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About Partners

Partners in Research for Development is the quarterly publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* presents articles that summarise results from ACIAR-brokered research projects and puts ACIAR research initiatives into perspective.

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Front cover: A researcher inspecting a corn crop in the Philippines, where an ACIAR-supported project has helped smallholder vegetable growers tap into higher-value supply chains. Photo: ACIAR

Back cover: An onion crop in Bangladesh, where an ACIAR-supported project has helped improve crop productivity in saline-affected coastal areas. Photo: ACIAR

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From the CEO

Wendy Umberger

In this edition of *Partners* magazine, my first as CEO, the theme is 'unlocking economic potential for smallholder farmers'.

Professor Wendy Umberger

I first became involved with ACIAR nearly 17 years ago as a collaborating scientist on projects in Papua New Guinea, the Pacific region, Indonesia and Vietnam. At the time, as an agricultural economist and value-chain analyst, I was tasked with understanding what was impeding smallholder households' adoption of technologies and practices that would improve their access to high-value markets.

Those issues continue to be both challenges and opportunities in agricultural development for food security. It has also been central to my own journey of learning and knowledge-sharing in the years since, working in a variety of roles in the agricultural development sector.

I have observed firsthand the collaborative approach of ACIAR to research and extension, through in-country partnerships and on-the-ground involvement, and how this has created life-changing opportunities for millions of people. This work has been further amplified by the commitment of ACIAR to capacity building and the subsequent presence and influence today of highly trained in-country professionals.

The impact of ACIAR over its 40-plus years is extraordinary. The opportunity to be the new CEO of an organisation I admire is a tremendous honour. Many of the food security gains of recent decades face renewed pressure from climate change, conflict and what many fear will be an increasing incidence of pandemics.

Resolving these complex modern-day challenges requires innovative and coordinated responses across industry, governments, academia and civil society, and significant new investment and expertise from across disciplines and sectors.

Through my involvement in projects across the Indo-Pacific region, I have repeatedly been amazed at the entrepreneurial drive of people when given meaningful access to training, information and inputs, including new technologies and finance. Often small or simple investments have large and sustainable impacts.

When farmers understand markets and what drives the prices they receive, and they can respond to quality or marketing issues, they are able to trade in more profitable value chains.

Over the past 2 to 3 decades, ACIAR investment in capacity building – the training of local in-country extension officers, researchers, academics and policymakers – has facilitated truly impactful partnerships between Australian researchers and research institutions, and their counterparts in partner countries.

This has created a network of expertise able to apply a more holistic approach to modern agricultural development. It allows project teams to implement agricultural science, business and economic strategies in concert with considerations such as cultural diversity and gender equity and policies.

This edition of *Partners* magazine, my first as CEO, is a timely example of this. The theme is 'unlocking economic potential for smallholder farmers' and features projects from Vietnam, Pakistan, Africa, Pacific Island countries, Laos, Cambodia, Bangladesh, India (West Bengal), Indonesia and the Philippines. The articles showcase our vast collegiate collaborations that are dedicated to alleviating hunger and disadvantage, and also improving the world's knowledge and understanding of how to strengthen food systems in the face of ever-changing environmental, economic and geopolitical pressures. This is the journey we share.

Professor Wendy Umberger
Chief Executive Officer, ACIAR

Researchers from Fiji travel to Australia to examine coconut and other non-traditional forest resources for the manufacture of engineered wood products. Photo: ACIAR

Enhancing commercial engagement in international agricultural research

Two ACIAR research projects are helping improve impact through commercial engagement, increasing the application and sustainability of outcomes from ACIAR research.

The 'slow magic' of agricultural research, as described by eminent agriculturalist Professor Phil Pardey, is delivering impact long after a research project concludes. ACIAR has been focusing on effective commercial engagement, particularly with local businesses, in project design and implementation, to maximise the impact of its investment.

Mr Howard Hall, ACIAR Special Advisor, Commercial Engagement and Adoption, said that farmers are usually involved in integrated and complex value chains where businesses buy and sell products, and provide other services such as advice and finance.

'With the focus from ACIAR on long term impact, the commercial engagement area is exploring ways to involve the private businesses in the design, delivery and post-project investment that adds value to the farmers' normal business system,' said Mr Hall.

Mr Hall said businesses, farmers and researchers face barriers in enabling sustainable impact. The new commercial engagement approach from ACIAR is seeking to overcome these barriers – improving the connection between private businesses in the value chain and publicly funded research.

Often encouraging dialogues between the different partners and involving all of them in research design and implementation, has a significant effect on delivering long term impact and improving the capacity of each partner to add value.

To support effective commercial engagement, ACIAR has introduced an Agribusiness Reference Group (ARG), in Vietnam and Pakistan. The ARG is improving communication and understanding between governments, institutions and industry about the research needed and how this can be utilised to deliver value for both businesses and farmers.

Agribusiness Reference Group in Vietnam

The primary purpose of an ARG is to identify groups of businesses that have interest in exploring how working with ACIAR-supported projects could benefit them and how this can also support the greater impact of the research project.

The first ARG was started in Vietnam in 2020. Initially interrupted by COVID-19, the first phase of the Vietnam ARG raised awareness amongst businesses that ACIAR research is seeking to be aligned with the needs of businesses that can also deliver livelihood impacts for smallholder farmers in Vietnam.

'There is a big opportunity for ACIAR to use the ARG as a pathway to understand not only what government and universities think is important, but also what industry thinks is important,' said Mr Hall.

Even with interruptions, the Vietnam ARG has resulted in several successful forums and workshops, wherein businesses, government and researchers have met and discussed specific agricultural topics of interest, such as a formal memorandum of understanding between local partners committed to developing a successful sea cucumber value chain in an area where it has not existed previously.

The Vietnam ARG is now creating more direct project connections with businesses and building long term partnerships between businesses and projects, enhancing the 'slow magic' of agricultural research.

Agribusiness Reference Group in Pakistan

The Pakistan ARG, which was initiated in 2022, has been able to establish direct partnerships more quickly between projects and businesses without the interruptions of the pandemic.

Dr Munawar Kazmi, ACIAR Country Manager, Pakistan, said there are two main developments he hopes to see come out of the ARG.

'The first is to see more companies co-investing and being part of ACIAR research and helping design future research,' said Dr Kazmi.

'We were expecting that when our research outputs are delivered, they are passed on to agribusinesses. However, often the linkage between research and business is weak, operating in separate siloes. So, the ARG is helping to link the three corners of the farmer/producer, researcher and agribusiness triangle.

'With the support of the ARG the expectation is that projects will undertake research that is of value for agribusiness, and they become a key partner in taking it to scale. If projects are not generating business opportunities for industry and producers or farmers, you cannot achieve sustainable change for smallholder farmers' lives. We hope that commercial engagement will become part of proposal design process and from day one researchers will enagage the potential business partners.'

ACIAR project leader Dr Rajendra Adhikari has been leading an agribusiness project on developing competitive and inclusive value chains of pulses in Pakistan since 2018 and has benefited from being involved with the ARG.

Based on his involvement and the subsequent partnerships developed with agribusinesses as a result, Dr Adhikari said the ARG allowed researchers to understand and appreciate priorities of commercial entities and align research to add value.

'It has helped identify agribusinesses who share values of growing the business by helping and sharing the benefits with smallholder producers, who are typically the main value creator in agribusiness value chains,' said Dr Adhikari.

Key points

1. ACIAR has been focusing on effective commercial engagement, particularly with local businesses, in project design and implementation, to maximise the impact of its investment.
2. The Agribusiness Reference Group is improving communication and understanding between governments, institutions and industry about the research needed and how this can be utilised to deliver value for both businesses and farmers.
3. The main goal of the Commercial Engagement Fund is to enable collaboration with businesses on publicly funded research projects.

Commercial Engagement Fund

Another way that ACIAR is supporting commercial engagement is through the establishment of the Commercial Engagement Fund (CEF) – a Fund which looks to invest where both businesses and governments see timely opportunities to improve the impact of research projects.

