


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

Country Manager

Dr Norah Omot

Research Program Managers

Crops: Dr Eric Huttner

Fisheries: Prof Ann Fleming

Forestry: Dr Nora Devoe

Horticulture: Ms Irene Kernot

Livestock Systems: Dr Anna Okello

Social Systems: Dr Clemens Grünbühel

Soil and Land Management: Dr James Quilty

See page 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)