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INTERNATIONAL YEAR OF FRUITS
& VEGETABLES EDITION

partners

IN RESEARCH FOR DEVELOPMENT



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International
Year of Fruits
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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: Nguyen Thi Huong harvesting VietGAP-certified tomatoes in Vietnam (page 15). Photo: Bùi Thị Hằng, Northern Mountainous Agriculture and Forestry Science Institute.

Back cover: Fruit on sale in a Sri Lankan market.



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From the CEO

Professor Andrew Campbell

ACIAR has always invested in research beyond the three main staples of wheat, maize and rice. In this International Year of Fruits and Vegetables it is timely to highlight our research in horticulture.

When we look at our nearest neighbours in Timor-Leste, Papua New Guinea and across the Pacific region more broadly, we see the importance of fruits, vegetables and nuts including coconuts, cassava and yams. Horticultural crops are garnering more attention given the increasing global interest in nutrition security, as distinct from just ensuring that we are producing enough calories.

This issue features our work developing the citrus industry in the Pacific region, and on nutrition-sensitive agriculture—ensuring that agricultural research helps to deliver more nutritious diets. We also feature our long-term horticultural research partner the World Vegetable Center.

Our approach to partnerships was the focus of a United Nations Food Systems Summit (UN FSS) Dialogue we co-convoked in May—“Multi-stakeholder Partnerships for Scaling Agricultural Innovation”. The second Dialogue we co-convoked was on “Food Loss Research”, during which we launched the new Food Loss Research Program—a partnership between ACIAR and Canada’s International Development Research Centre. These Dialogues were rich in content. A great diversity of people from different agencies across many countries were able to participate thanks to their online format, allowing the Dialogues to be more inclusive.

Online participation in events has ensured such activities can continue amidst COVID-19. Travel restrictions are obviously affecting how ACIAR research projects are being delivered. In some cases, this has resulted in positive changes that are improving how work is done. This is especially true where there are well-established project teams that know each other well. Here, we are seeing in-country partners stepping up to take on more responsibilities



and leadership. I hope this will be a permanent shift. For newer projects, where relationships between partners are only developing, we know the challenge has been harder.

In October, Australia’s Commission for International Agricultural Research meets in Wagga Wagga in a visit hosted by Charles Sturt University. The New South Wales Department of Primary Industries and Agrifutures Australia, will also participate. This will be the first time the current Commissioners will meet in the field.

While we are grateful we can meet in this way, we acknowledge that many ACIAR partner countries remain in various states of lockdown or are otherwise constrained. We are acutely aware of the challenges this presents the research sector and our international colleagues, friends and research partners personally. Our support through online delivery of our fellowship and capacity building programs continues as does our flexibility in identifying creative and effective ways to support ongoing research.

Throughout COVID-19, the ACIAR country network has continued to perform superbly. The investments we have made over recent years in building up the network and attracting outstanding locally engaged staff to our ten country offices is paying off handsomely. Many of our in-country staff are still working from home in challenging circumstances due to the COVID-19 situation in their country yet maintaining productivity for ACIAR. Thank you. 🌱

A handwritten signature in black ink, appearing to read "A. Campbell". The signature is written in a cursive, flowing style.

Fresh produce research for better health, livelihoods

Celebrating the International Year of Fruits and Vegetables

Whether you put them in stews, sauté them with rice or eat them raw, fruits and vegetables form the cornerstones of healthy diets around the world. They not only supply our bodies with rich nutrients but also provide livelihoods to millions of smallholder farmers—especially women, who generally tend to be more active in horticultural farming than men.

In the International Year of Fruits and Vegetables 2021, supporting efforts to improve people's diets to include fruits and vegetables is a focus to strengthen immune systems and overall health.

Key points

- 1 2021 is the International Year of Fruits and Vegetables.
- 2 Increasing the quantity and diversity of fruits and vegetables people eat is central to creating improved health outcomes and better nutrition.
- 3 ACIAR invests in horticulture research that supports improved nutrition, as well as increased productivity.



With 2021 marking the International Year of Fruits and Vegetables (IYFV) in the middle of a global pandemic, IYFV is dedicated to raising awareness of the important role of fresh produce in human nutrition, food security and health.

'In the current health crisis we are facing around the world, promoting healthy diets to strengthen our immune systems is especially appropriate,' Food and Agriculture Organization of the United Nations Director-General, Mr Qu Dongyu, said during the launch of IYFV while emphasising the importance of technology and innovation in sustainable food production.

ACIAR horticulture research

At ACIAR, fruits and vegetables have 'always been a really important part of our program', says Ms Irene Kernot, ACIAR Research Program Manager for Horticulture.

But, ACIAR's approach to horticulture research has gone through changes over the years from having a focus mostly on improving livelihoods and production systems to placing increased emphasis on nutrition and health.

Ms Kernot says the shift happened within the past 10 years 'and I think it will continue to grow'. One reason is that if farmers and others residing in rural villages aren't healthy then it's difficult to improve their livelihoods.

Growing diversity

A survey conducted by ACIAR-supported researchers in Papua New Guinea's Autonomous Region of Bougainville has shown that lower yield and lower incomes directly correlate to farmers developing more than two types of chronic ailments.

Poor nutrition also contributes to stunting: a major life-long problem for children in the Pacific region. And noncommunicable diseases, partially driven by unhealthy diets, represent the single largest cause of premature mortality in the Pacific region, according to the World Health Organization.

But, farmers' ability to grow more diverse, higher quality fruits and vegetables doesn't necessarily translate to improved family diet. At least that's what an ACIAR researcher found in Sigatoka Valley, also known as the "salad bowl" of Fiji.