The main goal of the CEF is to enable collaboration with businesses on publicly funded research projects, such as ACIAR-supported projects.

Private businesses seek to respond quickly to market demand, taking advantage of rapidly changing dynamics. Publicly funded research, such as those delivered by ACIAR, takes time to build effective partnerships that deliver impact. The CEF is bridging the gap, enabling public and private organisations to work more effectively together in a timely manner and facilitate innovative and timely collaboration with private industry in ACIAR-supported projects.

ARG meetings in Vietnam have been well supported by commercial, research and government representatives. Photo: ACIAR Vietnam

Key tools for commercial engagement

Three CEF projects have been completed so far – these include the development of viable long-term commercialisation of a coconut veneer plywood sheet product, initiating private sector partnerships to sustainably grow the smallholder dairy sectors of Indonesia and the Philippines, and landscape and opportunity analysis in the Pacific tuna sector.

‘When a business invests in something, they want to get it on the ground as quickly as possible and these tools developed enables these businesses to do just that.’

Through these projects, there have been a number of key business tools developed that can enhance future commercial engagement.

Mr Ian Buck, Buck Advisory, led the coconut veneer commercial engagement module, which involved supporting a product developed out of a long-term ACIAR-supported forestry project in Fiji – utilisation of wood from senile coconut palms.

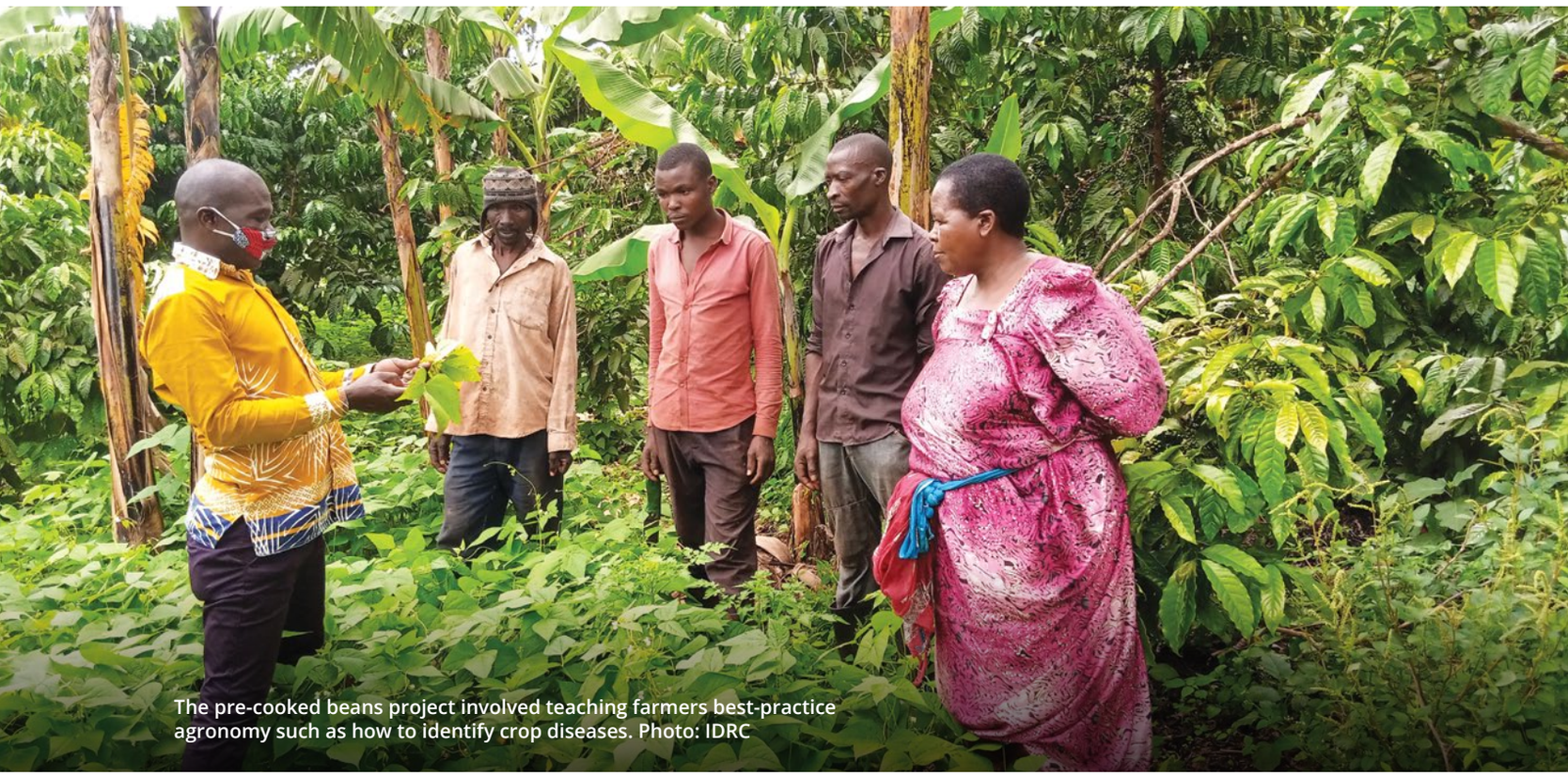
To assist in finding appropriate agribusiness partners efficiently, the specifically selected commercial engagement team lead by Mr Buck created the Project Opportunity Prospectus, which defines and presents the commercial opportunities and benefits for a potential private partner to engage in the project. The Partner Search Framework was also crafted to identify suitable private sector firms to partner with and ensure appropriate due diligence such as considerations of ethical, financial and commercial reputation and credentials and confirming company business plans align with project goals.

‘When a business invests in something, they want to get it on the ground as quickly as possible and these tools developed enables these businesses to do just that,’ said Mr Buck.

‘Supporting good communication between research teams and commercial partners during a project is also an important feature of success.’

While the original coconut project provided the research to prove this value-add process was possible, commercial engagement projects like this help implement the research by creating sustainable business partnerships and providing improved income and livelihood opportunities for disadvantaged communities.

ACIAR PROJECTS: ‘Developing competitive and inclusive chains of pulses in Pakistan’ (ADP/2017/004)
ARSF – funded project: Developing digital value chain solutions for smallholders pulses farmers in Pakistan
‘Defining priority commercialisation pathways, and potential private commercialisation partners for viable long-term commercialisation of products emerging from FST/2019/128’ (AGB/2021/172)
‘Initiating private sector partnerships to sustainably grow the smallholder dairy sectors of Indonesia and the Philippines’ (AGB/2021/171)
‘Landscape and Opportunity Analysis in the Pacific Tuna sector’ (AGB/2021/173)



The pre-cooked beans project involved teaching farmers best-practice agronomy such as how to identify crop diseases. Photo: IDRC

A decade of difference in Africa

Innovative practices, new products and thousands of jobs have been created through the Cultivate Africa's Future Fund, which, after a decade of research for development, has transformed livelihoods and lives.

Ms Jennifer Nakaya had a powerful message when she addressed the delegates assembled for a recent Nairobi conference marking the completion of the 10-year Cultivate Africa's Future Fund (CultiAF) program.

The smallholder bean producer had been part of the joint venture between ACIAR and Canada's International Development Research Centre (IDRC) aimed at strengthening on-farm production, associated businesses and supply chains across eastern and southern Africa.

Ms Nakaya, who is now the chairperson of a grower group of about 100 mostly female members, said the impact of the program had been significant.

Gaining knowledge of agronomic practices and post-harvesting handling, her bean crop now provides her with a stable income, allowing her to pay school fees, expand her production acreage and invest in residential and commercial property. 'It has transformed my life,' said Ms Nakaya.

Her testimony is one of dozens shared by smallholder farmers involved in the CultiAF program, which has helped to advance production for a wide range of enterprises, many of which are run by women.

This includes mango, fish, poultry, bean, sorghum and pig production and a novel project developing insect feed for livestock. The program also involved projects on crop insurance, finance and agribusiness including support for young entrepreneurs.

