resources Information Systems that was developed in the 1980s and 1990s. It 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.[23]

To cope with growing population pressure, sweetpotato is being grown with a shorter fallow period, more rotations with legume crops and shorter cropping periods compared with 10 years ago. Sustainable intensification of production is needed, and this project focuses on smallholder farmers who have the potential to increase their household income through sweetpotato marketing. Professor Neal Menzies of the University of Queensland leads a project to determine the optimum rates of mineral fertilisers and opportunities to use available and accessible organic nutrient sources to avoid soil fertility decline, increase production, and improve the benefit:cost ratio of input. The project also focuses on the social aspect of practice change to understand what is effective and acceptable to smallholder family farmers, and how women and men farmers can share soil management roles.[24]

The first stage of a cocoa farming systems project in Papua New Guinea demonstrated that yields can be increased with improved soil management and better soil fertility, lifting smallholder incomes and improving the livelihoods of smallholder cocoa farming households. A new project, led by Professor Damien Field of the University of Sydney, will build on the outputs and outcomes of the first phase of research. The project will evaluate opportunities to develop site-specific solutions to improve cocoa farming systems using locally available resources to address soil constraints, and improve the soil health and productivity of cocoa plantations. The influence of composts and crop diversification on soil and plant health and the quality of cocoa also will be investigated. The second phase of research also allows for greater dissemination of findings of the first stage of the project, working with households to support shared decision-making between men and women and equitable distribution of benefits.[25]

Country Manager
Ms Doreen Iga

Research Program Managers
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands (CIM/2012/086)
2. Managing basal stem rot in oil palm by converting infected logs to biochar [Papua New Guinea] (CROP/2019/147)
3. Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management (FIS/2018/151)
4. Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators (FIS/2018/154)
5. Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
6. Developing alternative small-scale fishery models in the Fly River, Western province, Papua New Guinea (FIS/2020/110)
7. Strengthening agricultural resilience in Western province: methods for place-based livelihoods approach [Papua New Guinea] (FIS/2021/113)
8. Strengthening agricultural resilience in Western province: mapping place-based strength and assets [Papua New Guinea] (FIS/2021/122)
9. Enabling community forestry in Papua New Guinea (FST/2016/153)
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. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
13. Developing the cocoa value chain in Bougainville [Papua New Guinea] (HORT/2014/094)
14. Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia (HORT/2018/194)
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. Responding to emerging pest and disease threats to horticulture in Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
18. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
19. COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
20. Improving livelihoods of smallholder coffee communities in Papua New Guinea (ASEM/2016/100)
21. Climate smart agriculture opportunities for enhanced food production in Papua New Guinea (ASEM/2017/026)
22. Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea (SSS/2018/137)
23. 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)
24. Sustaining soil fertility in support of intensification of sweetpotato cropping systems [Papua New Guinea] (SMCN/2012/105)
25. Optimising soil management and health in Papua New Guinea integrated cocoa farming systems (phase 2) (SLAM/2019/109)

Timor-Leste

A$1.7 million
Budgeted funding

5
Bilateral and regional research projects

1
Small research activity

Before the COVID-19 pandemic, food systems in Timor-Leste were already under stress from many factors, including seasonally recurring food shortages, input supply challenges, low productivity, pests and diseases, and limited access to capital. The coincidence of the pandemic and the incursion of African swine fever in 2020 placed added challenges on Timor-Leste.

The Government of Timor-Leste effectively controlled the COVID-19 pandemic throughout 2020, but a second wave in mid-2021, with a corresponding long state of emergency, is a major threat to public health and the economy.

With 70% of the population living in rural areas, there is a heavy reliance on 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 many recent improvements in a range of essential services, there is a high prevalence of poverty and associated illiteracy, and infant stunting rates are among the highest in the world. As a result, a fundamental problem facing most Timor-Leste rural households is their inability to generate sufficient reliable income from agriculture to improve the living conditions and livelihood opportunities of their families.

The reasons for constrained on-farm crop and animal production and productivity are complex and varied. They include 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-harvest 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.

Following the rapid global spread of the COVID-19 pandemic from early 2020, Australia's program of development cooperation with Timor-Leste pivoted quickly to respond to the challenges being faced, with a focus on health security, stability and (of particular importance to ACIAR) economic recovery. Specifically, in relation to the ACIAR program, Australia committed to helping combat the high rates of malnutrition in Timor-Leste through targeted support to the healthcare system, complemented by efforts in other sectors, including social protection and agriculture.

Country priorities

In response to the COVID-19 pandemic, ACIAR funded an analysis of food systems vulnerabilities, which included Timor-Leste as one of 5 focus countries. This analysis, published in November 2020, identified opportunities for future research to contribute to the greater resilience of Timor-Leste food systems. These include:

- improved social protection measures for vulnerable households
- a renewed focus on the productivity of smallholder agriculture with gradual intensification and improved feed and biosecurity regimes
- greater efforts to expand private sector market developments and increase employment
- greater focus on education and relevant technical training to increase the availability of skilled graduates.

These priorities will inform discussions with Timor-Leste in 2021–22 to identify future priorities for ACIAR-funded collaboration. Focus areas may include opportunities in coastal fisheries, agroforestry, livestock (especially cattle and poultry) and cropping systems, as well as seeking opportunities for trilateral research collaboration with Indonesia.

2021–22 research program

- **6 ACIAR-supported projects in Timor-Leste**
- **4 projects are specific to this country**
- **2 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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 | Soil and Land Management

Moving from food security to improved nutrition and rural incomes is a priority for the Timor-Leste Government. Expansion of the government and construction sector in recent decades has created new markets for agricultural products and new opportunities for local farmers. A project led by Professor William Erskine of the University of Western Australia has undertaken 5 years of research to intensify farming systems sustainably, so that farmers can expand from subsistence to income-generating farming. In the sixth and final year of the project, activities will focus on production and application of biochar from rice hulls, selection and multiplication of sandalwood seedlings, mungbean crops for the dry season and improved varieties of legumes.[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 in Timor-Leste and the East Nusa Tenggara 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 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 for innovation within the coastal fisheries post-harvest sector, with a focus on income benefits for both women and men. This new approach addresses the historic 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 community-led infrastructure and skill development investments.[3]

Livestock Systems

ACIAR has supported a research-for-development program for smallholder cattle enterprises in Timor-Leste for several years. The program involves on-station testing and on-farm adaptation of small-scale cattle production and management technologies. The vast majority of cattle producers in Timor-Leste use extensive grazing systems to grow cattle and 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 markets. A project led by Assoc Prof Luis Prada e Silva of the University of Queensland is supporting smallholder crop-livestock farmers and market-chain operators in Timor-Leste through more efficient commercially oriented cattle production and improved access to markets.[4]

In 2014, the World Organisation for Animal Health identified clear priorities for improvement in veterinary services in Timor-Leste. A key component was to strengthen programs for disease surveillance, diagnosis, emergency preparedness and response for priority exotic and endemic diseases. Emergency and emerging infectious disease, including African swine fever, are a threat to the expansion of livestock production in Timor-Leste and the region. Dr Jenny-Ann Toribio of the University of Sydney leads a small research activity to strengthen the passive disease surveillance system in Timor-Leste. The project will focus on building capacity in the veterinary service for emergency and emerging animal disease detection. A case study for best-practice passive animal health surveillance in Timor-Leste will focus on definitive diagnoses of mortality of young pigs.[5]

Soil and Land Management

Farming systems in Timor-Leste have low levels of productivity and are constrained by soil factors, seasonal variability and limited resource access. A new project in 2022 will seek to improve farming productivity in Timor-Leste through a 2-stage process. In the first stage, Professor Andrew McWilliam of Western Sydney University will lead a research team to investigate farmer motivations and aspirations, and traditional knowledge and management of soil and land resources, including reluctance to use fertilisers. In the second stage, a series of collaborative on-farm trials will address soil-related productivity constraints to achieve the aspirations identified by the farmers.[6]

Country Manager
Dr Peter Horne

Research Program Managers
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Livestock Systems: Dr Anna Okello
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com) (CIM/2014/082)
2. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
3. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
4. Smallholder cattle enterprise development in Timor-Leste (LPS/2014/038)
5. Improved animal health surveillance in Timor-Leste (LS/2019/158)
6. Understanding tradition and fostering appropriate innovation in soil management to improve farmers productivity and livelihood in Timor-Leste (SLAM/2020/141)

Children glean the exposed reef at low tide, at Adarai on the Timor-Leste southern coast. Photo: Alex Tilley. ACIAR project FIS/2017/032

5.2

East and South-East Asia

East and South-East Asia

Collectively, the countries of East and South-East Asia are the most populous in the world and an economic powerhouse. Ten of these countries are members of the Association of Southeast Asian Nations (ASEAN) and engage closely in terms of trade and investment with east Asian countries, including China and South Korea.

For the past decade, the region has shown a decline in 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 and is the fifth largest economy in the world, with a combined GDP of A$4.8 trillion in 2018.

With more than 100 million hectares of agricultural land, the ASEAN countries collectively are a major producer, supplier, and exporter of various crops, grains (including rice) and livestock products. Although agriculture only contributes around 10% of total ASEAN GDP, it is the main sector for employment in most member states, accounting for approximately one-third of total ASEAN employment. Given its significant role, the development of the food, agriculture and forestry sectors in ASEAN countries is vital to ensuring equitable and inclusive growth in the region.

The vast and rapid spread of COVID-19 means that the economic outlook in the region remains highly uncertain. Various groups, including the Organisation for Economic Co-operation and Development (OECD) and the World Bank, forecast that growth in South-East Asia will be low (falling from 44.4% to 1%), and that 9.6 million people will become extremely poor due to the pandemic. Several countries in the region (for example, Laos and Cambodia) have high debt levels and low foreign currency reserves, increasing their risk of financial crisis.

The COVID-19 pandemic exposed the vulnerabilities of food supply chains in the region, prompting calls for the region to become food resilient and sustainable by shortening existing food supply chains and strengthening food systems. The pandemic also heightened the pressure on countries to reverse the trend of underinvesting in the food and agriculture sector. This includes investing in rural logistics, upskilling, research and development, in addition to harnessing the use of digital technology to benefit the farming community.

Food security, food safety and better nutrition remain priority concerns within the region. These priorities align with ASEAN's goals of agricultural cooperation. Support for women's economic empowerment, which has become a prominent approach to addressing gender gaps in economic spheres, including agriculture, continues to grow.

Partner countries in the ACIAR East and South-East Asia region

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

Photo: University of Southern Mindanao

Drivers of regional collaboration

The principal driver of regional collaboration in the East and South-East Asia region is ASEAN, which for more than 50 years has addressed shared challenges and engaged trade and development partners, including Australia and China. Recently, regional collaboration has been driven by critical factors such as the pandemic, geopolitics and transboundary concerns.

Trade and investment are the major drivers of economic growth in the region, aided by overseas development assistance. Assistance to ASEAN countries has increased, with the most notable being China's Belt and Road Initiative.

In the agricultural research sector, ACIAR is supporting regional collaboration through support to APAARI. Cross-border challenges such as plant and animal biosecurity remain prominent and also drive regional integration. In the Mekong region, plant diseases have recently spread across borders, destroying crops of cassava and banana. African swine fever has taken a tremendous economic toll on countries such as Vietnam, the Philippines, Laos and Cambodia. In 2020, the COVID-19 pandemic raised biosecurity and One Health (the interface between human, animal, and environmental health) as priorities in the region.

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. Natural disasters threaten food security and rural livelihoods and have economic consequences for the whole region, so disaster mitigation is a common interest among neighbouring countries. The 'ASEAN Declaration on One ASEAN One Response' aims to increase the speed, scale and solidarity of disaster response in the region.

In 2020, ACIAR supported an assessment of food system security, resilience and emerging risks in the Indo-Pacific in the context of COVID-19. This assessment identified a range of 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 included the whole region, there was a particular focus on Indonesia and Philippines as case studies.

ACIAR East and South-East Asia region program

The ACIAR program in East and South-East Asia remains the largest across the 4 regions in which we operate. The nature of our engagement within the region is strongly bilateral, based on robust partnerships with national research systems, longstanding diplomatic connections and sustained development collaboration with Australia. However, there is a growing trend towards regional collaboration between countries facing shared challenges. 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.

Region-wide cooperation on forest biosecurity

Our on-the-ground work in South-East Asia primarily occurs with 7 partner countries (listed on page 75). However, we do work with development and coordinating organisations based in other countries in the region on issues and programs of regional significance.

For example, in recent decades Thailand has transitioned from aid recipient to aid donor. Thailand hosts regional organisations of relevance to ACIAR programs, including APAARI (see page 22), the Asian Institute of Technology and the FAO regional office. We also include Thai expertise on projects of regional significance when opportunities arise.

In 2021–22, we have a regional project, 'Building effective forest health and biosecurity networks in South-East Asia' (FST/2020/123), that includes partners from Thailand and Malaysia, as well as partners from Cambodia, Indonesia, Laos and Vietnam. A description of this project can be found on page 85 in the Cambodia chapter.

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. We contribute to this by funding regional research collaboration and through our support and chairing of APAARI.

Among our newer regional collaborations in the East and South-East Asia region 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 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.

Another research collaboration focusing on plant biosecurity engages the whole of the Mekong region and China. The research will address serious diseases of cassava through a multipronged strategy involving breeding, surveillance, agronomy and seed systems interventions, coupled with engagement with government institutions and agribusiness.

The incursion of African swine fever to the region in 2019 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.

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 Vietnam, Indonesia and the Philippines. While bilateral relationships remain the predominant model for development cooperation in the region, trilateral collaboration is increasingly possible and desired by partner countries.

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.

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 2021–22, 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

East & South-East Asia region program 2021–22

Partner country	No. projects
Cambodia	15
China	2
Indonesia	25
Laos	16
Myanmar	12
Philippines	15
Vietnam	26

Note that a project may be conducted in several countries, therefore the total number of projects in this table will be greater than the number of projects in the region.

Research portfolio

16
Agribusiness projects

1
Climate Change project

3
Crops projects

14
Fisheries projects

7
Forestry projects

5
Horticulture projects

14
Livestock Systems projects

9
Social Systems projects

10
Soil and Land Management projects

0
Water projects

Table 5.2 Current and proposed projects in the East and South-East Asia region, 2021–22

Project title	Project code	Country
Agribusiness		
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
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, 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
Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines	AGB/2018/196	Philippines
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	Vietnam
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
Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia	AGB/2020/121	Indonesia
Food loss in the catfish value chain of the Mekong River Basin (Food Loss Program)	CS/2020/209	Cambodia, Laos, Vietnam
Climate Change		
Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam	WAC/2019/150	Fiji, Vietnam
Crops		
International Mungbean Improvement Network 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
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	Cambodia
Fisheries		
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

Project title	Project code	Country
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
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
Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia	FIS/2019/123	Philippines
Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities	FIS/2020/109	Indonesia
Blue economy: valuing the carbon sequestration potential in oyster aquaculture	FIS/2020/175	Vietnam
Institutional effectiveness and political economy of coral reef restoration in the Philippines	FIS/2021/112	Philippines
Supporting grouper farming smallholders in Vietnam to improve their small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds	FIS/2021/121	Vietnam
Forestry		
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	Indonesia
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	Laos
Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam	FST/2016/152	Vietnam
Reducing forest biosecurity threats in South-East Asia	FST/2018/179	Indonesia, 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, Indonesia, Laos, Malaysia, Thailand, Vietnam
Forest restoration for economic outcomes	FST/2020/137	Laos
Horticulture		
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
Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations	HORT/2016/190	Cambodia, Philippines
An integrated management response to the spread of Fusarium wilt of banana in South-East Asia	HORT/2018/192	Indonesia, 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		
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
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

Project title	Project code	Country
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	Laos, Vietnam
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia	LS/2019/116	Indonesia
Collaboration on One Health economic research for systems	LS/2019/118	Cambodia
Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia	LS/2019/142	Cambodia, Myanmar, Vietnam
Global burden of animal disease initiative: Indonesia case study	LS/2020/156	Indonesia
COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance	LS/2020/203	Myanmar, Papua New Guinea, Philippines
Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines	LS/2020/204	Kenya, Philippines, Vietnam
Vulnerability in the Anthropocene: a prospective analysis of the need for social protection	LS/2020/206	Myanmar, Vietnam
Livestock climate lens Part 1: data landscape analysis	LS/2020/207	Myanmar, Vanuatu
Social Systems		
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	Cambodia
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 relations for practice change	SSS/2019/138	Cambodia
Policy impact in Laos: from research to practice	SSS/2020/142	Laos
Understanding agrichemical use in South-East Asian agriculture	SSS/2020/143	Laos, Vietnam
Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia	SSS/2020/160	Cambodia, Laos
Assessment of Indonesia's agricultural innovation system	SSS/2021/100	Indonesia
Soil and Land Management		
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	Indonesia
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	Philippines
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
Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines	SLAM/2020/117	Philippines
Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors	SLAM/2020/118	Indonesia
Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire	SLAM/2020/140	Indonesia
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	Cambodia, Laos
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Cambodia

Notes: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes. The project list was compiled in June 2021. Additional projects not listed in this table may be commissioned during 2021–22.

Cambodia

A$3.3 million
Budgeted funding

15
Bilateral and regional research projects

In 2020, the Kingdom of Cambodia largely avoided a health crisis due to swift actions to detect and contain local COVID-19 outbreaks. However, Cambodia still suffered critical shocks triggered by the global pandemic, and the economic impacts were more severe than the health impacts.

During the last 2 decades, Cambodia was the fastest growing country in East Asia, averaging a 7.7% real growth rate. The nation's key growth drivers were construction, tourism and merchandise exports, which accounted for more than 70% of growth and 39% of total paid employment, but these were severely affected by the global pandemic. Prior to COVID-19, poverty in Cambodia was reported to be less than 10%.

About 76% of Cambodia's population lives in rural areas and agriculture remains the main source of employment. Agriculture contributed 21% to national GDP in 2019. More than 60% of poverty alleviation from 2007 to 2011 was attributed to positive developments in the agriculture sector, and in 2020 the World Bank reported that the agriculture sector was the least affected by the global pandemic. During the pandemic, agriculture benefited from increased labour availability due to layoffs in the services and industry sectors and the return of migrant workers from cities and abroad.

Wet season rice cultivation increased to 2.3 million hectares (7.2% increase) in 2020 due to better weather conditions. Dry season rice harvesting also increased by 39%. Rice exports continue to increase, with milled rice now being exported to 41 countries around the world. China is the biggest market (56%), followed by 19 countries in Europe and 3 ASEAN countries (Malaysia, Singapore and the Philippines).

Crop production, especially rice, continues to account for most (60%) agricultural GDP. In addition to traditional exports of rice, cassava and rubber, emergent agricultural export products such as bananas and mangoes are promising. However, there are opportunities for Cambodia to develop and strengthen its agriculture sector through diversification, higher value-added crops, fisheries and livestock. Currently development is limited by relatively slow adoption of modern agricultural technology, including input use and irrigation.

Border closures, travel restrictions and business shutdowns during the pandemic hit the complex web of agricultural supply chains, affecting input suppliers, producers, collectors, processors and consumers in Cambodia. Food supply, demand disruptions and market uncertainties strained critical supply chains and posed threats to food systems in the country. Movement restrictions, lack of in-country transportation and the existing debt with microfinance institutions prevented farmers from accessing agricultural services and inputs for the next planting season.

There were other concerns too. Domestic livestock production covers about 82% of domestic demand for animal products. Although measures have been put in place by the Ministry of Agriculture, Forestry and Fisheries to avoid disruptions to the supply chains due to the COVID-19 pandemic, there were pre-existing influences, for example the African swine fever outbreak, that were already reducing production.

In December 2019, the Ministry of Agriculture, Forestry and Fisheries launched the 2019–25 Agriculture Sector Development Strategy which aims at modernising the agriculture sector. This is an important step towards accelerating the transformation from subsistence farming to commercial agriculture.

Country priorities

ACIAR and the Royal Government of Cambodia (represented by the Ministry of Agriculture, Forestry and Fisheries) have an ongoing 10-year agreement on the strategic priorities for research collaboration. From 2019 to 2029, research collaborations will focus on 3 domains to support the development of Cambodian agriculture:

- sustainable intensification and diversification of agriculture, focusing on non-rice crops in traditional crop-rice systems 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.

2021–22 research program

- **15 ACIAR-supported projects in Cambodia**
- **5 projects are specific to this country**
- **10 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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.

Cambodian and Indonesian fisheries research organisations are working together to enhance the skills of Cambodian researchers in fish nutrition, hatchery production and fish health. Ultimately, the project supports livelihoods of about 2 million people in Cambodia, including fish farmers such as Mrs Yit Sophea (pictured). Photo: Majken Soegaard. ACIAR project: FIS/2016/130

Agribusiness

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).[1]

Agribusiness | Crops

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 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

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, such as machine planting of direct-seeded rice, using high-quality seed at lower seed rates. Having established growers' confidence to purchase more expensive high-quality seed, the project is now concluding its investigation of scale-up and scale-out models for adoption at village and community level. The project is building the capacity of farming communities, tertiary agricultural education institutions and agricultural input suppliers to support new technologies beyond the life of the project.[3]

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.[4]

ACIAR is supporting a regional project to develop technically viable and economically and socially sustainable ways to improve the resilience of cassava production systems and value chains. Photo: Majken Soegaard. ACIAR project: AGB/2018/172

Fisheries

In Cambodia, about 80% of the animal protein consumed comes from freshwater fisheries, which provide work for about 2 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 Dr Mike Rimmer and Professor Nicholas Paul of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. In 2021, experienced researchers from Indonesia will conduct final training activities to enable Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health.[5]

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing 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 establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[6]

Forestry

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[7]

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 little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but struggle to deliver fruit that meets market or regulatory standards. Dr Muhammad Sohail Mahzar of the Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade will lead a new project in Cambodia and the Philippines that 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.[8]

Livestock Systems

Several issues threaten regional, and potentially global, health security in the Mekong region: fast economic growth rates, marked climate and other environmental disruptions, and shifting human and animal geographies. Zoonotic disease outbreaks such as SARS (severe acute respiratory syndrome) and the current outbreak of COVID-19 are thought to be attributed, in part, to these converging issues. Professor Barbara McPake of the Nossal Institute for Global Health leads a project to identify opportunities to improve collaboration between human and animal health sectors and use incentive-based regulation to intervene in veterinary markets in the region, to improve health security and livestock productivity.[9]

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making 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 is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[10]

Social Systems

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 farmers' perceptions of problems and solutions. A project led by Dr Brian Cook of the University of Melbourne has investigated the adoption of technologies and best practice for sustainable cassava production in north-western Cambodia, where the crop area is expanding rapidly and market returns are high. The final stage of the project will be completed in 2021 with the analysis of household interviews and village engagement activities. This will inform understanding on why some groups adopt new technologies, and identify barriers specific to poor, marginalised and female-headed households.[11]

The previous project found that extension does not overcome powerful social relations, especially credit and debit. Dr Brian Cook of the University of Melbourne also leads a new project that 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.[12]

In Laos and Cambodia, access to formal financial services is low. It is substantially lower among rural and remote communities, and lower again for women. Dr Erin Taylor of Western Sydney University leads a project that will review theoretical frameworks to understand how the approach to digital financial services in Laos and Cambodia compares with global trends, and what global lessons can be applied. The project will assess theories of change and impact methodologies that have been used around the world to introduce digital financial services to reduce poverty in rural areas and improve gender equality. The project aims to identify best practices and suggest improvements to methodologies, potentially highlighting the need for new models.[13]

Soil and Land Management

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 develop site-specific soil management practices. The project concludes in 2022 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 the FAO World Reference Base for Soil Resources.[14]

Cambodian cattle farmer Sar Samoul on her way to the field where her herd grazes. She has planted forages as a part of a project investigating how farmers can grow more profitable crops with less water. Photo: Majken Soegaard. ACIAR project SMCN/2012/075

Agricultural production in the lowlands of Cambodia and Laos is characterised by a high proportion of each nation's poorest and most food-insecure people. Their livelihoods are generally reliant on rainfed, low-input rice production and limited livestock keeping. Practices to increase the overall productivity by introducing managed forage production in these farming systems have been 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 will be trained to conduct ongoing research and promote outcomes.[15]

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

Research Program Managers
Agribusiness: Mr Howard Hall
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Rice farming on the lowlands of Cambodia is difficult due to periods of drought. ACIAR supports research where farmers are experimenting with other crops to make the system more sustainable. Photo: Majken Soegaard. ACIAR project SMCN/2012/075

Current and proposed projects

1. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia (CSE/2015/044)
4. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
5. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
6. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
7. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
8. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
9. Collaboration on One Health economic research for systems [Cambodia] (LS/2019/118)
10. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
11. Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia (ASEM/2013/003)
12. Next generation agricultural extension: social relations for practice change [Cambodia] (SSS/2019/138)
13. Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia (SSS/2020/160)
14. Land suitability assessment and site-specific soil management for Cambodian uplands (SMCN/2016/237)
15. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)

China

A$0.1 million
Budgeted funding

2
Bilateral and regional research projects

China's rapid economic growth and investment in research capability along with the changing dynamics of its relationship with Australia have created an opportunity for a radically refreshed research relationship with ACIAR for mutual benefit.

China's third white paper on foreign aid, released in January 2021, introduced a new focus on trilateral aid cooperation. Given that our program of bilateral research collaboration with China came to an end in 2020, the white paper creates an opportunity to explore new modes of collaboration off the platform of strong and longstanding research partnerships.

Country priorities

ACIAR research collaboration with China commenced in 1984 and for more than 10 years it was the largest ACIAR country program, reflecting the huge challenges that existed in addressing rural poverty that affects hundreds of millions of people. Outcomes of research in forestry, cropping systems and livestock have had lasting impacts on researchers, farmers and systems. The dramatic transformation of the Chinese economy resulted in a reorientation of the ACIAR program in the mid-2000s to focus on geographies and themes where collaboration with Australian researchers would have the greatest impacts.