'The fruit and vegetables were all going for sale while the people's diets were still very strongly focused on the starchy staples. So sometimes obvious

interventions don't make a difference. You really need to work with the communities to understand,' says Ms Kernot.

Part of the challenge is the universal appeal of instant food. Being able to toss something into the microwave after a long day at work is more convenient than having to cook a meal.

Another challenge is societal perceptions of takeaway food. Some people—especially those trying to move up the socioeconomic ladder—believe that ordering out shows others that you are financially well off. That was highlighted during an ACIAR project in Africa, which looked at incorporating indigenous vegetables into school food programs. 'The researchers really had to work around the perception that this was poor, yucky food you wouldn't really feed your family if you were upwardly mobile,' says Ms Kernot.

Investing for nutrition

Moving forward, ACIAR plans to increase investment in nutrition, especially in Pacific island countries and Africa. Focus areas include establishing school gardens that engage children from a young age, diversifying crop systems and emphasising the value of nutritious indigenous vegetables like the orange-reddish Fe'i banana in the Pacific region over imported bananas like Cavendish.

Ms Kernot says good nutrition isn't just about horticulture, it's about a whole balanced diet that incorporates starch, livestock, fish etcetera. With increasing climate disasters affecting every facet of life, nutrition programs might need to look into shortening supply chains to strengthen food security as well as examining urban and peri-urban systems so that people can grow horticulture products where there isn't a lot of land, like in hydroponic systems or on rooftops.

ACIAR plans to continue communicating its nutrition goals by participating in United Nations Food Systems Summit Dialogues around IYFV, and through the recently launched Food Loss Research Program.

Ms Kernot says that she and her colleagues also intend to hold internal discussions that will enable researchers to brainstorm and better understand the nutritional impacts of their projects across various portfolios.

'We're talking more internally and engaging in global discussions and hoping that all of this translates to real action,' she says. 'That's the challenge.' 🌱



INTERNATIONAL YEAR OF FRUITS AND VEGETABLES

2021

FOOD FOR THOUGHT: ISSUES FOR ACTION

The International Year of Fruits and Vegetables (IYFV) 2021 is a unique opportunity to raise awareness of the important role of fruits and vegetables in human nutrition, food security and health and as well in achieving United Nations Sustainable Development Goals.

In the (IYFV-2021) Background Paper four issues for action are identified:



POLICY

Public policy has the power to influence all levels of the fruit and vegetable value chain, thereby shifting production and consumption patterns.



CAPACITY

Capacity development of stakeholders at all levels of the supply system is critical to assuring the safety, quality, shelf-life and availability of fresh produce in local markets.



PARTNERSHIPS

The complexity of the fruit and vegetable sector necessitates multi-sectorial approaches among governments, the private sector, civil society, academia and research institutions to support innovation, technology and infrastructure development.



DATA

Successful policies and investments require data. A holistic and integrated policy agenda informed by data at each step of the value chain will help to balance supply and demand and to combat malnutrition.

For more information on the International Year of Fruits and Vegetables

www.fao.org/fruits-vegetables-2021/en

IYFV@fao.org

Food and Agriculture Organization of the United Nations

Rome, Italy



Changing lives with African indigenous vegetables

Providing locally-sourced African leafy vegetables to schools for use in school meals has proven a winning model during a pilot program in Busia County, Kenya.

Dr Victor Wasike from the Genetic Resources Research Centre in Nairobi, says the success of the pilot program was evident in multiple benefits including enhanced nutrition, improved school performance and achievement, employment and economic growth, and also in more personal stories of lives changed.

He explains that one participant in the pilot program—a widow named Joyce—was able to sell her indigenous vegetables to the school for it to use in making meals for the students.

‘After engaging with us, from the sale of indigenous vegetables, she was able to improve her house,’ Dr Wasike says. ‘She replaced the thatch roof with tin and bought herself a TV, which she thought was only affordable to the rich. She also put solar panels on the roof to run the TV. We can see that people’s lives have changed. The program has lit a fire of enthusiasm for African leafy vegetables.’

Addressing malnutrition

Many children in poverty-stricken areas of Kenya suffer from malnutrition, which has been strongly associated with impaired physical and cognitive development. In Busia County around 70% of the people live in poverty and two-thirds are unable to meet their basic food needs. Among children under the age of five, 26% are stunted and 11% are underweight.

Yet, Busia is home to locally adapted indigenous crops including leafy vegetables. These are highly nutritious and grow widely with minimum inputs, offering benefits to both human health and the environment. Despite their potential, these species are underutilised in local diets and production systems, which have tended towards more Western eating in recent decades.

As Dr Danny Hunter, Alliance of Bioversity International and the International Center for Tropical Agriculture, explains, farmers wanting to grow African leafy vegetables also face problems with transport and infrastructure to gain access to



A student enjoys his lunch incorporating the African leafy vegetable cowpea as part of a school meals program to improve nutrition in poverty-stricken areas of Kenya.

markets—hence the pilot project to link farmers and local schools and to provide the vegetables for school meals.

In addition to improving the nutrition of the students the pilot project aimed to develop a steady market for African leafy vegetables.

‘The first ACIAR project was the scoping project to see how we could develop a school procurement process,’ Dr Hunter says.

‘Here, the leadership of the Mundika School and the role of the Sustainable Income Generating Investment Group—a farmer umbrella organisation based in Busia—were central to making this a reality in terms of organisation, training and logistics.’

That pilot project proved that the pieces do indeed fit together, with synergistic benefits, that, as Dr Wasike puts it, ‘lit a fire’. But that is not to say there weren’t challenges along the way.



From weeds to precious crops

'Indigenous vegetables were previously associated with the poor and the sick,' Dr Wasike says. 'Some of them are considered weeds. No one wants to eat weeds.'