IDRC program manager Ms Mercy Rurii said hearing the testimonies of the participants at the final conference was inspiring: 'You get blown away by the impact it has had on people.'

New products, more income

The success of CultiAF is attributed to a combination of improved on-farm productivity and partnerships with the private sector, which helped farmers to capitalise on their gains through the creation of new markets and products.

'The private sector has helped to convert fresh produce into useful, nutritious products for consumers that have also increased income for smallholder farmers,' explained Ms Rurii.

Innovations to combat fruit fly, for example, significantly reduced the rates of mango losses. Drying technology was then developed to provide a market for the extra produce, with dried mango worth about double that of fresh fruit. Growers have now formed a cooperative and are exporting their produce.

'They have taken a product that was a problem and converted it into money,' said Ms Rurii. 'And that money goes into the hands of the smallholder farmers, which means they can send their children to school, build their houses, access health care and provide the community with more dietary diversity.'

'The private sector has helped to convert fresh produce into useful, nutritious products for consumers that have also increased income for smallholder farmers.'

Four levels of impact

The CultiAF program incorporated 4 research themes: increasing productivity and reducing post-harvest losses; advancing gender equality; nutrition and human health; and climate change and water management.

One project that cut across all 4 themes was the development of pre-cooked beans, which involved farmers such as Ms Nakaya.

Beans are a staple in eastern Africa, but the traditional variety, when dried, take 2–3 hours to cook. Through CultiAF, the National Agricultural Research Organisation (NARO) in Uganda and the Kenya Agricultural Research Organisation (KALRO) developed new varieties that can be pre-cooked before sale.

This means less fuel and water is required for cooking, reducing the strain on natural resources. New markets opened, for example, in urban areas where water and firewood can be scarce and canned products are expensive. And new products, such as a popcorn-style bean snack, have been created.

As beans are the second-most important source of protein in eastern Africa, these advances address malnutrition, while providing more income for growers, many of whom are female. A digital payment platform was also developed as part of the project so that female growers could be paid directly for their produce.

This has transformed livelihoods for women, who in the past were often sidelined in markets controlled by men.

'The farmers are women but the marketeers are men, so the project team developed an app to put control directly into their hands,' said Ms Rurii.

Recipe for success

'Involving women intentionally from the start to ensure projects delivered meaningful impacts for them is one of the strengths of CultiAF,' said ACIAR Senior Director, Multilateral and Government Partnerships, Dr Julianne Biddle.

It is one of the 5 key elements she attributes to the program's success. Others include committed local leadership; a cross-boundary approach enabling strong regional collaboration and knowledge-sharing; honouring farmers by working to understand their real challenges; and looking at the whole value chain, considering barriers and enablers for farmers.

Dr Biddle said the 10-year time frame of the program allowed for rigorous research and testing, and meaningful partnerships to be developed along the value chain.

'We know that agricultural research is a long game and CultiAF has nurtured and built relationships that will ensure the research outcomes will continue to advance. I expect there'll be a lot more impact over time,' said Dr Biddle.

The Nairobi conference celebrated both CultiAF and the relationship between ACIAR and IDRC. 'This was a substantial 50:50 partnership and it has really laid the foundations for a strong peer connection between the two organisations, which will continue to produce agricultural research for development with tremendous impact,' said Dr Biddle.

MORE INFORMATION: Cultivate Africa's Future Fund ACIAR, aciar.gov.au/aciar-idrc-partnership/cultivate-africas-future-fund

Key points

1. Cultivate Africa's Future Fund (CultiAF) is a 10-year program partnered by ACIAR and the International Development Research Centre (IDRC) to improve food security and gender equality across eastern and southern Africa.
2. It concluded in 2023 having advanced production and strengthening supply chains for a wide range of enterprises, many run by women.
3. The 10-year time frame allowed for rigorous research and testing, and meaningful partnerships to be developed along the value chain, leading to lasting impact.

Citrus developments bearing fruit in Tonga and Samoa

Citrus production and market development in Tonga and Samoa are creating commercial opportunities for smallholder farmers and boosting local supplies of fresh, high-quality fruit.

Harvests from newly developed orchards in Tonga are raising hopes for increased access to locally grown citrus fruit. Lemons, limes, sweet oranges and mandarins are all well known on the islands, but imported fruit has grown to dominate local markets in recent decades.

However, harvests from new orchards established 5 years ago under an ACIAR-supported project mark an anticipated revival of local fresh fruit production. Mandarins in particular have sold quickly, fetching good prices this year.

An initial ACIAR-supported project investigated tropical fruit crops in Fiji, Tonga and Samoa. Although that project ended in 2020, it identified citrus as an important fruit crop for development in Tonga and Samoa. Horticultural expert Professor Steven Underhill at the University of the Sunshine Coast led this work and now also leads Phase 2, which will run until 2025, and is focused solely on citrus.

Professor Underhill said citrus has a comparatively long shelf life and a winter harvest provides an off-season fruit supply. They are also a diabetic-friendly fruit, which is important as almost one in 3 adults in Tonga and Samoa is estimated to suffer from diabetes. This fits with one of the project's objectives: to get people to eat more fresh fruit.

Health and business goals

ACIAR Research Program Manager, Horticulture, Irene Kernot said increasing the availability of affordable fresh fruit could help to increase consumption and improve diets.

From an agribusiness perspective, Ms Kernot said investing in improved tree genetics, along with propagation and crop management skills will also support new business opportunities for smallholders in Tonga.

As part of the original ACIAR project, more than 1,000 citrus trees were planted in 5 orchards. Varieties trialled include Washington and Valencia oranges; Emperor, Imperial, Afourer and Ellendale mandarins; Meyer lemon and Tahitian lime.

Citrus propagation and management in Tonga are being led by ACIAR project partner, MORDI. Photo: University of the Sunshine Coast

Key points

1. Citrus orchards established in Tonga as part of an ACIAR-supported project are trialling 8 varieties to identify those best suited to local conditions and consumer preferences.
2. The first crops from these orchards have sold well in Tonga, achieving prices equal to or better than imported fruit.
3. In Samoa, a local women's group is leading the development of new citrus products, adding value to local crops and extending their income-earning potential.

Elite Australian rootstock with advanced disease resistance and vigour, plus early and late season varieties, have the potential to extend local production from 4–6 weeks to 6 months.

In Tonga, 3 orchards are based on the outer island of Eua. One is a private orchard and 2 are community-run. There are also a further 2 commercial orchards on the main island of Tongatapu. One is owned by the NGO Mainstreaming of Rural Development Innovation (MORDI) Tonga Trust, the other by fruit export enterprise Nishi Trading.

Nishi Trading Managing Director Mr Minoru Nishi said the ACIAR-supported research has helped to find species well suited to the climate in Tonga. His company was the first to harvest and sell crops from trees established as part of this work. He supports the production of more fresh, high-quality fruit for local consumers to replace imports.

'It will help increase incomes for people involved in fruit tree production and fruit retailing. By building local skills and capacity, it is also helping to improve employment opportunities,' said Mr Nishi.

Smallholders in Samoa collect citrus for sale and for development of new products. Photo: University of the Sunshine Coast

Skills development

The project is also building local capacity and skills in tree propagation and grafting, pruning and orchard management, including the staff at MORDI.

'They are now running a highly successful plant nursery,' said Professor Underhill. 'The relationship with MORDI has also been essential in developing the community orchards on Eua, and also in providing training to local farmers in propagation and orchard management.'

Demand for the fruit produced to date has been strong and Professor Underhill said surveys will be conducted to determine consumer preferences for different varieties, particularly of oranges and mandarins, as well as barriers to increased fruit consumption.

Samoan trials

In Samoa, there is an existing small-scale citrus industry on the island of Savai'i with native citrus trees that are well adapted to local conditions. A trial is underway to compare local seed-produced trees with imported elite grafted material.