ACIAR-supported projects in Tibet and Inner Mongolia Autonomous Regions ended in 2020. For the first time since 1984, we have no bilateral activities in China. This provided an opportunity for us to reassess our relationship with China. The Commission of the International Agricultural Research strongly endorsed the position for ACIAR to refresh its relationship with China, building on the foundation of decades of trusted research relationships. During 2020–21, we will therefore engage with senior leaders in the Chinese research system to discuss what form that collaboration might take, noting that whether it be bilateral, trilateral or both, it will need to be based on principles of substantial co-investment (either in the form of parallel investments and/or trilateral collaboration) and mutual benefits for both countries.

Our key partners in China currently include the Chinese Academy of Agricultural Sciences, the Chinese Academy of Tropical Agricultural Sciences, Inner Mongolia Agricultural University, China Agricultural University, the Chinese Academy of Agricultural Sciences, Lanzhou University and Gansu Agricultural University.

2021–22 research program

- **2 ACIAR-supported projects in China**
- **Both projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in China. The projects are grouped according to research program.

Agribusiness

Success in rural transformation is measured not only by income growth in the rural population, but also by the degree of inclusiveness in the 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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.

Project: Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)

Horticulture

Huanglongbing, 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 huanglongbing management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huanglongbing 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.

Project: Preparedness and management of huanglongbing (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)

Country Manager, China
Mr Wang Guanglin

Research Program Managers
Agribusiness: Mr Howard Hall
Horticulture: Ms Irene Kernot

See page 197 for contact details.

A trilateral project aims to enhance the sustainable management of huanglongbing 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. ACIAR project: HORT/2019/164

Indonesia

A$6.5 million
Budgeted funding

20
Bilateral and regional research projects

5
Small projects and activities

Indonesia is a major emerging market economy, predicted to be the fourth largest globally by 2050. The agriculture, fisheries and forestry sectors are key drivers of economic growth and also the foundation of poverty reduction. Indonesia is one of the most important and long-term partners of ACIAR.

Indonesia's agriculture, fisheries and forestry sectors have long been an integral part of the economy, with millions of hectares of arable land and extensive marine resources across the diverse archipelago. Although their contribution to Indonesia's GDP has declined in the past years, these sectors remain critical as they employ about one-third of the workforce. Smallholder farmers throughout rural Indonesia have proven to be the backbone of the sector, particularly during the prolonged COVID-19 crisis.

During 2020, disruption caused by the COVID-19 pandemic prompted the government to divert capital from infrastructure developments to help manage the crisis response. Indonesia's economy remained relatively strong and maintained a steady growth rate based on robust domestic consumption and ongoing efforts of policy reforms as well as simplification of investment procedures.

Digital transformation and infrastructure development are a focus for future economic growth, driven by the increasing middle-class population, the agenda for human capital development, geographic position and positive progress in free trade agreements.

Indonesia has implemented strategies to achieve goals of the 2030 Agenda for Sustainable Development, especially SDG 2: Zero Hunger. The 2020–2024 National Medium-Term Development Plan includes a renewed focus on enhancement of small and medium-size enterprises and improving economic investment climate, agricultural digital transformation, land and irrigated water management and improving the governance of the national food system.

Under its nationally determined contributions submitted to the Paris Agreement, Indonesia committed to reducing greenhouse gas emissions by up to 29% with national efforts, and up to 41% with international support. A significant amount of the reductions are to come from land-based systems. To meet these commitments, Indonesia is working to enhance the use of new technologies in land management, increasing renewable technologies for energy generation, and restoring degraded peatlands. All of these initiatives have been raised with ACIAR as areas of potential collaboration.

The Indonesian Government recently established a super agency, the National Institute for Research and Innovation, which is an autonomous entity that will be responsible for R&D in all sectors. This massive reorganisation will transform the way we collaborate with Indonesia well into the future.

Country priorities

Feeding a nation of around 270 million people, especially in the context of the COVID-19 pandemic, has been reasserted as a critical priority by the Indonesian Government. The prolonged pandemic has had severe economic and non-economic impacts on the population and economy, including the agriculture, fisheries and forestry sectors. As most communities still rely on these sectors, Indonesia faces a complicated situation if the pandemic continues, with impacts on both food production and livelihoods. This is also a high-risk situation for food security due to the decrease in purchasing power and food supply chains.

In the second term of President 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 in Indonesia for a decade, and it is focused on both market linkages and alleviating poverty through improved family farming. While Indonesia retains a strong desire to sustain current research collaboration with us in the forestry, agriculture and fisheries sectors, our new short-term and medium-term priorities of significance include:

- creating a single integrated data system to district level
- strengthening agricultural financing facilities
- improving corporate-based food crop production
- strengthening the competitiveness of dedicated horticultural zones
- improving the production, value-add and competitiveness of export crops (especially cocoa, coffee, rubber, palm oil and tea)
- strengthening biosecurity
- driving the productivity and genetic quality of livestock
- the conservation and management of forestry agroecosystems (including peatland restoration and waste management)
- improving seed systems.

During 2020, we examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. This information, published in our report *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*, will be used to inform future research and development to support food systems resilience in the Indo-Pacific region. Food systems assessments were undertaken at 5 locations, including Indonesia.

The priorities of the Ministry of Marine Affairs and Fisheries for 2021–24 are to maximise the revenue from the capture fisheries for small fishers' welfare; improve the productivity of some export-oriented commodities, especially shrimp, lobster and seaweed, supported by appropriate R&D programs; and develop aquaculture villages across Indonesia.

Given the major reorganisation of Indonesia's research structure, it is timely that we are working with the National Development Planning Ministry (Bappenas) and Ministry of Agriculture in a rapid assessment of agricultural research systems in Indonesia. The collaboration is identifying policy opportunities to support a major transformation of Indonesia's research, innovation and delivery systems to better support the transition of some sections of smallholder agriculture to more profitable small business enterprises, while sustaining food security for Indonesia's growing population. This collaboration is the first step towards setting new priorities and finding different ways of working together, once the constraints of the COVID-19 pandemic ease.

2021–22 research program

- **25 ACIAR-supported projects in Indonesia**
- **14 projects are specific to this country**
- **11 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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

Research agencies in Indonesia and the international development community have focused on promoting innovative farm technologies to sustain and improve agricultural productivity in upland catchments. However, literature reviews and evaluations suggest that adoption rates of these conservation-oriented land use practices are low. Professor Randy Stringer of the University of Adelaide leads a project that has studied socioeconomic and environmental impacts of existing national and local policies. In 2022, the project will produce policy advice and recommendations for national and district-level decision-makers, develop and support decision-support tools to enhance long-term agricultural productivity, facilitate improved connections between farmers and markets, improve through-chain processes, reduce negative environmental impacts and improve household incomes and livelihoods.[1]

Success in rural transformation is measured not only by income growth in the rural population, but also by the degree of inclusiveness in the 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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.[2]

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 aims to increase knowledge about how to design and implement innovative and inclusive agricultural value chain financing models in South-East Asia. During 2021–22, the project will review, research and trial innovative financing models for agricultural value chains and evaluate specific chain finance interventions in Indonesia and Vietnam.[3]

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 2 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.[4]

The IndoDairy project aims to improve the research capacity of lead agencies and identify extension models to enhance the adoption of profitable management practices and technologies to increase on-farm profitability. In 2019, dairy researchers from Indonesia visited a dairy farm in Queensland. Photo: Patrick Cape. ACIAR project AGB/2012/099

Domestic demand for milk in Indonesia significantly outstrips supply and growth of the domestic dairy sector. Historically, most milk production occurred on Java, so the Government of Indonesia has identified 12 additional provinces for dairy development. A project led by Professor Wendy Umberger of the University of Adelaide conducted a comprehensive analysis, research and interventions in collaboration with cooperatives and a dairy processor in the smallholder dairy sector in west Java and north Sumatra. In its final year, the project will encourage ongoing sector development, policy dialogue and industry advocacy. The objectives are to improve the research capacity of lead agencies and identify profitable management practices and extension models to enhance the adoption of technologies and increase on-farm profitability. There will also be a comprehensive evaluation of project achievements and outcomes for smallholder farming families and consumers.[5]

The rapid growth of tourism in Bali and the consequent demand for large quantities of safe, high-quality food are not matched by the capacity and capability of local agricultural production and agribusiness. This threatens the social and natural values of the island. Additionally, the 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 pathway to guide engagement and investment in collaborative agribusiness value chains. This will support livelihoods, and reliably and sustainably deliver safe, high-quality produce to nearby markets in the tourism sector in Bali.[6]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through a 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 in Bangladesh, India, Myanmar and Australia. Phase 2 of the network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[7]

Fisheries

Indonesia is the world's largest producer of tuna, accounting for approximately 20% of global production. Its fishing fleet spans the eastern Indian Ocean and the western and central Pacific Ocean, and ranges from small-scale to industrial vessels. A project led by Dr Campbell Davies of CSIRO contributes to Indonesia's longer-term goal of improving the economic and social benefits of tuna fisheries, while reducing the conservation risks to regionally important fish stock. During the final year of the project, researchers will complete work with Indonesian fisheries scientists, industry and managers to evaluate harvest strategies and develop management capability for Indonesian tuna fisheries.[8]

Dependency on the tuna fishing industry is high in eastern Indonesia. Jobs in the tuna industry provide substantial sources of income and food, but many also carry significant safety risks and income insecurity. Conventional methods are typically not suitable for assessing how fisheries perform in terms of social welfare. A small research activity led by Professor Kate Barclay of the University of Technology Sydney will develop and test methods for assessing harvest strategies for sustainable tuna fisheries in Indonesia, in terms of their impacts on the welfare of dependent communities. This information will be integrated into the tuna harvest strategy being developed by the Government of Indonesia.[9]

In Cambodia, about 80% of the animal protein consumed comes from freshwater fisheries, which provide work for about 2 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 Dr Mike Rimmer and Professor Nicholas Paul of the University of the Sunshine Coast, and in partnership with Cambodian and Indonesian fisheries research organisations. In 2021, experienced researchers from Indonesia will conduct final training activities to enable Cambodian researchers to gain skills in fish nutrition, hatchery production and fish health.[10]

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 in Timor-Leste and the East Nusa Tenggara 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 guide policy development in Timor-Leste that benefits poor households.[11]

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing 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 establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[12]

Forestry

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. During 2021, the project will report on 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.[13]

A new project in 2021–22, 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 developed for the fungus *Ceratocystis* in acacia to eucalypts, which have replaced acacias in plantations in the wet tropics. It will 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.[14]

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[15]

Scientists from Institute of Forest Tree Improvement and Biotechnology viewing samples of wood with the fungus, *Ceratocystis*. ACIAR continues its support of development of technologies to underpin good plant biosecurity practices in forestry. Photo: Adi Rahmatullah. ACIAR project FST/2018/179

Horticulture

About 40 tropical fruit fly species 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. During 2021–22, focus areas for the project include training farmers and other stakeholders in area-wide management techniques, evaluation of techniques implemented in the field, and integration of techniques into best management practice.[16]

Fusarium wilt tropical race 4 (TR4), or 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. During 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[17]

Huanglongbing, 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 huanglongbing management practices. A trilateral project with partners from Australia, Indonesia and China will be conducted to enhance the sustainable management of huanglongbing 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.[18]

Livestock Systems

Agricultural expansion and deforestation have resulted in land-use change that is linked to the altered dynamics and distribution of malaria and other vector-borne diseases globally. While substantial gains have been made towards eliminating 2 major parasites that cause malaria in humans in South-East Asia, there are increasing cases of malaria in humans due to zoonotic *Plasmodium knowlesi* from macaques, which is transmitted by certain mosquito species. Associate Professor Matthew Grigg of the Menzies School of Health Research leads a project to strengthen the surveillance of zoonotic malaria in Indonesia, and evaluate the disease burden, agricultural practices and mosquito vectors associated with transmission. The findings will inform public health control efforts and sustainable agricultural development.[19]

The Global Burden of Animal Diseases program is an ambitious 10-year initiative funded by the Bill & Melinda Gates Foundation to develop a global metrics system for animal disease burden. The program will guide public and private investments in animal health and welfare to improve societal outcomes from animals at global, national, sector and farm levels. Providing improved equability for livestock and aquatic producers on the margins, particularly women, is a key driving principle. Using the conceptual framework of the program, Dr Dianne Mayberry of CSIRO will lead an ACIAR-supported project team to conduct a Global Burden of Animal Diseases case study in Indonesia to prepare a resource for prioritisation and evaluation of investments related to animal health in Indonesia.[20]

Social Systems

ACIAR has a longstanding partnership with the Indonesian Agency for Agricultural Research and Development (IAARD). The relationship has been almost exclusively through research projects, capacity building and communications/publications. At the request of the Ministry for National Development Planning (Bappenas), ACIAR is supporting a small research activity implemented by ABT Associates Pty Ltd and PT Mitra Asia Lestari to identify opportunities for strengthening Indonesia's agricultural innovation system. The project comprises a rapid assessment and then identification of recommendations for Indonesia to start a pilot program in 2022, aiming to better enable transformation of the agriculture sector in support of more profitable small-scale enterprises and food security for Indonesia's growing population.[21]

Soil and Land Management

Coastal agricultural systems support the livelihoods of many people in Indonesia. These systems vary in intensity, from predominantly low-value rice production to highly intensive mixed rotations that include rice, 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 soil and human health issues and challenges associated with the safe and sustainable production of high-value shallot and chilli cropping systems in coastal agroecosystems of Indonesia.[22]

Smoke haze from indiscriminate burning of peatlands has become a major issue in South-East Asia in recent decades. Smoke haze negatively affects public health and the economy within Indonesia and other countries in the region. A multidisciplinary program of research led by Dr Daniel Mendham of CSIRO supports Indonesia's commitment to restore large areas of degraded peat and achieve sustainable livelihoods for communities living on peatland. The project concludes in 2022 with analysis, evaluation and dissemination of new knowledge to prevent fires in peatlands and improve peatland restoration practices, while enabling meaningful, profitable and sustainable alternative livelihoods.[23]

Changing climates are resulting in severe drought conditions in Indonesia, particularly during El Niño events. Under these conditions, there has been an unprecedented increase in peat fires. The thick smoke and air pollution from the fires has affected much of South-East Asia. Dr Liubov Volkova of the University of Melbourne is working with stakeholders and the Government of Indonesia to improve the knowledge base of parameters for calculating greenhouse gas emissions from peat fires in increasingly degraded peatland areas. This work will enable the government to include peat fire emissions in their international reporting to the UN Framework Convention on Climate Change and claim emission reduction benefits over time.[24]

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 their strong potential as tools to empower government and communities to monitor and help manage peatland restoration. These techniques monitor changes to peat moisture levels and carbon and methane flux from the ecosystem. This small research activity, led by Dr Samantha Grover of RMIT University, is using this data to work with communities, government agencies and other stakeholders to provide valuable information that supports decision-making in peatland restoration and fire management. Stakeholder engagement, which has already commenced, is a major focus of this project.[25]

A farmer checks her chilli plants in the coastal farming area of Yogyakarta. Shallot and chilli cropping systems provide a high-value enterprise for farmers in coastal agroecosystems. ACIAR supports research to ensure safe and sustainable production of these crops. Photo: Adi Rahmatullah. ACIAR project SLAM/2018/145

Country Manager, Indonesia
Ms Mirah Nuryati

Research Program Managers
Agribusiness: Mr Howard Hall
Climate Change: Dr Veronica Doerr
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Agricultural policy research to support natural resource management in Indonesia's upland landscapes (ADP/2015/043)
2. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
3. Inclusive agriculture value chain financing [Indonesia, Vietnam] (AGB/2016/163)
4. Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains (AGB/2010/099)
5. Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia (AGB/2012/099)
6. Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia (AGB/2020/121)
7. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
8. Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits (FIS/2016/116)
9. Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities (FIS/2020/109)
10. Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia (FIS/2016/130)
11. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
12. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
13. Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2) (FST/2016/141)
14. Reducing forest biosecurity threats in South-East Asia [Indonesia, Vietnam] (FST/2018/179)
15. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
16. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region [Indonesia, Philippines] (HORT/2015/042)
17. An integrated management response to the spread of Fusarium wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
18. Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia (HORT/2019/164)
19. Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia (LS/2019/116)
20. Global burden of animal disease initiative: Indonesia case study (LS/2020/156)
21. Assessment of Indonesia's agricultural innovation system (SSS/2021/100)
22. Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia (SLAM/2018/145)
23. Improving community fire management and peatland restoration in Indonesia (FST/2016/144)
24. Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire (SLAM/2020/140)
25. Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors (SLAM/2020/118)

Laos

A$3.8 million
Budgeted funding

13
Bilateral and regional research projects

3
Small projects and activities

Laos has made substantial progress in reducing poverty from 25% in 2012–13 to 18% in 2018–19. However, poverty in rural areas is more than 3 times higher than in urban areas, and reduction of rural poverty remains a high priority of the Lao Government.

In 2020, the Lao Government imposed COVID-19 containment measures that helped avert a health crisis. However, the restrictions resulted in disruptions to the labour market and supply chains that deliver inputs to export-oriented manufacturing industries and the construction sector. Since the outbreak, more than 200,000 Lao migrant workers have returned from abroad, resulting in a loss of remittance income for many households. The World Bank has warned that the economic shock due to COVID-19 could push as many as 214,000 people into poverty.

To date, the livelihoods of farming households have only been moderately affected by the pandemic. Family farming is the main source of income for approximately 75% of households and 92% of these households were able to operate their family farms unaffected by the pandemic. The agriculture sector acted as a buffer during this time and absorbed workers that had been laid off in other sectors. About 10% of workers laid off in manufacturing and wholesale and retail trade were re-employed in agriculture.

Disruptions in transportation and weak demand for agricultural products were the common challenges for commercial farmers in 2020. Declining agricultural exports and business closures in other economic sectors, such as hotels and restaurants, led to a reduction in market outlets for many commercial farmers. Disruptions in transportation increased the cost of production inputs and caused delays in transporting farm products.

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 5-year development plan aims to support greater than 3% growth in the agriculture and forestry sector. These sectors are expected to contribute 19% to the national economy. The newly amended Forestry Law continues to drive national priorities, given government commitment to protect forest cover while making the forestry sector able to support livelihoods of its people. Also guiding the strategic priorities of the Ministry of Agriculture and Forestry is the Lao Government's National Nutrition Strategy (2015–2025), which aims to reduce chronic malnutrition (stunting) in children under 5 from the current rate of 33% to 25% by 2025.

ACIAR-supported research shows that integrating fishways to allow passage of migratory fish up and down regulated rivers has lasting economic and social benefits for river communities. Research is now focused on facilitating sound, cross-sector decision-making on fish passage construction programs. Photo: Candice Bartlett. ACIAR project FIS/2018/153

Country priorities

In 2021–22, if the COVID-19 pandemic status is favourable, ACIAR will recalibrate our long-term strategic program priorities based on consultation with Lao stakeholders. In the meantime, the strategic priority outcomes that currently guide our 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.

2021–22 research program

- **16 ACIAR-supported projects in Laos**
- **6 projects are specific to this country**
- **10 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute

leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8). [1]

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 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

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.[3]

Fisheries

The Xayaburi Power Company, which is responsible for the design and construction of the Xayaburi hydro-electric dam across the Mekong River in Laos, built a complex fishway system designed to enable the upstream and downstream passage of migratory fish. There are hundreds of species of fish in the Mekong River, varying 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 Xayaburi Power Company to develop robust tools and techniques to assess the effectiveness of the Xayaburi Dam fish passage facilities, and provide a standard for other hydro-electric dams planned for the mainstem Mekong River.[4]

Floodplain development and the regulation of river flows for rice production across South-East Asia are affecting fisheries and fish migration, and the livelihoods of communities that depend on fish for protein and trade. Previous ACIAR-supported research showed that integrating fishways into water regulator designs, allowing 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 establish a stakeholder network to facilitate sound, cross-sector decision-making on fish passage construction programs across South-East Asia. During 2021–22, researchers will work with donor bodies and government sectors to determine the factors that drive investment decisions, and to support locally generated national guidelines and university curriculum in Cambodia, Laos and Indonesia.[5]

Dr Monthathip Chanphengsay, Director General of National Agriculture and Forestry Research Institute (far left) and Dulce Carandang Simmanivong, ACIAR Regional Manager, East and South-East Asia (next left), plant the casssava mosaic disease resistant plantlets in Laos.
Photo: Khounkham Douangphachone. ACIAR project AGB/2018/172

Students working in a wood-processing workshop at the Faculty of Forestry at the National University of Laos. New processing capability and development of engineered wood products from an ACIAR-supported project have enhanced the capacity of wood manufacturing industries and grown markets for plantation timber in Laos, as well as created a use for underused plantation resources in Australia. Photo: Majken Soegaard. ACIAR project FST/2016/151

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 will complete the development of new processing capability and engineered wood products from small-diameter timbers. 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. During 2021–22, reports will be completed on the characterisation of the current plantation resource and options for modelling future wood supply, as well as prospective pathways for influence and change in relevant policy, governance and administrative environments.[6]

The Lao Government has set ambitious targets to restore forest cover in the country. Agroforestry will befundamental to this process by allowing joint cultivation of trees and agricultural crops across the landscape and reducing logging pressure on residual natural forests while not adversely affecting food security. A small research activity led by Associate Professor Mark Dieters of the University of Queensland will build on the 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.[7]

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[8]

Laos has an ambitious target of 70% forest cover by 2030 but currently nearly half of the country is degraded or unstocked forest. The Government of Laos seeks to restore native forest while also providing benefits to resident and neighbouring communities. A new project addresses the opportunity to shape reforestation policy and practice, determining how to fulfil the government requirements. Professor Patrick Baker of the University of Melbourne leads this project, which will test post-disturbance treatments to accelerate and channel forest recovery towards desired economic, social, and ecological outcomes. By testing ecosystem assembly theory, the project will advance the state of the art in forest restoration.[9]

Horticulture

Fusarium wilt tropical race 4 (TR4), or 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. During 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[10]

Livestock Systems

Laos is a comparatively small producer of pork compared with Vietnam and China, but pork production has grown significantly in recent years. Improved safety of animal source foods that is free from zoonotic parasites such as *Taenia solium*, or pork tapeworm, is gaining greater attention in the region. Dr Amanda Ash of Murdoch University leads a project to identify and recommend interventions to mitigate the risk of disease from food-borne parasites in pigs, adding value to the growing cross-border pig trade between northern Laos and Vietnam. During 2021–22, research and activities will focus on informing and developing protocols to manage food-borne parasitic disease at the farm level.[11]

Goat production in Lao has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Traditional extensive goat-raising methods can 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 aiming to enhance income-generating opportunities for goats in Lao farming systems, while identifying sustainable production practices. Additionally, the project is seeking greater understanding of consumer preferences for goats in Vietnam to further develop market specifications, especially for premium meat.[12]

Social Systems

The Lao Government 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. Dr Hilary Smith and Professor Peter Kanowski from the Australian National University will examine ACIAR-commissioned research projects through an analysis of case studies and in-depth interviews with key stakeholders to identify the processes, practices and circumstances that facilitate or hinder the influence and uptake of ACIAR-commissioned research within Lao policy contexts.[13]

Agrichemicals are an important tool for increasing agricultural yields and a necessary contributor to food and nutrition security. However, off-label use can have significant impacts on human and environmental health. A small research activity, led by Dr Liana Williams and Dr Lucy Carter of CSIRO, is using a human-centred approach to understand the interplay between agrichemical use and the institutional and regulatory frameworks that are intended to safeguard against off-label use, as well as networks for access to chemicals, information and training. Agrichemical use will be analysed through case studies in selected crops in Laos and Vietnam. Understanding gained from the study will serve as a foundation for future ACIAR research.[14]

In Laos and Cambodia, access to formal financial services is low. It is substantially lower among rural and remote communities, and lower again for women. Dr Erin Taylor of Western Sydney University leads a project that will review theoretical frameworks to understand how the approach to digital financial services in Laos and Cambodia compares with global trends, and what global lessons can be applied. The project will assess theories of change and impact methodologies that have been used around the world to introduce digital financial services to reduce poverty in rural areas and improve gender equality. The project aims to identify best practices and suggest improvements to methodologies, potentially highlighting the need for new models.[15]

Soil and Land Management

Agricultural production in the lowlands of Cambodia and Laos is characterised by a high proportion of each nation's poorest and most food-insecure people. Their livelihoods are generally reliant on rainfed, low-input rice production and limited livestock keeping. Practices to increase the overall productivity by introducing managed forage production in these farming systems have been 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 will be trained to conduct ongoing research and promote outcomes.[16]

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

Research Program Managers
Agribusiness: Mr Howard Hall
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos (CROP/2019/145)
4. Assessing upstream fish migration measures at Xayaburi Dam in Laos (FIS/2017/017)
5. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
6. Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)
7. Supporting agroforestry through tree improvement and gene conservation in Laos (FST/2020/119)
8. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
9. Forest restoration for economic outcomes [Laos] (FST/2020/137)
10. An integrated management response to the spread of Fusarium wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
11. Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos (LS/2014/055)
12. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
13. Policy impact in Laos: from research to practice (SSS/2020/142)
14. Understanding agrichemical use in South-East Asia agriculture [Laos, Vietnam] (SSS/2020/143)
15. Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia (SSS/2020/160)
16. Management practices for profitable crop livestock systems for Cambodia and Laos (SMCN/2012/075)

ACIAR is supporting research to increase the overall productivity of crop and livestock systems in Laos and Cambodia by introducing managed forage production to these farming systems. ACIAR project SMCN/2012/075

Myanmar

A$1.7 million
Budgeted funding

8
Bilateral and regional research projects

4
Small projects and activities

Almost 70% of Myanmar's 54 million people live in rural areas and rely on crop production and fisheries or 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.

Prior to the COVID-19 pandemic of 2020, Myanmar was steadily catching up economically with its ASEAN neighbours, with the economy growing at around 6% per annum in recent years. Despite that impressive growth, more than one-third of Myanmar's population is in poverty, and 6% are in extreme poverty. In 2018, Myanmar was strongly reliant on intra-ASEAN trade of agricultural products, and was both the largest exporter and importer within ASEAN countries in the region. The agriculture sector contributed about 30% of Myanmar's GDP. While ASEAN neighbours were among its top investors in recent years, China had the largest economic footprint in the country.

Country priorities

In 2020, research priorities for the ACIAR program in Myanmar aligned with 2 of the 3 focuses of Myanmar's Agricultural Development Strategy and Investment Plan (2018–2023): productivity, and market linkages and competitiveness. Specifically, the ACIAR program in Myanmar is focused 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
- linking Myanmar regionally through multi-country research collaborations.