'If parents considered the indigenous vegetables were weeds and the school wanted to serve indigenous vegetables, the parents would think the schools were feeding their children on weeds.'

Key points

- 1 Children in poverty-stricken areas of Kenya are vulnerable to malnutrition and associated impaired physical and cognitive development.
- 2 A pilot ACIAR-supported project has found a way to effectively incorporate more healthy indigenous vegetables into school meals.
- 3 The livelihoods of local farmers who can supply the indigenous vegetables is also benefitting from the program.

Providing nutrition education to students, teachers, administrators and parents reversed this perception. The project analysed nutrient levels of the indigenous vegetables and sensitised the children, their parents and the public on the nutritional and health benefits through cooking demonstrations. A farmer group member was employed by the school to cook the vegetables in a way the children would enjoy.

'We had a cultural and open day at the school,' Dr Wasike says. 'We called in parents, the county administration, the Minister for Agriculture and education officials, and showed them what we were doing. All participants in the event—the kids, parents, teachers—ate the vegetables and liked them. The kids were saying "This is good, and we have been told that our brain grows better when we eat these".'

The African leafy vegetables were introduced to the students through the school's existing meals program. The school kitchen served the vegetables for lunch to

540 students, starting out by serving them one day a week and worked up to serving them five days a week.

'Over two years, we saw exam results get better—anecdotally we can see that school performance has improved, although we can't say by how much yet. Certainly, the school matron reported that the frequency of kids getting sick had substantially reduced,' Dr Wasike says.

When COVID-19 struck Busia County the schools were partially closed, with only students who were working towards their final exams continuing to attend classes. This greatly reduced demand for the African leafy vegetables for school meals. But by this time, there was broader community understanding of the benefits of African leafy vegetables and the nutrients they contain.

Dr Wasike says some participating farmers set up roadside stalls to sell African leafy vegetables and they are once again more frequently being sold in local markets.

'People have begun to change and look at African leafy vegetables in a different way,' he says. 'In some eateries in Nairobi, currently a plate of indigenous vegetables is more expensive than meat, because of the associated health benefits.'

'In collaboration with the Ministry of Health in Busia, we established demonstration farms around community health centres. Mothers see this as they come for antenatal visits and learn of the nutritional benefits.'

'Eating indigenous vegetables is currently considered a more sustainable way to supply micronutrients than through supplements.'

Opportunity abounds

Dr Wasike and Dr Hunter agree the school food project could go much further.

'It was very good that ACIAR stepped in to provide funding for the pilot and to test the project,' Dr Hunter says.

'A lot happened with relatively small investment.'

On the back of the success of the school feeding program in Africa, ACIAR is now interested to see similar school garden and food initiatives in the Pacific region. 🌱

ACIAR PROJECT: School Food Revolution: Evaluating opportunities for further research, GP/2017/007.



Linking agriculture with better nutrition

By Jessica E Raneri, Senior Nutrition-Sensitive Agriculture Advisor, ACIAR and the Agricultural Development and Food Security Section, Department of Foreign Affairs and Trade

For a long time, agricultural research has focused on increasing yields of commodity staple crops—such as rice and wheat—that are often energy rich but micronutrient poor. This has contributed to there now being more than enough food produced globally to feed everyone. Yet, more than 690 million people still go hungry, more than 150 million children are stunted by malnutrition and there are nearly 60 million more undernourished people now than there were in 2014.

These statistics indicate there's still something wrong with how we have been addressing global hunger and nutrition. We don't just need more food. We need more nutritious and affordable food that is readily accessible and eaten by everyone, especially the most vulnerable.

Agriculture and nutrition

Thankfully, the past decade has seen a paradigm shift to recognising that nutrition can—and must—fit within the scope of agriculture.

Agriculture can improve nutrition because it is a source of food and income, and it can be used to empower women who are central to supporting the health of their families. Agriculture is the most direct way to improve food security and nutrition of the rural poor.

Addressing nutrition challenges via agricultural research and interventions or 'nutrition-sensitive agriculture' moves beyond a sole focus of simply

ensuring there is sufficient food produced to fill empty bellies, towards opportunities for agriculture to nourish growing bodies.

Nutrition-sensitive agricultural research means finding opportunities through agriculture to improve the availability of, access to and utilisation of nutritious foods.

ACIAR and nutrition

Globally, one in five deaths is associated with poor diet quality, characterised in part by insufficient consumption of whole grains, fruit, vegetables, nuts, seeds, dairy and legumes.

ACIAR has a nearly 40-year history of investing in agricultural research that targets those foods. Largely, ACIAR projects have focused on improving the availability of these foods through a range of interventions. This includes developing more resilient higher-yielding varieties, biofortifying crops to increase micronutrient availability, improving food safety and diversifying production systems.

For example, ACIAR supports the production and consumption of leafy vegetables by Pacific island communities. It also researches the production and consumption of nutritious legumes—including in Africa by developing and promoting precooked beans, and through mungbean research that targets more productive varieties. Plus, it has a range of fish projects that aim to improve nutrition and livelihoods.

However, while ACIAR has invested in research that could be expected to have nutritional benefits, in the past nutrition has not been an explicit or primary

Key points

- 1 Increasing food production alone is not enough to ensure people get access to and consume more nutritious food.
- 2 Improving people's diets is central to ACIAR's nutrition-sensitive approach to agricultural research.





part of ACIAR's strategies. To date, it has not yet conducted impact assessments to determine changes in nutrition outcomes and its projects have not often had measurable nutritional targets.

That is now changing, with ACIAR developing impact assessments of nutrition-sensitive investments.

Setting nutrition targets

Recent reviews of the impact of agriculture on nutrition have shown that increasing productivity does not always lead to the increased consumption of healthier foods.