An important core focus of the project's work in Samoa is enabling citrus value-adding opportunities. The local citrus harvest includes limes, oranges and grapefruit but it is a short season, which causes a supply glut and low prices.

According to the Samoan project coordinator Dr Seeseei Molimau-Samasoni at the Scientific Research Organisation of Samoa (SROS), preliminary discussions between SROS and citrus farmers revealed a keen interest in value-adding, with farmers eager to make full use of the local citrus supply, particularly during peak season.

Fiji-based food scientist Dr Richard Beyer has been leading this work as part of the project. At a product development workshop on Savai'i in April 2023, he introduced community members to food safety and handling procedures, and to a range of products and preserving processes that they might try.

'There was "explosive enthusiasm" from the women attending,' said Dr Beyer.

Workshop experiments created 8 new products using citrus ingredients, and 4 other products to supplement production during the citrus off-season, with half showing promise for further development.

The women have since formed a group to develop new food products and business opportunities. Products include an orange syrup that is proving popular on Samoa's traditional pancake breakfasts, a fruit juice cordial, citrus confectionary and chillies pickled in lime juice.

With the right products and packaging, Dr Beyer said these products have the potential to generate new business opportunities, tapping into tourist markets as well as local demand.

ACIAR PROJECT: 'Enhanced fruit systems for Tonga and Samoa (Phase 2): community-based citrus production Tonga, Samoa' (HORT/2019/165); 'Enhanced fruit production and/ postharvest handling systems for Fiji, Samoa, and Tonga' (HORT/2014/077).

Flexible crop options help farmers tackle erosion

Research into environmentally and economically sustainable farming systems has opened the door to a whole-system shift in land use.

An ACIAR-supported project to reduce erosion on steep upland slopes in the north-west Vietnam/north-east Laos border region has become a lesson in adaptability – for researchers as well as the smallholder farmers they have been working with.

This area is a remote region that struggles with endemic poverty and was long ago dedicated to poppy production.

Launched in 2017, the primary focus of the 6-year project was to improve maize-based farming systems on sloping lands along the Vietnam and Laos border, improving income stability and reducing soil degradation.

However, the start of the project coincided with low maize prices. Following a policy implemented as a result of the research outputs from an ACIAR-supported agroforestry project, provincial and district authorities in Vietnam provided incentives to encourage farmers to diversify from maize, which reduced maize plantings by 20%.

Farmers turned instead to tree crops: plums, longans and mangoes.

As ACIAR Research Program Manager, Soil and Land Management, Dr James Quilty explained, this change in crop type made the erosion challenge even more complicated.

Smallholders in Vietnam learning that grasses planted between fruit trees can help to stabilise soil on slopes and provide fodder for livestock. Photo: The University of Queensland

'The erosion issues in maize were actually exacerbated by the practice in Asia to keep the ground beneath fruit trees bare,' said Dr Quilty. 'None of the residue retention, minimum tillage-type practices that had been developed for maize were being carried forward during the transition into tree crops.'

Because it takes years for fruit trees to produce a marketable crop, the researchers found themselves not just with an erosion challenge, but also with the need to provide options to help farmers maintain cash flow during the transition.

This meant finding crop options to fill an income gap while also providing stable groundcover.

Project leader Dr Mike Bell from The University of Queensland said the project's dynamics changed enormously. This was further compounded by farmers in Laos and Vietnam being at different stages of crop transition.

'While many on the Vietnam side are transitioning out of maize, most on the Laos side are still looking to increase maize production. They are still learning about maize agronomy,' explained Dr Bell.

Three-pronged approach

Dr Bell said the project's priority was to find a way to stabilise farming systems on slopes with up to a 35% gradient. The team identified 3 options.

The first is an understory species *Centrosema pascuorum*, a low-growing, nitrogen-fixing perennial legume that is compatible with both maize and fruit trees, and can potentially provide forage for livestock to help diversify incomes.

The second option is a 'relay crop', such as rice bean, that is grown with maize and generates groundcover with ongoing agronomic and economic benefit. Rice bean has a small but growing market for its seeds.

The third option is to plant grass strips for erosion control, which can also be cut for fodder to feed cattle.

Local project scientist from the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI) Mr Xuan Thao Hoang said experimental sites were set up

Rice beans provide an option to plant with both fruit tree crops and maize. Photo: The University of Queensland

Key points

1. Intensive maize cultivation on steep slopes in the northern Laos/Vietnam border region is causing severe erosion.
2. This project developed flexible, systems-based approaches to improve sustainability and farmer incomes, featuring diversified maize, fruit and cattle-based operations.
3. Cross-border cooperation is a key feature of the research and extension.

to study these options and their economics, labour and fertiliser requirements.

'The forage and groundcover options are easy for farmers to establish, have low input costs and quickly generate groundcover,' said Mr Hoang.

'The seeds of *Centrosema* and rice bean can be provided cheaply, while the high protein content in cover crop biomass provides good quality livestock feed and helps to build soil organic matter.

'These species can fit with a diversity of cash crops and fruit trees, so should reduce erosion at the landscape level.'

Laos focus

In Laos, however, the project required a different focus. Here the project sought to lift farmers' maize knowledge as well as stabilising the system with forage species.

Dr Bell said farmers started reporting, through consultation meetings, that they were pleased with the forage grasses and keen to diversify into cattle, but were reluctant to buy them because they did not know how to look after the animals.

As a result, the project team has initiated cross-border workshops on silage techniques to preserve forage for feeding over winter, while the greater need for animal husbandry training will form part of future project planning.

The project will conclude this year, and the results of the project to date are promising. However, Dr Bell and Dr Quilty hold concerns about both maize and the incoming fruit trees perpetuating a history of boom-bust cycles.

'The demand for maize for animal feed has always been high, but the local maize price fluctuates with the world trade price,' explained Dr Quilty.

'A drop in maize prices occurred as the project began. This, combined with soil erosion concerns, helped to fast-track the fruit trees in Vietnam.

'However, the rapid transition into tree crops has occurred with limited varietal options, with narrow harvesting windows for perishable products, resulting in lower-than-expected returns. The current upswing in maize prices highlights the benefits of maintaining income diversity through diverse enterprise mixes.'

ACIAR PROJECT: 'Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR' (SMCN/2014/049)

The Pacific sheep and goat improvement team visiting a project goat farm in Fiji.
Photo: University of New England

Sheep and goats the focus of livestock productivity challenges

From the Pacific region to Pakistan, research to help smallholder sheep and goat farmers improve the productivity of their livestock is also equipping them with the knowledge to help them access premium markets.

There is a growing focus on the commercial production of sheep and goats in the Pacific nations of Fiji and Samoa, where ACIAR-supported research is helping smallholders improve the productivity and profitability of their flocks and herds.

Both countries have developed their own national sheep breed, the Fiji Fantastic and the Mamoe Samoa, which offer the potential to establish locally branded meat as an agritourism product. Target premium markets include hotel chains, restaurants, catering services and supermarkets.

In addition to sheep, Fiji also has commercial goat herds, with goat meat popular among the country's Indian and Muslim populations.

Production issues are similar for both sheep and goats, and research activities with smallholder farmers are focusing primarily on improving survival and growth rates for young animals.

The University of New England is leading this work in partnership with the governments of Fiji and Samoa, with livestock scientist Dr Tiago Silva based in Fiji as the project coordinator.

A key driver of this project is a desire by the Fijian and Samoan governments to replace low-quality, often high-fat, imported sheep meat with higher-quality, locally produced meat.

'Imports make up 90% of sheep meat consumed and there is an existing high demand that local producers can supply, achieving prices comparable to imported meats,' said Dr Silva.

Record of progress

The aim of the ACIAR-supported project is to help smallholders improve their productivity and supply more animals into domestic markets, more profitably. Creating a nationally branded sheep meat for premium markets is a longer-term goal for the industry.

Farm record-keeping is a high priority for the project, to gather both baseline data on industry productivity and to help smallholders better evaluate their businesses.

