

5.1

Pacific



Pacific

The countries of the western Pacific region are set apart from the rest of the world. Many are small and geographically isolated, have limited land mass and arable land, fragile natural environments and few 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 and recover from disasters and climate change effects, which are prominent in the region.

In 2021–22, the region was confronted with a string of civil and natural disasters that included civil unrest and demonstrations in Solomon Islands, volcanic eruption and tsunami in Tonga, and flooding and landslides due to cyclones across several countries.

Pacific island 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.

For the last 2 years, 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. Many Pacific island countries have intensified their vaccination programs, including boosters to help manage the spread of the virus. Australia has assisted the region by providing donations of vaccines and support to local health systems.

In 2020 ACIAR published a report¹ that examined food systems in the Pacific region and the vulnerabilities that were exposed or amplified by the COVID-19 shock. Income and production by farmers and fishers were impacted by the movement restrictions; service delivery was disrupted, especially on small and medium islands; local markets closed reducing the availability of fresh produce, which was felt most by urban areas; tourism declined significantly reducing farm incomes that were reliant on supplying tourism establishments; and migration to rural areas increased food demand and pressure on agriculture. Lockdowns and border closures also resulted in employment and income losses, remittances declined and general household and business spending declined. In response to this analysis, ACIAR commissioned an assessment of agrifood systems transformation through circular migration between Pacific island countries and Australia². This assessment concluded that the combination of continued labour demands in Australian agriculture, COVID-19 socioeconomic impacts in the Pacific, and future food systems risks in Pacific island countries, create an opportunity for greater agriculture-oriented research and training within agriculture-related labour mobility.

¹ Robins L, Crimp S, van Wensveen M, Alders RG, Bourke RM, Butler J, Cosijn M, Davila F, Lal A, McCarthy JF, McWilliam A, Palo ASM, Thomson N, Warr P & Webb M (2020) *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action*, ACIAR Technical Report No. 96, Australian Centre for International Agricultural Research, Canberra.

² Davila F, Dun O, Farfootko C, Jacobs B, Klockner N, Vuoti E, Kaumaitotoya L, Birch A, Kaoh P, Pitakia T, Tu'itahi S (2022) *Agri-food systems transformation through circular migration between Pacific island countries and Australia*, ACIAR Technical Report No. 100, Australian Centre for International Agricultural Research, Canberra.



The impact of the pandemic continues to hit the Pacific region hard. Agriculture and fresh produce emerged as the foundation of the economy for the region and ensured food security for the population when the manufacturing sector, trade and services stalled.

To reduce and mitigate ongoing impacts of COVID-19 on economies, Pacific region countries adopted a variety of measures, including economic stimulus packages, home gardening programs through seed distribution, farm support packages and backyard aquaculture farms. Cash transfers to most vulnerable households were also implemented to augment loss of income.

While many Pacific region countries are still contending with and responding to the onshore surge of the Omicron variant of COVID-19, the region and governments are preparing to restart their economies and open borders. The past 2 years have resulted in renewed interest in, and support for, agriculture, fisheries and forestry; enthusiasm for innovation in food systems and value chains; and the creation of new domestic market opportunities.

Drivers of regional collaboration

While acknowledging the 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.

Partner countries in the ACIAR Pacific region

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



ACIAR research projects are designed with consideration for sustainable and inclusive economic development, such as projects in the highlands of Papua New Guinea where crop production and crop protection research enables growers to supply more product to local markets. ACIAR Research Program Manager, Horticulture, Irene Kernot (centre), visited a market with research team members to learn more about project impacts.



ACIAR alumnus and Senior Research Officer, Fiji Ministry of Agriculture, Dr Rohit Lal, leads soils training in Taveuni, Fiji. The soils training aims to help farmers learn to recognise soil nutrient deficiencies and ways to improve soil health. Photo: Sunayna Nandini

ACIAR Pacific region program

The 2017 Pacific Step-up highlighted in the Australian Government's 2017 Foreign Policy White Paper elevated Australia's partnerships with the Pacific region to a new level and focused on strategically secure and economically stable support for the region. This strong focus was re-emphasised by Australia's new government in 2022.

In 2022-23, 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 the region enters the new normal. We will focus our efforts on re-building the agriculture sector post-pandemic and re-engaging with partners, including face to face discussions where possible. We are also supporting Pacific Week of Agriculture and Forestry, which Fiji will host in March 2023.

We continue to support alumni of ACIAR capacity building programs and fellowships to work hand-in-hand with Australian researchers to provide insights into how the pandemic is affecting local food security and to ensure future food security 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 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. 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.

Pacific region program 2022-23

Partner country	No. projects
Pacific island countries	34
Fiji	20
Kiribati	4
Samoa	13
Solomon Islands	14
Tonga	11
Vanuatu	9
Papua New Guinea	22