Following the rapid global spread of the COVID-19 from early 2020, Australia's program of development cooperation pivoted quickly to respond to the challenges being faced by the Indo-Pacific region, with a focus on health security, stability and (of particular importance to ACIAR) economic recovery. Specifically, as part of Australia's Myanmar COVID-19 Response Plan, ACIAR committed to continuing to support improvements in food production and rural incomes through improvements in agriculture, livestock and fisheries.

The political instability that was sparked by the military coup of February 2021 has resulted in Australia's development program with Myanmar being redirected to support the immediate humanitarian needs of the most vulnerable and poor, with implementation through non-government partners.

2021–22 research program

- **12 ACIAR-supported projects in Myanmar**
- **5 projects are specific to this country**
- **7 projects are part of regional projects**

ACIAR is not supporting any new research collaborations in 2021–22. Although the following sections describe individual ACIAR-supported projects in Myanmar, all these projects have largely or fully ceased functioning. ACIAR is working with each of the current projects, in consultation with international partners, to identify those that can continue to operate in line with Australia's policy of engagement with Myanmar.

Agribusiness

Smallholders who produce high-value vegetables in the Moc Chau district of Northwest Vietnam have a new supply channel to modern retail markets in Hanoi as a result of a previous ACIAR-supported project. A subsequent project, led by Dr Gordon Rogers of Applied Horticultural Research, has addressed research and development gaps in Vietnam to ensure the new vegetable chains are reliable, inclusive, sustainable and scalable. The research experience and knowledge developed through these projects in Vietnam was applied to rapidly identify, develop and evaluate a pilot high-quality vegetable chain in Myanmar. The project concludes in 2021–22, with the consolidation of effective frameworks and approaches to establish and develop resilient smallholder vegetable chains in northern Vietnam and Myanmar.[1]

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 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[2]

Crops

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through a 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 in Bangladesh, India, Myanmar and Australia. Phase 2 of the network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[3]

The International Mungbean Improvement Network provides access to genetic material and supports variety development to improve cropping options for smallholder farmers in eastern Africa, South Asia and South-East Asia. Australian farmers also benefit from the network. ACIAR project CROP/2019/144

Fisheries

Rice and fish are key components of diets in Myanmar, as well as being 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 ponds within 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 Akester of the WorldFish Center is findings ways to improve rice–fish systems in the Ayeyarwady Delta to enhance production and management, and support policymakers develop enabling policy for land use. The last phase of the project will analyse data, consolidate learnings and include a closing workshop with partners.[4]

Livestock Systems

Small ruminants, such as goats and sheep, 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 is helping farmers in Myanmar improve goat 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.[5]

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. ACIAR project LS/2019/142

About half of Myanmar's 15 million cattle are in the Central Dry Zone. Their primary use is to provide draught power, transportation and manure for fertiliser. Myanmar is undergoing significant transformation, and mechanisation is expected to quickly reduce the need for draught animals over the next decade. This provides a unique opportunity for smallholder farmers to move from keeping draught animals to producing beef cattle. Dr Dianne Mayberry of CSIRO Agriculture and Food leads a project to support smallholder farmers to identify 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.[6]

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making 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 is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[7]

It is widely reported that the impact of COVID-19 on food systems across the Indo-Pacific is exacerbating gendered inequalities in the region, such as unequal access to productive resources, markets and institutions for women. Professor Sara Davies of Griffith University leads a small research activity to develop an evidence-based approach to identify and understand the specific gendered impacts of COVID-19 responses on food security and socioeconomic outcomes in Myanmar, the Philippines and Papua New Guinea. These insights will be used to outline opportunities and design approaches that will begin to mitigate the harm caused by the COVID-19 disruption at the individual, household and community level. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[8]

The COVID-19 pandemic exposed multiple failures in economy and society, and it is clear that the costs of the global shock have not been equally distributed. Also contributing to the ACIAR COVID-19 impacts assessment is a small research activity led by Dr Paulo Santos of Monash University aims to understand what drives vulnerability to poverty among agricultural households in Myanmar and Vietnam, and what research needs to originate from such analysis. The research analyses existing expenditure and consumption data to quantify the relative importance of different shocks on poverty.[9]

The Australian and New Zealand governments share a common interest in investing and assisting partner countries to improve livestock production and productivity, including the potential to reduce greenhouse emissions from livestock production systems. A small research activity led by Dr Paul Cheng of the University of Melbourne is assessing what data exists for calculation of greenhouse gas emissions for selected smallholder livestock projects supported by ACIAR and the New Zealand Ministry of Foreign Affairs and Trade. The study will focus on livestock systems in Vanuatu and Myanmar. It will provide an understanding of the opportunities and challenges for incorporating livestock monitoring, reporting and verification data collection and/or analysis in development projects in the longer term. The study will also provide an understanding of the attitudes and interest of project partners to participate in such activities into the future.[10]

Social Systems

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.[11]

Soil and Land Management

Agriculture in Shan State, Myanmar, has enormous potential to help lift 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 ineffective nutrient management and removal of nutrients in residues, and continual erosion of topsoil. Dr Terry Rose of Southern Cross University leads a small research activity that will explore opportunities to arrest soil degradation with a particularly focus on reducing erosion on sloping lands. The project will assess previous research and development efforts aimed at addressing soil degradation in Shan State, and gain an understanding of potential barriers to adoption of legume-based pastures, livestock in farming systems and uptake of new agronomic methods and technologies.[12]

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

Research Program Managers
Agribusiness: Mr Howard Hall
Crops: Dr Eric Huttner
Fisheries: Prof Ann Fleming
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
2. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
3. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
4. Development of rice fish systems in the Ayeyarwady Delta, Myanmar (FIS/2016/135)
5. Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar (LS/2014/056)
6. Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management (LS/2016/132)
7. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
8. COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
9. Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program) [Myanmar, Vietnam] (LS/2020/206)
10. Livestock climate lens Part 1: data landscape analysis [Myanmar, Vanuatu] (LS/2020/207)
11. Building institutions for the sustainable management of artesian groundwater in Myanmar (SSS/2018/135)
12. Soil-based challenges for cropping in Shan State (nutrient acquisition) [Myanmar] (SLAM/2018/190)

Philippines

A$4.4 million
Budgeted funding

11
Bilateral and regional research projects

4
Small projects and activities

The Philippines experienced strong economic growth over the last decade to 2019, buoyed by robust domestic consumption, low inflation, improving labour market conditions, and steady remittances from overseas Filipino workers. Associated with this has been a major increase in funding support to research in the agriculture and fisheries sectors.

In 2020, the country's economic growth significantly slowed down because of natural disasters such as volcanic eruptions and strong typhoons, and the COVID-19 pandemic, which virtually ceased economic activities due to one of the world's longest and strictest enforced periods of community quarantine.

The Philippines continues to be heavily impacted more than a year since the pandemic started. Many businesses have shut down, unemployment has increased, particularly among workers in the informal sector, and domestic consumption and purchasing power have been considerably reduced. Efforts to reopen the economy following a hard lockdown early in the pandemic resulted in high infection rates due to movement restrictions being eased.

While the agriculture sector has shown some resilience and even grew in the first 3 quarters of 2020, these gains were overturned by the devastation brought about by strong typhoons late in 2020.

Food insecurity remains a significant issue for the poorest and most vulnerable, especially in urban areas, and there is potential for further food shortages due to impacts on supply chains and export restrictions in supply markets.

To address the challenges to food security, particularly on availability and access, the Philippine Government has focused its efforts at the national and local level on providing financial assistance to vulnerable families, distributing food aid, and promoting alternative production and sources of food including through home gardening. The government has also provided assistance to food producers, including:

- financial assistance
- bulk buying of fruits, vegetables and livestock for distribution as food aid
- coordination of logistics and movement of supply, creating local hubs and markets
- improving post-harvest facilities
- e-retailing
- disease management, particularly for African swine fever and fall armyworm.

The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) is ACIAR's main government partner in the Philippines. In support of national efforts to mitigate the impacts of the pandemic on agriculture and food systems, PCAARRD initiated a COVID-19 response program, GALING-PCAARRD, which assists communities around the country through technology information sharing, food product distribution, and provision of food production technologies and livelihood opportunities amidst the current challenges of the pandemic, and hopefully beyond.

The Philippine Government scaled up efforts to address hunger and to ensure all public-led initiatives are coordinated, responsive and effective. In January 2021, the government launched the National Food Policy, which aims to strengthen government agencies, both at the national and regional levels, and local government units to provide citizens necessary programs and interventions to end hunger, achieve food security, improve nutrition and attain sustainable agriculture.

The Philippines is one of Australia's longest-standing bilateral relationships and we will celebrate 75 years of diplomatic ties in 2021. Bilateral cooperation is underpinned by the Philippines-Australia Comprehensive Partnership. As the second largest bilateral grants partner for the Philippines, Australia will collaborate with the Philippine Government to help manage and recover from COVID-19.

Country priorities

ACIAR has worked with the Philippine Government, research and academic institutions, private sector and civil society partners for almost 4 decades. The partnership has evolved with significant co-investment from our main bilateral partner, PCAARRD, in recent years.

Our program in the Philippines focuses on research to make agricultural products more productive, marketable and internationally competitive, and to build resilience of smallholder farmers, fishers and their households from impacts of natural disasters and climate change, including external shocks such as the COVID-19 pandemic. 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.

We work with the Philippine Government to promote prosperity, reduce poverty and enhance stability, and to help respond to the Philippines' agricultural research and development priorities by:

- making horticultural products more competitive in the market
- ensuring competitive and sustainable fisheries and aquaculture
- managing land and water resources for profitable and sustainable agriculture
- improving returns from low-input livestock production systems
- mitigating the effects of climate change on the rural poor
- increasing adoption of technology, through understanding and addressing constraints and extension with poor Indigenous households in the southern Philippines.

These priorities remain relevant, and the underlying issues have been compounded in light of the COVID-19 pandemic. During 2020, ACIAR examined food systems in the Indo-Pacific region to identify vulnerabilities that were exposed or amplified by the COVID-19 shock. This information, published in our report *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action (ACIAR Technical Report 96)*, will be used to inform future research and development to support food systems resilience in the Indo-Pacific region. Food systems assessments were undertaken at 5 locations, including the Philippines. The assessment helped identify focus areas for research collaboration in the Philippines that will contribute to increasing food systems resilience in the face of future shocks.

Capacity building is closely linked to our research initiatives. This priority area has a greater focus on leadership and career development through short-term and medium-term support for Philippine partners. Whenever possible, we encourage our partners to participate the John Allwright Fellowship, the John Dillon Fellowship, the Meryl William Fellowships and other initiatives under the alumni engagement plan.

In recent years, ACIAR has introduced innovations to how we deliver our learning and development programs. One example is the Philippine Agribusiness Masterclass that successfully brought together a cohort of researchers, academics, farmer leaders and representatives from the private sector to collaborate. In 2021, the John Dillon Fellowship was redesigned and in the coming year it will be delivered in-country to a cohort of up to 20 participants with a strong focus on cross-organisational collaboration and strengthening ties with Australian collaborators. The first in-country fellowship program commenced in the Philippines in May 2021, with participants from key government and research partners.

Outreach and communications are also becoming increasingly important to strengthen understanding and awareness of the impact of our programs as part of Australia's aid program in the Philippines, and to support and strengthen relationships between in-country project partners and stakeholders.

2021–22 research program

- **15 ACIAR-supported projects in the Philippines**
- **9 projects are specific to this country**
- **6 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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 farmer-to-farmer learning alliances with private sector and grower groups, and between communities, governments and research stakeholders to improve smallholders' income and community livelihoods through the value-chain improvements implemented.[1]

ACIAR-supported research in the southern Philippines showed that integrating vegetable value-chain development and community engagement leads to improved innovation, competitiveness, quality and value. However, success occurred at very local scales and, in general, the majority of smallholder horticulture growers in the Philippines are not able to compete in higher-value, more-demanding markets. A new project will 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, the project will work with producers of coffee and high-value fruits and vegetables in the southern Philippines. This project aligns directly with 2 research priorities of PCAARRD.[2]

Fisheries

Dried sea cucumbers are highly valued in markets across China and South-East Asia. Overfishing and poor fisheries management throughout the Asia-Pacific region have resulted in serious declines of sea cucumber stocks and even led to fishery closures, reducing income-generating opportunities for coastal communities. A project led by Professor Paul Southgate of the University of the Sunshine Coast is developing culture methods that support pond-based sea cucumber farming in Vietnam and sea-based farming in the Philippines. During 2021–22, the project will be training hatchery staff in new methods, continuing field experiments and feeding trials, and refining pond culture methods.[3]

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

Buidling on successful research in coral restoration techniques, ACIAR is now funding work to improve institutional effectiveness and build networks to support restoration programs. Photo: University of the Philippines. ACIAR project FIS/2019/123

In the Philippines, the successful restoration of damaged coral reefs 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 Peter 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 finishes in 2021 with training courses for local communities, reef managers and researchers to build capacity for future fish surveys, reef restoration programs and best-practice reef fisheries management.[4]

Coral reef ecosystems provide important livelihood opportunities to coastal communities in the Philippines, but they are threatened by climate change, overfishing, destructive fishing practices and pollution. While the success of coral restoration using sexual techniques has been confirmed by previous and ongoing ACIAR-supported projects, significant challenges remain regarding the integration of this technology with existing maritime policy and governance to ensure the sustainability of restored reefs. Associate Professor Michael Fabinyi of the University of Technology Sydney leads a new project that aims to improve the institutional effectiveness of coral reef restoration in the Philippines by understanding political-economic influences and drivers at multiple scales, and applying lessons learned through a marine governance network-based approach.[5]

Previous ACIAR research partnerships successfully demonstrated 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 leads a 5-year project to significantly increase the scale of restoration interventions. Techniques established in previous projects will be refined for application in large-scale restoration trials in 4 regions of the Philippines. Trials will be monitored to quantify coral reproduction success. The project will work with communities, researchers and local governments to establish coral restoration networks in the trial regions to support local restoration activities. Heat-stress experiments will be conducted to quantify larval production, settlement and recruitment rates to identify heat-tolerant adult coral genotypes that are resilient under future climate-change scenarios.[6]

Horticulture

About 40 tropical fruit fly species 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. During 2021–22, focus areas for the project include training farmers and other stakeholders in area-wide management techniques, evaluation of techniques implemented in the field, and integration of techniques into best management practice.[7]

Vegetable consumption is low in the Philippines for several reasons, including the perception that vegetables are of poor quality and unsafe. 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 vegetable supply chains to meet consumer expectations in terms of quality, food safety, nutritional value and price. During 2021–22, the project will continue to measure the social and economic impact of adopting new vegetable good agricultural practice (GAP) protocol and continue training key support personnel, including leading farmers.[8]

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 little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but struggle to deliver fruit that meets market or regulatory standards. Dr Muhammad Sohail Mahzar of the Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade will lead a new project in Cambodia and the Philippines that 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.[9]

Fusarium wilt tropical race 4 (TR4), or 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. During 2021–22, field surveys of production systems and natural environments will be conducted, and there will be ongoing development and training in statistics and experimental procedures for glasshouse and field experiments.[10]

Panama disease has become widespread in banana plantations throughout South-East Asia. ACIAR supports a project to develop an integrated management response to the spread of the disease throughout the region. Photo: Conor Ashleigh. ACIAR project HORT/2018/192

Livestock Systems

The animal origins of COVID-19 have again placed concerns about zoonotic diseases in the global policy limelight. Wet markets in Asia were singled out as a source of global pandemic risk and there were calls to close, ban, regulate and reform them. While some wet markets centre heavily on wild animals, many do not sell wildlife or bushmeat. More commonly, a wet market is a fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains. Dr Kevin Bardosh and Associate Professor Cecily Maller of RMIT University leads a rapid assessment to understand how the COVID-19 pandemic has impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms, food security, and women's economic empowerment. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[11]

It is widely reported that the impact of COVID-19 on food systems across the Indo-Pacific is exacerbating gendered inequalities in the region, such as unequal access to productive resources, markets and institutions for women. Also contributing the ACIAR assessment of COVID-19 impacts, Professor Sara Davies of Griffith University leads a small research activity to develop an evidence-based approach to identify and understand the specific gendered impacts of COVID-19 responses on food security and socioeconomic outcomes in Myanmar, the Philippines and Papua New Guinea. These insights will be used to outline opportunities and design approaches that will begin to mitigate the harm caused by the COVID-19 disruption at the individual, household and community level.[12]

Social Systems

More than 24 million people in the Philippines, most of whom live below the poverty line, rely on subsistence agriculture, especially in the country's rural uplands. 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 the livelihoods of low-income residents of rural areas. During 2021–22, pilot testing of designs for woodlots, agroforestry systems and woodlot/crop systems suited to smallholders and communities will be completed. Three manuals on smallholder-based tree-crop farming systems will be produced for extension and instruction. Based on several studies within the project, guidelines will be published to assist the formulation of forest and landscape restoration policy within the Asia-Pacific region.[13]

Soil and Land Management

Rubber is the fourth largest crop in the poorest province of the southern Philippines, Agusan del Sur. 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. By introducing improved profitable rubber-based intercropping systems and sustainable management regimes, a project led by Professor Chengrong Chen of Griffith University aims to boost household incomes for Indigenous smallholder subsistence farmers. During 2021–22, key soil constraints and the most suitable lands for rubber-based cropping systems will be identified. Demonstration sites and capacity building are underway to promote resilient market-oriented rubber-based intercropping systems with low risk, high productivity and profitability.[14]

Vegetable production systems of upland farming areas of the Philippines are intensively managed and suffer problems including severe soil acidity, undiagnosed micronutrient deficiencies, excessive accumulation of copper and zinc, excessive application of fertilisers and manures, and erosion. A range of serious soil-borne pathogens also affect productivity in these intensive farming systems. Dr Stephen Harper of the University of Queensland leads a new project to develop management strategies that mitigate, remediate and reduce the risks of contaminants in soils across 3 major vegetable production regions. The project starts with research to provide a clear understanding and validation of the current soil nutrient status, including excesses and deficiencies, and potential short-term and long-term impacts of accumulation of essential heavy metals, particularly copper and zinc, on vegetable production.[15]

Country Manager, The Philippines
Position vacant at the time of publication

Research Program Managers
Agribusiness: Mr Howard Hall
Fisheries: Prof Ann Fleming
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 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. Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines (AGB/2018/196)
3. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
4. Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [Philippines] (FIS/2018/128)
5. Institutional effectiveness and political economy of coral reef restoration in the Philippines (FIS/2021/112)
6. Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia (FIS/2019/123)
7. Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region (HORT/2015/042)
8. Developing vegetable value chains to meet evolving market expectations in the Philippines (HORT/2016/188)
9. Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations (HORT/2016/190)
10. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines] (HORT/2018/192)
11. Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program) (LS/2020/204)
12. COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines] (LS/2020/203)
13. Enhancing livelihoods through forest and landscape restoration [Philippines] (ASEM/2016/103)
14. Land management of diverse rubber-based systems in southern Philippines (SLAM/2017/040)
15. Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines (SLAM/2020/117)

Vietnam

A$4.8 million
Budgeted funding

18
Bilateral and regional research projects

8
Small projects and activities

Vietnam contained COVID-19 very effectively through 2020 and into 2021. As a result, it was one of only a few countries in the world with positive economic growth during that period. The agriculture sector remained a firm foundation for that growth, contributing 15% to the country's GDP.

Despite the good performance of agriculture, the sector experienced a range of difficulties. These included disruptions of traditional value chains due to travel restrictions in the pandemic, the impact of African swine fever and the extreme events associated with natural disasters, such as the terrible flood in the central region, saline intrusion in the Mekong Delta and hail storms in the northern mountainous areas.

Vietnam has a stated ambition to become a country with world-class agriculture, prosperous rural areas, modern infrastructure, efficient use and sustainable protection of agricultural resources, and resilience to climate change. In agriculture specifically, Vietnam is aiming to be in the top 15 agricultural developed countries and rank tenth in agricultural processing technology by 2030. To achieve these goals, Vietnam has prioritised focus on export commodities that meet good agricultural practice and other quality standards, and by value-adding to products through new technologies.

Vietnam sees research-for-development (especially the application of 4.0 technology) as the key to achieving its ambitions to improve efficiency, productivity and increase the competitiveness of agricultural products. Research for rural development also continues to be vital, especially linking poorer rural areas to exports through free trade agreements. The main challenges to achieving these ambitions in the coming years remain the negative impacts of climate change, water shortage, soil degradation and development gaps of ethnic minorities and women in rural areas.

As a country vulnerable to climate change, Vietnam's agriculture sector has identified climate change mitigation and adaptation as a long-term mission. Measures to adapt or mitigate the negative impacts of climate change have been proposed, especially restructuring crop choices and times with the specific conditions, improving land and water management and applying technology for farming activities, and diversifying occupations for people in the rural areas.

Since 2020, One Health (the interface between human, animal, and environmental health) has drawn more attention than ever. Vietnam's One Health partners (including Australia) recently pledged to support a partnership framework for the 2021–2025 period, focusing on zoonotic diseases and antimicrobial resistance. Soil health and the relationship between soil fertility, crop nutrition, and pests and diseases (especially soil-borne diseases) are also priorities.

Country priorities

ACIAR has sustained a program of research collaboration with Vietnam for the past 28 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 key ambitions of the strategy are to:

- improve the capacity of Vietnamese researchers, research managers and development partners to support sustainable and equitable farming and livelihood systems in the Mekong River Delta, Central Highlands and Northwest regions and in the fisheries and aquaculture sector
- improve the skills, livelihoods and incomes of smallholder farmers, including ethnic minorities in the mountainous areas of the Central Highlands and Northwest regions, 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 a 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.

In early 2020, Vietnam and ACIAR reaffirmed these priorities as being the key focus for our partnership. We also reaffirmed the commitment to:

- co-fund 75% of projects during the 10-year period
- develop 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.

2021–22 research program

- **26 ACIAR-supported projects in Vietnam**
- **12 projects are specific to this country**
- **14 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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.

Farmer Leo Van Lech in Son La province, Vietnam, has implemented a new agroforestry systems on his sloping land and is obtaining better production and fruit quality. As director of a local cooperative, he is encouraging other farmers to apply the new technique.
Photo: Huong Nguyen. ACIAR project FST/2016/152

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 Associate Professor Robin Roberts of Griffith University. The research has also focused on roles and opportunities for women in the industry. The project will conclude in 2021–22, identifying opportunities to improve through-chain operations and chain competitiveness, and reporting on options to overcome ongoing barriers to competitiveness and ways to improve capacity, industry stakeholder linkages and knowledge sharing.[1]

Smallholders who produce high-value vegetables in the Moc Chau district of Northwest Vietnam have a new supply channel to modern retail markets in Hanoi as a result of a previous ACIAR-supported project. A subsequent project, led by Dr Gordon Rogers of Applied Horticultural Research, has addressed research and development gaps in Vietnam to ensure the new vegetable chains are reliable, inclusive, sustainable and scalable. The research experience and knowledge developed through these projects in Vietnam was applied to rapidly identify, develop and evaluate a pilot high-quality vegetable chain in Myanmar. The project concludes in 2021–22, with the consolidation of effective frameworks and approaches to establish and develop resilient smallholder vegetable chains in northern Vietnam and Myanmar.[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 2021–22, the project will continue testing and evaluation of virus-free planting material and resistant varieties, and on-farm testing of new agronomic practices and training of farmers and extension officers. The establishment of facilities using innovative methods for rapid multiplication of clean planting material continues, funded in joint ventures with private firms and non-government organisation in multiple countries.[3]

Unmanaged expansion of coffee and pepper production in the Central Highlands region has resulted in deforestation and production on unsuitable land. Increasingly, the region is subject to the impacts of climate change, with increasing temperatures and erratic rains. There has also been misuse and overuse of mineral fertilisers, irrigation water and synthetic pesticides. A new 4-year project aims to enhance smallholder livelihoods, including vulnerable populations, by improving the sustainability of coffee and black pepper farming systems and value chains. Research led by Dr Estelle Bienabe of the World Agroforestry Centre will start with an investigation of soil-borne pests and diseases, on-farm and in nurseries, and the use of bio-inoculants with soil remediation strategies.[4]

To combat serious diseases of cassava, ACIAR supports a project that is evaluating virus-free planting material and resistant varieties, and conducting on-farm testing of new agronomic practices and training of farmers and extension officers. Photo: Huong Nguyen. ACIAR project AGB/2018/172

About 1.5 million smallholder farmers in the Mekong River Delta region rely on rice for their livelihood. Rice is grown on small farms, with 2 or 3 crops produced each year. The industry faces issues such as reduced returns to farmers, soil degradation, environmental pollution and declining seed purity and grain quality. During 2017, the Government of Vietnam developed a policy to encourage reduced total rice production but a focus on high quality, with the aim of exporting to premium markets. A new 4-year project, led by Dr Jaquie Mitchell of the University of Queensland, aims to establish a highly productive, sustainable, traceable and quality-assured value chain for tropical medium-grain rice in the Mekong River Delta for the benefit of rice-farming households and to meet established market requirements of the partnering global marketer.[5]

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project led by Dr Alan de Brauw of the International Food Policy Research Institute aims to increase knowledge about how to design and implement innovative and inclusive agricultural value chain financing models in South-East Asia. During 2021–22, the project will review, research and trial innovative financing models for agricultural value chains and evaluate specific chain finance interventions in Indonesia and Vietnam.[6]

The most important constraint to the development of a temperate fruit industry in northern Vietnam is the lack of coordination between farmers and stakeholders in the private sector (seedling producers, growers, traders and retailers), and between the private sector and local government. This small research activity led by Mr Oleg Nicetic of the University of Queensland has established an inclusive multi-stakeholder industry association, imported new varieties from Australia and completed the first harvest of imported varieties in field trials. Externally funded monitoring and guidance of association governance, commercial scale multiplication and release of varieties to participating farmers will continue beyond the project term.[7]

Vietnam has experienced excellent growth in agriculture, value-added agriculture and farm incomes over recent decades. However, 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.[8]