Small groups of farmers in Fiji and Samoa are taking part in hands-on training, as well as cost-of-production and record-keeping trials for the project. Field officers visit monthly to collect data from project books recording herd and flock productivity details such as births and birth weight, animal deaths, sales and expenses.

Farmers are testing supplementary feeding or 'creep feeding' strategies for young livestock using a simple fence or enclosure with small gaps, and additional food in the centre that only young animals can reach.

Each farm has also been provided with hanging scales to monitor the growth rates of their animals, along with drenches, and field staff regularly monitor the worm burden in animals.

'Building relationships and working closely with the smallholder farmers and their families has also revealed the significant involvement of women in raising livestock and making commercial decisions,' said Dr Silva.

'Our project training activities actively encourage women to take part, and they are highly engaged, particularly around animal nutrition and rearing practices.'

In addition to the traditional challenges, smallholders in Fiji and Samoa face threats from dogs, with up to 30% of animal deaths attributed to dog attacks. One farmer taking part in the program also realised he had lost 30% of his animals to theft. The project is now considering options to address this issue.

Drench research

Research into the level of internal parasites in animals and potential drench-resistance in Fiji has been a key part of the project, responding to concerns raised in a previous ACIAR-supported project that identified a high worm burden in both sheep and goats.

Dr Silva said trials with commercial farms showed the problem was not as severe as feared. However, sampling of farms across the country shows a high incidence of worms, suggesting a discrepancy between actual and reported drenching practices.

Drenching is also integrated into the smallholder research activity, which aims to quantify any production losses caused by worms in sheep and goat farms.
Mrs Alice Baleiverata is a field officer for the project in the western region of Fiji and said the farmers she works with have been impressed with the effects of drenches trialled with pregnant does.

'The farmers have noticed that the babies are stronger at birth, and their growth rates are really fast. They've seen an improvement in weight gain for the kids and the mothers,' said Mrs Baleiverata.

Supported by results similar to these, cost-of-production assessments for smallholders are helping to identify the benefits in growth and return from sales that justify the expense and effort of regular drenching and monitoring of worms.

Fiji Fantastic sheep grazing improved pastures of Koronivia grass and Leucaena in Western Fiji.
Photo: University of New England

Key points

1. Small ruminants – sheep and goats – are the focus of ACIAR-supported research to improve animal productivity for smallholders in Fiji, Samoa, Pakistan, Laos and Vietnam.
2. Improving the survival and growth of newborns has been identified as a key overarching strategy to improve productivity.
3. Supporting smallholders with more information about the health and condition of their animals helps them make daily management decisions and improves their negotiations with traders to obtain better prices.

Government staff are key to project implementation, which includes training for staff at the Ministry of Agriculture and Waterways in Fiji and the Ministry of Agriculture and Fisheries in Samoa to strengthen in-country livestock extension services.

Both countries have government livestock breeding and research centres that are supporting the project with drench, feeding and pasture trials.

ACIAR Research Program Manager, Livestock, Dr Anna Okello said improved productivity will help build domestic supply in Fiji and Samoa. There is also a potential opportunity for supplying premium agritourism markets with national – rather than imported – products, particularly with the continued investment in infrastructure such as transport and abattoirs.

Dr Okello highlighted this project as part of the growing ACIAR investment into small ruminants.

'Small ruminants are often overlooked in research, particularly when compared to that of the cattle industry, although sheep and goats are crucial to the food security and income for some of the world's most vulnerable people,' said Dr Okello. 'They provide livelihoods for women, in particular, and for landless people, who can often use unimproved pastures and urban areas to graze their animals.'

The project team in Sindh, Pakistan, discussing pictorial fact sheets with female farmers. Photo: The University of Melbourne

The 5-year project in Fiji and Samoa is expected to conclude in June 2024, while a 3.5-year project on goat production in the Sindh and Punjab regions of Pakistan ended last year. Another 5-year project looking at goat production in Laos and Vietnam will end later this year.

Dr Okello said all of these projects are providing valuable data that will support further development of the small ruminant sectors in ACIAR partner countries. To improve productivity and incomes, benchmarking animal health, feeding strategies, regular weighing of animals and record-keeping are common elements in the projects.

Opportunities for smallholders in Pakistan

In Pakistan, smallholders form the backbone of national sheep and goat production, with extensive networks of buyers in the domestic market including traditional markets and the rapidly developing supermarket sector. There are also export opportunities across the Middle East, particularly for Muslim Eid al-Adha and Eid al-Fitr festivals each year.

Associate Professor Angus Campbell at The University of Melbourne, who led the Pakistan project in collaboration with the University of Lahore, said the activities with smallholders included introducing creep feeding strategies, monitoring animal growth and sale weights, and learning to assess the body condition of animals.

This gave smallholders additional information to use when negotiating with traders, with up to 80% of project participants reporting higher prices for their goats. The live weight value of animals increased 5–10%, although some individual farmers received 2–3 times the typical prices.

While all 3 of the small ruminant research projects are investigating market options, Dr Okello highlighted the export potential of animals as an exciting opportunity, particularly for Pakistan's smallholder producers.

Building on the recently completed project in the Sindh and Punjab regions, ACIAR is commissioning a new project in 2024 with the International Center for Agricultural Research in the Dry Areas, which aims to build on the achievements of small ruminant research in Pakistan and Ethiopia targeting markets in the Middle East.

ACIAR PROJECT: 'Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan' (LS/2018/105); 'Improving small ruminant production and supply in Fiji and Samoa' (LS/2017/033); 'Goat production systems and marketing in Lao PDR and Vietnam' (LS/2017/034)

Bangladeshi government officials inspect salt-tolerant sunflowers being grown as part of coastal region cropping trials. Photo: ACIAR

Growing more food for less in Bangladesh

In Bangladesh, ACIAR-supported projects are helping smallholder farmers improve the profitability and sustainability of their farming enterprises by reducing inputs and increasing production, with lessons for the entire region.

Bangladesh is home to more than 1.5 million smallholder farmers producing food in some of the world's most difficult conditions. Growers face dramatic seasonal weather changes, from drought to monsoon, so optimising agronomic practice is critical to ensure that farms remain environmentally and economically sustainable.

In the face of these challenges, ACIAR has supported research to improve water, salt and nutrient management on-farm to provide farmers with more diverse cropping options and greater yields.

A succession of programs has improved agronomic knowledge in the region to increase the profitability for smallholder farmers while bolstering food security for the broader population.

Less is more for nutrient management

One of the projects, 'Nutrient management for diversified cropping in Bangladesh (NUMAN)' (LWR/2016/136), has shown that yields and profits can be increased with a balanced approach to fertilisers and reducing overall inputs.

Led by Murdoch University's Professor Richard Bell, the project tapped into a network of more than 4,000 smallholder farmers through the local Conservation Agriculture Service Providers Association (CASPA).

The project found that farmers were over-applying fertilisers, particularly nitrogen, to maximise production of high-yielding rice crops and high-value produce such as potatoes and watermelon.

But Professor Bell said that with a more balanced mix of nitrogen, phosphorus, potassium, sulphur and micronutrients, farmers could spend less for a greater return.

'We found that farmers were not optimising nutrients, but if they did, there were savings in costs and gains in yield,' said Professor Bell. 'Farmers could increase their profitability and produce more food for less.'

Assisted by a 'research engine' of 6 PhD candidates from Bangladesh universities, the project identified optimal nutrient application rates across several sites based on soil type and cropping pattern.

The project demonstrated 'fairly simple' farming practices around nutrient management that are more environmentally sustainable, improve productivity and reduce costs.

Reduced fertiliser use also saves the Bangladesh Government money. To improve food security, the government currently subsidises fertilisers for farmers, and when fertiliser prices skyrocketed at the start of 2021, its annual outlay of US$700 million jumped to US$3 billion in 18 months.

To translate the project's nutrient use findings into a change of practice, the project team produced a one-page information card listing optimal fertiliser rates according to particular agroecological regions.

