



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.

62
projects

48 research
projects

14 small
research
activities

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 Baleisuvu, 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 Koronivia 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

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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

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Crops: Dr Eric Huttner

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Livestock Systems: Dr Anna Okello

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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