Catfish (*Pangasius* sp) farming and wild caught catfish are important income generating activities for smallholder farmers in the Mekong River Basin and are an extremely important source of dietary protein for those countries' populations. The continued availability of catfish for human consumption is influenced by many factors including the impacts of climate change, the COVID-19 pandemic, consumer perceptions on food and health safety provenance, and environmental and political changes. Dr Van Kien Nguyen of the Health and Agricultural Policy Research Institute leads a new project in Cambodia, Laos and Vietnam to identify food loss and waste along the catfish value chain; conduct foresight exercises to determine the uncertainties of catfish production for food systems; and develop solutions to reduce food loss in catfish production. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).[9]

Climate Change

Australia is a world leader in greenhouse gas mitigation research in agriculture. This project provides the opportunity to assist partner countries to strengthen their national greenhouse gas accounting systems towards the same high standard used by Australia, and to use these systems to identify, quantify and implement on-farm management options that reduce emissions. Led by Professor Peter Grace of Queensland University of Technology, the project team will work with government institutions in Fiji and Vietnam, and will help grow capability in the data management, analyses and reporting needed to support current and future emissions reduction commitments under the Paris Agreement. The team will also collaborate with a sister project, led by the New Zealand Agricultural Greenhouse Gas Research Centre, which is pursuing the same approach in Kenya and Indonesia.[10]

Fisheries

Dried sea cucumbers are highly valued in markets across China and South-East Asia. Overfishing and poor fisheries management throughout the Asia-Pacific region have resulted in serious declines of sea cucumber stocks and even led to fishery closures, reducing income-generating opportunities for coastal communities. A project led by Professor Paul Southgate of the University of the Sunshine Coast is developing culture methods that support pond-based sea cucumber farming in Vietnam and sea-based farming in the Philippines. During 2021–22, the project will be training hatchery staff in new methods, continuing field experiments and feeding trials, and refining pond culture methods.[11]

Unique among Pacific island countries is the production of half-pearls, or mabé, in Tonga from the winged pearl oyster. Although half-pearls are generally less valuable than round pearls, an individual oyster can produce multiple half-pearls (unlike round pearls). With appropriate training, pearl production can be accomplished by community members over a 10-month culture period, compared to approximately 2 years for round pearls. Professor Paul Southgate of the University of the Sunshine Coast completes a project in 2021 that is supporting further expansion of community-based pearl farming and handicraft production in Tonga and demonstrating the feasibility of similar development in Vietnam.[12]

Hybrid grouper farming is the most profitable marine fish aquaculture sector in Vietnam, involving over 400 hatchery operators and grow-out farmers. The Directorate of Fisheries aims to increase small and medium enterprises in marine aquaculture, but the hybrid grouper sector is constrained by reliance on a nutritionally poor and variable supply of 'trash' fish. Farmers report they are willing to use more sustainable, cost-effective formulated feeds, but the development of commercial feeds in Vietnam is constrained by a lack of data on suitable feed formulations. This project, led by Dr Leo Nankervis of James Cook University, will deliver nutritional data required to formulate cost-effective feeds that promote superior growth and survival compared with 'trash' fish, and so attract smallholder farmers to switch to formulated feeds. Cooperation with large feed mills in Vietnam's private sector will support the local supply of cost-effective diets for hybrid grouper and underpin broad-scale adoption of commercial pelleted feeds.[13]

Hybrid grouper farming is the most profitable marine fish aquaculture sector in Vietnam. ACIAR-supported research is finding nutritional data to formulate cost-effective feeds that promote superior growth and survival, which can be sustainably sourced. Photo: Khanh Long. ACIAR project FIS/2021/121

Marine bivalves, such as mussels, clams and oysters, are known to sequester carbon in their shells. There is interest in the potential for bivalves to mitigate the effects of climate change. In northern Vietnam, a small research activity led by Dr Sarah Ugalde of the University of Tasmania is examining the role of the Portuguese oyster (*Crassostrea angulata*) aquaculture industry in the carbon cycle and rates of carbon sequestration. This new information will be used to evaluate the potential value for oyster carbon farming to reduce climate-change impacts through shell recycling and value-adding, including through the use of carbon crediting mechanisms.[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 finalise 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 2021–22, 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 research into the impact of the *Ceratocystis* fungus on acacias to eucalypts that have replaced acacias in the wet tropics. It will 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]

Increased trade, global movement and a changing climate increase the threat of emerging pests and diseases. The capability to detect and respond to forest pest and disease incursions is crucial to minimising their impacts. In South-East Asia, this capacity varies widely among countries, but there is a general lack of preparedness to respond to invasive pests and diseases. A new project will establish an effective and sustainable forest biosecurity network in South-East Asia to improve risk management for invasive forest pests and diseases. Associate Professor Simon Lawson of the University of the Sunshine Coast will lead the project, which will use shared field protocols and data as an entry point and foundation for coordinated biosecurity response. The project will develop science tools to support and sustain the forest biosecurity network and develop coordinated forest biosecurity policies for South-East Asia.[17]

Livestock Systems

Market demand for beef is increasing rapidly in Vietnam, outstripping 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. In the final year, the project will focus on capacity building of stakeholders in the beef value chain, including key advisory and extension staff. A working group will be established to design an up-scaling strategy for a sustainable crop-livestock system.[18]

Asia is a major global producer of pork, with South-East Asia and southern China currently providing the majority of regional production. Food safety is a significant and growing concern in Vietnam, and 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 bacterial food-borne disease across informal pork markets in Vietnam. In the final year of the project, researchers will deliver a roadmap based on evaluations of approaches to food safely and recommendations that could lead to impact at scale.[19]

Goat production in Lao has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. Traditional extensive goat-raising methods can 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 aiming to enhance income-generating opportunities for goats in Lao farming systems, while identifying sustainable production practices. Additionally, the project is seeking greater understanding of consumer preferences for goats in Vietnam to further develop market specifications, especially for premium meat.[20]

Poultry enterprises offer opportunities to improve the nutrition of households and economically empower women, who are the key custodians of smallholder poultry in South-East Asia. However, low-producing chicken genotypes typically dominate smallholder or family production systems. Dr Tadelle Dessie of the International Livestock Research Institute leads a project that is testing and making 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 is also strengthening the capacity of young scientists in the project countries to conduct high-quality research on village poultry systems, for the benefit of smallholder farmers.[21]

The Safe Pork project aims to reduce the burden of bacterial foodborne disease across informal pork markets in Vietnam. Photo: ILRI Vietnam.
ACIAR project LS/2016/143

The animal origins of COVID-19 have again placed concerns about zoonotic diseases in the global policy limelight. Wet markets in Asia were singled out as a source of global pandemic risk and there were calls to close, ban, regulate and reform them. While some wet markets centre heavily on wild animals, many do not sell wildlife or bushmeat. More commonly, a wet market is a fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains. Dr Kevin Bardosh and Associate Professor Cecily Maller of RMIT University leads a rapid assessment to understand how the COVID-19 pandemic has impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms, food security, and women's economic empowerment. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[22]

The COVID-19 pandemic exposed multiple failures in economy and society, and it is clear that the costs of the global shock have not been equally distributed. Also contributing to the ACIAR COVID-19 impacts assessment is a small research activity led by Dr Paulo Santos of Monash University aims to understand what drives vulnerability to poverty among agricultural households in Myanmar and Vietnam, and what research needs to originate from such analysis. The research analyses existing expenditure and consumption data to quantify the relative importance of different shocks on poverty.[23]

Social Systems

Agrichemicals are an important tool for increasing agricultural yields and a necessary contributor to food and nutrition security. However, off-label use can have significant impacts on human and environmental health. A small research activity, led by Dr Liana Williams and Dr Lucy Carter of CSIRO, is using a human-centred approach to understand the interplay between agrichemical use and the institutional and regulatory frameworks that are intended to safeguard against off-label use, as well as networks for access to chemicals, information and training. Agrichemical use will be analysed through case studies in selected crops in Laos and Vietnam. Understanding gained from the study will serve as a foundation for future ACIAR research.[24]

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 the 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.[25]

Sea-level rise and changes to seasonal rainfall patterns reduce freshwater availability and higher saline intrusion of farms in the Mekong River Delta during the dry season. ACIAR is supporting research to identify options for profitable crop diversification in the region. ACIAR project SLAM/2018/144

Soil and Land Management

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. To maintain productivity and profitability, farmers require better soil-management techniques and profitable alternative crops to grow in the dry season. A project led by Dr 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 through diversification of saline-affected rice-based cropping systems and create a capacity legacy to enable these systems to adapt to ongoing climate change.[26]

Country Manager, Vietnam
Ms Nguyen Thi Thanh An

Research Program Managers
Agribusiness: Mr Howard Hall
Climate Change: Dr Veronica Doerr
Fisheries: Prof Ann Fleming
Forestry: Dr Nora Devoe
Livestock Systems: Dr Anna Okello
Social Systems: Dr Clemens Grünbühel
Soil and Land Management: Dr James Quilty

See page 197 for contact details.

Current and proposed projects

1. Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam (AGB/2012/061)
2. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
3. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
4. 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)
5. Planning and establishing a sustainable smallholder rice chain in the Mekong Delta [Vietnam] (AGB/2019/153)
6. Inclusive agriculture value chain financing [Indonesia, Vietnam] (AGB/2016/163)
7. Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam (AGB/2018/171)
8. 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. Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Lao PDR, Vietnam] (CS/2020/209)
10. Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam [Fiji, Vietnam] (WAC/2019/150)
11. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
12. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
13. Supporting grouper farming smallholders in Vietnam to improve their small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds (FIS/2021/121)
14. Blue economy: valuing the carbon sequestration potential in oyster aquaculture [Vietnam] (FIS/2020/175)
15. Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam (FST/2016/152)
16. Reducing forest biosecurity threats in South-East Asia [Indonesia, Vietnam] (FST/2018/179)
17. Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam] (FST/2020/123)
18. Intensification of beef cattle production in upland cropping systems in Northwest Vietnam (LPS/2015/037)
19. Safe Pork: market-based approaches to improving the safety of pork in Vietnam (LS/2016/143)
20. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
21. Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam] (LS/2019/142)
22. Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program) (LS/2020/204)
23. Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program) [Myanmar, Vietnam] (LS/2020/206)
24. Understanding agrichemical use in South-East Asia agriculture [Laos, Vietnam] (SSS/2020/143)
25. Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam (SSS/2018/139)
26. Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam (SLAM/2018/144)

5.3

South Asia

South Asia

South Asia is an immensely diverse and densely populated region. It is home to 1.5 billion people – one-quarter of the world's population. South Asia has the highest concentration of poor people in the world, with more than 500 million people living in extreme poverty.

Despite the population pressure, the region has shown impressive annual economic growth at an average of 6.7%. However, the COVID-19 pandemic is projected to significantly and negatively impact on the economic growth of the region, pushing another 71 million people into 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 population depend on agriculture for their livelihood. Although the share of agriculture in rural employment remains high, growth of the rural non-farm sector is accelerating and now provides a sizeable share of rural income and employment, primarily in services.

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 5 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, which is an indicator of acute malnutrition. South Asia also has a high prevalence of micronutrient deficiencies, overconsumption and diet-related non-communicable disease.

While the countries of South Asia face common challenges and opportunities in agriculture, there are also fundamental differences between and within these countries, in terms of the broad characteristics that influence the nature and success of agriculture. India has 15 distinct agroecological zones. Nepal has 3 distinct topographical zones. The northern hilly region of Bangladesh is geographically distinct from the southern coastal areas, mostly alluvial, with fertile floodplains associated with 3 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. These regional variations throughout South Asia must be considered when designing a meaningful program for research collaboration to accommodate regional distinctions and varying degrees of vulnerability of the local population.

According to the International Food Policy Research Institute's *2021 global food policy report: transforming food systems after COVID-19*, South Asia faces continuing and, in some cases, intensifying problems related to climate change, natural disasters, poor food safety and distortionary policies. Fall armyworm devastated Afghanistan, Pakistan and parts of India and Nepal in 2020. Bangladesh and India struggled with flooding during the pandemic and, in India, bird flu caused a nationwide food-safety scare. Distortionary policies, and the increasing costs of implementing them, remain, despite overwhelming evidence of their negative impacts and the potential to repurpose these much-needed resources for climate-smart investments or to build robust food-safety institutions. A perplexing reality remains the relatively low volume of agricultural trade among the countries of South Asia.

Given the high population densities and large numbers of vulnerable people, the COVID-19 pandemic has been an especially huge challenge for South Asia. Agriculture is highly dependent on informal labour, which has been severely limited during lockdowns and restricted by social distancing measures. These are all disruptive factors for supply chains and agriculture markets.

Photo: Conor Ashleigh.

Partner countries in the 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 is 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, across the region, watertables are 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.

Climate variability, competing and increasing demands from agriculture and industry (including energy production) and population growth are creating severe demands on water availability. Regional cooperation is increasingly essential to manage these shared resources and address shared issues. 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 South Asia region program

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 regionwide 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.

Our strategy in South Asia focuses on communities, production systems and resource management in the 3 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 the 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. Addressing these could play a major role in achieving food and nutrition security and stability in the region.

The medium-term 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.

South Asia region program 2021–22

Partner country	No. projects
Bangladesh	11
India	7
Nepal	5
Pakistan	13
Sri Lanka	2

Note that a project may be conducted in several countries, therefore the total number of projects in this table will be greater than the number of projects in the region.

Research portfolio

3 Agribusiness projects

1 Climate Change project

7 Crops projects

1 Fisheries project

1 Forestry project

2 Horticulture projects

1 Livestock Systems project

0 Social Systems projects

0 Soil and Land Management projects

9 Water projects

Table 5.3 Current and proposed projects in the South Asia region, 2021–22

Project title	Project code	Country
Agribusiness		
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
Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (Food Loss Program)	CS/2020/193	Pakistan, Sri Lanka
Climate Change		
Mitigation and adaptation co-benefits modelling trial in Bangladesh	CLIM/2021/109	Bangladesh
Crops		
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	Bangladesh
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
International Mungbean Improvement Network 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Wheat blast resistant wheat	CROP/2020/165	Bangladesh
Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan	CROP/2020/167	Bangladesh, Ethiopia, Pakistan
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
Forestry		
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
Improving smallholder wellbeing through participation in modern value chains: sustaining future growth in the Pakistan citrus industry	HORT/2020/129	Pakistan
Livestock Systems		
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	Pakistan
Water		
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	Bangladesh
Adapting to salinity in the southern Indus Basin	LWR/2017/027	Pakistan
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	LWR/2019/073	Bangladesh, India
Water management for small-holder farmers: outscaling ACIAR research in Andhra Pradesh Drought Mitigation Program	WAC/2018/164	India
Transforming smallholder food systems in the Eastern Gangetic Plain	WAC/2020/148	Bangladesh, India, Nepal
Regional foresight for food systems in the Eastern Gangetic Plains	WAC/2020/158	Bangladesh, India, Nepal
Opportunities for brackish and saline aquaculture in Pakistan	WAC/2020/179	Pakistan
Virtual Irrigation Academy business models in Pakistan	WAC/2020/180	Pakistan
Supporting inter-provincial water allocation decision making in Pakistan	WAC/2021/103	Pakistan

Bangladesh

A$1.8 million
Budgeted funding

9
Bilateral and regional research projects

2
Small projects and activities

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

The agriculture sector accounts for more than half of employment in Bangladesh. Notwithstanding its transformation from a country of chronic food shortages to one of net food grain self-sufficiency, Bangladesh still faces very substantial food security challenges. While poverty is steadily declining, many people still live below the poverty line.

Recently, 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. The ongoing challenge is to improve productivity of low-lying areas and rainfed cropping systems and increase rural incomes. This goal is adversely affected by increasing seasonal climate variability, reduced freshwater river flows and seawater intrusion.

Climate change is the most pressing issue for Bangladesh, 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 must develop adequate adaptive capacity to protect its people and economy. 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 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 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.

Key priorities for Bangladesh (National Agriculture Policy 2018) that align with ACIAR objectives are:

- diversification of crops, including production of high-value crops
- development and promotion of stress-tolerant, disease-resistant and nutritious crop varieties
- improvement of crop production systems for market-oriented agriculture
- building national capacity in innovation
- extension of technologies to increase overall productivity growth and reduce the difference between research farm and field-level yields.

We support 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. Over 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 the north and north-west regions 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 our support.

Key agricultural production challenges are common to many countries of South Asia, and we play a role in strengthening regional 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 established the ACIAR–Bangladesh Collaboration Strategy 2021–2030 and confirmed the following priorities for research collaboration:

- 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.

Research will focus on farming systems of north, north-west and coastal Bangladesh.

The Krishi Gobeshona Foundation is a strategic partner and co-investor with ACIAR in Bangladesh. The foundation is an agricultural research funding organisation that has made major investments in funding research and capacity building in ACIAR-supported projects. The partnership with the foundation for collaboration in agriculture research and development in Bangladesh was renewed in January 2021.

With a focus on grain-based agriculture, a project in China, Bangladesh, Indonesia and Pakistan endeavours to understand the nature and drivers of successful rural transformation in order to provide better evidence for policy advice. Photo: Conor Ashleigh. ACIAR project ADP/2017/024

2021–22 research program

- **11 ACIAR-supported projects in Bangladesh**
- **4 projects are specific to this country**
- **7 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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 measured not only by income growth in the rural population, but also by the degree of inclusiveness in the 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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.[1]

Climate Change

There are many potential agricultural management changes that could help accelerate global responses to climate change, but the pace of climate response is slow. Co-benefits modelling could help accelerate climate response by allowing more efficient screening of many potential interventions at once, comparing them to identify the subset that is most promising. The Agricultural Model Intercomparison and Improvement Project is a global collaborative initiative that has developed such a co-benefits modelling approach. A small research activity, co-led by Dr Carolyn Mutter and Erik Mencos Contreras at Columbia University in New York, will collaborate with colleagues in Bangladesh to trial the modelling methods in rice production systems. The researchers will refine and validate the approach and identify climate responses that have the greatest potential for multiple benefits in a cropping system, which have local as well as global significance.[2]

Crops

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 the decision-making behaviour of farm households using a behavioural economics framework. During 2022, the project will report on its testing of interventions on agricultural extension, input provision and service delivery, which are designed to encourage the uptake by smallholder farmers of innovations developed by other ACIAR projects. The project will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[3]

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. A 5-year project led by Professor William Erskine of the University of Western Australia aims to improve productivity and profitability of dry-season cropping on non-saline land, and introduce pulses and wheat with improved salinity tolerance for saline land. Final-year activities for the project include demonstrations of best practice for mungbean, cowpea, garden pea and wheat production, field validation of wheat lines for salinity tolerance, and piloting the deployment of mini-mills to process pulses grains.[4]

A new fungal disease, wheat blast, is now established in Bangladesh and is a serious risk to food security in South Asia. Recent outbreaks have been small but widespread. A large-scale epidemic is inevitable in conducive conditions, and this will have a large impact on wheat production. A new project has been established to support the operation of the wheat blast screening platform established under a previous ACIAR-supported project. The platform is operated in Jashore by Bangladesh researchers, with support from CIMMYT, and is being used by the global wheat research community. Dr Pawan Kumar Singh of CIMMYT leads the new project, which will identify new sources of resistance to wheat blast, map the resistance genes, facilitate the rapid breeding of elite varieties for Bangladesh farmers and document variety adoption by farmers.[5]

Hybrid wheat has the potential to produce more grain from the same or less land, significantly contributing to food security and land sustainability. However, technical difficulties of hybrid wheat development and the high cost of hybrid seed have constrained the commercial development of new varieties for many decades. Professor Richard Trethowan of the University of Sydney leads a new project that aims to extend the benefits of new hybrid wheat systems to researchers, wheat breeders, farmers and consumers in Pakistan, Bangladesh and Ethiopia. The university has developed a novel, cost-effective and practical system to rapidly produce large numbers of wheat hybrid combinations for testing in breeding programs, and to produce large amount of hybrid seeds for sale to farmers at an acceptable cost. The project will establish the performance of the hybrids, and determine effective technical processes and business models to produce the seed in collaboration with the national programs and local seed providers in each country.[6]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through a 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 in Bangladesh, India, Myanmar and Australia. Phase 2 of the network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[7]

Water

Improved nutrient management to increase the profitability and sustainability of intensive and emerging cropping systems is the focus of a project in the coastal zone of Bangladesh, led by Professor Richard Bell of Murdoch University. The first phase of the project (2017 to 2021) established that the adoption of fertiliser recommendation tools can decrease production costs and increase income and yield for smallholder farmers. The project has been extended until the end of 2022 to scale out the use of tools developed by the project and advance practice change. The final phase of the project will test a collective action approach for nutrient management and expand the scope for monitoring and evaluation of the innovations.[8]

In the salt-affected coastal zones of the Ganges Delta, which lies in both Bangladesh and India, this project has clearly demonstrated that improved crop, water and salt management 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, 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 the 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.[9]

ACIAR supports a project to understand how adoption and adaptation of technologies such as salt-tolerant wheat and pulses can be increased beyond project areas. Photo: Conor Ashleigh. ACIAR project CIM/2014/076

A new project aims to understand how food systems can be transformed to improve farm livelihoods while reducing inequity, production risk and unsustainable resource use. Photo: Conor Ashleigh. ACIAR project WAC/2020/148

The Eastern Gangetic Plains straddles Bangladesh, India and Nepal. The region is home to 450 million people and has the world's highest concentration of rural poverty. People in this region have a high dependence on agriculture for food and livelihood security. A new project, starting in 2021, aims to understand the processes and practices of transforming food systems through diversification to improve farm livelihoods while reducing inequity, production risk and unsustainable resource use. Dr Tamara Jackson of the University of Adelaide leads this project that begins with understanding the existing context for diversification in the region, covering a range of different technologies, scaling interventions, and policies and programs. The project will consider these elements individually and demonstrate the interactions between them using case studies to highlight where and how diversification has occurred in the past. In subsequent phases, the project will identify priority opportunities with communities and determine their fit with projected climate change and water availability, and the impact of high-level policies.[10]

The Sustainable Development Investment Portfolio (SDIP) drew on Australian expertise and technologies to improve integrated management of water, energy and food production in the basins of the Indus, Ganges and Brahmaputra rivers. ACIAR supported 10 projects over 8 years within this program in Bangladesh, India and Nepal. A small project will prepare delegates to build on the outcomes of SDIP at international and regional dialogues in the second half of 2021. Led by Dr Avinash Kishore of the International Food Policy Research Institute, a core team of local partners will undertake participatory 'foresight for food' exercises in their respective domains and then communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[11]

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Managers
Agribusiness: Mr Howard Hall
Climate Change: Dr Veronica Doerr
Crops: Dr Eric Huttner
Water: Dr Robyn Johnston

See page 197 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. Mitigation and adaptation co-benefits modelling trial in Bangladesh (CLIM/2021/109)
3. Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh (CIM/2014/076)
4. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
5. Wheat blast resistant wheat [Bangladesh] (CROP/2020/165)
6. Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan (CROP/2020/167)
7. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
8. Nutrient management for diversified cropping in Bangladesh (LWR/2016/136)
9. Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India] (LWR/2019/073)
10. Transforming smallholder food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/148)
11. Regional foresight for food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)

India

A$0.7 million
Budgeted funding

5
Bilateral and regional research projects

2
Small projects and activities

With more than 1.3 billion people, India is the second most populous country in the world, after China, and accounts for 18% of the world's population. Two-thirds of India's population live in rural areas, with landholdings averaging 1.1 hectares. The rural population is highly vulnerable to the impacts of a declining natural resource base, biosecurity threats and climate change.

Worth US$2.94 trillion, India is the world's fifth largest economy, overtaking the United Kingdom and France. 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 exporter of cotton. While the contribution of the agriculture sector to GDP is declining, agriculture remains a major source of employment and accounts for 42% of the total national workforce.

The COVID-19 pandemic and associated lockdowns affected all sectors of the Indian economy; however, agriculture emerged as the main driver of economic growth, recording positive growth of 3.4% (at constant prices) in 2020–21.

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 sector is still challenged by inefficient market mechanisms, subsidy distortions, lack of storage infrastructure, inefficient use of natural resources and susceptibility to climate change and extreme weather events.

In response to the COVID-19 pandemic, the government announced the 'Atmanirbhar Bharat Abhiyan' (Self-Reliant India) program in 2020. The initiative included institutional credit facilities at concessional rates, creation of an Agriculture Infrastructure Development Fund for projects at farm-gate and aggregation points, and release of emergency funds to provide working capital to farmers through crop loans. The initiative continued into 2021 with increased allocation to the infrastructure fund.

The Government of India, in its various policies and schemes, focuses closely on the role of women in agriculture. It advocates mainstreaming of women's role in agriculture as part of all programs 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, where they 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. As part of the response being coordinated by Australia's High Commission, in 2021–22 ACIAR is working to clarify the role we can play in supporting the ambition for increased research collaboration between India and Australia.

India and Australia will enhance collaboration on science, technology and research during 2021–22, with one focus being sustainable intensification with a nutrition framework. Photo: Conor Ashleigh. ACIAR project WAC/2020/158

Country priorities

ACIAR has supported a program of collaborative research with India since 1983. Presently, the ACIAR research program with India is delivered entirely through a regional collaborative approach involving neighbouring countries with shared issues and opportunities. Substantial co-investment from India will increasingly become a desired characteristic of our partnership 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 2021–22, as part of a partnership refresh between ACIAR and Indian Council of Agricultural Research, we will explore, at India's request, the possibilities for enhanced collaboration in:

- sustainable intensification with a nutrition framework
- diversification into new dry-season crops
- the role of biotechnology in crop development
- new mechanisation opportunities including farm robotics
- a next phase of mungbean breeding for high-yielding varieties
- groundwater management (overexploitation and under-exploitation)
- co-investment and trilateral collaboration.