The information card was distributed to more than 33,000 farmers and the researchers have received 'highly positive feedback'. Professor Bell said that farmers who used it generally saw a reduction in fertiliser costs and greater crop yields.

Key points

1. Strategies to help smallholder farmers in Bangladesh balance their fertiliser applications are improving yields while reducing costs.
2. Crops suited to salt-affected soils and dry-season conditions have been identified to expand options for smallholders in coastal Bangladesh and West Bengal, India.
3. Dry-season crops combined with short-season rice are allowing smallholders to grow two crops a year, with increased incomes.
4. Targeted crop and nutrient options are increasing yields, improving livelihoods and contributing to improved food security for the region.

The task now, he said, is to broaden the scope of the extension so more farmers can benefit from the findings.

Bangladesh collaborator Dr Emanul Haque is working with private enterprise to stock the information cards in fertiliser outlets. And work is underway with CASPA to hold peer-to-peer sessions among farmers on how to use the card. Information is also being spread through direct messaging and social media using smartphones.

More crops for saline-affected land

Professor Bell is also involved in a second ACIAR-supported project, which is investigating how to intensify cropping in the salt-affected coastal zones of Bangladesh and the West Bengal region in India. He said the aim is to challenge assumptions about what we can and cannot grow in these areas.

Led by Dr Mohammed Mainuddin from CSIRO Environment, the project is dedicated to diversifying crop options in the coastal zones where 90% of people depend on agriculture for their livelihoods and about 40% live below the poverty line.

The first phase of the project started in 2015 and has already had a significant impact, said Dr Mainuddin. He explained that farmers have traditionally relied on growing just one crop each year – rice in the monsoon season.

'The objective was to develop technology so farmers could improve productivity of the monsoon crop and also grow another crop in the dry season to improve their livelihoods,' said Dr Mainuddin.

The project found that a new shorter-season, high-yielding, salt-tolerant rice variety could be successfully grown in the wet season and harvested early. This allowed for another crop to be planted immediately after the rice harvest, while there was still ample moisture in the soil.

Zero-till potato covered in straw mulch has proven particularly successful as a second crop, along with watermelon, garlic, sunflower, maize and spinach, among other vegetables. In some areas, where there are sufficient water storages, dry-season rice is also an option.

'Looking at satellite images, we can see many areas now completely covered with crops in the dry season,' said Dr Mainuddin. 'This represents additional income that is changing farmers' lives.'

The difference on the ground

Mrs Shuli Ray is one such farmer. She was initially sceptical about cultivating crops on her family's small plot of saline-affected land, which had never provided enough food even for themselves. But in 2019, a watermelon crop she grew based on the project's research returned A$1,150.

A Bangladeshi farmer grows shorter-duration rice and a crop of long melon or bottle gourd on a wired structure above his rice crop. Photo: ACIAR

This was enough to lease more land and convince her husband to join her working on-farm. Since then, she has made improvements to her home, acquired cows and agricultural equipment including an irrigation pump, paid for one daughter's wedding and another's college education, while saving a 'modest' amount of money in the bank.

Dr Mainuddin says phase two of the project is working to extend such economic impacts across more of the region.

The researchers are building a more complete picture of the landscape beyond their initial test sites using remote sensing image analysis to detect water stores. This will help determine which crops will be suitable for specific areas.

Resilience to climate change impacts is also being strengthened by encouraging farmers to build channels that will drain run-off from the more frequent dry-season downpours that can destroy non-rice crops.

'One way of convincing farmers is not by speaking, but showing the benefit through demonstration sites,' said Dr Mainuddin. 'Once they see the benefits, they are easily convinced and they share their learning with friends, relatives and neighbours.'

Dr Mainuddin said impact is growing every year as more farmers, witnessing the benefits, take up the technology. Adoption has also been encouraged through media and government extension activities in West Bengal and Bangladesh, where funding has been provided to in-country partner research organisations, institutes and universities to demonstrate the technology.

Scaling-up benefits

ACIAR Research Program Manager, Soil and Land Management, Dr James Quilty said the project teams have worked closely with each other and with smallholder farmers to enable broad and meaningful impact.

'There have been real benefits to farmers' productivity as well as environmental benefits, soil health benefits, food security benefits and a benefit to the government of Bangladesh,' said Dr Quilty.

'They are a very good example of how we are developing, designing and supporting research in an integrated way.

'We've developed this knowledge, we've shown it can work and that farmers are willing to adopt it. I'm interested in ensuring that we don't stop where we're at.'

Considering the gains demonstrated, and as the projects enter their final stages, he said the next step is to scale-up – to encourage adoption at a broader scale by providing information in a format that is useful to farmers.

Opportunities are being explored with Australia's Department of Foreign Affairs and Trade to help enable a comprehensive countrywide roll-out of the research findings.

ACIAR PROJECTS: 'Nutrient management for diversified cropping in Bangladesh (NUMAN)' (LWR/2016/136); 'Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India' (LWR/2014/073)

Building an understanding of the social impacts of mobile financing on farmers in Laos and Cambodia can help inform future policies. Photo: Shutterstock

Inclusive finance for smallholder farmers in South-East Asia

Two ACIAR-supported projects are exploring ways to improve access to financial services for smallholder farmers in South-East Asia to further develop farming technologies and processes.

One of the major barriers that smallholder farmers face in embracing new technologies and more efficient processes is limited access to finance. Two ACIAR-supported projects are underway to assess how financial services can be improved to invest in whole-of-value-chain improvements, new technologies and value adding.

The first of these projects is an agricultural value-chain project, building knowledge about how to design and implement innovative and inclusive financing models in Indonesia, Vietnam and Myanmar. The project began in 2018 and will conclude in 2024.

It began with an assessment of the current landscape of agriculture value-chain finance, including an analysis of how gender affects access to finance.

Dr Alan de Brauw, a senior research fellow at the International Food Policy Research Institute and project leader, said this revealed that female farmers regularly had less access to capital than their male counterparts.

The project has continued to engage with the gender dynamics of agriculture finance, exploring gender-based financial decision-making throughout various value chains.

Another key finding was limited government-supported low-interest loan options for disadvantaged groups, especially for agriculture.

Building effective value chains

Dr de Brauw said the project aims to develop more private sector financing options for agriculture to create more effective value chains, as public financing can cause distortion to value-chain development.

The project has established pilot projects in Indonesia and Vietnam that are testing various finance models that involve engaging with farmers as a collective. In Vietnam, the pilot was run with a coffee company, and the Indonesian pilots included rice polishing, shallots and vegetable value chains.

'Companies are motivated to engage with the model to improve regular supply or expansion potential,' said Dr de Brauw. 'And private banks can have more confidence in loaning to farmers because they have a regular flow of money, so they are going to be able to pay back those loans. Especially if you include insurance in the model.'

Dr de Brauw noted that the uptake of the offered loans was not as high as they had expected, so the final year of the project will analyse factors influencing uptake.

ACIAR Research Program Manager, Agribusiness, Mr David Shearer, said it is essential to develop mechanisms that enable finance to flow into the agrifood system at all stages of the value chain, to create more sustainable systems that can address larger challenges, and effectively scale innovations.

'Financial mechanisms are a key pillar of being able to take innovation to scale. And we need innovation to address big global challenges, such as agriculture's contribution to greenhouse gas emissions. If we don't get the financing right, we won't get the impact right,' said Mr Shearer.

Mobile financial services

Another newly launched ACIAR-supported 6-year project is exploring the impacts of mobile financial services on farming households in Cambodia and Laos.

It will involve a literature review of existing global evidence of the impacts of mobile finance tools such as savings, financial management tools and credit. It will then engage in research on the impacts of these tools in the specific contexts of farmers in Cambodia and Laos.

Managing director of Finthropology and project co-leader Dr Erin Taylor said understanding the positive and negative impacts of access to mobile finance services can then help inform policies and direct development programs involving the digitisation of financial services for agriculture.