To improve nutritional outcomes—or make sure people have better diets—projects need to have clearly defined pathways that target nutrition from their conception. Doing so ensures that nutrition is embedded into key aspects of project implementation that support consumption of healthier foods that arise from agricultural research.

ACIAR is now encouraging its research programs and projects to take a nutrition-sensitive approach to the design of its projects. ACIAR wants its research partners to think beyond increasing the availability of foods and extend this to improved accessibility and utilisation of these foods for better nutrition as well.

It wants them to consider including more nutritious species and varieties in their research—for example beta carotene-rich sweetpotato. Moreover, it wants them to create incentives for households to spend income generated by livelihood-focused projects on more nutritious foods by shifting consumer demand towards better diets.

ACIAR is also supporting a consumer-demand-oriented approach to improve nutrition. It wants to identify local food and nutrition security gaps, and in particular what the dietary gaps are. This should reveal where, across the food production system, innovation and research solutions can help to improve the availability, accessibility, consumption and sustainability of nutritious foods.

At the same time, ACIAR is improving the understanding and application of nutrition-sensitive agriculture among research program managers and project leaders. This is helping to ensure projects are designed with consideration of how to improve nutrition from the start.

Through these initiatives, it is targeting the consumption of more, and a more diverse range of, nutritious and safe foods that meet the nutritional needs of smallholder farmers in low-income countries.

Fruit and vegetables

Put simply, central to the issue of nutrition is the consumption of more fruit and vegetables because they are exceptionally nutritious and provide multiple health benefits.

Even simple research projects can make a difference. For example, ACIAR supports a project in Bougainville with cocoa growers. It wanted to see if the growers would eat a more nutritious diet if they grew vegetables as a companion crop in their cocoa blocks.

The project trains extension officers in vegetable production and provides cocoa growers with vegetable seeds. As a result, not only do the growers eat a greater diversity of vegetables—which they now grow themselves—but their vegetable production provides additional income because they sell the produce that they don't consume at home.

It's only by thinking about, and planning for, the inclusion of nutritional targets in research—like in the Bougainville cocoa grower example—that ACIAR can see if research helps improve people's diets. 🌱



Making sure smallholder farmers and their families and communities have healthier diets—including eating more fruits and vegetables—is an essential component of 'nutrition-sensitive' agricultural research.



Commercial citrus a ‘game changer’ in the Pacific region

Four years on from the launch of an ACIAR project to improve fruit production in the Pacific, the first mandarins from a newly established commercial orchard in Tongatapu have been snapped up by Tongan shoppers.

‘We are extremely happy with the quality of the fruit: it’s sweet, juicy and easy to peel,’ says Mr Minoru Nishi, whose Nishi Trading Company has set up an irrigated orchard of nearly 200 mandarin, navel orange, lemon and Tahitian lime trees as part of the project.

‘The Afourer mandarins from our first harvest in May sold very quickly in the supermarket at T\$4 (A\$2.30) for a bag of fruit weighing around 600 grams, which is about T\$1 cheaper than imported citrus,’ Mr Nishi says.

‘There’s still a lot of work to be done but this project has been a game changer, thanks to ACIAR engaging the private sector and community groups. It will benefit the country of Tonga as a whole.’

Pacific horticulture


The 2016–20 project aimed to increase the efficiency of fruit value chains, provide targeted capacity building to the private sector and government extension services, and enhance the engagement of smallholder farmers and communities in managed orchards to reduce fruit imports and improve nutrition.

Fruit production in the Pacific region represents less than 10% of overall horticultural output, with very few large-scale orchards and most citrus imported. While many backyards have fruit trees such as oranges, they aren’t maintained and the fruit is of poor quality.

‘Much of the project was working through the research challenges as very little had been done to investigate fruit crops in the Pacific, with the exception

Key points

- 1 Fruit has been harvested from a commercial orchard of citrus in Tonga and sold to local consumers.
- 2 Government staff are being trained in orchard maintenance and tree propagation skills.
- 3 Packing, processing and cool room facilities have also been established as part of the overall development of the industry.



Citrus is now being harvested from a commercial orchard established in Tonga. Photo: Nishi Trading Company.



of pineapples, papaya, mango and breadfruit,' says project leader Professor Steven Underhill from the Australian Centre of Pacific Islands Research at the University of the Sunshine Coast.

'Each crop had different issues in each country, and while breadfruit was identified as a priority crop with potential for the Pacific, the standout success was citrus in Tonga.'

While the project partnered with the Ministry of Agriculture and Food, Forests and Fisheries Tonga, Professor Underhill also approached Mainstreaming of Rural Development Innovation (MORDI) Tonga Trust and Nishi Trading to encourage communities on Tongatapu and the outer 'garden island' of 'Eua to also take part.

Growing citrus

'Citrus has a number of benefits: it's counter-seasonal in winter months so there is supply when other fruit is not available, it's relatively drought tolerant, and while it requires a level of post-harvest handling, it also has a long shelf life,' says Professor Underhill.

'One of the major benefits of having locally grown fruit is that it will help to combat the high incidence of non-communicable diseases in the Pacific such as diabetes and cardiovascular disease.'

Elite grafted genetics were imported from commercial orchards in Australia, including Washington and Valencia oranges; Emperor, Imperial, Afourer and Ellendale mandarins; Meyer lemon and Tahitian lime, as well as trial plots of black sapote, guava, dragon fruit, star fruit and avocados.

Grafted trees were planted at three main sites: in the Houma community and the Ha'atu'a community on 'Eua Island, and at Nishi Trading's site at Utulau, on the main island of Tongatapu. Some trees were also allocated to Hango College on 'Eua Island and Tonga's Ministry of Agriculture and Food, Forests and Fisheries.