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

Research portfolio



3

Agribusiness projects



5

Climate Change projects



1

Crops project



9

Fisheries projects



6

Forestry projects



11

Horticulture projects



6

Livestock Systems projects



7

Social Systems projects



4

Soil and Land Management projects



0

Water projects

52
projects

37 research
projects

15 small
research
activities

Table 5.1 Current and proposed projects in the Pacific region, 2022-23

Project title	Project code	Country
Agribusiness		
Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2)	AGB/2014/057	Fiji, Tonga, Vanuatu
Defining priority commercialisation pathways and potential private commercialisation partners for viable long-term commercialisation of products emerging from FST/2019/128	AGB/2021/172	Fiji
Landscape and opportunity analysis in the Pacific tuna sector: Foundation analysis to identify innovation pathways to enhance participation by the Pacific community and value retention in the region	AGB/2021/173	South Pacific general
Climate Change		
Transformation pathways for Pacific coastal food systems	CLIM/2020/178	Kiribati, Solomon Islands
Sustainable intensification for climate-resilient development in Pacific island countries	CLIM/2020/186	Samoa, Tonga
Institutional barriers to climate finance through a gendered lens in Fiji, Samoa and Solomon Islands	CLIM/2021/110	Fiji, Samoa, Solomon Islands
Supporting greenhouse gas inventories and livestock data development in Fiji	CLIM/2021/160	Fiji
Supporting the tracking sharing learning platform of the Adaptation Research Alliance	CLIM/2022/108	Global
Crops		
Finding a genetic basis for oil palm responses to basal stem rot in a long-term infected block	CROP/2021/130	Papua New Guinea, Solomon Islands
Fisheries		
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	Tonga, Vietnam
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
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: Developing methods for strengths-based livelihoods approach	FIS/2021/113	Papua New Guinea
Strengthening agricultural resilience in Western Province: Mapping place-based strengths 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 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
Kava land use changes	FST/2021/146	Fiji, Vanuatu
Horticulture		
Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific	CS/2020/191	Fiji, Samoa, Solomon Islands, Tonga
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	Fiji, Samoa, Solomon Islands, Vanuatu
Developing the cocoa value chain in Bougainville	HORT/2014/094	Papua New Guinea
Responding to emerging pest and disease threats to horticulture in the Pacific islands	HORT/2016/185	Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga
Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands	HORT/2017/025	Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	Papua New Guinea
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
PICfood: Driving vegetable food environments to promote healthy diets in Pacific island countries	HORT/2021/141	Fiji, Samoa
Biosecurity planning	HORT/2021/151	Cambodia, Papua New Guinea
Understanding school food provision in the Pacific: Scoping the potential of local food systems to improve diets, nutrition and livelihoods	HORT/2021/159	Fiji
Livestock Systems		
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
A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu	LS/2018/185	Vanuatu
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in 3 provinces in Papua New Guinea	LS/2018/217	Papua New Guinea
Development of a third party verified voluntary sustainable certification program for beef and other key commodities in Vanuatu	LS/2020/155	Vanuatu
Strengthened surveillance for vector-borne zoonotic and livestock diseases in Papua New Guinea	LS/2021/158	Papua New Guinea

Project title	Project code	Country
Social Systems		
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
Climate-smart coastal landscapes for sustaining fisheries-based livelihoods and food security in the Pacific	SSS/2021/120	Fiji, Tonga
Soil and Land Management		
Better soil information for improving Papua New Guinea 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 island countries Phase 2: Investigating nutrient dynamics and the utility of soil information for better soil and crop management	SLAM/2020/139	Fiji, Samoa, Tonga, Vanuatu
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	SMCN/2012/105	Papua New Guinea



Pacific island countries



A\$11.85 million
Budgeted funding



26
Bilateral and regional
research projects



9
Small projects and
research activities

Agriculture, fisheries and forestry are vital sectors for the majority of Pacific island communities and countries, because of their contributions to rural livelihoods, gross domestic product (GDP) and food security, as well as increasing opportunities for local regional and international markets.

The Multi-Country Programming Framework for the Pacific Islands 2018–2022, developed in partnership with the Food and Agriculture Organization of the United Nations (FAO), identified the following common challenges across the Pacific island countries:

- » limited land mass and dispersed population
- » fragile natural environments and lack of arable land
- » narrow resource bases and reliance on ocean resources
- » high vulnerability to climate change, external economic shocks, and natural disasters
- » exposure to increasingly frequent and more intense severe weather and climate events, including droughts, floods and tropical storms
- » high dependence on food imports
- » dependence on a limited number of economic sectors
- » remoteness and distance from global markets
- » high costs for energy, transportation and communication.

These constraints interact with one another and contribute to increased vulnerability to shocks – both economic shocks (such as abrupt changes in food and fuel prices) and natural disasters (such as cyclones, floods and droughts, earthquakes and tsunamis). These vulnerabilities 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.

The vulnerability of Pacific island countries is increased by their narrow resource base, which implies the economic dependence of many islands on exports of a single commodity or limited range of commodities.

For much of the twentieth century, most Pacific island economies were heavily dependent on copra as their principal source of export income; however, with the falling value of coconut oil, this previous source of wealth has become a 'poverty trap' for many communities and countries that lack the resources to diversify into higher value products (which could support the rejuvenation of the industry) or into other crops and commodities.

Other countries are heavily dependent on marine resources, especially tuna, for their export earnings. In this case, significant vulnerability arises from the limited control that each country has over the management of this resource. An emerging threat is that rising sea temperatures, especially when accentuated by El Niño cycles, may affect the migration of some tuna species, potentially taking fish populations out of the waters of Pacific island countries that depend heavily on them economically.

Dependence on logging – and especially the export of round logs – is a challenge in western Melanesian countries (Papua New Guinea, Solomon Islands and, to a lesser extent, Vanuatu). The natural forest resource is declining rapidly, often accompanied by serious environmental degradation, and exploitation brings little lasting benefit to landowners or to the national economy. Partner countries wish to move towards more sustainable management of forest resources and local processing to add value to the timber but lack the economic resources and skills to make this transition.