'It's widely understood that efforts to include people in the formal financial system can have lots of positive impacts. But what's happened recently is that a lot of tools have become digital. So, our big question is, when farmers start to use digital tools instead of cash, what happens?' said Dr Taylor.

... context is critical when researching the impact of a new technology, as the effects can vary greatly in different social environments.

Mobile financial tools can provide access to financial services to a much broader range of people, such as remote communities who can make faster transactions with lower transaction fees without immediate access to a physical bank. Women can also access these financial resources independently of their family.

However, it can also have negative effects. This includes potentially increasing indebtedness through increased access to credit through microfinance institutions. There have also been contexts where access to mobile money has made it easier for people to gamble.

ACIAR Research Program Manager, Social Systems, Dr Todd Sanderson said context is critical when researching the impact of a new technology, as the effects can vary greatly in different social environments.

'Every new technology will land in a different country context in a different way. It will reflect the peculiarities of social structures and values, and the way this manifests in behaviours and decisions,' said Dr Sanderson. 'I see this project as a good example of the contribution we can make to the global public-good knowledge base, to affect development pathways in positive ways.'

ACIAR PROJECT: 'Inclusive agriculture value chain financing' (AGB/2016/163); 'Building the evidence base on the impacts of mobile financial services for women and men in farming households in Cambodia and Laos' (SSS/2020/160)

Key points

1. Improved access to financial services gives smallholder farmers opportunities to adopt improved technologies and processes.
2. Inclusive agricultural value-chain financing can improve the efficiency and effectiveness of financial services in agriculture.
3. Understanding the impacts of mobile financial services can inform policies and development programs for the digitisation of finance tools.

Samoa's seaweed revival targets production for health benefits

A seaweed revival is underway in Samoa, with community-directed research identifying how men and women can create new livelihood opportunities by expanding sea-based production.

Seaweed has traditionally been a part of Samoan cuisine, and new research as part of an ACIAR-supported project is seeing renewed interest in local species to boost health and incomes. A core part of the project was an analysis of local diets to identify how local seaweeds could address nutritional shortfalls.

Species assessed included *Caulerpa*, or green sea grapes, also known as limu fuafua, which is eaten as a celebratory food when in season, particularly at communal events. The other species is *Halymenia*, a red seaweed that is still eaten by some elder community members, although it has fallen out of favour in the general community.

Dietitian and public health nutritionist Dr Libby Swanepoel has led this project, as part of the team at the University of the Sunshine Coast.

Dr Swanepoel said while the original project plan included Kiribati, restrictions related to the COVID-19 pandemic meant this could not go ahead. However, close relationships with project partners at the Department of Agriculture and Fisheries in Samoa allowed work there to continue, with the 2-year project concluding in March this year.

Key points

1. Dietary and nutritional research has highlighted the role that seaweed can play in improving local diets and supporting local livelihoods in Samoa.
2. Community-led discussions in 10 Samoan villages have identified the role of men and women in seaweed production and value chains.
3. A pilot program has co-designed a community action plan to support the strengthening of seaweed livelihoods and incomes for both women and men.

Seaweed and nutrition

The project team engaged with 10 local communities to gather information about diet, including any seaweed consumption. A smartphone app designed specifically for the dietary interviews was well supported by community participants.

Data about the nutritional values of a standard Samoan diet was then paired with the nutritional profile of the selected seaweeds. The results suggested that increased consumption of both sea grapes and *Halymenia* could add important micronutrients to local diets, including iodine, magnesium and potassium. *Halymenia* could also contribute much-needed calcium.

These findings support increased seaweed consumption, said Dr Swanepoel, and could underpin increased demand and opportunities to expand production.

Production and supply chains

The project team also worked with local communities to identify the roles that men and women play in seaweed production and the supply chain, and how they might benefit from an expansion of the seaweed sector. Views from men and women were captured separately.

Dr Swanepoel said the project was revised from one focused on wild harvesting to include sea-based farming, to align activities with another seaweed project underway in the same communities at the same time. This was a United Nations Development Programme initiative, funded by the Government of Japan, to pilot sea grape farming at 20 sites in 10 villages in Samoa.

'This change had implications for the business development opportunities for women,' noted Dr Swanepoel. 'Wild harvesting lends itself to women's work. But farming involves more physical labour. Setting out sea cages to grow sea grapes and bringing them in is physical work, which lends itself to men.

Samoan Ministry of Agriculture and Fisheries staff and village representatives with harvested sea grapes. Photo: MAF

A bag of freshly picked sea grapes, or limu, (*Caulerpa racemosa*) ready to eat. Photo: MAF

'Often, it's then women who harvest the sea grapes from cages, clean and process them and bundle them for sale. We must be cautious when introducing new technology that women aren't inadvertently pushed out of the value chain.'

The village of Vaisala then participated in the co-design of a village community action plan for seaweed, which included both wild harvest and aquaculture opportunities.

Planning action

'We brought everybody together for a couple of days to collectively workshop what seaweed production would ultimately look like in their village,' said Dr Swanepoel.

'Villagers developed a plan that built in the equal distribution of work between all village members and aligned with their aspirations. It also included a plan for the distribution of any income generated from the seaweed activities.'

Principal Fisheries Officer of the Inshore Fisheries and Aquaculture Sections of the Ministry of Agriculture and Fisheries Ms Ulusapeti Tiitii has worked closely with the project including the action plan workshop.

'The action plan and activities have now been incorporated into the existing village fisheries management plan and our team is working with that community in implementing activities,' said Ms Tiitii.

'They expanded their marine reserve to allow harvesting and farming in new areas and have also cleaned up the coastline, where sea grapes are growing naturally.'

Ms Tiitii reported increased interest in seaweeds from local consumers as a result of the nutritional research and sharing those results with local communities. Consumer demand has seen the price of sea grapes triple. *Halymenia*, which had all but disappeared from the markets, is also reappearing. 'People are starting to realise that these are good commodities not only for sale, but also for consumption,' said Ms Tiitii.

Equitable access to opportunities

ACIAR Acting General Manager, Country Partnerships, Ann Fleming said the collaborative approach taken in the Samoan project represents a different way of engaging with enterprise development.

Canvassing views from different groups was an important step to ensure equitable outcomes by identifying social and cultural norms that might prevent some community members from accessing new economic opportunities.

'It is important to integrate appropriate social and gender research into projects that aim to introduce new technologies for economic opportunities, to ensure culturally aligned and equitable access to those opportunities, rather than just setting up the products and markets and hoping the rest will all fall into place,' said Professor Fleming.

ACIAR PROJECT: 'Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa' (FIS/2019/125)

PhilGAP training gives vegetable growers in the Philippines a market edge

Smallholder farmers in the Philippines are improving the safety of their farming practices and the vegetables they produce, winning new buyers in some of the country's most sensitive food markets.

A stepped training program developed as part of an ACIAR-supported project in the Philippines is helping many smallholder farmers move towards Philippines Good Agricultural Practice (PhilGAP) certification for their farming and food safety practices.

Mr Adam Goldwater from Applied Horticultural Research is the operations coordinator for the project to develop vegetable value chains in the Philippines, linking smallholder farmers with higher-value vegetable markets.

Farmer training is one element of the project, along with the value chain and production research, which is being undertaken at 6 pilot sites on the islands of Mindanao and Leyte, involving about 130 smallholders.

Skills for smallholders

The training program is based on the existing PhilGAP certification and takes an extended hands-on approach over several months, to help smallholders move step-by-step towards full certification.

The training program has 4 elements: food safety, environmental sustainability, growing high-quality produce and worker health and safety.

'We start with the easy things, such as the differences between the chemicals farmers might be using, and how to apply them for best effect, safely,' explained Mr Goldwater. 'Then we move onto record keeping, trying to keep track of what's been done on the farm, and using those records to analyse profitability and comparing crops to support farm viability,' said Mr Goldwater.

He highlighted challenges for smallholders in parts of the process that require financial investment, such as building separate storage facilities for different chemicals and installing a toilet on-farm.