Four years later, the first fruit is being picked from some of the 300 trees in five commercial orchards.

Commercial development

Professor Underhill readily acknowledges that without the local buy-in of Nishi Trading as a commercial partner and MORDI Tonga providing the community interface, the project would not have been as successful, particularly since COVID-19 has prevented any Australian visits to the islands in 2020-21.

MORDI Tonga General Manager Mr Soane Patolo says 15 communities on the more elevated island of 'Eua took a lot of convincing to turn over valuable land to

plant the trees and learn how to cultivate, prune and manage them, but seeing the citrus bear fruit has changed their minds.

'It has been a major eye-opener to raise the trees from rootstock but we have trained 18 of MORDI's staff in routine maintenance of the orchard, and the challenge now is to make this sustainable through upgrading our skills,' Mr Patolo explains.

Building knowledge, skills

Senior horticulturist supporting the project, John Chapman, says a significant number of Tongans have been trained in citrus planting, fertilising, pruning, weed control, irrigation, and pest and disease identification and control using soft chemicals.

'They've also been exposed to the strategic challenge of caring for an orchard with no obvious reward for four years before it starts to bear fruit and all the benefits that that brings,' says Mr Chapman.

'Now with the orchards successfully established and starting to produce commercial quantities of fruit, the focus for the next phase shifts from growing the trees as fast as possible to slowing down growth and maximising flowering, fruiting and fruit quality—both external and external—and then developing and supplying markets, mainly local but also lime exports to New Zealand.


'Also critical will be the establishment of rootstock trees to supply rootstock seedlings and training a cohort of Tongans working with the orchards to vegetatively propagate by grafting. This will sustain the new culture and allow wider distribution of grafted varieties.'

Mr Patolo says he's hopeful that in the future, each household in Tonga will have at least five trees in an orchard-type planting, with one of these being citrus.

'The King of Tonga says he will allocate land for a plantation on 'Eua if we can supply the citrus seedstock for it. We would like to roll the project out to other islands too,' says Mr Patolo.

Mr Nishi is continuing to progress the work.

'We already had our own packing shed and have built a factory for processing and a new cool store facility with a capacity of 1740 m³, which has the potential to make dried or frozen product as well as juice citrus and watermelons down the track,' Mr Nishi says.

'This is a positive change and a good approach to sustainable development in Tonga.' 

ACIAR PROJECT: Enhanced fruit production and postharvest handling systems for Fiji, Samoa, and Tonga, HORT/2014/077.



In developing countries, most food loss occurs on farm or in processing, transport and storage. ACIAR and IDRC have launched a Food Loss Research Program to reduce these losses.

New Food Loss Research Program launched

Together, ACIAR and Canada's International Development Research Centre (IDRC) have launched a new research program to address food loss in developing countries.

The new A\$3m Food Loss Research Program will support projects in Asia, Africa and the Pacific region.

ACIAR CEO Professor Andrew Campbell says food loss and waste are huge—and growing—issues globally.

'The world needs to continually increase food production to feed the growing population,' Professor Campbell says.

'But if we didn't lose or waste as much food, there wouldn't be as much pressure to increase production. And pressure to increase production is pressure to increase water use, land use and nutrient use, as well as greenhouse gas emissions.'

Around one-third of food produced globally is either lost before it reaches the point of consumption or wasted after it reaches consumers. How this happens differs between countries.

Generally, in industrialised countries, food waste is the bigger problem. It occurs at the point of consumption, with food being thrown out from people's kitchens, restaurants or supermarkets. In low- and middle-income countries, on the other hand, food loss is the challenge, occurring on farm and during processing, storage and transportation.



President of IDRC Dr Jean Lebel says reducing food loss is also an effective strategy to improve people's lives and livelihoods.

'It's an area of science where if we make gains, we not only make gains in food loss but we boost returns to farmers. We improve nutrition and we increase incomes for families,' says Dr Lebel.

He adds that while food loss is not a new issue, progress to address it has been insufficient and too slow.

The roots of the innovative Food Loss Research Program bode well for a new approach that engages partners in a collaborative way.

Project foundations

ACIAR and IDRC have invested in analysing and mapping the future of food, led by the XPRIZE team. XPRIZE is an approach to identifying faster and more effective ways to have a positive impact in the world by using competition. The resulting 'Future of Food Impact Roadmap' has identified some of the biggest challenges facing agriculture and food production systems today.

One challenge identified is our ability to manage food systems within environmental limits. Curtailing food loss and waste is highlighted as a major opportunity for reducing the environmental impacts of food production.

Dr Sarina Macfadyen, Principal Research Scientist at CSIRO, is coordinating the Food Loss Research Program.

Key points

- 1 ACIAR and Canada's International Development Research Centre (IDRC) have launched a co-funded Food Loss Research Program.
- 2 The program will target food loss in developing countries in Asia, Africa and the Pacific region.
- 3 Reducing food loss and waste will help improve farm incomes and local food security while reducing pressure on water, land and nutrients, as well as greenhouse gas emissions.

'After consultation with people working in the agri-food systems of developing countries, we could see the absence of useful information on food loss and waste in some of the low- and middle-income countries was potentially one factor constraining the implementation of solutions,' Dr Macfadyen says.

'Furthermore, changes in formal and informal food chains operating in these countries, the types of intermediaries involved and how consumers are accessing food is changing rapidly.

'The Food Loss Research Program aims to identify and test opportunities for reducing food loss in Asia, Africa and the Pacific region.'

'We not only make gains in food loss but we boost returns to farmers.'

Dr Jean Lebel, IDRC

To commence the program, project ideas were invited as part of an ideas-generation process. It was open to researchers and research institutions in partner countries.