This context is not static but evolves on a number of scales, in time and space. Changing demographics are one key factor, with populations increasing at more than 2% per annum in Solomon Islands and Vanuatu (as well as Papua New Guinea), leading to mounting concerns about local food security and increasing pressure on the natural resource base. Elsewhere in the Pacific region, populations are either stable (increasing at less than 1% per year) or falling (due to emigration), leading to labour shortages and making it harder to develop profitable enterprises. Additionally, there is a strong move towards urbanisation across the Pacific region, with more than one-third of the total population now living in cities. This has disrupted traditional food systems and diets and is leaving some rural areas and outlying islands with declining populations, hampering economic development and making it hard for governments to assure basic services.

Another widespread vulnerability of Pacific islands agriculture – though with different impacts in each country and island – is to invasive pests and diseases. Island environments have inherently limited natural resilience in the face of aggressive invasive species due to the limited local diversity of ‘natural enemies’. Recent years have been marked with rapidly spreading outbreaks of, for instance, invasive ant species, the destructive ‘Guam strain’ of the familiar coconut rhinoceros beetle, and the giant African snail. Emerging diseases of livestock (and potentially fisheries) may be equally destructive, even if less visible to the general public.

Pacific region leaders have repeatedly identified 2 overriding threats to the economic development and wellbeing of people in the region:

1. Climate change and its impact on food systems

Pacific island countries are disproportionately affected by climate change, while having little scope to influence the drivers of climate change. All countries in the Pacific region are concerned about the potential impacts of climate change on rising sea levels (given that much of the population and most of the productive agriculture in the Pacific islands is in coastal areas or coastal plains), food systems (including new threats from invasive pest species) and on their fragile marine resources.

2. Rapid rise in non-communicable diseases, associated with declining diet quality

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



Fijian farmer, Mr Emosi Ravato, uses a high tunnel (a plastic covered structure) to increase production of certain crops, increase the length of the growing season and grow crops that otherwise could not be grown in his area. Photo: Central Queensland University

Given these challenges, Pacific leaders have strongly emphasised the need for greater resilience in Pacific region food and agriculture systems as a means to counteract vulnerabilities and to increase food and nutritional security. While investing in agriculture fisheries and forestry has been widely recognised as one of the most effective ways of stimulating broad-based economic growth, the effort to increase resilience, rather than focusing primarily on increasing productivity, has become a theme that underpins the entire agricultural development agenda in the Pacific region. Given the scale and complexity of the problems faced by Pacific island partner countries, it is fortunate that the Pacific region has a strong tradition of multilateral and bilateral institutions and partnerships that have supported many decades of collaboration and concerted action, to address a wide range of issues.

The Pacific Islands Forum provides the overall framework for policy development and action, while the technical agencies, especially the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP), provide support to member countries in taking action across a range of sectors and development issues, including health, education, the environment, biosecurity, trade, communications and infrastructure.

ACIAR has been a leading supporter of regional and bilateral research collaboration in the region with SPC, partner countries and other agencies, in agriculture, forestry and fisheries. These existing relationships provide a vital foundation for a portfolio of integrated and cross-sectoral research that will be needed to tackle the 2 high level challenges outlined above. ACIAR started working with partners in the Pacific region in 1983 and, for the next 2 decades, the majority of projects were sectorally and technically focused.

Country priorities

The ACIAR 10-Year Strategy 2018–2027 positions the agency’s support to the Indo-Pacific region. Following the 2017 White Paper Pacific Step-up. Stepping up Australia’s engagement with our Pacific family, ACIAR placed greater emphasis on supporting Australia’s ‘near neighbours’ in the Pacific region. This was in response to the significant long-term challenges faced by our partners in the Pacific region, including: climate change and responding to natural disasters; sustaining economic growth and boosting education, developing skills and jobs for growing populations; pursuing gender equality and recognising the essential role of women in achieving better development outcomes; preventing major disease outbreak and tackling transnational crime.

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 increase 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 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, well-coordinated technological innovations and ways of working.

ACIAR currently works with 7 Pacific island countries: Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

2022–23 research program

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

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in 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 viability of the coconut sector in the Pacific region is being challenged by the increasing proportion of coconut palms becoming senile. Many farmers are reluctant to renew palms due to the initial cost and reduced income until the newly planted palms yield fruit. A current ACIAR-supported forestry project is exploring the sale of senile stems by farmers to the timber industry, with revenue from sales expected to act as an incentive for farmers to remove the senile palms and offset the costs of replanting. A small research activity led by Mr Ian Buck of Buck Advisory will develop a framework for directly engaging private sector partners in the project to ensure new value chains for coconut veneer timber products are connected to viable markets via committed and capable processing and marketing entities. This framework will be applicable to other projects where understanding the business operating environment and engagement of suitably qualified private sector partners are essential to maximising the adoption and uptake of project lessons and outcomes.¹

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 of PARDI, 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. Concluding in 2022, the project will finalise the delivery and evaluation of mentoring programs tailored to the honey, tilapia and agritourism sectors, provide technical and supervisory support to master students at partner universities, and develop and trial a profitability and accounting tool for smallholder beekeepers.²

Tuna is recognised as one of the greatest shared natural resources of Pacific island countries, providing jobs, government revenue and contributing to meeting the nutritional needs of the Pacific island communities. However, population growth, climate change and overfishing have placed increasing pressure on the sustainability of tuna resources. A small research activity led by Ms Deb Doan of Business for Development will identify innovation pathways and assess the commercial feasibility for improving returns (defined as sustainable resource management, maximum catch utilisation and increased retention of value) for Pacific island countries' tuna sectors and economies more broadly. Researchers will analyse previous projects to identify key barriers to success and critical success factors.³