2021–22 research program

- **7 ACIAR-supported projects in India**
- **1 project is specific to this country**
- **6 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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

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 the decision-making behaviour of farm households using a behavioural economics framework. During 2022, the project will report on its testing of interventions on agricultural extension, input provision and service delivery, which are designed to encourage the uptake by smallholder farmers of innovations developed by other ACIAR projects. The project will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[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, which aims 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]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through a 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 in Bangladesh, India, Myanmar and Australia. Phase 2 of the network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[3]

Water

Australian experts are providing technical support to 5 large land and water management programs in the Indian states of Andhra Pradesh and Odisha. These programs draw 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. COVID-19 outbreaks in South Asia mean that training will be delivered online and field activities have been postponed. There is growing interest in the training, and other partners may join during 2021–22.[4]

In the salt-affected coastal zones of the Ganges Delta, which lies in both Bangladesh and India, this project has clearly demonstrated that improved crop, water and salt management 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, 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 the 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.[5]

The Eastern Gangetic Plains straddles Bangladesh, India and Nepal. The region is home to 450 million people and has the world's highest concentration of rural poverty. People in this region have a high dependence on agriculture for food and livelihood security. A new project, starting in 2021, aims to understand the processes and practices of transforming food systems through diversification to improve farm livelihoods while reducing inequity, production risk and unsustainable resource use. Dr Tamara Jackson of the University of Adelaide leads this project that begins with understanding the existing context for diversification in the region, covering a range of different technologies, scaling interventions, and policies and programs. The project will consider these elements individually and demonstrate the interactions between them using case studies to highlight where and how diversification has occurred in the past. In subsequent phases, the project will identify priority opportunities with communities and determine their fit with projected climate change and water availability, and the impact of high-level policies.[6]

The Sustainable Development Investment Portfolio drew on Australian expertise and technologies to improve integrated management of water, energy and food production in the basins of the Indus, Ganges and Brahmaputra rivers. ACIAR supported 10 projects over 8 years within this program in Bangladesh, India and Nepal. A small project will prepare delegates to build on the outcomes of the Sustainable Development Investment Portfolio at international and regional dialogues in the second half of 2021. Led by Dr Avinash Kishore of the International Food Policy Research Institute, a core team of local partners will undertake participatory 'foresight for food' exercises in their respective domains and then communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[7]

Regional Manager, South Asia
Dr Pratibha Singh

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

See page 197 for contact details.

Current and proposed projects

1. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
2. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
3. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
4. Water management for small-holder farmers: outscaling ACIAR research in Andhra Pradesh Drought Mitigation Program [India] (WAC/2018/164)
5. Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India] (LWR/2019/073)
6. Transforming smallholder food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/148)
7. Regional foresight for food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)

New cropping technologies and improved water management techniques will be identified in a new project in the salt-affected coastal zones of the Ganges Delta, which lies in both Bangladesh and India. Photo: Conor Ashleigh. ACIAR project WAC/2019/134

Nepal

A$0.7 million
Budgeted funding

4
Bilateral and regional research projects

1
Small research activity

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.

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 3 tiers of government.

Agriculture in Nepal is highly diverse due to the wide range of climates and geographies in the country. 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:

- the need for seed system improvements
- 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.

Natural disasters also frame the recent history of the country. In 2015, the deadliest earthquake in 81 years struck Nepal, followed by hundreds of aftershocks and another severe earthquake 17 days later. 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.

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 2021–22 continues to be the engagement of Nepal in a regional program to improve integration of soil, water, crop, livestock and tree components of the farming systems.

Increased farm and forest productivity remains a core priority of Nepal for collaboration with ACIAR to improve food and nutrition security of the rural poor. In the Middle Hills districts, where the impacts of earthquakes and floods remains, our program supports the request of the Nepalese Government to focus primarily on research to support increased timber production from community forests. Another area of requested focus is understanding the implications of federalism on agriculture in 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 2021–22. 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.

Nepal hosts an important regional research body – the International Center for Integrated Mountain Development. In 2021–22, ACIAR will work with the centre to identify prospective areas for research collaboration.

2021–22 research program

- **5 ACIAR-supported projects in Nepal**
- **1 project is specific to this country**
- **4 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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.

Crops

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 the decision-making behaviour of farm households using a behavioural economics framework. During 2022, the project will report on its testing of interventions on agricultural extension, input provision and service delivery, which are designed to encourage the uptake by smallholder farmers of innovations developed by other ACIAR projects. The project will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.[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, which aims 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]

Forestry

The Middle Hills of Nepal are home to 44% of the country's population, and 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.[3]

Water

The Eastern Gangetic Plains straddles Bangladesh, India and Nepal. The region is home to 450 million people and has the world's highest concentration of rural poverty. People in this region have a high dependence on agriculture for food and livelihood security. A new project, starting in 2021, aims to understand the processes and practices of transforming food systems through diversification to improve farm livelihoods while reducing inequity, production risk and unsustainable resource use. Dr Tamara Jackson of the University of Adelaide leads this project that begins with understanding the existing context for diversification in the region, covering a range of different technologies, scaling interventions, and policies and programs. The project will consider these elements individually and demonstrate the interactions between them using case studies to highlight where and how diversification has occurred in the past. In subsequent phases, the project will identify priority opportunities with communities and determine their fit with projected climate change and water availability, and the impact of high-level policies.[4]

The Sustainable Development Investment Portfolio drew on Australian expertise and technologies to improve integrated management of water, energy and food production in the basins of the Indus, Ganges and Brahmaputra rivers. ACIAR supported 10 projects over 8 years within this program in Bangladesh, India and Nepal. A small project will prepare delegates to build on the outcomes of the Sustainable Development Investment Portfolio at international and regional dialogues in the second half of 2021. Led by Dr Avinash Kishore of the International Food Policy Research Institute, a core team of local partners will undertake participatory 'foresight for food' exercises in their respective domains and then communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.[5]

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Managers
Crops: Dr Eric Huttner
Forestry: Dr Nora Devoe
Water: Dr Robyn Johnston

See page 197 for contact details.

Current and proposed projects

1. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
2. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
3. Enhancing livelihoods through improved forest management in Nepal (FST/2017/037)
4. Transforming smallholder food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/148)
5. Regional foresight for food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)

ACIAR supported 10 projects within the Sustainable Development Investment Portfolio over 8 years in Bangladesh, India and Nepal. A new project will support local partners to undertake participatory 'foresight for food' exercises. Photo: Conor Ashleigh. ACIAR project WAC/2020/158

Pakistan

A$3.1 million
Budgeted funding

10
Bilateral and regional research projects

3
Small projects and activities

Agriculture is the largest sector of Pakistan's economy, contributing 19% to GDP and engaging 38% of the national workforce. This is the largest segment of the workforce and two-thirds are women. Pakistan's strong research system has been driving innovation and improvements in this sector.

The COVID-19 pandemic has put significant pressure on the economy of Pakistan. Drastic measures to control the pandemic significantly reduced economic activity (including activity in agrifood systems), with consequent impacts on livelihoods, food security and nutrition.

Before the pandemic, about 25% of the population lived below the national poverty line. Food insecurity is typically high, with 20–30% of the population (40 to 62 million people) experiencing some form of food insecurity and chronic vulnerability through natural hazards and shocks, including the ongoing pandemic. The continued lockdown has affected the demand for food. This is due not only to limited physical access but also declining financial resources. The lockdown has reduced or eliminated the earnings of almost 3 million informal daily wage labourers working in agriculture and other related activities.

Food market mechanisms in Pakistan are strong and well-integrated but temporary supply shocks occurred due to disturbance in logistics. This affected the price and supply of perishable goods, imported food and processed food. Along with a high rate of population growth, food and water security are among the most pressing challenges for Pakistan in the current circumstances.

Pakistan recognises that cost-effective availability of energy, water and food is essential to ensure sustainable economic growth and development. Sizeable national and provincial programs are being funded to revolutionise the agriculture and livestock sectors. These programs are aimed at increasing agricultural productivity and value addition, reducing dependence on imports, supporting and stimulating agriculture-based industries, and improving the livelihoods and wellbeing of farming communities.

Pakistan is ranked third in the world of countries facing water shortages. It is estimated that Pakistan will become the most water-stressed country in South Asia by 2040, with absolute water scarcity by 2025. The are many reasons for the country's water scarcity. The most important are climate change, urbanisation and high dependence on groundwater for agriculture and other operations.

Country priorities

Australia has a 70-year development assistance relationship with Pakistan, which has contributed to Pakistan's long-term economic prosperity, stability and resilience. ACIAR is regarded as a key international partner supporting agricultural research in Pakistan. Australia is seen as a country with deep, relevant expertise in agriculture, livestock production and water management. Our work is high profile and regularly gains the attention of policymakers at national and provincial levels.

Australia has helped Pakistan increase livelihood opportunities for men and women living in poverty by enhancing agricultural productivity and expanding revenue streams for farmers through improved water management practices, adding value to raw agricultural products and improving access to markets. Our programs have invested in the people of Pakistan, especially women and girls.

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

The ongoing focus of our research collaboration is:

- empowering women to enhance farm incomes
- water management, particularly horizontal expansion, salinity management, water harvesting, and low-cost/high-efficiency irrigation systems
- crop improvement, particularly productivity enhancement and access to novel breeding techniques
- horticulture, including fresh produce and nursery certification systems
- agribusiness development, including background research in value-adding, product development, branding and traceability systems for growing private sector needs, which the national system cannot provide
- models for rural transformation.

When pandemic conditions permit, we will recalibrate our relationship with Pakistan with a 10-year plan for research cooperation. This will enable a stronger equal partnership of international research collaboration with substantial co-investment for mutual benefit.

2021–22 research program

- **13 ACIAR-supported projects in Pakistan**
- **9 projects are specific to this country**
- **4 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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

Pulses are important to both agricultural systems and diets in Pakistan, but domestic production has declined in recent decades and now 80% of lentils and 10% of chickpeas are imported to meet domestic demand. A project led by Dr Rajendra Adhikari of the University of Queensland is developing socially inclusive and competitive value chains for pulses in Punjab and Sindh, and spillover benefits are expected for Khyber Pakhtunkhwa. These 3 regions are characterised by gender inequality within industry and society. Chickpeas, lentils and mungbean are well-suited to smallholder farming by both women and men. By developing production and market knowledge and increasing capacity of farmers and stakeholders, the project will improve connections between farmers and markets. The project will produce policy advice and recommendations for national and district level decision-makers and assist industry development.[1]

Success in rural transformation is measured not only by income growth in the rural population, but also by the degree of inclusiveness in the 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. With a focus on grain-based agriculture, during 2021–22 the project will select study regions and collect data to understand the components of success and the different impacts of rural transformation on women and men.[2]

Horticulture, especially fresh fruits and vegetables are important food commodities in both Pakistan and Sri Lanka. Maintaining quality and freshness under humid tropical conditions presents a vast challenge in meeting the growing demand for domestic consumption and export. Supply chains are inadequate and inefficient. Food losses are large, especially during seasonal gluts. Associate Professor Anwar Shah of Quaid-e-Azam University leads a new project using mango and tomato as focal commodities to map value chains in Pakistan and Sri Lanka, to identify the extent and root causes of food losses. The project will then design and demonstrate affordable technological and organisational options to mitigate losses and create new economic opportunities. Sri Lanka provides a useful case study to contrast the fruits and vegetables value chain of Pakistan, as the 2 countries are at different stages of development and face different exposure regimes and vulnerabilities. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).[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, which aims 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]

Hybrid wheat has the potential to produce more grain from the same or less land, significantly contributing to food security and land sustainability. However, technical difficulties of hybrid wheat development and the high cost of hybrid seed have constrained the commercial development of new varieties for many decades. Professor Richard Trethowan of the University of Sydney leads a new project that aims to extend the benefits of new hybrid wheat systems to researchers, wheat breeders, farmers and consumers in Pakistan, Bangladesh and Ethiopia. The university has developed a novel, cost-effective and practical system to rapidly produce large numbers of wheat hybrid combinations for testing in breeding programs, and to produce large amount of hybrid seeds for sale to farmers at an acceptable cost. The project will establish the performance of the hybrids, and determine effective technical processes and business models to produce the seed in collaboration with the national programs and local seed providers in each country.[5]

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. In 2022, a project led by Dr Ata-ur Rehman of Charles Sturt University will finalise farmer-led research and demonstrations of improved varieties, agronomic practices and community seed production to increase the production and profitability of pulses.[6]

Pakistan is one centre in a network of wheat improvement centres across South Asia and eastern Africa working to reduce the vulnerability of wheat to stripe rust. Photo: Conor Ashleigh. ACIAR project CIM/2014/081

Case studies and evaluations highlighted key success factors associated with a value-chain approach to rural development projects in the dairy sector, and will be a useful basis for other research groups. Photo: Conor Ashleigh. ACIAR project LPS/2016/011

Horticulture

The horticulture sector in Pakistan is significant, both domestically and for export production. The Australia–Pakistan Agriculture Sector Linkages Program made significant progress in strengthening the value chains for mango and citrus, and exploring prospects for developing heat-tolerant varieties of vegetables. Dr Babar Ehsan Bajwa of CABI leads a project that is strengthening selected vegetable value chains in Punjab and Sindh provinces, as part of the Agriculture Value Chain Collaborative Research Program (Aik-Saath). 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 2021–22, technical innovations and scaling out improvements to increase the capacity and incomes of farming families, traders and intermediaries will be tested and developed.[7]

Citrus is Pakistan's leading fruit crop and although production is increasing, productivity is below comparable countries, farm-gate waste is high and value is stagnant. Waste continues throughout the value chain, with post-harvest losses in citrus ranging between 23% and 38%. Despite these limitations, the industry's main product, Kinnow mandarin, has market potential at higher levels of quality and value, especially for export. Further, citrus industry development is a priority for provincial and national governments. A new project in 2021, led by Dr Rajendra Adhikari of the University of Queensland, aims to improve the wellbeing of citrus-producing smallholder families from participation in inclusive value chains that meet market needs and provide equitable returns to farmers.[8]

Livestock Systems

Rising demand and prices for beef in Pakistan present new opportunities for smallholder farmers. Traditionally, beef is a by-product of the dairy sector. Male animals and old cows are used for meat, so there are trade-offs between increasing milk production and growing cattle and buffaloes for meat. A project led by Dr David McGill of the University of Melbourne identified practices to improve on-farm efficiency and profitability, and new value-chain opportunities. The project concludes in 2022 with case studies and evaluations to highlight the key success factors associated with the value-chain approach to rural development projects. These examples form a useful basis for other research groups, projects and organisations.[9]

Water

Salinity currently affects 4.5 million hectares of land across Pakistan and 54% of the southern Indus Basin. In this region, salinisation and sodification of surface soils and waterlogging threaten agricultural production and livelihoods, resulting in high rates of poverty for communities living in affected areas. A 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. During 2021–22, the project will conduct activities in Pakistan and Australia to understand biophysical and institutional trends in relation to agricultural production systems, develop an accessible database of salinity adaptation options for farmers, and investigate and develop monitoring tools and decision-support applications for use by farmers.[10]

In Asian mega-deltas such as the Mekong and Ganges, one response to salinisation from seawater intrusion has been a shift from cropping to brackish and saline water aquaculture. In Pakistan, aquaculture production is relatively limited. During 2021–22, scientists from the International Water Management Institute and the WorldFish Centre, led by Dr Mohsin Hafeez, will review the options and potential for brackish and marine aquaculture in Pakistan, and the extent to which aquaculture could provide a transformative adaptation strategy for areas affected by salinisation in the southern Indus Basin.[11]

Irrigated cropping is critical to Pakistan's economy and food security, and effective management of the country's irrigation is an urgent priority. While basin-level water management is efficient, distribution of water at the community level is inefficient and unfair, and yields and water productivity are low. A small project led by Dr Richard Stirzaker of CSIRO, in partnership with Pakistan Council for Research on Water Resources, will demonstrate use of the Virtual Irrigation Academy (including Chameleon and Full-Stop soil moisture monitoring) to understand its potential to improve irrigation water management in Pakistan. The Virtual Irrigation Academy provides a digital platform to monitor soil water, underpinned by a process of social learning to improve irrigation management at the farm and scheme level. The program was developed through ACIAR-supported projects in southern Africa.[12]

The Indus Basin Irrigation System is the world's largest continuous irrigation system and it provides water, energy and food security for Pakistan. Responsibility for the system's surface water resources is shared between the Indus River System Authority, the Water and Power Development Authority and provincial irrigation departments. Allocation of the water resource is a complex process that is only a few people understand. CSIRO, through a DFAT-funded project in close collaboration with partners in Pakistan, developed the Water Apportionment Accord Tool to enable a more transparent and consistent allocation process. A small project will consolidate and expand the use of the tool during 2021–22. Dr Mobin-ud Din Ahmad of CSIRO will support and train in-country partners for the next 2 rounds of seasonal planning, and further develop and refine the software and training material associated with the tool.[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 197 for contact details.

Current and proposed projects

1. Developing competitive and inclusive value chains of pulses in Pakistan (ADP/2017/004)
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. Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (Food Loss Research Program) (CS/2020/193)
4. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
5. Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan (CROP/2020/167)
6. Increasing productivity and profitability of pulse production in cereal-based cropping systems in Pakistan (CIM/2015/041)
7. Strengthening vegetable value chains in Pakistan for greater community livelihood benefits (HORT/2016/012)
8. Improving smallholder wellbeing through participation in modern value chains: sustaining future growth in the Pakistan citrus industry (HORT/2020/129)
9. Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan (LPS/2016/011)
10. Adapting to salinity in the southern Indus Basin [Pakistan] (LWR/2017/027)
11. Opportunities for brackish and saline aquaculture in Pakistan (WAC/2020/179)
12. Virtual Irrigation Academy business models in Pakistan (WAC/2020/180)
13. Supporting inter-provincial water allocation decision making in Pakistan (WAC/2021/103)

Sri Lanka

A$0.5 million
Budgeted funding

2
Bilateral and regional research projects

Following a 26-year civil war and a tsunami in 2004 that left tens of thousands of people dead, injured or homeless, Sri Lanka has moved ahead to achieve middle-income country status. ACIAR is exploring opportunities for re-engagement based on mutual benefit and co-investment.

While Sri Lanka ranks 72 out of 189 countries on the Human Development Index 2020, growth has not been uniform. 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 post-conflict 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 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, any further re-engagement with Sri Lanka will build on lessons from this first project and on significant co-investment from Sri Lanka.

2021–22 research program

The 2016 scoping study for ACIAR's re-engagement with Sri Lanka identified 6 broad areas for potential future collaboration with Sri Lanka. Given that the partnership is completely new, in 2020–21 we started a single multidisciplinary project in aquaculture for freshwater shrimp, which includes a socioeconomic component, focused on communities in the Northern province.

This year we start a second project looking at ways to reduce food loss in fruit and value chains in Sri Lanka and Pakistan, as part of the Food Loss Research Program (see page 8).

ACIAR is supporting a project that is investigating stocking, monitoring and harvesting practices to optimise fish and prawn productivity and improve product quality. ACIAR project FIS/2018/157

Agribusiness

Horticulture, especially fresh fruits and vegetables are important food commodities in both Pakistan and Sri Lanka. Maintaining quality and freshness under humid tropical conditions presents a vast challenge in meeting the growing demand for domestic consumption and export. Supply chains are inadequate and inefficient. Food losses are large, especially during seasonal gluts. Associate Professor Anwar Shah of Quaid-e-Azam University leads a new project using mango and tomato as focal commodities to map value chains in Pakistan and Sri Lanka, to identify the extent and root causes of food losses. The project will then design and demonstrate affordable technological and organisational options to mitigate losses and create new economic opportunities. Sri Lanka provides a useful case study to contrast the fruits and vegetables value chain of Pakistan, as the 2 countries are at different stages of development and face different exposure regimes and vulnerabilities. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).

Project: Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (Food Loss Research Program) (CS/2020/193)

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 a previous ACIAR project 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. A project led by Dr Clive Jones of James Cook University is investigating stocking, monitoring and harvesting practices to optimise fish and prawn productivity and improve product quality. The project will also conduct market-chain analysis to ensure farming practices meet market product requirements and benefits are socially equitable.

Project: Improved productivity, efficiency and sustainability of the culture-based fishery for finfish and giant freshwater prawn in Sri Lankan reservoirs (FIS/2018/157)

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Manager
Agribusiness: Mr Howard Hall
Fisheries: Prof Ann Fleming

See page 197 for contact details.

5.4

Eastern and Southern Africa

Eastern and Southern Africa

While the economic performance of the African region has been strong for several years, the COVID-19 pandemic has taken a heavy toll on lives and economies. Economic activity is projected to decline by 3.3% in 2020, confirming the region's worst recession in more than half a century.

Eastern and southern African countries have been the most affected by the economic impacts of the pandemic, with heavy disruptions to tourism, domestic consumption and investment due to lockdowns and movement restrictions. This could push an estimated 40 million people into extreme poverty in 2021 if appropriate measures are not taken, erasing the gains of the last 5 years. The region is expected to rebound in 2021, although this is subject to great uncertainties from both external and domestic risks.

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 44% 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 impacts associated with climate change, which continue to hamper agricultural production, productivity and reliability and increase the demand for land and water. In addition, rural demographics continue to change. Rural populations are ageing, many farms are getting smaller, and rural youth are 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. Their small farms are transforming into business operations, which in turn brings 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.

Partner countries in the ACIAR Eastern and Southern Africa region

- Burundi
- Ethiopia
- Kenya
- Malawi
- Mozambique
- Rwanda
- South Africa
- Tanzania
- Uganda
- Zambia
- Zimbabwe

Photo: Andrew Munuwa

Farmers from the Kiwere irrigation scheme have worked with researchers as part of a regional project transforming smallholder irrigation into profitable and self-sustaining systems. Photo: Andrew Munuwa. ACIAR project LWR/2016/137

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 introduced a biannual 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. The 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.

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 we will continue to liaise with are the Forum for Agricultural Research in Africa and the African Union Development Agency–New partnership for Africa Development.

We also liaise with sub-regional organisations, which are mainly coordination bodies for research, policy and markets, especially the Association for Strengthening Agricultural Research in Eastern and Central Africa, the Food, Agriculture, and Natural Resources Policy Analysis Network, the Centre for Coordination of Agricultural Research and Development for Southern Africa and the Common Market for Eastern and Southern Africa.

Southern and Eastern Africa region program 2021–22

Partner country	No. projects
Burundi	1
Ethiopia	7
Kenya	8
Malawi	4
Mozambique	5
Rwanda	2
South Africa	5
Tanzania	5
Uganda	3
Zambia	2
Zimbabwe	4

Note that a project may be conducted in several countries, therefore the total number of projects in this table will be greater than the number of projects in the region.

Research portfolio

2 Agribusiness projects

0 Climate Change projects

8 Crops projects

0 Fisheries projects

0 Forestry projects

1 Horticulture project

4 Livestock Systems projects

0 Social Systems projects

0 Soil and Land Management projects

2 Water projects

5 CultiAF2 projects

Table 5.4 Current and proposed projects in the Southern and Eastern Africa region, 2021–22

Project title	Project code	Country
Agribusiness		
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) – Zambia (Food Loss Research Program)	CS/2021/115	Zambia
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) – Malawi (Food Loss Research Program)	CS/2020/210	Malawi
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
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 2	CROP/2019/144	Bangladesh, India, Indonesia, Kenya, Myanmar
Protecting Ethiopian lentil crops	CROP/2020/164	Ethiopia
Mechanization and conservation agriculture-based crop-livestock innovation in eastern Africa	CROP/2020/166	Kenya, Tanzania
Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan	CROP/2020/167	Bangladesh, Ethiopia, Pakistan
Demand led plant variety design for emerging markets in Africa	FSC/2013/019	Ghana, Kenya, South Africa, Tanzania
Horticulture		
Developing a biosecurity system for small banana growers resilient to Fusarium wilt TR4 in southern and eastern Africa	HORT/2020/128	Mozambique, South Africa, Tanzania
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
Resilient and low-carbon livestock systems for trade and food security in the rangelands of eastern and southern Africa	LS/2020/152	Ethiopia, Kenya, Zimbabwe
Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa	LS/2020/154	Kenya, Rwanda, Uganda
Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines	LS/2020/204	Kenya, Philippines, Vietnam
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
CultiAF2		
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 programme to combat their menaces (CultiAF 109040)	GP/2019/175	Malawi, Mozambique, Zambia, Zimbabwe
Harnessing dietary nutrients of underutilised 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

Eastern & Southern Africa

A$6.1 million
Budgeted funding

19
Bilateral and regional research projects

3
Small projects and activities

The agricultural environments of eastern and southern Africa and 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 3 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. Our work is highly regarded and remains as relevant now as it was 30 years ago because of our focus on brokering research partnerships between Africa and Australia and our long-term commitment to addressing specific constraints in agricultural production with multiyear projects.

We currently invest 10% of our annual budget in our Eastern and Southern Africa regional program and directly fund projects in partnership with 11 African countries. However, our footprint is much broader because of our contribution to the CGIAR, which has 4 of its centres located in Africa and, until recently, spent half of its total budget in Africa.

Our program is delivered primarily through bilateral country research partnerships (linked to regional impact pathways) and regional collaborations coordinated with sub-regional organisations. We also have a strong element of engagement through the CGIAR. The portfolio of projects covers a diverse range of priorities, guided by the recommendations of the regional research coordination bodies that we collaborate with.

We also have a substantial collaboration with the Canadian International Development Research Centre that is focused on Africa – the Cultivate Africa's Future Fund (CultiAF). CultiAF is in its second phase, supporting 9 projects across 7 countries. Four projects were rolled over from CultiAF phase 1 and ended in mid-2021. This program harnesses the complementary interests and skill sets of both organisations to deliver projects researching:

- the potential of insects as feed for poultry, fish and pig production
- harnessing underutilised 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.

2021–22 research program

- **22 ACIAR-supported projects in eastern and southern Africa**
- **18 projects are specific to this country**
- **4 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our 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.