High-impact projects

It's anticipated that initially four projects will be funded under the Food Loss Research Program, targeting fruits, vegetables and fish. Each will work to uncover and understand high-impact food loss issues along the supply chain and work with networks of stakeholders to address these.

Professor Campbell says these projects aim to increase the production of highly nutritious foods such as fruit, vegetables and animal proteins that are missing from many people's diets.

'ACIAR's purpose is to help smallholder farmers, and if we can improve value chains so that less product is lost or wasted before it gets sold, that will help to improve the livelihoods and income for smallholders, as well as local food security,' he says.

'Helping farmers to reduce loss and waste is the other side of the coin from helping farmers to increase production.'

Dr Macfadyen agrees, saying: 'You can't really improve food security and poverty in developing countries by focusing just on research to increase production. By sustainably increasing production and reducing food loss and waste we have a much better chance of addressing food security and nutrition insecurity in communities and countries.'



A new focus

Professor Campbell says the Food Loss Research Program marks an ‘important evolution’ in looking at food from a systems perspective.

In some low- and middle-income countries in which ACIAR research teams operate, there is a general lack of post-harvest infrastructure for reducing food loss, despite many potential technology solutions.

‘Many of these innovations have never been adopted or implemented at a broad scale. However, the way these new projects have been developed and planned means there is a high likelihood that the teams will provide useful information for the development of locally-relevant solutions,’ says Dr Macfadyen.

She says rather than taking a technology from developed countries and trying to get it to work in other countries—which has been unsuccessful in the past—ACIAR, IDRC and their partners are assessing the food loss situation thoroughly, asking stakeholders for their ideas and constraints and trialling innovations that may be more appropriate for the target country.

‘Each project team involves two or more focal countries that are at different stages of development for the food chain under investigation so the transfer of interventions and an understanding of how change can be supported long-term may be more likely,’ says Dr Macfadyen.

Dr Lebel emphasises the importance of collaborating with a network of partners in the focus countries—including people from across the public and private sectors and researchers and non-researchers—to achieve this long-lasting impact.

‘Let’s embrace the complex challenge because out of complexity—and by bringing people together—we can come to relatively simple and actionable solutions,’ he says.

He adds that engaging with in-country partners means giving them power and that is the key to success.

‘We have to empower people. We tend to forget that in empowering there is a transfer of power. If you aren’t empowering others, it’s because you aren’t giving away your power,’ says Dr Lebel.

‘It’s not black magic. People need the resources, so let’s give them the resources. Learn from that and then translate it to reach others.

‘It’s profound. ACIAR and IDRC have always been true to this empowerment: giving responsibility to the people in the field.’

Importance of Australia-Canada cooperation

ACIAR and IDRC have worked together to invest in and support international agricultural research for development since 2013.

The Food Loss Research Program is their latest collaboration.


‘By working together, we have a wider reach and a bigger impact,’ says Professor Campbell.

Through the program both agencies also aim to support progress towards the Sustainable Development Goals (SDGs). In particular this includes Target 12.3 under *SDG 12: Responsible production and consumption* which aims to ‘halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses’.

The nature of how the Food Loss Research Program will be conducted also aligns with *SDG 17: Partnerships for the goals*.

‘The SDGs will only be accomplished if we are looking at them globally. The year 2030 is tomorrow for us. It’s not only the date that is important, it’s the journey,’ says Dr Lebel.

‘Our partnership with ACIAR has been so brilliant that it leads me to believe our journey of collaboration with Australia is in its early days. We have plenty to still do together.’

The program was launched as part of a United Nations Food Systems Summit Dialogue on food loss co-hosted by ACIAR and IDRC. The Dialogue drew together research leaders from around the world to discuss the global problem of food loss and advance planning and cooperation to help address it. 

ACIAR PROJECT: Food Loss Research Program, www.aciar.gov.au/cross-cutting-areas/food-loss-research-program





As part of the ACIAR-supported Good Agricultural Practice project in the Philippines, Visayas State University helped get more vegetables to community members affected by COVID-19.

Good Agricultural Practice programs secure farm-to-plate safety

Knowledge and awareness of the benefits and practicalities of safe fruit and vegetable production continues to spread across Myanmar, Vietnam and the Philippines as ACIAR seeks to strengthen value chains through the implementation of Good Agricultural Practice (GAP) programs for farmers.

Key points

- 1** Good Agricultural Practice (GAP) quality assurance programs support farm practices that improve food safety.
- 2** Consumers need to be part of GAP programs to encourage them to ask for and pay for safer GAP-certified produce.
- 3** In-country partners are key to engaging with farmers and stakeholders across the supply chain to embed GAP programs.



The GAP projects in three countries have developed links between farmers and retailers at the same time as providing education and support for safe work practices, growing quality produce and ensuring environmental sustainability.

Project leader Dr Gordon Rogers of Applied Horticultural Research, says this type of quality assurance system gives farmer groups direct contact with and receive feedback from retailers. Consumers become more aware of certified quality food and farmers implement safety processes.

‘Some of the biggest wins have come in Vietnam, which had previously been challenged by food safety issues such as pesticide poisoning and high nitrates in crops due to fertiliser overuse,’ says Dr Rogers.

‘Vietnam now has chains of safe vegetable stores as well as supermarkets that require compliance with VietGap or Safe Veg certification, which has created the market for this produce. The project has been able to supply about 12,000 tonnes of certified vegetables a year from the north-west region out of the overall supply of 70,000 tonnes, and some farmers are earning 10 times what they used to.’