Climate Change

Australia is a world leader in greenhouse gas mitigation research in agriculture. A new project in 2022–23 works with Fiji to strengthen its national greenhouse gas accounting systems for livestock towards the same high standard used by Australia and to use these systems to support the identification and implementation of on-farm management options that reduce emissions. The project supports the implementation of Fiji's Low Emission Development Strategy. Led by Dr Natalie Doran-Browne of Riverine Plains Inc, the project team will work with government institutions in Fiji 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 project team will also collaborate within Fiji and across the region to support Pacific greenhouse gas inventory systems.⁴

Evidence suggests that responding to climate change requires collaboration, learning and community-based participatory processes – all 'softer' types of response that are rarely formally supported through institutional mechanisms. A small research activity, led by Dr Rowena Maguire of Queensland University of Technology, is exploring whether the relative lack of institutional support for 'softer' types of climate response, and the underrepresentation of women and particular cultures, are linked, acting as both causes and consequences of the insufficient action on climate change. The team will conclude the research with a multi-country workshop and the production of 3 country case studies. The research team will present their findings at COP27.⁵

The impacts of climate change and population growth are projected to lead to the collapse of coastal livelihoods dependent on coral reef-based fish and nearshore fish throughout Pacific island countries. Different food and livelihood options need to be progressed in ways that are owned and driven by local communities, facilitated by governments and civil society groups. Led by Dr James Butler of the Cawthron Institute, a new project will combine scientific analysis and local knowledge about pathways toward novel and transformative circular food production options, and develop the transformative capacity needed in local communities to identify leverage points and create transformative change.⁶

Smallholder farmers in Pacific island countries are vulnerable to reductions in the availability of fresh water under climate change and increasing demands from growing populations. Co-led by Professor Timothy Reeves and Dr Dorin Gupta of the University of Melbourne, the project will explore opportunities for sustainable intensification systems in smallholder farming systems in Samoa and Tonga. In other parts of the world, these systems which combine multiple interventions for benefits that may be 'more than a sum of the parts' have been successful in intensifying agricultural production while providing climate adaptation and mitigation benefits. This project will investigate whether such integrated management changes may help Pacific island countries in similar ways.⁷



Basal stem rot is a fungal disease that kills oil palm in plantations across South-East Asia and the Pacific region. An ACIAR-supported project is studying the effectiveness of removing infected dead trees to reduce inoculum pressure (CROP/2021/130).

Crops

Basal stem rot is a fungal disease that kills oil palm in plantations across South-East Asia and the Pacific region. Growers have limited options to manage the disease. New trees are planted after the death of the infected trees but experience suggests that the incidence of the fungus seems to increase with each successive planting. Removing infected dead trees may reduce inoculum pressure but is costly and the benefit has not yet been demonstrated. A new research activity in 2022, led by Dr Agnieszka Mudge of the University of Queensland will continue monthly monitoring of an experimental plot established 11 years ago. Data will be analysed to determine if infection dynamics and impact differ between genetically characterised families of trees and if there is a difference between lots where infected stem bases and roots of dead trees are removed compared with plot where they are left in place.⁸

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 2023 that is supporting further expansion of community-based pearl farming and handcraft production in Tonga and demonstrating the feasibility of similar development in Vietnam.⁹

Mabé (half-pearl) jewellery and shell handcraft industries provide income opportunities for coastal communities and women's social enterprises in the western Pacific. Previous projects have increased the technical skills of communities in producing juvenile oysters, farming mabé shell in Fiji and Tonga, and producing 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.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 will complete 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

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 regional agrifood systems using newly integrated data sources that allow mapping and analysis of what food is being produced, distributed, traded and sold. During 2022–23, the analysis results will continue to 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.¹²

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 project led by Dr Dirk Steenbergen of the University of Wollongong 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 the Pacific region. In 2022–23 the project team will implement an awareness raising strategy, assess food and nutrition security in the scaling of community-based fisheries management and develop a centralised information management system to monitor the impact of information dissemination activities.¹³

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 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.¹⁴

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 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, focusing on income benefits. 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 appropriate community-led infrastructure and skill development investments. In 2022–23 activities will include monitoring fish distribution and marketing, documenting livelihood experiences and building the capacity of women in safe aquatic food handling practices.¹⁵



Coastal fisheries are critical for providing food security and local employment across the Pacific region. Increasingly ACIAR-supported projects are focused on building resilience to global change and dwindling fisheries resources. Photo: Conor Ashleigh

Forestry

Renewal of the coconut estate is a priority for governments, development agencies and researchers throughout the Pacific region. In Fiji, a project 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. In 2022–23, the project team will focus on mapping senile coconut stands and identifying opportunities to promote gender equity within the value chain.¹⁶

Kava is a major cash crop in the Pacific region and a revered, traditional crop, grown for at least 3,000 years. Using time series geospatial data and ground truthing, this project will examine changes in the area and methods of kava cultivation in leading Pacific region producer countries, Vanuatu and Fiji. Kava is becoming big business, with the number of producers, production, sales, revenue and exports climbing. Governments and aid agencies are promoting the kava industry, but kava cultivation has resulted in deforestation. Researchers aim to assess land cover change from kava cultivation and to consider whether environmental harm is resulting and can be mitigated.¹⁷

Although primary forest reduction is significant, Solomon Islands economy and livelihoods remain 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 with 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 2022 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.¹⁸