A project facilitiated by the Alliance for Agricultural Research and Development for Food Security has strengthened education and training programs for plant breeders across Africa and increased capacity in demand-led variety design. Photo: Emmie Wachira. ACIAR project FSC/2013/019

Agribusiness

Zambia and Malawi are among the hungriest and the fastest urbanising countries in the world. The number of people in acute food situations continues to rise, grabbing international attention in policy dialogues on food and nutrition security. One of the key strategies to address this hunger and nutrition challenge lies in addressing food loss along the food value chain. With the demographic shift to cities and towns, food value chains now involve many actors that influence the way that food is produced, processed, distributed, marketed and consumed. This situation has resulted in increased number of actors, raised questions of actor responsibility and inefficiency (both resulting in increased food loss), increased cost of food and reduced nutrition security. Dr Gilbert Siame of the University of Zambia and Dr Mtafu Manda of Mzuzu University of Malawi lead 2 new projects that seek to make an intervention at 4 stages of the fresh food value chain (only fresh produce) in selected cities in Zambia and Malawi to understand the drivers and implications of food loss at points of production, transportation, open-air markets and households. This project is part of the ACIAR–IDRC Food Loss Research Program (see page 8).[1, 2]

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 25) and led by Professor Kaye Basford of the University of Queensland engages with plant-breeding and university sectors in many countries. Phase 1 identified skills and processes needed for breeders to obtain high-performing plant varieties to meet the demands of emerging markets in Sub-Saharan Africa. Phase 2 provided more plant breeders with access to the program and focused on the implementation of best practice in demand-led plant-breeding programs for beans and tomatoes. The project concludes in 2021 with the strengthening of education and training programs for plant breeders across Africa to build capacity in demand-led variety design.[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, which aims 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]

Hybrid wheat has the potential to produce more grain from the same or less land, significantly contributing to food security and land sustainability. However, technical difficulties of hybrid wheat development and the high cost of hybrid seed have constrained the commercial development of new varieties for many decades. Professor Richard Trethowan of the University of Sydney leads a new project that aims to extend the benefits of new hybrid wheat systems to researchers, wheat breeders, farmers and consumers in Pakistan, Bangladesh and Ethiopia. The university has developed a novel, cost-effective and practical system to rapidly produce large numbers of wheat hybrid combinations for testing in breeding programs, and to produce large amount of hybrid seeds for sale to farmers at an acceptable cost. The project will establish the performance of the hybrids, and determine effective technical processes and business models to produce the seed in collaboration with the national programs and local seed providers in each country.[5]

Faba bean is the most important legume crop in Ethiopia, where pulses contribute 15% of the protein consumed. A newly established disease, faba bean gall, threatens the ongoing cultivation, viability and existence of the crop 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 2021–22, the project continues crop and farmer surveys to understand the distribution of faba bean diseases and the influence of location and farming practices, and to explore integrated management options for the control of disease.[6]

Using new plant breeding methods, a 5-year project aims to deliver genotypes of the common bean (*Phaseolus vulgaris*) that have 30% shorter cooking time, higher zinc and iron content than current varieties, better resistance to bruchid beetle and *Pythium* root rot, and adapted agronomic traits. The 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.[7]

Mungbean is an ideal rotation crop for smallholder farmers. The International Mungbean Improvement Network, established through a 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 in Bangladesh, India, Myanmar and Australia. Phase 2 of the network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.[8]

Legumes hold potential for both sustainable cropping and food security in eastern and southern Africa. ACIAR is supporting research to improve cropping systems for faba beans, common beans, mung beans and lentils in 2021–22.

Lentils are one of the main pulses consumed and an essential rotation cash crop for smallholders in cereal-based cropping systems of the mid-highlands of Ethiopia. Protecting the lentil crop and increasing its productivity is a priority for the Ethiopian Institute of Agricultural Research, as previously minor viral diseases have recently become high-impact epidemics. A new project led by Professor Martin Barbetti of the University of Western Australia will mobilise the best expertise in Australia and the International Center for Agricultural Research in the Dry Areas to support Ethiopian lentil breeding and plant pathologists, provide germplasm with a high level of resistance to the target diseases and establish sustainable disease management practices, with the overall aim of restoring resilience to a farming system under threat.[9]

We intend to commission a new project in eastern Africa (under design at the time of publishing) to explore the costs and benefits of applying conservation agriculture methods with small, mechanised tools in mixed crop-livestock systems where farmers need to manage trade-offs between retaining crop residues on the soil and using them to feed cattle.[10]

Livestock are the lifeblood of rangeland farming systems and the people that thrive within them. A new project will address knowledge gaps and identify opportunities to increase livestock productivity and trade, while reducing greenhouse gas emissions. ACIAR project LS/2020/152

Horticulture

Fusarium wilt tropical race 4 (TR4) of bananas is caused by a highly destructive and invasive plant pathogen, the soil-borne fungus *Fusarium* sp. The disease, also called Panama disease, was first detected in Africa in 2013, in northern Mozambique, and further spread of the disease in and beyond Mozambique would be catastrophic. In eastern and central Africa, 70–100 million people rely directly or indirectly on bananas for their livelihoods. A new project led by Mr Stewart Lindsay of the Queensland Department of Agriculture and Fisheries aims to understand the vulnerabilities of banana farming systems in Mozambique and Tanzania and work with country partners and landholders to identify biosecurity measures to reduce risks and mitigate the damage in farmer fields. The project aims to build knowledge specifically for smallholder banana production systems, which can inform research, extension, regulatory and policy decisions more broadly in Africa, Asia and Latin America, where smallholder banana producers are common.[11]

Livestock Systems

Livestock management is an important source of farm-level diversification for smallholder farmers in eastern and southern Africa. Improved links 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 facilitated smallholder farmers to supply pasture-fed beef for sale at selected supermarket outlets. During 2021–22, researchers will continue to work with local stakeholders to establish commercially viable, pasture-fed beef value chains, and improve the competitiveness of small-scale beef cattle farmers through demonstration sites and development of decision-support tools. Concurrently, capacity building of extension officers will occur, with a particular focus on training as facilitators of peer learning.[12]

Extensive livestock systems support the majority of Africa's livestock population, but many pastoralists experience chronic food, nutrition and economic insecurity. Furthermore, livestock account for almost 80% of total agricultural emissions in eastern Africa. In the rangelands of eastern and southern Africa, sociocultural practices and climate are not conducive to crop production. Livestock are the lifeblood of these systems and the people that thrive within them. A new project, focused on Ethiopia, Kenya and Zimbabwe, will address knowledge gaps and identify emergent opportunities to increase livestock productivity and trade, while reducing greenhouse gas emissions. Dr Dawit Solomon of the International Livestock Research Institute will lead the project, which is structured around 4 key intervention areas: community-based rangeland management, small ruminant community-based breeding initiatives, animal health and increased off-take through livestock marketing.[13]

Through the INSFEED projects, which are part of CultiAF, the International Centre of Insect Physiology and Ecology and partners successfully demonstrated mass insect rearing on organic waste, resulting in both a proven animal protein source and organic fertiliser. Post-harvest technologies were established to ensure product shelf-life and safety, meeting national standards for the use of insects as ingredients in compounded feeds. Dr Chrysantus Tanga of the International Centre of Insect Physiology and Ecology leads a new project that starts with scaling up the production of insects and insect-based feed products through modular rearing systems. These systems are already established in Kenya and Uganda and will be assessed for Rwanda. Several storage techniques will be investigated for their potential to improve both shelf and on-farm storage conditions in Kenya.[14]

The animal origins of COVID-19 have again placed concerns about zoonotic diseases in the global policy limelight. Wet markets in Asia were singled out as a source of global pandemic risk and there were calls to close, ban, regulate and reform them. While some wet markets centre heavily on wild animals, many do not sell wildlife or bushmeat. More commonly, a wet market is a fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains. Dr Kevin Bardosh and Associate Professor Cecily Maller of RMIT University leads a rapid assessment to understand how the COVID-19 pandemic has impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms, food security, and women's economic empowerment. This project contributes to stage 3 of the ACIAR assessment of COVID-19 impacts on food systems in our region.[15]

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. This project, led by Professor Jamie Pittock of the Australian National University, has involved irrigation schemes supporting more than 15,000 farmers in Mozambique, Zimbabwe and Tanzania. Due to be completed in 2022, the project has introduced soil and water management technologies that have increased the productivity and incomes of farmers and made irrigation schemes more self-sustaining. In its final year, the project will report on the best methods for dissemination of technologies and identify the factors leading to inequity among farmers in water supply and financial benefit from irrigation schemes.[16]

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. Phase 2 of the project, led by Dr Richard Stirzaker of CSIRO, 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. The project also supports activities with irrigation schemes in Mozambique and Zimbabwe, in collaboration with the project described above.[17]

Dr Makarius Mdemu inspects grain harvested from the Magozi Irrigation Scheme in Tanzania. Irrigation has significant potential to contribute to food security in Sub-Saharan Africa and ACIAR supports research that is introducing technologies that increase productivity and incomes of farmers and make irrigation schemes more self-sustaining. Photo: Andrew Munuwa. ACIAR project LWR/2016/137

CultiAF2 projects

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, such as drought-tolerant varieties and small-scale threshers.[18]

Inefficiency constrains the performance of government and farmer-led smallholder irrigation schemes in Mozambique. A CultiAF2 project led by Dr Mario Chilundo of the 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.[19]

High-value horticultural crops are key drivers of economic development in Sub-Saharan Africa. Fruit crops can return a 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 the 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.[20]

Nutritional deficiencies are widespread in Uganda's poor rural and urban communities, particularly in women of reproductive age and children under 5 years, due to limited access to animal protein and micronutrient-rich foods, especially fish. Dr Jackson Efitre of Makerere University, Uganda, leads the NutriFish project and works 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 improve the livelihoods of vulnerable groups. It also aims to increase by-product processing through public–private partnerships.[21]

High-value horticultural crops are key drivers of economic development in Sub-Saharan Africa. CultiAF projects are developing opportunities and technologies to increase incomes and provide employment for smallholders both on and off the farm, especially women and youth.

Crop insurance is an option for farmers to protect their livelihoods against losses, as climate changes and extreme weather events become 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. This project focuses on technologies such as satellite and cell phone imagery to verify crop losses and observe management practices.[22]

Regional Manager, Eastern & Southern Africa
Dr Leah Ndungu

Research Program Managers
Climate Change: Dr Veronica Doerr
Crops: Dr Eric Huttner
Horticulture: Ms Irene Kernot
Livestock Systems: Dr Anna Okello
Water: Dr Robyn Johnston
CultiAF2: Dr Anna Okello

See page 197 for contact details.

Current and proposed projects

1. Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) – Malawi (CS/2021/115)
2. Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) – Zambia (CS/2020/210)
3. Demand led plant variety design for emerging markets in Africa [Ghana, Kenya, South Africa, Tanzania] (FSC/2013/019)
4. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
5. Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan (CROP/2020/167)
6. Faba bean in Ethiopia: mitigating disease constraints to improve productivity and sustainability (CIM/2017/030)
7. Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda] (CROP/2018/132)
8. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
9. Protecting Ethiopian lentil crops (CROP/2020/164)
10. Mechanisation and conservation agriculture based crop-livestock innovation in eastern Africa [Kenya, Tanzania] (CROP/2020/166)
11. Developing a biosecurity system for small banana growers resilient to *Fusarium* wilt TR4 in southern and eastern Africa [Mozambique, South Africa, Tanzania] (HORT/2020/128)
12. High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2) (LS/2016/276)
13. Resilient and low-carbon livestock systems for trade and food security in the rangelands of eastern and southern Africa [Ethiopia, Kenya, Zimbabwe] (LS/2020/152)
14. Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa [Kenya, Rwanda, Uganda] (LS/2020/154)
15. Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program) (LS/2020/204)
16. Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe] (LWR/2016/137)
17. Virtual Irrigation Academy Phase 2: from water monitoring to learning to governance [Malawi, Mozambique, South Africa, Zimbabwe] (WAC/2018/162)
18. Climate-smart interventions for smallholder farmers in Ethiopia (CultiAF 109038) (GP/2019/173)
19. User driven approaches to make government and farmer led smallholder irrigation in Mozambique more productive (CultiAF 109039) (GP/2019/174)
20. Alien invasive fruit flies in Southern Africa: Implementation of a sustainable IPM programme to combat their menaces (CultiAF 109040) [Malawi, Mozambique, Zambia, Zimbabwe] (GP/2019/175)
21. Harnessing dietary nutrients of underutilised fish and fish-based products in Uganda (CultiAF 109041) (GP/2019/176)
22. Improving agricultural productivity and resilience with satellite and cellphone imagery to scale climate-smart crop insurance (CultiAF 109076) [Kenya] (GP/2019/177)

6

Capacity building

Capacity building

Science and innovation are critical to advancing agriculture and livelihoods in the Indo-Pacific region. However, of equal importance to our partner countries is the development of individual and organisational 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 partner organisations 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 maximise the adoption of new knowledge and technologies.

In 2021–22, the program is adapting to the new COVID/post-COVID operating environment, as innovative new programs are established that utilise alumni and local leadership to build capacity. During this time, we are delivering our flagship programs, the John Dillon and Meryl Williams fellowships remotely, while increasing welfare support to our in-Australia John Allwright Fellows until they can return home. We will also be rolling out an innovative new online learning program, ACIAR Learn, that will utilise our in-country networks to deliver enhanced capacity-building outcomes. The one-off COVID-19 research support facility, the Alumni Research Support Facility, will begin to deliver research findings and results in 2021–22, which will shape organisational responses to future shocks to food systems.

Meryl Williams Fellowship

In 2019, we launched the Meryl Williams Fellowship Program. This initiative works with female agricultural researchers, providing them with the skills and knowledge to take on greater leadership positions in their employing institutions. The fellowship contributes to more secure food systems by providing women in agricultural science with greater access to resources and decision-making, building collaborative networks, supporting career advancement and driving institutional progress towards gender equity. The fellowship is delivered by the University of New England. In 2021–22, it will continue to run in an adapted format that supports leadership within the constraints of COVID-19.

The first cohort of Fellows in 2021-22 are continuing activities in their home countries, where COVID19 regulations allow. These activities have been developed collaboratively with each Fellow and their organisation to provide the most relevant experience for each Fellow's development. Mentoring programs are ongoing, as is the University of New England's engagement with the cohort. Of the first cohort, 6 Fellows were successful in securing research funding through the ACIAR Alumni Research Support Facility. In 2021–22, they will lead these research projects and contribute to COVID-19 responses in their home agencies.

The second cohort of the Meryl Williams Fellowship has started with Fellows from Timor-Leste, Vanuatu, Tonga, Samoa, Kiribati, Tuvalu, Solomon Islands, Myanmar, the Philippines, Nepal and Mongolia. In 2020-21, these Fellows completed workshops on leading with resilience and are now part-way through mentoring partnerships training. Face-to-face workshop arrangements have been postponed due to COVID-19, but we remain committed to ensuring the Fellows are engaged in ongoing leadership activities in 2021–22.

John Dillon Fellowship

We have been delivering the John Dillon Fellowship for 20 years. The program develops the leadership and management skills of mid-career professionals, particularly scientists, researchers and economists working in agriculture research-for-development in ACIAR partner countries. To date, there are more than 180 alumni of the program across our partner countries. In 2021–22, we will be delivering an innovative new approach to the program in partnership with our new provider, the University of New England.

As part of our response to the COVID-19 pandemic, the John Dillon Fellowship program was redesigned to build on the program's past success, while providing relevant skills for researchers and scientists to deal with an increasingly complex environment. In 2021–22, ACIAR is delivering the program in individual country cohorts of up to 18 participants with a strong focus on cross-organisational collaboration and strengthening ties with Australian partners. This approach further bolsters Australia's approach to science diplomacy. In 2021–22, the program will be delivered through a mixture of online and in-person training (where possible), focusing on organisational cohorts from the Philippines and Vietnam.

John Allwright Fellowship

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. Our capacity-building team will continue to support and monitor the welfare of John Allwright Fellows in 2021–22, with regular contact and by linking them with other Fellows in their institutions to strengthen their networks.

In 2021–22, the John Allwright Support Facility will provide support, advice and direction to John Allwright Fellowship scholars and ACIAR. The facility includes regular check-ins with Fellows during their higher degree research program. This includes both academic and welfare support, noting the significant challenges associated with research during a global pandemic. The facility will primarily act as a second layer of support to provide advice and hands-on assistance to help the Fellows achieve their qualifications and advise ACIAR on how we can improve management of the Fellowship.

The John Allwright Fellowship Executive Leadership program continues to be a key mechanism to enhance leadership skills development for Fellows in Australia. While COVID-19 has impacted this program, it will continue when new Fellows arrive. 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.

Pacific scholarships

Our longstanding agricultural research scholarship program with the University of South Pacific was redesigned, expanded and renamed PASS (Pacific Agricultural Scholarship Support Program). 2021 saw the inclusion of scholarships at Fiji National University, and a return to offering PhD scholarships, including faculty upgrades. Currently, there are 21 Pacific scholars studying under this program. Scholars are aligned to an ACIAR research project and have an Australian co-supervisor.

The redesigned PASS academic support program is being delivered through the University of Sunshine Coast's Australian Centre for Pacific Island Research, in conjunction with Southern Queensland University, Central Queensland University, Science Research Organisation of Samoa and a range of other sub-contractors. Through PASS, Pacific students and staff will have access to the extensive Pacific Agriculture Information System, which houses more than 1,000 Pacific agricultural records. This will address the difficulty researchers have in locating information about their own countries.

The PASS academic support program engages both with the Schools of Agriculture and Offices of Research at University of South Pacific and Fiji National University. Activities in 2021–22 include support to locate strategic research priorities, monthly Pacific seminars (which are jointly presented to Pacific and Australian students) and higher degree research supervision workshops for students and academics. The program is responsive to requests and needs as they arise. A number of these resources will extend to Papua New Guinea's University of Technology and University of Natural Resources and Environment during 2021–22.

Alumni program

In response to the COVID-19 pandemic, the Alumni Research Support Facility was opened for applications. This is 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. Across the 2 phases of the program, the facility is supporting 65 small research projects led by ACIAR alumni across the Indo-Pacific. In 2021–22 many of these research project will be completed, with findings related to agency and research responses to the pandemic. We will be working closely with this cohort of researchers to support them to undertake outreach activities to ensure this research has maximum impact.

During 2021–22, we will be delivering our new Global Alumni Strategy, with an increased focus on supporting alumni through the COVID/post-COVID operating environment. The aim of this strategy is to engage with ACIAR alumni to build the skills, knowledge and networks of agricultural researchers and scientists to contribute to positive development outcomes in the agricultural research-for-development sector.

Under the Global Strategy, in 2021–22 ACIAR Country and Regional Offices will be implementing their 3-year alumni engagement plans. These plans have identified the priorities and interests of each country's alumni. From these, annual plans identify a program of activities to be implemented at the country and regional level, including training workshops (both online and in-person), networking events and new opportunities for alumni.

In 2021–22, we will continue to build on our virtual alumni network, 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 facilitate country chapter pages with links to information about events, research collaborations and discussion forums. ACIAR Alumni 360 also includes information on the Capacity Building Program, including calls for applications to our fellowships, funding opportunities, and publications and other resources. There are currently around 600 active members on the platform, and we expect this will continue to grow in 2021–22.

ACIAR Learn (online learning)

As part of our COVID-19 response, in 2021–22 we will be delivering an innovative new program, ACIAR Learn. ACIAR Learn is a partnership between the University of Queensland, Catalpa International and ACIAR that will deliver bespoke online learning for agricultural researchers. The program will use best-practice student-centred learning approaches, combined with the expertise of Australian agricultural science knowledge. In this period, we will be delivering the program to our in-country project staff and across our global alumni. The program is overseen by an expert panel and will include a strong research focus to allow us to effectively evaluate the program and share the lessons learned with other research and learning organisations.

Organisational capacity building

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 capacity building has on strengthening institutions. Under our organisational capacity-building research, we are identifying approaches that have been successful in enhancing our research partners' organisational effectiveness for improved agricultural research. This body of work is informing new approaches to enhance institutional awareness in research projects for more effective and sustainable research outcomes. In 2021–22 we will continue to work with a select number of partner organisations and develop shared pathways and approaches to supporting increased organisational effectiveness.

Other training activities

ACIAR supports training activities delivered by the Crawford Fund. This includes the Master Class and Training Program, a new program of e-mentoring linking agricultural researchers from developing countries with mentors in Australia, and the Next-gen suite of activities designed to build interest in careers in international agricultural research.

General Manager, Outreach and Capacity Building
Ms Eleanor Dean

ACIAR fellowships contact
Mr Geoffrey O'Keefe
Manager, Capacity Building Program

See page 196 for contact details.

Table 6.1 **Participation in ACIAR capacity-building programs**

Programs	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22 (est)
John Allwright Fellowship						
No. active in year	140	97	85	75	70	37
No. awarded in year	22	7	12	10	10	No round
John Dillon Fellowship						
No. active in year	10	10	28	28	20	15
Meryl Williams Fellowship						
No. active and awarded in year	–	–	–	20	40	40
Pacific Scholarships						
No. active in year	11	13	10	10	23	23
No. awarded in year	5	6	6	3	14	15
Alumni training						
No. participants	–	–	75	90	140	180
Launch fund						
No. events supported	–	–	11	15	11	8

7

Increasing influence and impact

Increasing influence and impact

Reflecting the ACIAR 10-Year Strategy 2018–2027 and its 6 strategic objectives, the Outreach Program is designed to communicate the work of ACIAR to 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 2021–22, 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-oriented content strategy, including segmenting our messaging to key target audiences
- identifying opportunities to further 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 our website, including developing a more dynamic blog format and a dedicated page for key thematic areas
- developing an online catalogue of scientific publications and enhancing online ordering
- building our In-Country Communication Officer Network to increase our reach and continue to communicate actively and effectively in-country and in our regions.

Stakeholder engagement

Work will continue on implementing domestic and international stakeholder engagement strategies to ensure we take a strategic approach to improving awareness and detailed understanding of ACIAR among specific stakeholder groups.

In 2021–22, the stakeholder engagement strategy will:

- 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 international 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
- continue to position ACIAR to help deliver on our 10-year strategy.

We will continue to participate in key sector events both in person and online to share the results of our research with a highly targeted audience.

Another significant event for ACIAR will be hosting the CGIAR System Council meeting in Australia. While the timing is likely to be November 2022, planning will be underway throughout 2021–22 to provide a series of opportunities for international delegates that demonstrate Australian leadership in agricultural innovation.

40 years of ACIAR

During 2021–22 the Outreach Program will leverage our 40-year anniversary to communicate our achievements and impact in a variety of forums. This will include producing 2 key publications: an impact assessment and a history of ACIAR that highlights achievements and partnerships through case studies and interviews. The Crawford Fund will also update its signature publication, *Doing Well by Doing Good*, that outlines the value of international agricultural research both in developing countries and in Australia.

A series of stakeholder events and a social media campaign, including video and photography, will be delivered throughout the year under the 40-year anniversary banner. A special edition of *Partners* magazine will also be produced.

Website

The ACIAR website has undergone significant redevelopment in the past 3 years. User experience is now much improved on project, program, country and regional pages, and the search function is also much improved. During 2021–22, there will be further development of the website to increase usability, provide richer content and improve reach to our audiences.

New page templates will be created for a more dynamic liquid design news-style blog incorporating data visualisation and video content, along with more dynamic bespoke pages created for our key thematic areas, including Climate, Gender, Nutrition, Capacity Building and Measuring our Impact.

At the same time, the Google analytics and search engine optimisation of the website has been reviewed and audited, with work commencing on the recommendations to ensure it improves our site visibility and increases our organic traffic.

Social media

Growing from 20,000 followers in 2017 to an audience of nearly 90,000 in 2021, our social media channels are key communication tools. Through Facebook, Twitter, Instagram, LinkedIn and YouTube, we can reinforce the impact of ACIAR-funded research to an engaged audience. During 2020–21 we audited our social media channels to develop a deeper understanding of the different audiences following ACIAR on each platform. In 2021–22, we will use this knowledge to create a digital playbook for each channel to ensure more targeted content and segmenting of our messaging to key audiences.

Digital content production will continue, with an emphasis on short-form video, photography and infographics.

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.

Publications

Publications, including annual corporate reports, are an essential part of our outreach and communication work. Publications contribute to ensuring audiences in Australia and our partner countries can access and use our research findings.

The Scientific Publications Committee continues to 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 2021–22, we will develop an online back catalogue of ACIAR scientific publications and improve the online ordering system. We will also 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 accor ding to statutory and legislative requirements, and these will be available both online and, in limited numbers, as hard copy. The Annual Operational Plan and the Annual Review are published each year, both as accessible snapshots of our plans and activities.

The production of our flagship publication, *Partners in Research for Development,* continues on a quarterly basis, with ongoing review of content, audiences and delivery modes.

In-country communication

In 2021–22 we will continue to build our network of communication professionals in our Country Offices.

Currently, there are communication officers in 5 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 provide ACIAR Country Offices with communication expertise, ensuring more proactive content is being produced and increasing engagement with our partners and stakeholders. This is particularly important while international borders are closed.

Media partnerships

We will continue to partner with media organisations, both domestically and internationally, to raise the profile of our work to a wider audience. In 2021–22, we will engage with journalists in our region online to allow for COVID-19 travel restrictions.

We will also work closely with the Crawford Fund to generate positive media coverage, especially in regional and agriculture-based media in Australia.

Next-gen campaign

The Crawford Fund has developed high-school curriculum materials that profile the work of ACIAR and other international agricultural research organisations and highlight a number of key issues, including gender and food loss. These materials are part of the Crawford Fund's Next-gen campaign, which are targeted at undergraduate and high-school students. Next-gen aims to raise awareness about careers in international agricultural research. The Crawford Fund also oversees the administration of Researchers in Agriculture for International Development, whose membership contribute and feature in the Next-gen campaign through appearances in video and at events, both in person and online.

General Manager, Outreach and Capacity Building
Ms Eleanor Dean

See page 196 for contact details.