Partnerships for success

The focus on food safety from paddock to plate has also given rise to partnerships with other donor agencies such as CSIRO’s Aus4Innovation, which will team up with ACIAR to meet a need for low-cost cool rooms to maintain vegetable quality, identified through the VietGap program.

ACIAR Research Program Manager for Agribusiness, Mr Howard Hall, warns it is important that the GAP movement put more emphasis into educating retailers and food service outlets to encourage them to ask for and pay for GAP-certified produce.

‘GAP certification in isolation will not earn anyone more money from the product unless the customers reward the farmers for being GAP certified,’ says Mr Hall.

‘And being certified is not a quick solution to riches unless research and development teams and advisors appoint locally aware coordinators: people who can gain the trust of farmers and work with them on getting connected to the right markets and customers. This is what we learnt in Myanmar.’

The interaction and support of local in-country coordinators in Myanmar has been key to encouraging farmers to establish supply chains of high-quality, safely produced vegetables to large supermarkets in Yangon, often earning triple their usual returns.

Premium prices

Identifying markets that will pay a premium price for compliance with food safety systems is a priority of the Philippine GAP project, which is at a much earlier stage. While recognition of accredited produce is not as high as in Vietnam yet, Dr Rogers says there is a lot of interest from Philippine intermediaries called concessionaires who act as a “middle man” in the market.

‘The concessionaires buy fruit and vegetables from farmers and supply them to supermarkets, and they are really interested in the idea of certified safety and quality. We are also focusing on the food service sector groups that require certification,’ he says.


‘At the other end we’re working with farmers and the Department of Agriculture, which provides training and certification systems, and the Visayas State University’s College of Agriculture in the central Philippines, which is providing tech support and field trials.’

A scaled GAP approach has been developed by a former proponent of Australia’s on-farm assurance program, Freshcare, to teach farmers practical skills beginning with the 80:20 rule—that they’ll get 80% benefit from 20% effort on things like basic hygiene and using the right pesticides.

Dr Rogers has identified other opportunities to assist with the GAP programs and fine-tune issues such as certification and the building of public trust in the system.

‘There needs to be some assistance with certification and policing of quality assurance compliance in Vietnam and the public doesn’t have a high level of trust in the program so it would be good to have some sort of overarching system to encourage that,’ he says.

‘We’ve also relied mainly on retailers to provide point-of-sale material for the program as it’s outside the scope of the project, but there is potential to educate the public to change their perception of the quality and safety of vegetables.’

The 2021 political unrest in Myanmar has greatly affected this research collaboration and team. ACIAR is monitoring the situation to identify when the collaboration might recommence. 

ACIAR PROJECTS: Improving livelihoods in Myanmar and Vietnam through vegetable value chains, AGB/2014/035; Developing vegetable value chains to meet evolving market expectations in the Philippines; HORT/2016/188.



Safe, healthy vegetables for Philippine communities during COVID-19

When COVID-19 community quarantine restrictions first impacted ACIAR partner the Visayas State University (VSU) in Baybay City in March 2020, a VSU academic turned to the Philippines' Good Agricultural Practice (GAP) project for help.

Under the GAP project, VSU had been providing technical assistance and evaluating field trials for local farmers around Leyte in the central Philippines to help them gain accreditation for growing healthy vegetables produced with the safe use of pesticides.

But with many of the VSU's students unable to get home and neighbouring communities fearful of going out to shop, project leader Dr Zenaida Gonzaga says the project was asked to put hundreds of available vegetable seedlings to immediate use to ensure food security.

'At the time we had assorted seedlings ready to be planted for the GAP project but our vice principal of research and extension asked if we could grow them at VSU to feed the local people, so we allocated funding to seedlings, fertiliser, more seed and drip irrigation and planted out two areas of 2,000 m²,' recalls Dr Gonzaga.

She found herself preparing breakfast daily from 5am for university staff who worked in the field to grow and harvest the crops as part of the VSU initiative.

'At a weekly meeting we would identify students and people in need and every Tuesday from 7am to 9am long lines of people would queue up to receive their vegetables,' says Dr Gonzaga.

'We also made vegetable food packs for the staff of the VSU Hospital, who worked to prevent COVID-19

through sanitation and disinfection as well as doing health checks for people going into and out of the university.'

The project had a goal to supply 11,000 kg of fresh vegetables but succeeded in distributing 12,000 kg and more than 2,000 food packs. Project officers and VSU staff also distributed seedlings to local residents and provided online training in technical issues and management of the crops.

Dr Gonzaga says the rapid-response project has dramatically boosted local awareness of the Philippine GAP project. She has since successfully lobbied the Baybay City Council for one million pesos or A\$27,000 to invest in sanitation facilities and protective structures for chemicals and fertiliser on local farms.

Alternative crops are also being trialled at VSU, with promising results from two varieties of bulb onion which are usually imported. Filipinos have been found to eat 25% less vegetables than the World Health Organization's recommended intake, due mainly to availability and affordability but also to the perception of the quality and safety of vegetables.

Dr Gonzaga says she's confident that market expectations are changing in the Philippines and consumers are increasingly interested in purchasing vegetables that are certified as safe to eat.



Serving up healthy veggies where they're needed most

This year—the International Year of Fruits and Vegetables—marks the fifth decade of the World Vegetable Center (WorldVeg).

World Veg is an international non-profit research institute committed to helping smallholder farmers and local communities in developing countries increase vegetable production. It also works to make nutritious vegetables available and affordable for consumers.

'Globally, almost a billion people suffer chronic malnutrition, and about two billion have micronutrient deficiencies,' says Dr Roland Schafleitner, who leads the vegetable diversity and genetic improvement program at WorldVeg. 'At the same time, approximately two billion people are overweight.'

'Fresh fruit and vegetables provide fibre, some protein and many of the essential micronutrients—vitamins, minerals and antioxidants—needed for a healthy, balanced diet.'