Horticulture

School meals programs based on home-grown models can serve as platforms for transforming food systems while improving education quality. A small research activity led by Dr Sarah Burkhart of the University of the Sunshine Coast aims to understand the current extent and status of school food provision and environments in Pacific island countries. The research will identify and enhance nutrition-sensitive institutional food procurement opportunities, including school feeding programs, to provide reliable markets for small-scale producers in Fiji. It will also investigate the potential to scale-up school feeding initiatives in the Pacific region.¹⁹

Developing 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 2022–23, the project will focus on providing technical training for extension staff and conducting in-country plant health clinics and pesticide awareness workshops. The project will continue to build surveillance and diagnostic capacity for managing emerging pests and diseases, including fall armyworm. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.²⁰

Coconuts contribute, directly and indirectly, to the livelihoods of coastal communities throughout the Pacific region. 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. In 2022–23 researchers will focus on training staff in field transfer of plantlets derived from embryo culture and identifying key varieties for preservation in the new cryopreservation facility that will be built and commissioned.²¹





Increasing vegetable consumption is a key food system change required in the Pacific region to address malnourishment. Mrs Aradhana Deesh (right) is pictured with vegetable seedlings, she has grown as part of an ACIAR-funded research project for ACIAR alumni. Photo: Sunayna Nandini

In the Pacific region, vulnerability of horticultural produce to post-harvest losses is often more dependent on where and how a product is grown, transported and sold, rather than on the 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 (page 23).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

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 2022-23, 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.²⁴

Pacific island countries are some of the most malnourished in the world, with among the lowest vegetable availability and consumption globally. Increasing vegetable consumption is a key food system change, but the barriers and opportunities to vegetable consumption are not currently well understood. The PICfood project aims to assess food environments in Fiji and Samoa, strengthen links between agriculture and health and identify the most important entry points for food system change towards increasing the diversity of vegetables consumed. Research findings and citizen food forums will inform agriculture, food and nutrition policy and practice for healthy diets in the Pacific.²⁵

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. The 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.²⁶

Livestock Systems

Strong domestic demand for honey and the potential to export honey and its by-products offers an opportunity to smallholder farmers in Fiji and Papua New Guinea. A project, led by Dr Cooper Schouten 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 2022–23, the project will continue to develop best-practice pest and disease management programs, particularly in readiness for incursions of varroa and tropilaelaps mites. Development of post-harvest quality management programs for producers and packers will continue, for standards, certification and testing processes for export grade honey. The project will also provide capacity building opportunities for beekeeping associations to support smallholder industry development.²⁷

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 2022–23, the project will continue the on-farm monitoring program to understand the use and costs of feed resources on farms and reproductive productivity and stock losses, across the course of a year. Innovative feed systems, such as fodder banks and creep feeding, will be demonstrated and trialled.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 Central Queensland University 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. The project will also start studies to determine low-input interventions, such as improved grazing management, introduction of legumes and improved animal management, to increase productivity and farm-gate prices for smallholder cattle.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. The project concludes in 2022, with the development of a proposed design, recognised standards and governance structure of a third party verified voluntary sustainable certification program for key commodities (beef, cocoa, coffee and agritourism).³⁰



ACIAR-supported projects have enabled cattle farmers in Vanuatu to increase on-farm productivity and cattle sales through accredited abattoirs, which is a critical step to increase national beef production and meet expanding market opportunities. Photo: Jean Pierre Niptik

Social Systems

The Livelihood Improvement through Facilitated 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 farmer-based learning networks and community social capital. Dr Mary Johnson of RMIT University, in partnership with Filipino collaborators, will contribute 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. In 2022-23, the project team will visit Fiji to conduct a review and implement capacity building activities with community-based research staff. The project will also focus on developing the research partnership between the Philippines, Fiji and Australia.³¹

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 responses to climate-smart landscape adaptation. In the project's final year, 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.³²

Integrated 'Reef to Ridge' management means protecting and sustainably utilising connected environments to promote co-benefits of biodiversity and natural and cultural resources. Dr Cherise Addinsall of Southern Cross University will lead a new project, working with Vanuatuan communities in developing 'Community Conservation Area' agreements between communities and the government to establish sustainable agricultural livelihoods alongside existing formalised land tenure and conservation goals. The project also aims to investigate models of inclusive and evidence-informed decision-making processes under climate change. In 2022-23 the project will be engaged in partnership building with local communities, government bodies and potential scaling institutions.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 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. In 2022-23, researchers will continue adapting the Family Farm Teams manual and identify individuals to undertake Family Farm Teams training and other capacity building activities. These peer educators will deliver training modules for participating smallholder men and women.³⁴

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 soil carbon loss, and climate change. A new project in 2023 expands on previous 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 crop 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. Researchers will introduce cost-effective technologies for rapid soil and plant analysis and real-time data capture to agricultural extension services. The project seeks to improve linkages along the export value chain by developing information pathways between the grower, extension agent and exporter, focusing on soil nutrient and carbon management.³⁵

Regional Manager, Pacific and Papua New Guinea

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Horticulture: Ms Irene Kernot

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Social Systems: Dr Clemens Grünbühel

Soil and Land Management: Dr James Quilty


See page 186 for contact details.