8

Appendixes

Appendix 1

Details of current and proposed projects and small research activities, 2021–22

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Agribusiness						
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	21/03/2018	15/12/2022	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 Wide Fund for Nature - Indonesia
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	1/09/2018	30/06/2023	Dr Rajendra Adhikari	The University of Queensland	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
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains [Indonesia]	AGB/2010/099	1/03/2014	31/12/2021	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	30/06/2022	Assoc Prof Robin Roberts	Griffith University	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement (CIRAD), 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
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	13/06/2016	31/12/2021	Prof 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	31/01/2022	Dr Gordon Rogers	Applied Horticultural Research	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement (CIRAD), 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

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Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu]	AGB/2014/057	12/06/2017	31/12/2022	Prof Steven Underhill	University of the Sunshine Coast	Pacific Island Farmers Organisation Network, Pacific Islands Development Forum, Pacific Islands Private Sector Organization, Southern Cross University, University of the South Pacific, The University of Adelaide, The University of Queensland, University of the Sunshine Coast
Inclusive agriculture value chain financing [Indonesia, Vietnam]	AGB/2016/163	25/06/2018	30/09/2023	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 Myanmar, Institute of Policy and Strategy for Agriculture and Rural Development, Myanmar Economics Association, The University of Sydney
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	1/07/2018	31/12/2021	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 [Cambodia, Laos, Myanmar, Vietnam]	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	1/02/2021	31/10/2024	Dr Estelle Bienabe	World Agroforestry Centre	Deakin University, Institute of Policy and Strategy for Agriculture and Rural Development, International Center for Tropical Agriculture, National Institute of Agricultural Planning and Projection, Plant Protection Research Institute, Tay Nguyen University, The University of Sydney, Western Highlands Agriculture and Forestry Science Institute
Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines	AGB/2018/196	1/08/2021	31/07/2025	Dr Lilly Lim-Camacho	CSIRO	Australian National University, Foodlink Advocacy Co-operative, University of the Philippines at Los Banos, University of the Philippines, Mindanao, Visayas State University

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Planning and establishing a sustainable smallholder rice chain in the Mekong Delta [Vietnam]	AGB/2019/153	1/01/20222	31/12/2025	Dr Jaquie Mitchell	The University of Queensland	Ang Giang University, Australian Grain Storage Pty Ltd, Can Tho University, Cuu Long Rice Research Institute, New South Wales Department of Primary Industries, Rice Research Australia Pty Ltd, Ricegrowers Vietnam
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	30/11/2021	Assoc Prof Tiho Ancev	The University of Sydney	—
Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia	AGB/2020/121	1/11/2020	30/04/2022	Mr Jeremy Badgery-Parker	Primary Principles Pty Ltd	—
Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (Food Loss Research Program)	CS/2020/193	1/11/2021	30/06/2024	Anwar Shah	Quaid-e-Azam University	—
Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program) [Cambodia, Laos, Vietnam]	CS/2020/209	1/07/2021	30/06/2024	Van Kien Nguyen	Health and Agricultural Policy Research Institute	—
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) - Malawi	CS/2021/115	1/07/2021	30/06/2023	Dr Mtafu Manda	Mzuzu University	—
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) - Zambia	CS/2020/210	1/07/2021	30/06/2023	Dr Gilbert Siame	University of Zambia	—

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Climate Change						
Transformational pathways for Pacific fisheries communities [Solomon Islands, Kiribati]	WAC/2020/178	1/02/2022	31/12/2025	Dr James Butler	CSIRO	to be determined
Conservation agriculture and sustainable intensification systems for transformational climate adaptation and greenhouse gas mitigation in Pacific island countries [Samoa, Tonga]	CLIM/2020/186	1/01/2022	31/12/2025	Prof Timothy Reeves & Dr Dorin Gupta	The University of Melbourne	Lincoln University, Pacific Community, University of South Pacific (Samoa)
Mitigation and adaptation co-benefits modelling trial in Bangladesh	CLIM/2021/109	7/23/2021	10/31/2022	Dr Carolyn Mutter & Mr Erik Mencos Contreras	Colombia University	Oregon State University, International Maize and Wheat Improvement Center
Transforming Pacific coastal food production systems [Pacific island countries – general]	FIS/2020/108	1/01/2021	30/06/2022	Dr James Butler	CSIRO	Cawthron Institute, Pacific Community, University of Technology Sydney, AgResearch New Zealand
Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam	WAC/2019/150	1/01/2022	30/06/2021	Prof Peter Grace	Queensland University of Technology	Ministry of Agriculture Fiji, Ministry of Agriculture and Rural Development Vietnam, Ministry of Economy Fiji, The University of Melbourne, New Zealand Agricultural Greenhouse Gas Research Centre
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	30/06/2022	Prof Ian Godwin	The University of Queensland	Guadalcanal Plains Palm Oil Limited, Solomon Islands 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	30/06/2022	Prof William Erskine	The University of Western Australia	Bangladesh Agricultural Research Institute, Bangladesh Agricultural University, CSIRO, Bangladesh Department of Agricultural Extension
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan]	CIM/2014/081	1/08/2016	30/06/2022	Prof Robert Park	The University of Sydney	Nepal Agricultural Research Council, Ethiopian Institute of Agricultural Research, Indian Institute for Wheat and Barley Research, Pakistan Agricultural Research
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	1/10/2016	30/06/2022	Prof William Erskine	The University of Western Australia	Timor-Leste 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	30/10/2022	Dr Ata-ur Rehman	Charles Sturt University	Muhammad Nawaz Sharif University of Agriculture (Multan, Punjab), Sindh Agricultural University (Tandojam, Sindh), University of Arid Agricultural Rawalpindi (Punjab), Pakistan Agricultural Research Council

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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, New South Wales Department of Primary Industries
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (Phaseolus vulgaris) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda]	CROP/2018/132	1/08/2019	30/06/2024	Prof Wallace Cowling	The University of Western Australia	Ethiopian Institute of Agricultural Research, Institut des Sciences Agronomiques du Burundi, Kenya Agricultural and Livestock Research Organisation, Maruku Agricultural Research Institute (Tanzania), National Crops Resources Research Institute (Uganda), Rwanda Agriculture and Animal Resources Development Board, International Center for Tropical Agriculture
International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar]	CROP/2019/144	1/07/2020	30/06/2025	Dr Ramakrishnan Nair	The World Vegetable Center	Bangladesh Agricultural Research Institute, Myanmar Department of Agricultural Research, Indian Institute of Pulses Research, Indonesian Legume and Tuber Crops Research Institute, Kenya Agricultural and Livestock Research Organisation, Queensland Department of Agriculture and Fisheries, The University of Queensland
Weed management techniques for mechanised and broadcast lowland crop production systems in Cambodia and Laos	CROP/2019/145	1/01/2021	31/12/2025	Dr Jaquie Mitchell	The University of Queensland	Cambodia Agricultural Research and Development Institute, National Agricultural and Forestry Research Institute, Laos, Royal University of Agriculture (Cambodia)
Managing basal stem rot in oil palm by converting infected logs to biochar [Papua New Guinea]	CROP/2019/147	1/07/2020	31/12/2021	Dr Agnieszka Mudge	The University of Queensland	PNG Oil Palm Research Association Inc
Protecting Ethiopian lentil crops	CROP/2020/164	1/07/2021	30/06/2026	Prof Martin Barbetti	The University of Western Australia	Amhara Region Agricultural Research Institute, Oromiya Agricultural Research Institute, Ethiopian Institute of Agricultural Research, International Center for Agricultural Research in the Dry Areas, New South Wales Department of Primary Industries
Wheat blast resistant wheat [Bangladesh]	CROP/2020/165	1/07/2021	30/06/2026	Dr Pawan Kumar Singh	International Maize and Wheat Improvement Center	Bangladesh Wheat and Maize Research Institute
Mechanisation and conservation agriculture-based crop-livestock innovation in eastern Africa [Kenya, Tanzania]	CROP/2020/166	1/09/2021	30/06/2026	Richard Bell	Murdoch University	African Conservation Tillage Network, China Agricultural University, Kenya Agricultural and Livestock Research Organisation, Sokoine University of Agriculture (Tanzania), Tanzania Agricultural Research Institute (TARI), University of Nairobi (Kenya)

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Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan	CROP/2020/167	1/09/2021	30/06/2026	Prof Richard Trethowan	The University of Sydney	Ethiopian Institute of Agricultural Research, Muhammad Nawaz Sharif University of Agriculture (Multan, Punjab), Bangladesh Wheat and Maize Research Institute, International Center for Agricultural Research in the Dry Areas, KWS
Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	CSE/2012/108	1/07/2018	31/10/2022	Dr Fay Rola-Rubzen	The University of Western Australia	Bihar Agricultural University (India), Nepal Agricultural Research Council, Rajshahi University (Bangladesh), Rangpur Dinajpur Rural Service (Bangladesh), Uttar Banga Krishi Vishwavidyalaya (India), University of New England
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, University of Battambang
Demand led plant variety design for emerging markets in Africa [Ghana, Kenya, South Africa, Tanzania]	FSC/2013/019	26/06/2014	31/12/2021	Prof 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 (ASARECA), Biosciences Eastern and Central Africa, Crawford Fund, Forum for Agricultural Research in Africa, Pan Africa Bean Research Alliance, Regional Universities Forum for Capacity Building in Agriculture, Syngenta Foundation for Sustainable Agriculture (SFSA), University of Nairobi, The University of Queensland, West Africa Centre for Crop Improvement (WACCI), University of Ghana, West and Central African Council for Agricultural Research and Development
Fisheries						
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	26/02/2018	30/03/2023	Dr Campbell Davies	CSIRO	Agency for Research and Human Resources Development Marine and Fisheries, Indonesia
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 (Philippines), Marine Science Institute – University of the Philippines, Mindanao State University at Naawan, Southeast Asian Fisheries Development Centre (Philippines), Ministry of Agriculture and Rural Development – Research Institute for Aquaculture No.3 (Vietnam)
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	1/09/2017	31/12/2021	Prof Paul Southgate	University of the Sunshine Coast	Ministry of Agriculture and Food, Forests and Fisheries (Tonga), Ministry of Agriculture and Rural Development – Research Institute for Aquaculture No. 3 (Vietnam)

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	13/12/2017	31/12/2021	Dr Mike Rimmer & Prof Nicholas Paul	University of the Sunshine Coast	Fisheries Administration (Cambodia), Institute for Mariculture Research and Fisheries Extension (Gondol, Indonesia), Institute for Coastal Aquaculture and Fisheries Extension (Maros, Indonesia), New South Wales 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 Akester	WorldFish Center	Department of Agriculture, Ministry of Fisheries, Myanmar Department of Agricultural Research, International Rice Research Institute
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song [Kiribati, Solomon Islands, Vanuatu]	FIS/2016/300	6/09/2017	31/12/2021	Prof Neil Andrew	University of Wollongong	Fisheries Department (Vanuatu), Ministry of Fisheries and Marine Resources Development, Kiribati, Ministry of Fisheries and Marine Resources, Solomon Islands, The Pacific Community, University of Wollongong, WorldFish Center
Assessing upstream fish migration measures at Xayaburi Dam in Laos	FIS/2017/017	1/09/2019	31/12/2022	Prof Lee Baumgartner	Charles Sturt University	Living Aquatic Resources Research Centre (Laos), National University of Laos, Xayaburi Power Company Limited (Laos)
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	1/09/2021	31/05/2025	Dr David Mills	WorldFish Center	CSIRO, Ministry of Agriculture and Fisheries, Timor-Leste, Research Centre for Marine and Fisheries Socio-economics Indonesia
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [Philippines]	FIS/2018/128	25/06/2018	31/12/2021	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	1/07/2021	30/06/2026	Assoc Prof Jesmond Sammut	University of New South Wales	Australian Nuclear Science and Technology Organisation, CSIRO, James Cook University, National Fisheries Authority (Papua New Guinea), University of Papua New Guinea, University of Tasmania
Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos]	FIS/2018/153	1/01/2020	30/06/2024	Prof Lee Baumgartner	Charles Sturt University	Ministry of Agriculture and Livestock (Myanmar), Ministry of Marine Affairs and Fisheries (Indonesia), National University of Laos, Inland Fisheries Research and Development Institute (Cambodia)
Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators	FIS/2018/154	18/10/2021	30/06/2026	Assoc Prof 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 agrifood system analyses for the Pacific region [Kiribati, Solomon Islands, Pacific island countries – general, Vanuatu]	FIS/2018/155	1/08/2019	31/12/2022	Prof Neil Andrew	University of Wollongong	CSIRO, The Pacific Community, 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	1/06/2020	30/06/2025	Dr Clive Jones	James Cook University	National Aquaculture Development Authority, University of Ruhuna, Wayamba University of Sri Lanka
Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga]	FIS/2019/122	1/10/2021	30/06/2026	Prof Paul Southgate	University of the Sunshine Coast	The Pacific Community, Ministry of Fisheries and Forests, Ministry of Agriculture, Forests, Food and Fisheries, Ministry of Agriculture and Fisheries, National Fisheries College (Papua New Guinea)
Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia	FIS/2019/123	1/12/2020	31/10/2025	Prof Peter Harrison	Southern Cross University	Queensland University of Technology, The University of Melbourne, University of Technology Sydney, University of the Philippines
Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands	FIS/2019/124	1/08/2021	31/03/2025	Dr Hampus Eriksson	University of Wollongong	University of Canberra, WorldFish Center, Ministry of Fisheries and Marine Resources (Solomon Islands), Ministry of Fisheries (Timor-Leste)
Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa	FIS/2019/125	1/10/2020	31/03/2022	Dr Libby Swanepoel	University of the Sunshine Coast	The Ministry of Fisheries and Marine Resources Development (Kiribati), Ministry of Agriculture and Fisheries (Samoa)
Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities	FIS/2020/109	1/12/2020	30/06/2022	Prof Kate Barclay	University of Technology Sydney	Agency for Research and Human Resources Development Marine and Fisheries (Indonesia)
Developing alternative small-scale fishery models in the Fly River, Western Province, Papua New Guinea	FIS/2020/110	19/11/2020	28/02/2022	Dr James Butler & Mr Havini Vira	CSIRO & Ok Tedi Development Foundation (PNG)	—
Spatially integrated approach to support a portfolio of livelihoods [Solomon Islands, Pacific island countries –general]	FIS/2020/111	1/06/2021	31/05/2023	Dr Amy Diedrich	James Cook University	Ecological Solutions Foundation (Solomon Islands)
Coalitions for change in sustainable national community-based fisheries management programs in the Pacific [Kiribati, Solomon Islands, Pacific island countries – general, Vanuatu]	FIS/2020/172	1/09/2021	30/06/2025	Prof Neil Andrew	University of Wollongong	Ministry of Fisheries and Marine Resources Development (Kiribati), Ministry of Fisheries and Marine Resources (Solomon Islands), Fisheries Department (Vanuatu), The Pacific Community, WorldFish Center

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Blue economy: valuing the carbon sequestration potential in oyster aquaculture [Vietnam]	FIS/2020/175	1/09/2020	31/12/2021	Dr Sarah Ugalde	University of Tasmania	Ministry of Agriculture and Rural Development – Research Institute for Aquaculture No.1 (Vietnam), New South Wales Department of Primary Industries
Institutional effectiveness and political economy of coral reef restoration in the Philippines	FIS/2021/112	1/08/2021	31/12/2024	Assoc Prof Michael Fabinyi	University of Technology Sydney	University of the Philippines, Southern Cross University, Macquarie University
Strengthening agricultural resilience in Western Province: methods for place-based livelihoods approach [Papua New Guinea]	FIS/2021/113	1/09/2021	30/06/2023	Assoc Prof Katharine McKinnon	University of Canberra	Western Sydney University, Papua New Guinea Science and Technology Secretariat
Supporting grouper farming smallholders in Vietnam to improve their small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds	FIS/2021/121	1/08/2021	31/07/2022	Dr Leo Nankervis	James Cook University	Ministry of Agriculture and Rural Development – Research Institute for Aquaculture No.2, Research Institute for Aquaculture No.3 (Vietnam)
Strengthening agricultural resilience in Western Province: mapping place-based strength and assets [Papua New Guinea]	FIS/2021/122	1/09/2021	3/06/2023	Prof Katherine Gibson	Western Sydney University	Papua New Guinea Science and Technology Secretariat
Forestry						
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, Farm Forestry Consortium, Forestry Research, Development and Innovation Agency, Murdoch University, Threads of Life: Indonesia Textile Arts Centre, University of Mataram, World Wide Fund for Nature - Indonesia
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	1/04/2017	31/03/2022	Dr Hilary Smith	The University of Melbourne	Australian National University, Luang Prabang Teak Program, National University of Laos, Queensland Department of Agriculture and Fisheries
Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam	FST/2016/152	1/04/2017	31/12/2021	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	Assoc Prof Grahame Applegate	University of the Sunshine Coast	Papua New Guinea Forest Authority, Papua New Guinea Forest Research Institute, Ramu Agri-Industries Ltd, Timber and Forestry Training College of the PNG University of Technology

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Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	1/06/2017	30/06/2022	Dr Tony Page	University of the Sunshine Coast	Department of Forests (Vanuatu), Department of Industry (Vanuatu), Southern Cross University
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, 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	31/12/2023	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	1/07/2021	30/06/2025	Dr Tony Page	University of the Sunshine Coast	East New Britain Women and Youth in Agriculture, Organisation for Industrial, Spiritual and Cultural Advancement, Pacific Island Projects, Papua New Guinea Forest Authority, Papua New Guinea Forest Research Institute, Papua New Guinea University of Natural Resources and Environment
Reducing forest biosecurity threats in South-East Asia [Indonesia, Vietnam]	FST/2018/179	1/07/2021	30/06/2025	Dr Caroline Mohammed	University of Tasmania	Centre for Forest Biotechnology and Tree Improvement Research, SINARMAS
Coconut and other non-traditional forest resources for the manufacture of engineered wood products [Fiji]	FST/2019/128	1/02/2021	31/01/2026	Dr Rob McGavin	Queensland Department of Agriculture and Fisheries	Griffith University, Pacific Community, PHAMA Plus, The University of Queensland
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	18/05/2020	17/11/2021	Assoc Prof Mark Dieters	The University of Queensland	National Agriculture and Forestry Research Institute (Laos)
Building effective forest health and biosecurity networks in South-East Asia [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam]	FST/2020/123	1/07/2021	30/06/2025	Assoc Prof Simon Lawson	University of the Sunshine Coast	Department of Agriculture, Plant Quarantine Division, Laos, Department of Plant Protection, Cambodia, Forestry Administration, National Agriculture and Forestry Research Institute, Queensland Department of Agriculture and Fisheries, University of the Sunshine Coast, University of Tasmania
Livelihoods in forest ecosystem recovery [Solomon Islands]	FST/2020/135	1/07/2021	30/06/2027	Prof Helen Wallace	Griffith University	Ecological Solutions Foundation Solomon Islands, Ministry of Forest and Research
Forest restoration for economic outcomes [Laos]	FST/2020/137	1/07/2021	30/06/2026	Prof Patrick Baker	The University of Melbourne	—

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Horticulture						
Supporting an international initiative to maintain the coconut genetic resources network (COGENT)	GP/2018/193	1/01/2020	30/06/2022	Dr Jelfina Alouw	International Coconut Community	—
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa [Fiji, Samoa, Solomon Islands, Vanuatu]	HORT/2014/078	12/04/2017	30/12/2021	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, Pacific Community, The University of Adelaide
Integrating protected cropping systems into high value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga]	HORT/2014/080	1/04/2017	31/12/2021	Prof Phil Brown	Central Queensland University	Ministry of Agriculture and Food, Forests and Fisheries, Pacific Community, Queensland Department of Agriculture and Fisheries, 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	Prof 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	31/12/2022	Prof David Guest	The University of Sydney	Autonomous Region of Bougainville Department of Primary Industries and Marine Resources, Cocoa Coconut Institute of Papua New Guinea, Mars Australia, University of Natural Resources and Environment
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	1/03/2016	31/08/2021	Prof Phil Brown	Central Queensland University	Australian National University, Fresh Produce Development Agency Ltd, National Agricultural Research Institute, 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	1/11/2018	30/06/2023	Mr Stefano De Faveri	Queensland Department of Agriculture and Fisheries	Eastern Mennonite University, Gadjah Mada University, Indonesian Centre for Agriculture Socio Economic and Policy Studies, Indonesian Centre for Horticulture Research and Development, Provincial Agriculturist Office, 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	31/12/2022	Dr Babar Ehsan Bajwa	CABI International (Central and West Asia)	Agriculture Research Institute, Pakistan, Department of Agriculture Extension Punjab, Engro Foundation, 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

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Responding to emerging pest and disease threats to horticulture in Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga]	HORT/2016/185	1/04/2018	30/09/2023	Dr Michael Furlong	The University of Queensland	Ministry of Agriculture, Ministry of Agriculture and Fisheries, Ministry of Agriculture and Food, Forests and Fisheries, Ministry of Agriculture and Livestock, National Agricultural Research Institute, Pacific Community, 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, East West Seed Company Inc, Landcare Foundation of the Philippines Inc, The University of Sydney, Visayas State University
Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations	HORT/2016/190	1/01/2022	30/12/2026	Dr Muhammad Sohail Mahzar	Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade	General Directorate of Agriculture Cambodia, Cambodian Agriculture Research and Development Institute, University of the Philippines Mindanao, Provincial Agriculture Office Mindanao
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu]	HORT/2017/025	1/05/2019	31/12/2024	Dr Carmel Pilotti	Pacific Community	Kokonat Indastri Koporasen, 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 [Indonesia, Laos, Philippines]	HORT/2018/192	1/01/2020	31/12/2024	Mr Anthony Pattison	Queensland Department of Agriculture and Fisheries	Australian Banana Growers Council Inc, Gadjah Mada University, Horticultural Research Centre, Indonesian Tropical Fruit Research Institute, 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, Papua New Guinea Coffee Industry Corporation, University of the Sunshine Coast
Improving root crop resilience and biosecurity in Pacific island countries and Australia [Fiji, Samoa, Solomon Islands, Tonga]	HORT/2018/195	1/07/2021	30/06/2024	Dr Julie O'Halloran	Queensland Department of Agriculture and Fisheries	Ministry of Agriculture, Mainstreaming of Rural Development Initiative, Tonga Trust, Ministry of Agriculture and Livestock, Ministry of Agriculture and Forestry, Kastom Gaden, Pacific Island Ministry
Preparedness and management of huánglóngbìng (citrus greening disease) to safeguard the future of citrus industry in Australia, China and Indonesia	HORT/2019/164	1/07/2021	31/12/2025	Dr Jianhua Mo	New South Wales Department of Primary Industries	Citrus Australia Ltd, Citrus Research Institute of Chinese Academy of Agricultural Science, Gadjah Mada University, Indonesian Citrus and Subtropical Fruit Research Institute (ICSFRI)

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Enhanced fruit systems for Tonga and Samoa (phase 2): community-based citrus production	HORT/2019/165	1/09/2021	30/06/2025	Prof Steven Underhill	University of the Sunshine Coast	Mainstreaming of Rural Development Initiative, Tonga Trust, Ministry of Agriculture, Food, Forestry and Fisheries, Nishi Trading, Scientific Research Organisation of Samoa, The University of Queensland
Developing a biosecurity system for small banana growers resilient to Fusarium wilt TR4 in southern and eastern Africa [Mozambique, South Africa, Tanzania]	HORT/2020/128	1/07/2021	30/06/2023	Mr Stewart Lindsay	Queensland Department of Agriculture and Fisheries	Stellenbosch University, Mozambique, Tanzania,
Improving smallholder wellbeing through participation in modern value chains: sustaining future growth in the Pakistan citrus industry	HORT/2020/129	1/07/2021	30/06/2026	Dr Rajendra Adhikari	The University of Queensland	Queensland Department of Agriculture and Fisheries, University of Faisalabad, University of Sarghoda
Building a business case for investment in a coconut industry in the Pacific [Fiji, Samoa, Vanuatu]	HORT/2020/190	1/03/2021	1/10/2021	Mr Cameron Turner	The University of Queensland	Department of Industry, Fiji National University, Ministry of Agriculture (Vanuatu), Ministry of Agriculture and Fisheries, The University of Queensland
Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific (Food Loss Research Program) [Fiji, Samoa, Solomon Islands, Tonga]	CS/2020/191	1/07/2021	30/06/2024	Dr Seeseei Molimau-Samasoni	Scientific Research Organisation of Samoa	Fiji National University, Mainstreaming of Rural Development Initiative, Tonga Trust, Solomon Islands National University
Livestock Systems						
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	1/02/2016	30/06/2022	Assoc Prof Luis Prada e Silva	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 (CIRAD), 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	30/06/2022	Dr David McGill	The University of Melbourne	Charles Sturt University, Sindh Agricultural 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, Papua New Guinea Coffee Industry Corporation, Department of Agriculture and Livestock, Fiji Beekeepers Association, Ministry of Agriculture

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Investigating and developing interventions to mitigate food borne parasitic disease in production animals in Laos	LS/2014/055	15/11/2020	31/12/2023	Dr Amanda Ash	Murdoch University	Department of Communicable Diseases Control, Ministry of Health, Murdoch University, National University of Laos
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	1/03/2019	31/12/2021	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	31/12/2021	Dr Dianne Mayberry	CSIRO	Livestock Breeding and Veterinary Department, The University of Melbourne, University of Veterinary Science, Yezin Agricultural University
Safe Pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	1/10/2017	30/06/2022	Dr Fred Unger	International Livestock Research Institute	Hanoi University of Public Health, National Institute of Animal Sciences, The University of Sydney, Vietnam National University of Agriculture
High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2)	LS/2016/276	1/01/2018	30/06/2022	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	30/06/2024	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
Sectoral analysis and investment requirements for improving Fiji and Samoa small ruminant sector	LS/2018/183	1/11/2020	31/12/2021	Dr Rodd Dyer	The University of Queensland	The University of Queensland
A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu	LS/2018/185	1/10/2021	30/09/2024	Dr Simon Quigley	The University of Queensland	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity, Ministry of Trade, Commerce, Industry and Tourism, Queensland Department of Agriculture and Fisheries, Vanuatu Agricultural Research and Technical Centre
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia	LS/2019/116	1/01/2020	30/06/2022	Assoc Prof 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 [Cambodia]	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