Despite this, 19 smallholders have received full certification since the program began in 2019 and all participants have completed at least half of the training program. Another 30 or more are expected to be fully certified by the time the program finishes in June 2024.

Professor in Horticulture Dr Zenaida Gonzaga at Visayas State University is coordinating the project's research in the Philippines, including testing for potential sources of microbial and chemical contamination that may affect the safety of crops.

Dr Gonzaga said key issues are *Escherichia coli* bacteria in irrigation water, contamination from fresh manure applied as fertiliser and pesticide residues on vegetables. Interventions trialled in the Philippines and Australia include the use of withholding periods following the application of manures, after irrigation and after the use of pesticides, and washing treatments to remove pathogens from harvested produce.

Changing farm practices

Dr Gonzaga has also been involved in the training program and said one of the greatest successes from her perspective is the increased awareness of worker safety and the need for farmers to wear PPE (personal protective equipment) and protect themselves from exposure to chemicals.

'From a production perspective, trials of new crops and collaborations among farmers to stagger planting and harvest times have been important steps in improving value chains,' said Dr Gonzaga.

The use of protected cropping systems – some financially supported by local government – has boosted productivity and incomes and allowed smallholders to try new crops not traditionally grown in their area.

This has led to the establishment of onion production in Leyte, responding to a national shortage of this culinary essential.

The Jollibee Foods Corporation, which operates a multinational chain of fast-food restaurants, has been a supporter of the project's supply chain developments, keen to secure a supply of onions. The PhilGAP training is helping smallholders meet the company's baseline supply requirements.

Key points

1. A stepped training program is helping smallholder vegetable farmers improve the safety of their farming practices and the food they produce.
2. Research is helping to identify and develop strategies to manage potential sources of contamination.
3. Smallholders tap into higher-value supply chains with new crops such as onions and garlic and innovative marketing strategies to promote improved agricultural practices.

A student from Visayas State University working on an experimental crop being trialled in the Philippines. Photo: ACIAR

Other new crops being trialled to meet market opportunities include garlic, carrots and strawberries.

Benefits to farmers

Mr Goldwater said the project has also undertaken surveys to identify consumer attitudes to food safety.

'While PhilGAP certification doesn't always register with individuals, food safety is a concern. Institutions such as hospitals and corporate buyers such as Jollibee are also highly sensitive to food safety issues,' said Mr Goldwater.

Both the certification process and the resulting improved quality of produce is helping smallholders to tap into these markets.

Participating smallholders report gaining preferred supplier status with some of their wholesale and retail buyers, and at local markets, with an increase in repeat customers. Some receive price premiums, but that is not always the case.

Supermarkets have proven a difficult market for smallholders to access. The paperwork required has proved a burden, and delayed payments also pose difficulties.

Several farmers have turned to online sales to market their PhilGAP-certified vegetables; others have increased their farm-gate sales, sharing their farming stories directly with customers to achieve price premiums.

Growing demand

Mr Goldwater said the PhilGAP system has been in place for more than a decade, but there has not been market drivers for widespread adoption. However, with national private organisations leading the way, that could be about to change.

A stall inside the new BayBay City Hall, in Leyte, provided PhilGAP-certified farmers with the opportunity to market their produce, and their credentials to more than 1,000 employees. Photo: Visayas State University

ACIAR Research Program Manager, Horticulture, Ms Irene Kernot highlighted the importance of this project in the bigger picture of encouraging Filipinos to eat more vegetables for better health.

'To do that, consumers need to be confident that the produce is safe to eat. Developing training and farming systems to minimise and reduce contamination in a way that is practical for smallholders, that they can manage with limited resources, is an important part of that,' said Ms Kernot.

ACIAR PROJECT: 'Developing vegetable value chains to meet evolving market expectations in the Philippines' (HORT/2016/188)

The Commission with smallholder farmers in the Liquiça District of Timor-Leste during a site visit of ACIAR-funded research. Photo: ACIAR

Commission visits Timor-Leste

Australia's Commission for International Agricultural Research, consisting of 7 experts advising Australia's Minister for Foreign Affairs, visited Timor-Leste in June to explore research opportunities and learn about the country's agricultural development priorities.

Timor-Leste's agrifood systems face various challenges including food shortages, low productivity, pests and limited market access. With the majority of its population residing in rural areas, improving agricultural productivity and food systems is a major focus for the Timor-Leste Government.

The visit was part of a week-long agenda for the Commission, focusing on current and emerging food security and sustainable development challenges throughout the Indo-Pacific region.

The Philippines inaugural National Soil Health Summit was held in Manila in June. Photo: Presidential Communications Office

Inaugural national soil health summit in the Philippines

ACIAR partnered with the Department of Science and Technology – DOST-PCAARRD, Department of Agriculture – Bureau of Soils and Water Management, the Philippine House of Representatives and Griffith University for the Philippines first National Soil Health Summit held in June in Manila. The event, attended by His Excellency Ferdinand R. Marcos Jr, President of the Republic of the Philippines, senior Philippine government ministers, legislators, policymakers and Australian National Soils Advocate the Hon Penelope Wensley AC, brought together leading scientists, government officials, academics and the private sector to explore ways of working together to secure soil health and nutrition, and contribute to sustainable agriculture in the country.

Beekeepers inspecting hives during a workshop at the Pacific Islands Beekeeping Congress in Nadi, Fiji. Photo: ACIAR

Beekeepers swarm in Fiji for Pacific congress

The inaugural Pacific Islands Beekeeping Congress took place in Fiji in May, marking a significant milestone for the region's beekeeping community. The congress, supported by an ACIAR-funded project led by Southern Cross University, brought together 200 beekeepers from 10 different Pacific island countries to learn, network and strengthen beekeeping industry skills, knowledge and partnerships in the region. The event, the first of its kind for the region, was delivered in partnership with the Fiji Beekeepers Association and the Pacific Island Farmers Organisation Network and focused on improving the productivity and profitability of smallholder beekeeping enterprises.

Keynote speakers at the CultiAF Future Food Systems Conference. Photo: May Muthuri

Highlights from the CultiAF Future Food Systems Conference in Nairobi

ACIAR and the IDRC organised the Cultivate Africa's Future Food Systems Conference in Nairobi, Kenya, in June 2023. This landmark partnership, representing a A$37 million investment between 2013 and 2023, convened 695 agricultural enthusiasts, scientists, researchers, innovators and policymakers, with a shared vision of cultivating sustainable agriculture and food systems. The momentum gained from the conference through fruitful discussions, knowledge sharing and the formation of valuable partnerships will serve as a springboard for transformative action towards a more sustainable and inclusive agricultural landscape beyond the portfolio of the 9 existing CultiAF research projects.

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Coffee Berry Borer in Papua New Guinea

ACIAR has published the first module of a new training package for coffee extension officers and smallholder coffee producers in Papua New Guinea. This module covers the management of the coffee berry borer, which is becoming a significant pest in the region. Print copies of this module will be distributed through the Coffee Industry Corporation in Papua New Guinea, and the PDF is available from the ACIAR website.

Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia

ACIAR Impact Assessment Series #105 documents an assessment of the 'Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia' (HORT/2012/097) project, led by the Queensland Department of Agriculture, Fisheries and Forestry. The project developed scientific knowledge of the epidemiology of the tropical race 4 (TR4) strain of *Fusarium* wilt in the Philippines.

40 years of ACIAR

Since 1982, ACIAR has implemented more than 1,500 agricultural research-for-development projects, with more than 400 project partners, in almost 40 different countries. In doing so, ACIAR supports Australia's commitment to contributing to poverty reduction and livelihood improvement in the Indo-Pacific region. To mark 40 years of operation, a small selection of partnerships, ACIAR has published a book documenting a small selection of projects and people to convey the impact of ACIAR across regions, countries and different fields of research.

All ACIAR publications are free to download at **aciar.gov.au**

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The Australian Centre for International Agricultural Research (ACIAR) is part of Australia's international development cooperation program. Its mission is to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. ACIAR also administers Australia's contribution to the international agricultural research centres.