Current and proposed projects

1. Defining priority commercialisation pathways and potential private commercialisation partners for viable long-term commercialisation of products emerging from FST/2019/128 [Fiji] (AGB/2021/172)
2. Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu] (AGB/2014/057)
3. Landscape and opportunity analysis in the Pacific tuna sector: Foundation analysis to identify innovation pathways to enhance participation by the Pacific community and value retention in the region [South Pacific general] (AGB/2021/173)
4. Supporting greenhouse gas inventories and livestock data development in Fiji (CLIM/2021/160)
5. Institutional barriers to climate finance through a gendered lens in Fiji, Samoa and Solomon Islands (CLIM/2021/110)
6. Transformation pathways for Pacific coastal food systems [Kiribati, Solomon Islands] (CLIM/2020/178)
7. Sustainable intensification for climate-resilient development in Pacific island countries [Samoa, Tonga] (CLIM/2020/186)
8. Finding a genetic basis for oil palm responses to basal stem rot in a long-term infected block [Papua New Guinea, Solomon Islands] (CROP/2021/130)
9. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
10. Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
11. Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa (FIS/2019/125)
12. Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2018/155)
13. Coalitions for change in sustainable national community-based fisheries management programs in the Pacific [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2020/172)
14. Spatially integrated approach to support a portfolio of livelihoods [Solomon Islands, South Pacific general] (FIS/2020/111)
15. Innovating fish-based livelihoods in the community economies of Timor-Leste and Solomon Islands (FIS/2019/124)
16. Coconut and other non-traditional forest resources for the manufacture of engineered wood products [Fiji] (FST/2019/128)
17. Kava land use changes [Fiji, Vanuatu] (FST/2021/146)
18. Livelihoods in forest ecosystem recovery [Solomon Islands] (FST/2020/135)
19. Understanding school food provision in the Pacific: Scoping the potential of local food systems to improve diets, nutrition and livelihoods [Fiji] (HORT/2021/159)
20. Responding to emerging pest and disease threats to horticulture in the Pacific Islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
21. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
22. Adopting a gender-inclusive participatory approach to reducing horticultural food loss in the Pacific [Fiji, Samoa, Solomon Islands, Tonga] (CS/2020/191)
23. Improving root crop resilience and biosecurity in Pacific island countries and Australia [Fiji, Samoa, Solomon Islands, Tonga] (HORT/2018/195)
24. 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)
25. PICfood: Driving vegetable food environments to promote healthy diets in Pacific island countries [Fiji, Samoa] (HORT/2021/141)
26. Enhanced fruit systems for Tonga and Samoa (Phase 2): Community based citrus production (HORT/2019/165)
27. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
28. Improving small ruminant production and supply in Fiji and Samoa (LS/2017/033)
29. A farm planning approach to increase productivity and profitability of smallholder cattle systems in Vanuatu (LS/2018/185)
30. Development of a third party verified voluntary sustainable certification program for beef and other key commodities in Vanuatu (LS/2020/155)
31. Climate-smart landscapes for promoting sustainability of Pacific Island agricultural systems (ASEM/2016/101)
32. Landcare - an agricultural extension and community development model at district and national scale in Fiji (SSS/2019/140)
33. Climate-smart coastal landscapes for sustaining fisheries-based livelihoods and food security in the Pacific [Fiji, Tonga] (SSS/2021/120)
34. Improving agricultural development opportunities for female smallholders in rural Solomon Islands (SSS/2018/136)
35. Soil management in Pacific island countries 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\$6.79** million
Budgeted funding

 **16**
Bilateral and regional
research projects

 **6**
Small projects and
research activities

Papua New Guinea's economy is made up of 2 main industries: the labour-intensive agriculture, fisheries and forestry sectors, and the mineral and energy extraction sector, which accounts for most of the country's export earnings.

The agriculture, fisheries and forestry sectors are incredibly diverse, from remote subsistence crop production in the highlands to emerging freshwater aquaculture systems to commercially oriented export crops such as cocoa and coffee. These mixed subsistence and market systems support the livelihoods of more than 6.8 million people (85% of the population of Papua New Guinea). This immense diversity of livelihood systems brings significant challenges for Papua New Guinea policymakers, including limited infrastructure for delivering inputs and products to markets, high rates of inadequate nutrition, vulnerability to weather variability and climate change, and widespread lack of off-farm employment for youth. On-farm productivity is consequently and typically low. Improving returns from agriculture, fisheries and forestry and strengthening food nutritional security remain critical to improving the livelihoods of the majority of households in Papua New Guinea.

Direction for development for the country is currently provided by the Papua New Guinea Vision 2050, Papua New Guinea Development Strategic Plan 2010-2030 and 4 Medium Term Development Plans. The government emphasises that by 2050, renewable sectors including agriculture, fisheries and forestry, must account for 70% of GDP compared with the current 26%. Complementing these plans, 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. Of particular interest to ACIAR is the PNG Agriculture Medium Term Development Plan, which lapses this year. This plan defines the specific areas for investment in agriculture.

Over the past 40 years, ACIAR has supported projects throughout Papua New Guinea across its diversity of the rural livelihoods systems. While we continue to work across the country, areas of particular focus are the the Autonomous Region of Bougainville and the Western Province. Through the South Fly Resilience Plan, Australia is looking to assist communities in the South Fly District to transition out of food insecurity and develop resilient, sustainable livelihoods and inclusive governance.

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.

In 2022-23, ACIAR will refresh its partnership with Papua New Guinea establishing a long-term intent to underpin both research and capacity building collaboration. 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.

As women make up more than 50% of the labour force engaged in agriculture and 35% of women are actively involved in economic agriculture, gender equity will remain integral to all our projects in Papua New Guinea. Women in rural communities play a significant role in subsistence food production, household food nutritional security and agricultural value chains.