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Enhancing the management of antimicrobial resistance in Fiji	LS/2019/119	1/01/2020	30/06/2022	Dr Walter Okelo	CSIRO	Fiji National University, University of South Australia, University of Technology Sydney
Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia [Cambodia, Myanmar, Vietnam]	LS/2019/142	15/09/2020	30/06/2024	Dr Tadelle Dessie	International Livestock Research Institute	E-Merge Centre for Innovations - Africa, Livestock Development for Community Livelihood Organisation, Ministry of Agriculture and Fisheries, National Animal Health and Production Research Institute, National Institute of Animal Sciences
Improved animal health surveillance in Timor-Leste	LS/2019/158	15/02/20	30/10/21	Dr Jenny-Ann Toribio	The University of Sydney	Northern Territory Department of Primary Industry and Resources
Resilient and low-carbon livestock systems for trade and food security in the rangelands of eastern and southern Africa [Ethiopia, Kenya, Zimbabwe]	LS/2020/152	1/07/2021	30/06/2025	Dr Dawit Solomon	International Livestock Research Institute	—
Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa [Kenya, Rwanda, Uganda]	LS/2020/154	1/07/2021	30/06/2025	Dr Chrysantus Tanga	International Centre of Insect Physiology and Ecology	—
Assessing the potential of a high value 'sustainable beef' brand within the Vanuatu tourism sector to improve beef production and increase the market share for smallholders	LS/2020/155	1/06/2021	31/12/2022	Dr Cherise Addinsall	Southern Cross University	—
Global burden of animal disease initiative: Indonesia case study	LS/2020/156	1/07/2021	31/12/2023	Dr Diane Mayberry	CSIRO	Directorate of Animal Health, Indonesian Research Centre for Veterinary Sciences
COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program) [Myanmar, Papua New Guinea, Philippines]	LS/2020/203	1/01/2021	31/12/2021	Prof Sara Davies	Griffith University	—
Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program)	LS/2020/204	1/02/2021	31/12/2021	Dr Kevin Bardosh & Assoc Prof Cecily Maller	RMIT University	St Luke's Medical Center College, University of Nairobi, Vietnam Academy of Social Sciences

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program) [Myanmar, Vietnam]	LS/2020/206	1/01/2021	31/12/2021	Dr Paulo Santos	Monash University	—
Livestock climate lens Part 1: data landscape analysis [Myanmar, Vanuatu]	LS/2020/207	1/02/2021	31/12/2021	Dr (Paul) Long Cheng	The University of Melbourne	—
Social Systems						
Agrifood systems transformation through circular migration between Pacific islands and Australia (COVID-19 impacts program) [Samoa, Tonga, Vanuatu]	CS/2020/212	1/02/2021	30/09/2021	Dr Federico Davila	University of Technology Sydney	CSIRO, University of Wollongong
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 (Cambodia), Partners for Rural Development (Cambodia), Prek Leap National School of Agriculture, RMIT University
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	1/10/2017	31/03/2023	Prof George Curry	Curtin University	CSIRO, Papua New Guinea Coffee Industry Corporation
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems [Fiji, Tonga]	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), The Pacific Community, Stockholm Environment Institute - Asia (Thailand), The University of Auckland, The University of the South Pacific
Enhancing livelihoods through forest and landscape restoration [Philippines]	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 University of Queensland, Visca Foundation for Agricultural and Rural Development (Philippines)
Climate smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	18/03/2019	31/12/2023	Dr Steven Crimp	Australian National University	Climate Change and Development Authority (Papua New Guinea), CSIRO, Department of Agriculture and Livestock, Fresh Produce Development Agency Ltd (Papua New Guinea), National Agricultural Research Institute (Papua New Guinea), Phloem 3 Pty Ltd (Papua New Guinea), Papua New Guinea National Weather Service, Sustineo Pty Ltd (Australia/Papua New Guinea), The University of Goroka

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	1/01/2020	31/12/2021	Dr Sonali Senaratna-Sellamuttu & Mr Sanjiv de Silva	International Water Management Institute	Aqua Rock Konsultants, CSIRO, Irrigation and Water Utilization Management Department (Myanmar), 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 (Solomon Islands), Live and Learn Solomon Islands, Longgu District Mother's Union (Solomon Islands)
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	SSS/2018/137	1/10/2019	31/03/2024	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	31/03/2022	Dr Rochelle Spencer	Murdoch University	—
Next generation agricultural extension: social relations for practice change [Cambodia]	SSS/2019/138	11/01/2021	31/12/2025	Dr Brian Cook	The University of Melbourne	Macquarie University, Partners for Rural Development (Cambodia), The University of Adelaide, University of Battambang (Cambodia)
Landcare - an agricultural extension and community development model at district and national scale in Fiji	SSS/2019/140	1/03/2021	31/12/2024	Dr Mary Johnson	RMIT University	Australian Landcare International, Fiji National University, Landcare Foundation of the Philippines Inc, Ministry of Agriculture (Fiji), Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development, Tei Tei Taveni (Fiji), University of the Philippines at Los Banos, University of the Philippines, Mindanao
Policy impact in Laos: from research to practice	SSS/2020/142	15/07/2020	31/12/2021	Dr Hilary Smith & Prof Peter Kanowski	Australian National University	National University of Laos
Understanding agrichemical use in South-East Asia agriculture [Laos, Vietnam]	SSS/2020/143	12/10/2020	31/03/2022	Drs Liana Williams & Lucy Carter	CSIRO	Plant Protection Research Institute (Vietnam), National Agriculture and Forestry Research Institute (Laos)
Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia	SSS/2020/160	1/09/2021	31/08/2026	Dr Erin Taylor	Western Sydney University	National University of Laos, The University of Adelaide, Royal University of Phnom Penh
Assessment of Indonesia's agricultural innovation system	SSS/2021/100	31/03/2021	31/12/2021	Mr Graham Teskey	ABT Associates Pty LTd	PT. Mitra Asia Lestari (Indonesia)

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Soil and Land Management						
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	1/12/2017	31/12/2021	Dr Daniel Mendham	CSIRO	Australian National University, Forestry and Environment Research and Development Agency (FOERDIA), Forestry Research, University of the Sunshine Coast, Development and Innovation Agency, RMIT University, The University of Melbourne, Borneo Orangutan Survival Foundation, Yayasan Tambuhak Sinta (Indonesia)
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	22/03/2016	31/03/2024	Dr Matthew Denton	The University of Adelaide	Cambodia Agricultural Research and Development Institute, Department of Agricultural Land Management, Murdoch University, National Agriculture and Forestry Research Institute, Provincial Agriculture and Forestry Office, Royal University of Agriculture
Sustaining soil fertility in support of intensification of sweetpotato cropping systems [Papua New Guinea]	SMCN/2012/105	22/05/2020	30/04/2023	Prof Neal Menzies	The University of Queensland	National Agricultural Research Institute
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	10/11/2017	31/03/2022	Dr Wendy Vance	Murdoch University	Cambodia Agricultural Research and Development Institute, Department of Agriculture and Food, Western Australia, Royal University of Agriculture
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	1/01/2019	31/12/2023	Prof Chengrong Chen	Griffith University	Bureau of Soil and Water Management, Provincial Government of Agusan del Sur (PGAS), University of Southern Mindanao, Caraga State 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, Institute of Agricultural Sciences of Southern Vietnam, Murdoch University, New South Wales Department of Primary Industries, University of New England
Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia	SLAM/2018/145	1/08/2020	31/01/2025	Dr Stephen Harper	The University of Queensland	Balai Pengkajian Teknologi Pertanian (BPTP) Central Sulawesi, Bogor Agricultural University, Gadjah Mada University, Indonesian Soil Research Institute, Indonesian Vegetable Research Institute, Queensland Department of Agriculture and Fisheries, The University of Queensland
Soil-based challenges for cropping in Shan State (nutrient acquisition) Myanmar]	SLAM/2018/190	10/05/2019	17/08/2022	Dr Terry Rose	Southern Cross University	—

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
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	1/07/2021	30/06/2025	Mr Peter Wilson	CSIRO	Department of Agriculture and Livestock, National Agricultural Research Institute, Forestry Research Institute, Coffee Research Institute, University of Technology (Papua New Guinea)
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems (phase 2)	SLAM/2019/109	1/03/2021	28/02/2026	Damien Field	The University of Sydney	University of Natural Resources and Environment, Cocoa Board (Papua New Guinea)
Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines	SLAM/2020/117	1/01/2022	30/12/2025	Dr Stephen Harper	The University of Queensland	University of the Philippines Los Banos, Visayas State University, University of Science and Technology of Southern Philippines
Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors	SLAM/2020/118	1/09/2020	28/02/2022	Dr Samantha Grover	RMIT University	University of Melbourne, Borneo Orangutan Survival Foundation, Australian National University, Forestry and Environment Research and Development Agency (FOERDIA)
Soil management in Pacific islands (phase 2): investigating nutrient dynamics and the utility of soil information for better soil and crop management	SLAM/2020/139	1/10/2021	30/09/2025	Dr Ben Macdonald	CSIRO	Fiji Ministry of Agriculture, University of the South Pacific, The Pacific Community, Scientific Research Organisation of Samoa
Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire	SLAM/2020/140	1/10/2020	30/09/2021	Dr Liubov Volkova	The University of Melbourne	—
Understanding tradition and fostering appropriate innovation in soil management to improve farmers productivity and livelihood in Timor-Leste	SLAM/2020/141	1/01/2022	31/12/2025	Prof Andrew McWilliam	Western Sydney University	Deakin University

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Water						
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	1/08/2017	30/12/2022	Prof Richard Bell	Murdoch University	Bangladesh Agricultural Research Council, Bangladesh Agricultural Research Institute, Bangladesh Agricultural University, Bangladesh Rice Research Institute, Conservation Agriculture Service Providers Association, Khulna University, Patuakhali Science and Technology University, Soil Resource Development Institute
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]	LWR/2016/137	16/06/2017	30/06/2022	Prof Jamie Pittock	Australian National University	Ardhi University, CSIRO, 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 [Pakistan]	LWR/2017/027	15/03/2021	30/09/2023	Dr Michael Mitchell	Charles Sturt University	CSIRO, International Centre for Biosaline Agriculture, International Union for Conservation of Nature and Natural Resources, Mehran University of Engineering and Technology
Virtual Irrigation Academy Phase 2: from water monitoring to learning to governance [Malawi, Mozambique, South Africa, Zimbabwe]	WAC/2018/162	17/06/2019	30/06/2023	Dr Richard Stirzaker	CSIRO	Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Department of Agricultural Research Services, Department of Irrigation, National Institute of Irrigation
Water management for small-holder farmers: outscaling ACIAR research in Andhra Pradesh Drought Mitigation Program [India]	WAC/2018/164	1/10/2019	30/09/2022	Dr Uday Nidumolu	CSIRO	—
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India]	LWR/2019/073	1/11/2015	30/06/2022	Dr Mohammed Mainuddin	CSIRO	Bangladesh Agricultural Research Council, Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Bidhan Chandra Krishi Viswavidyalaya University, Central Soil Salinity Research Institute, Krishi Gobeshona Foundation, Murdoch University, Shushilan, Tagore Society for Rural Development
Transforming smallholder food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	WAC/2020/148	1/10/2021	30/09/2026	Dr Tamara Jackson	The University of Adelaide	Bangladesh Agricultural University, Department of Agriculture, West Bengal, India, International Food Policy Research Institute, International Maize and Wheat Improvement Center, Ministry of Land Management and Cooperatives, Rangpur Dinajpur Rural Service, Satmile Satish Club Opathagar, Uttar Banga Krishi Vishwavidyalaya

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Regional foresight for food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	WAC/2020/158	6/11/2020	12/31/2021	Dr Avinash Kishore	International Food Policy Research Institute	—
Opportunities for brackish and saline aquaculture in Pakistan	WAC/2020/179	1/07/2021	30/06/2022	Dr Mohsin Hafeez	International Water Management Institute	WorldFish
Virtual Irrigation Academy business models in Pakistan	WAC/2020/180	1/09/2021	30/08/2022	Dr Richard Stirzaker	CSIRO	Pakistan Council for Research on Water Resources
Supporting inter-provincial water allocation decision making in Pakistan	WAC/2021/103	25/03/2021	31/03/2022	Dr Mobin-ud Din Ahmad	CSIRO	—
Cultivate Africa's Future (phase 2)						
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 programme to combat their menaces (CultiAF 109040) [Malawi, Mozambique, Zambia, Zimbabwe]	GP/2019/175	1/04/2019	30/09/2022	Dr Samira Mohamed	International Centre of Insect Physiology and Ecology	—
Harnessing dietary nutrients of underutilised 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) [Kenya]	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 international) of commissioned organisations for current and proposed projects, 2021–22

Project title	Project code	Commissioned organisation
Australian Capital Territory		
Assessment of Indonesia's agricultural innovation system	SSS/2021/100	ABT Associates Pty Ltd
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
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
Enhancing the management of antimicrobial resistance in Fiji	LS/2019/119	CSIRO
Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta	LWR/2019/073	CSIRO
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
Soil management in Pacific islands (phase 2): investigating nutrient dynamics and the utility of soil information for better soil and crop management	SLAM/2020/139	CSIRO
Virtual Irrigation Academy Phase 2: from water monitoring to learning to governance	WAC/2018/162	CSIRO
Water management for small-holder farmers: outscaling ACIAR research in Andhra Pradesh Drought Mitigation Program	WAC/2018/164	CSIRO
Virtual Irrigation Academy business models in Pakistan	WAC/2020/180	CSIRO
Supporting inter-provincial water allocation decision making in Pakistan	WAC/2021/103	CSIRO
Strengthening agricultural resilience in Western Province: methods for place-based livelihoods approach	FIS/2021/113	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
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
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
Adapting to salinity in the southern Indus Basin	LWR/2017/027	Charles Sturt University
Farmer options for crops under saline conditions in the Mekong River Delta, Vietnam	SLAM/2018/144	Charles Sturt University

Project title	Project code	Commissioned organisation
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
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Southern Cross University
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	LS/2014/042	Southern Cross University
Assessing the potential of a high value 'sustainable beef' brand within the Vanuatu tourism sector to improve beef production and increase the market share for smallholders	LS/2020/155	Southern Cross University
Soil-based challenges for cropping in Shan State (nutrient acquisition)	SLAM/2018/190	Southern Cross University
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
Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan	CROP/2020/167	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 (phase 2)	SLAM/2019/109	The University of Sydney
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems	ASEM/2016/101	The University of Sydney & The University of Western Australia
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
Agrifood systems transformation through circular migration between Pacific islands and Australia (COVID-19 impacts program)	CS/2020/212	University of Technology Sydney
Developing social and economic monitoring and evaluation systems in Indonesian tuna fisheries to assess potential impacts of alternative management measures on vulnerable communities	FIS/2020/109	University of Technology Sydney
Institutional effectiveness and political economy of coral reef restoration in the Philippines	FIS/2021/112	University of Technology Sydney
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 agrifood 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
Coalitions for change in sustainable national community-based fisheries management programs in the Pacific	FIS/2020/172	University of Wollongong
Strengthening agricultural resilience in Western Province: mapping place-based strength and assets	FIS/2021/122	Western Sydney University

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Understanding tradition and fostering appropriate innovation in soil management to improve farmers productivity and livelihood in Timor-Leste	SLAM/2020/141	Western Sydney University
Building the evidence base on the impacts of mobile financial services for women and men in farming households in Laos and Cambodia	SSS/2020/160	Western Sydney University
Northern Territory		
Evaluating zoonotic malaria transmission and agricultural and forestry land use in Indonesia	LS/2019/116	Menzies School of Health Research
Improving mango crop management in Cambodia, the Philippines and Australia to meet market expectations	HORT/2016/190	Northern Territory Department of Primary Industry and Fisheries Industry, Tourism and Trade
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
Agribusiness-led inclusive value chain development for smallholder farming systems in the Philippines	AGB/2018/196	CSIRO
Transforming Pacific coastal food production systems	FIS/2020/108	CSIRO
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	CSIRO
Global burden of animal disease initiative: Indonesia case study	LS/2020/156	CSIRO
Understanding agrichemical use in South-East Asia agriculture	SSS/2020/143	CSIRO
Transformational pathways for Pacific fisheries communities	WAC/2020/178	CSIRO
Developing alternative small-scale fishery models in the Fly River, Western Province, Papua New Guinea	FIS/2020/110	CSIRO & Ok Tedi Development Foundation (PNG)
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Griffith University
Enhancing private sector-led development of the canarium industry in Papua New Guinea (phase 2)	FST/2017/038	Griffith University
Livelihoods in forest ecosystem recovery	FST/2020/135	Griffith University
COVID-19: gendered risks, impact and response in the Indo-Pacific: rapid research and policy guidance (COVID-19 impacts program)	LS/2020/203	Griffith University
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	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
Spatially integrated approach to support a portfolio of livelihoods	FIS/2020/111	James Cook University
Supporting grouper farming smallholders in Vietnam to improve their small-medium enterprise businesses by engaging with aquafeed companies to produce commercial feeds	FIS/2021/121	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

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Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	Queensland Department of Agriculture and Fisheries
Improving root crop resilience and biosecurity in Pacific island countries and Australia	HORT/2018/195	Queensland Department of Agriculture and Fisheries
Developing a biosecurity system for small banana growers resilient to Fusarium wilt TR4 in southern and eastern Africa	HORT/2020/128	Queensland Department of Agriculture and Fisheries
Improving greenhouse gas inventory systems to support the mitigation ambitions of Fiji and Vietnam	WAC/2019/150	Queensland University of Technology
Regional coral restoration networks and appropriate technologies for larger-scale coral and fish habitat restoration in the Philippines and Australia	FIS/2019/123	Southern Cross University
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	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
Planning and establishing a sustainable smallholder rice chain in the Mekong Delta	AGB/2019/153	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
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
Supporting agroforestry through tree improvement and gene conservation in Laos	FST/2020/119	The University of Queensland
Responding to emerging pest and disease threats to horticulture in Pacific islands	HORT/2016/185	The University of Queensland
Improving smallholder wellbeing through participation in modern value chains: sustaining future growth in the Pakistan citrus industry	HORT/2020/129	The University of Queensland
Building a business case for investment in a coconut industry in the Pacific	HORT/2020/190	The University of Queensland
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	The University of Queensland
Sectoral analysis and investment requirements for improving Fiji and Samoa small ruminant sector	LS/2018/183	The University of Queensland
A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu	LS/2018/185	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
Managing heavy metals and soil contaminants in vegetable production to ensure food safety and environmental health in the Philippines	SLAM/2020/117	The University of Queensland
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	SMCN/2012/105	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
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

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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 mabé pearl and shell-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
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
Building effective forest health and biosecurity networks in South-East Asia	FST/2020/123	University of the Sunshine Coast
Enhanced fruit systems for Tonga and Samoa (phase 2): community-based citrus production	HORT/2019/165	University of the Sunshine Coast
South Australia		
Agriculture for tourism: research to advance a synergistic development pathway for local agribusiness value chains and tourism in Bali, with application to similar high intensity regional tourism hubs throughout Indonesia	AGB/2020/121	Primary Principles Pty Ltd
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	The University of Adelaide
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	The University of Adelaide
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
Transforming smallholder food systems in the Eastern Gangetic Plains	WAC/2020/148	The University of Adelaide
Tasmania		
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	CSIRO
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	CSIRO
Blue economy: valuing the carbon sequestration potential in oyster aquaculture	FIS/2020/175	University of Tasmania
Reducing forest biosecurity threats in South-East Asia	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		
Vulnerability in the Anthropocene: a prospective analysis of the need for social protection (COVID-19 impacts program)	LS/2020/206	Monash University
Collaboration on One Health economic research for systems	LS/2019/118	Nossal Institute Limited
Rapid assessment of the impact of COVID-19 on wet market reforms: case studies from Vietnam, Kenya and the Philippines (COVID-19 impacts program)	LS/2020/204	RMIT University
Validating technologies for assessing and monitoring the impacts of re-wetting of peatland Indonesia using eddy flux towers coupled with the Chameleon sensors	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
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	The University of Melbourne

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Conservation agriculture and sustainable intensification systems for transformational climate adaptation and greenhouse gas mitigation in Pacific island countries	CLIM/2020/186	The University of Melbourne
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	The University of Melbourne
Forest restoration for economic outcomes	FST/2020/137	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
Livestock climate lens Part 1: data landscape analysis	LS/2020/207	The University of Melbourne
Reducing uncertainty in greenhouse gas emissions from Indonesian peatfire	SLAM/2020/140	The University of Melbourne
Next generation agricultural extension: social relations for practice change	SSS/2019/138	The University of Melbourne
Western Australia		
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Curtin University
Mechanisation and conservation agriculture-based crop-livestock innovation in eastern Africa	CROP/2020/166	Murdoch 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
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
Protecting Ethiopian lentil crops	CROP/2020/164	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	CABI International (Central and West Asia)
Mitigation and adaptation co-benefits modelling trial in Bangladesh	CLIM/2021/109	Colombia University
Climate-smart interventions for smallholder farmers in Ethiopia (CultiAF 109038)	GP/2019/173	Ethiopian Institute of Agricultural Research
Food loss in the catfish value chain of the Mekong River Basin (Food Loss Research Program)	CS/2020/209	Health and Agricultural Policy Research Institute
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	AGB/2018/172	International Center for Tropical Agriculture
Alien invasive fruit flies in Southern Africa: Implementation of a sustainable IPM programme to combat their menaces (CultiAF 109040)	GP/2019/175	International Centre of Insect Physiology and Ecology

Project title	Project code	Commissioned organisation
Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa	LS/2020/154	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	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
Asian chicken genetic gains: a platform for exploring, testing, delivering, and improving chickens for enhanced livelihood outcomes in South-East Asia	LS/2019/142	International Livestock Research Institute
Resilient and low-carbon livestock systems for trade and food security in the rangelands of eastern and southern Africa	LS/2020/152	International Livestock Research Institute
Wheat blast resistant wheat	CROP/2020/165	International Maize and Wheat Improvement Center
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	International Water Management Institute
Opportunities for brackish and saline aquaculture in Pakistan	WAC/2020/179	International Water Management Institute
Harnessing dietary nutrients of underutilised fish and fish-based products in Uganda (CultiAF 109041)	GP/2019/176	Makerere University Uganda
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) - Malawi	CS/2021/115	Mzuzu University
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands	HORT/2017/025	Pacific Community
Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka (Food Loss Research Program)	CS/2020/193	Quaid-e-Azam University
Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific (Food Loss Research Program)	CS/2020/191	Scientific Research Organisation of Samoa
International Mungbean Improvement Network 2	CROP/2019/144	The World Vegetable Center
User driven approaches to make government and farmer led smallholder irrigation in Mozambique more productive (CultiAF 109039)	GP/2019/174	University of Eduardo Mondlane
Managing food value chains for improved nutrition for urban vulnerable populations in Africa (Africitiesfood) (Food Loss Research Program) - Zambia	CS/2020/210	University of Zambia
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
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
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

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Contact ACIAR

Contact ACIAR

Australian Centre for International Agricultural Research
GPO Box 1571, Canberra ACT 2601, Australia

Phone	+61 2 6217 0500
Fax	+61 2 6217 0501
Email	aciar@aciar.gov.au
Facebook	ACIARAustralia
Twitter	@ACIARAustralia
Instagram	@ACIARAustralia
LinkedIn	Australian Centre for International Agricultural Research
YouTube	ACIAR Australia

Electronic address of this report
www.aciar.gov.au/publication/AOP-2020-21

Enquiries about this report are welcome, and should be directed to:

General Manager, Outreach and Capacity Building
Australian Centre for International Agricultural Research
GPO Box 1571
Canberra ACT 2601
Australia
Phone: +61 2 6217 0500
aciar@aciar.gov.au

ACIAR Executive

Chief Executive Officer
Prof Andrew Campbell
Phone: +61 2 6217 0578
andrew.campbell@aciar.gov.au

Chief Finance Officer
Ms Audrey Gormley
Phone: +61 2 6217 0567
audrey.gormley@aciar.gov.au

Chief Scientist
Dr Daniel Walker
Phone: +61 2 6217 0561
daniel.walker@aciar.gov.au

General Manager, Country Partnerships
Dr Peter Horne
Phone: +61 2 6217 0522
peter.horne@aciar.gov.au

General Manager, Outreach and Capacity Building
Ms Eleanor Dean
Phone: +61 2 6217 0547
eleanor.dean@aciar.gov.au

Country and Regional Managers

Pacific and Papua New Guinea region
Ms Mai (Gay Maureen) Alagcan
mai.alagcan@aciar.gov.au

Papua New Guinea
Ms Doreen Iga
Phone: +675 325 9333 ext 299
doreen.iga@aciar.gov.au

East and South-East Asia region
Ms Dulce Carandang Simmanivong
Phone: +856 21 353 800 ext. 227
dulce.simmanivong@aciar.gov.au

China
Mr Wang Guanglin
Phone: +86 10 5140 4172
guanglin.wang@aciar.gov.au

Indonesia
Ms Mirah Nuryati
Phone: +62 21 2550 5577
mirah.nuryati@aciar.gov.au

Philippines
Position vacant

Vietnam
Ms Nguyen Thi Thanh An
Phone: +84 24 3774 0263
an.nguyen@aciar.gov.au

South Asia region
Dr Pratibha Singh
Phone: +91 11 4139 9925
pratibha.singh@aciar.gov.au

Pakistan
Dr Munawar Raza Kazmi
Phone: +92 51 8355 367
munawar.kazmi@aciar.gov.au

Eastern and Southern Africa region
Dr Leah Ndungu
Phone: +254 20 4277 264
leah.ndungu@aciar.gov.au

Research Program Managers

Agribusiness
Mr Howard Hall
Phone: +61 2 6217 0541
howard.hall@aciar.gov.au

Climate Change
Dr Veronica Doerr
Phone: +61 2 6217 0587
veronica.doerr@aciar.gov.au

Crops
Dr Eric Huttner
Phone: +61 2 6217 0527
eric.huttner@aciar.gov.au

Fisheries
Dr Ann Fleming
Phone: +61 2 6217 0508
ann.fleming@aciar.gov.au

Forestry
Dr Nora Devoe
Phone: +61 2 6217 0549
nora.devoe@aciar.gov.au

Horticulture
Ms Irene Kernot
Phone: +61 2 6217 0530
irene.kernot@aciar.gov.au

Livestock Systems
Dr Anna Okello
Phone: +61 2 6217 0560
anna.okello@aciar.gov.au

Social Systems
Dr Clemens Grünbühel
Phone: +61 2 6217 0500
clemens.grunbuhel@aciar.gov.au

Soil and Land Management
Dr James Quilty
Phone: +61 2 6217 0558
james.quilty@aciar.gov.au

Water
Dr Robyn Johnston
Phone: +61 2 6217 0540
robyn.johnston@aciar.gov.au

Director Multilateral Engagement
Dr Julianne Biddle
Phone: +61 2 6217 0516
julianne.biddle@aciar.gov.au

Research Manager, Economics and Policy
Dr Todd Sanderson
Phone: +61 2 6217 0500
todd.sanderson@aciar.gov.au

Research Manager, Portfolio Planning and Impact Evaluation
Ms Bethany Davies
Phone: +61 2 6217 0510
bethany.davies@aciar.gov.au

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