2022-23 research program

- » **22 ACIAR-supported projects in Papua New Guinea**
- » **16 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

Basal stem rot is a fungal disease that kills oil palm in plantations across South-East Asia and the Pacific region. Growers have limited options to manage the disease. New trees are planted after the death of the infected trees but experience suggests that the incidence of the fungus seems to increase with each successive planting. Removing infected dead trees may reduce inoculum pressure but is costly and the benefit has not been demonstrated. A new research activity in 2022, led by Dr Agnieszka Mudge of the University of Queensland, will continue monthly monitoring of an experimental plot established 11 years ago. Data will be analysed to determine if infection dynamics and impact differ between genetically characterised families of trees and if there is a difference between lots where infected stem bases and roots of dead trees are removed compared with plot where they are left in place.¹

Fisheries

Mabé (half-pearl) jewellery and shell handicraft industries provide income opportunities for coastal communities and women's social enterprises in the western Pacific. Previous projects have increased communities' technical skills of communities in producing juvenile oysters, farming mabé shell in Fiji and Tonga, and producing 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.²

For 10 years, ACIAR and the National Fisheries Authority of Papua New Guinea have co-invested in R&D for inland fish aquaculture. Research has focused on increasing the production efficiency of small-scale fish ponds (for tilapia) 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. The project will support the National Fisheries Authority to develop commercial tilapia businesses in peri-urban areas and reservoirs, and support villages in remote regions to gain access to reliable and affordable farming inputs and culturally appropriate training services.³

The Western province is the largest province in Papua New Guinea. It encompasses great regional diversity in place-based economies, cultures and ecologies. After 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. A small research activity led by Associate Professor Katharine McKinnon of the University of Canberra offers an alternative, strengths-based approach, building on the strengths and assets of individuals, communities and places as a starting point for thinking collectively about solutions. The study funded by DFAT 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 region to support new approaches.⁴

A small research activity funded by DFAT is led by Professor Katherine Gibson of Western Sydney University. It 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. The primary objective is to map (conceptually and geographically) the place-based strengths and assets of Western Province, thus producing a knowledge base to inform agricultural resilience-building strategies.⁵



Women from Kaviananga village, along the Fly River in Western Province, sell fish at a local market. Market access is a major challenge for communities living along the Fly River. Photo: Aaron English

Forestry

In East New Britain Province, Papua New Guinea, 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 private and public sector stakeholders. 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. In 2022–23 the project will deliver training for 300 women in key processes of the galip value chain and pilot decentralised systems for galip nut initial processing, purchasing, consolidation and collection.⁶

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 2022 and aims to scale out the smallholder forest estate to the point where supporting services like nurseries and contract harvesting can be sustained, leading to an increase in planted area, wood supply and smallholder incomes. Key research questions address social and legal structures to facilitate planting on customary land to allow larger, more commercial woodlots.⁷

A project in the Eastern Highlands province, the Ramu and Markham valleys and the Lae region of Papua New Guinea 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 and reviewed institutional arrangements and policies that improve access to formal timber markets. The project concludes in 2022 with the delivery of a proposed improved ecoforestry management system for inclusion in national policy and alternative marketing and financial models to evaluate harvesting and marketing operations of small-scale, clan-based operators.⁸

Horticulture

High-value vegetable crops are essential to improving livelihoods in the Pacific region and Cambodia. Extension services are not well equipped to assist farmers in dealing with pests and diseases, with insufficient staff training resulting in crop losses of up to 30–40%, primarily due to pests and diseases. Plant health clinics offer a solution to this problem. A new project led by Dr Michael Furlong of the University of Queensland will establish an effective information system supported by research on key emerging pests in these regions to better prepare farmers to detect, respond to and continue to manage their farming businesses, all the while contributing to regional biosecurity preparedness.⁹



Improved germplasm and silvicultural systems for teak production, developed in an earlier ACIAR project, will underpin a new project aiming to scale out the smallholder forest estate.

Developing 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 2022–23, the project will focus on providing technical training for extension staff and conducting in-country plant health clinics and pesticide awareness workshops. The project will continue to build surveillance and diagnostic capacity for managing emerging pests and diseases, including fall armyworm. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.¹⁰

Coconuts contribute, directly and indirectly, to the livelihoods of coastal communities throughout the Pacific region. 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. In 2022–23 researchers will focus on training staff in field transfer of plantlets derived from embryo culture and identifying key varieties for preservation in the new cryopreservation facility that will be built and commissioned.¹¹

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 the project's final year, researchers will focus on completing village gardens and nurseries, evaluating soil quality, and finalising the establishment of support networks, research hubs and farmer training for cocoa production and other potential enterprises.¹²

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 2022–23, activities will include evaluation and updating of a best-practice integrated pest management (IPM) package and testing of biological and chemical control solutions.¹³

Livestock Systems

Strong domestic demand for honey and the potential to export honey and its by-products offers an opportunity to smallholder farmers in Fiji and Papua New Guinea. A project, led by Dr Cooper Schouten 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 2022–23, the project will continue to develop best-practice pest and disease management programs, particularly in readiness for incursions of varroa and tropilaelaps mites. Development of post-harvest quality management programs for producers and packers will continue, for standards, certification and testing processes for export grade honey. The project will also provide capacity building opportunities for beekeeping associations to support smallholder industry development.¹⁴

Tuberculosis is a leading cause of death in Papua New Guinea, and a leading cause of death from infectious diseases worldwide. In addition to pulmonary tuberculosis, there is a high burden of suspected extrapulmonary tuberculosis in the Pacific region, which requires different approaches to management and prevention. Dr Philipp Du Cross of the Burnet Institute is conducting a small research activity to determine the types of bacteria causing tuberculous lymphadenitis, with a focus on risk factors associated with exposure to animals. The study aims to define the proportion of clinically diagnosed tuberculosis lymphadenitis that is attributable to drug-sensitive and drug-resistant *Mycobacterium* spp. The results will be important for the development of clinical and program management of tuberculosis.¹⁵



Dr Julianne Biddle (ACIAR) and Quang Nguyen (PhD candidate, University of Queensland) inspect coconut varieties grown through somatic embryogenesis in the microbiological and plant containment facility at Gatton Campus (HORT/2017/025) Photo: Andrew Sillis

Japanese encephalitis is one of the most important causes of viral encephalitis in humans in South-East Asia. In Papua New Guinea, the disease primarily affects rural communities, with the highest rates of disease occurring in children. Although an effective vaccine is available, more than 100,000 cases occur annually, and Japanese encephalitis remains a potentially important zoonotic risk for the PNG population. A small research activity, led by Dr David Williams of CSIRO, brings together partners with a strong track record in human, animal and vector surveillance and aims to consolidate and build on the previous research activity to expand a One Health surveillance approach for Japanese encephalitis and other arthropod-borne viruses in Papua New Guinea.¹⁶

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, through the adoption of culturally acceptable and nutrient-efficient coffee-vegetable intercropping systems. In the project's final year, researchers will hold meetings in participating villages outlining the results of the trials and the potential benefits for farmer families and industry.¹⁷

Communities 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 2022-23, activities focused on field sites will continue to demonstrate the potential value of integrating scientific and Indigenous knowledge. Results from the first-round field trials will be analysed and used to inform the design of second-round trials.¹⁸

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. In 2022-23 the project team will deliver activities to build the capacity of youth change agents while developing Family Farm Teams resources specifically for young people.¹⁹

Soil and Land Management

In Papua New Guinea, sweetpotato is being grown with a shorter fallow period, more rotations with alternative crops and shorter cropping periods to cope with increasing population pressure. Sustainable intensification of production is needed. A project led by Professor Neal Menzies of the University of Queensland focuses on addressing soil fertility decline with smallholder farmers with the aim of improving yields and increasing household income through sweetpotato production. Concluding in 2023, the project will determine the optimum rates of mineral fertilisers and opportunities to use organic nutrient sources to avoid soil fertility decline, increase production, and improve the benefit:cost ratio of inputs.²⁰

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 and Dr Mark Thomas of CSIRO, will provide useful and targeted information about the natural resource base in support of agriculture, forestry and infrastructure 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 the agriculture and forestry sectors.²¹



The successful Family Farm Training model has been adapted to empower youth, especially females, to ensure they become an integral part of the family farming team. Pictured are youths in East New Britain, learning how to budget their funds. Photo: Aaron English

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 incomes and improving the livelihoods of smallholder cocoa farming households. A 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. In 2022-23, activities include training a cohort of local staff as mentors for smallholder farmers, assessing a family farm teams approach to learning about soil management and studying the influence of composts and crop diversification on soil and plant health and the quality of cocoa.²²

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See page 186 for contact details.

Current and proposed projects

1. Finding a genetic basis for oil palm responses to basal stem rot in a long-term infected block [Papua New Guinea, Solomon Islands] (CROP/2021/130)
2. Towards more profitable and sustainable mabé pearl and shell-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Samoa, Tonga] (FIS/2019/122)
3. Improving peri-urban and remote inland fish farming in Papua New Guinea to benefit both community-based and commercial operators (FIS/2018/154)
4. Strengthening agricultural resilience in Western Province: Developing methods for strengths-based livelihoods approach [Papua New Guinea] (FIS/2021/113)
5. Strengthening agricultural resilience in Western Province: Mapping place-based strengths and assets [Papua New Guinea] (FIS/2021/122)
6. Enhancing private sector-led development of the canarium industry in Papua New Guinea - phase 2 (FST/2017/038)
7. Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia (FST/2018/178)
8. Enabling community forestry in Papua New Guinea (FST/2016/153)
9. Biosecurity planning [Cambodia, Papua New Guinea] (HORT/2021/151)
10. Responding to emerging pest and disease threats to horticulture in the Pacific Islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
11. Safeguarding and deploying coconut diversity for improving livelihoods in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
12. Developing the cocoa value chain in Bougainville [Papua New Guinea] (HORT/2014/094)
13. Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia (HORT/2018/194)
14. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
15. Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in 3 provinces in Papua New Guinea (LS/2018/217)
16. Strengthened surveillance for vector-borne zoonotic and livestock diseases in Papua New Guinea (LS/2021/158)
17. Improving livelihoods of smallholder coffee communities in Papua New Guinea (ASEM/2016/100)
18. Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea (ASEM/2017/026)
19. Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea (SSS/2018/137)
20. Sustaining soil fertility in support of intensification of sweetpotato cropping systems [Papua New Guinea] (SMCN/2012/105)
21. Better soil information for improving PNG's agricultural production and land use planning: Building on PNGRIS and linking to the Pacific Regional Soil Partnership [Papua New Guinea] (SLAM/2019/106)
22. Optimising soil management and health in Papua New Guinea integrated cocoa farming systems - Phase 2 (SLAM/2019/109)