As well as alleviating malnutrition, improved vegetable production systems and innovative ways to trade, process and market produce can provide new income opportunities for smallholder farmers

(especially women and young people) and reduce the environmental impact of farming.

'You can earn more money with a hectare of vegetables than with a hectare of rice or wheat,' adds Dr Schafleitner. 'Vegetables are a pathway out of poverty.'

Biodiversity bank

WorldVeg maintains vegetable biodiversity by conserving genetic material—mostly in the form of seeds—from widely available vegetables like tomatoes, capsicums, eggplants and cucurbits as well as traditional vegetable species and wild crop relatives.

This genebank is the world's largest public-sector facility of its kind, with around 70,000 accessions of 440 plant species from more than 150 countries. It enables WorldVeg researchers to identify new plant traits—such as resistance to diseases or tolerance to heat—that could potentially be incorporated into improved crop varieties.



Women sell traditional leafy green vegetables at a market in Arusha, Tanzania—WorldVeg focuses on increasing the production and availability of nutritious vegetables. Photo: WorldVeg.



Agronomists test the new varieties in different environments to select the best performers, which are then scaled out to different regions and countries with the help of public-sector partners like ACIAR and private-sector partners such as seed companies.

WorldVeg has initiated programs to diversify food systems in parts of Africa through promoting traditional leafy vegetables, such as amaranth, African nightshade, spider plant and Ethiopian mustard.

Dr Schafleitner says such crops—often richer in iron, calcium and pro-vitamin A than commonly used vegetables such as white cabbage—can be more valuable to local communities than tomatoes and other conventional crops.

‘Traditional vegetables like amaranth or sweetpotato also often have two or more uses. The leaves can be used like spinach, the seed as grain or the root as a starchy staple.’

An example is ACIAR-supported research, completed in 2019, to promote traditional vegetable production and consumption for improved livelihoods in Papua New Guinea (PNG) and northern Australia.

‘Our work is often about conserving local germplasm and training local scientists in germplasm conservation,’ says Dr Schafleitner.

‘With urbanisation, and changes in land use and climate, we lose more species. Once they are lost, we cannot bring them back. This is why local germplasm conservation is very important.’

Disease-resistant tomatoes and chillies

ACIAR supports ongoing WorldVeg initiatives such as the International Mungbean Improvement Network and specific projects such as the development of disease-resistant tomatoes.

Key points

- 1 Vegetables can generate more income than other crops per hectare, and they are very nutritious.
- 2 WorldVeg is increasing the diversity of vegetables produced by smallholder farmers.
- 3 It also aims to ensure vegetables are accessible and affordable to local communities.

Through a WorldVeg/ACIAR project initially based in Vietnam researchers developed a technique to graft good-eating tomato varieties onto tough disease-resistant rootstock, making the plants resistant to bacterial wilt.

The technique boosted crop yields, increased farm profitability and provided new agribusiness opportunities for the supply of grafted plants. It is now being promoted and implemented in other countries.

Funding from ACIAR and other WorldVeg partners has led to the development of more robust, disease-resistant chillies and capsicums.

Through screening hundreds of pepper accessions, WorldVeg identified a standout variety resistant to damaging viruses from the Begomovirus genus. The variety is currently being trialled in India.

Less pesticide, more colour

Dr Ramakrishnan Nair—WorldVeg Regional Director for Central and South Asia—says the use of integrated pest management practices is essential for safe, sustainable food production.


‘Smallholder farmers will spray too much because they’re trying to avoid risk,’ says Dr Nair. ‘The label might recommend spraying twice, but they might spray the crop eight times.’

‘So we educate them about safe pest management practices to reduce pesticide use. This also reduces the cost of production, increasing income.’

The mungbean program

Dr Nair is often asked why WorldVeg undertakes mungbean research, given that grain and legume research is carried out by CGIAR and other institutes.

‘It’s a long story!’ says Dr Nair. ‘Basically, mungbean was overlooked in the early days of CGIAR. But the crop was also used in the sprout industry, particularly in South-East Asia, so it was decided that WorldVeg would work on mungbean.’

‘It’s a major crop, particularly in India, Pakistan, Bangladesh and Myanmar. With ACIAR’s help our International Mungbean Improvement Network is making mungbean even stronger.’ 

MORE INFORMATION: World Vegetable Centre, <https://avrdc.org/>

Mangoes lead to fruitful career

Meryl Williams Fellowship recipient Maria Cecilia Alaban has a passion for mangoes and a desire to make the most of opportunities and contribute in every way she can.

Mangoes hold a special place in Ms Maria Cecilia (Cel) Alaban's heart and mind. As a Science Research Specialist at the Crops Research Division of the Department of Science and Technology, Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD), Ms Alaban manages mangoes, among other tropical fruits.

'Mango was assigned to me in 2017,' Ms Alaban says. 'My supervisor was handling mango and it was handed to me.'

'My father is from Guimaras, which is an area known for mangoes, and we got extra income from selling mangoes as a child, so I have an emotional connection to mangoes.'

She also loves eating them and says Philippine mangoes are sweet and delicious. 'If I was given a different commodity, that would also be fine,' she adds with a characteristic smile. Indeed, when she initially began work after completing a Bachelor of Science in Agriculture, she worked on rice for four years.

'After graduation I accepted any job—I was excited to earn and support myself,' Ms Alaban says.

Heart in horticulture

But her heart was always in horticulture and she returned to the University of the Philippines to complete a Master of Science in Horticulture. From there, she progressed to her current role at DOST-PCAARRD and on to mangoes.

Ms Alaban's willingness to embrace whatever comes her way and to grow and learn at every opportunity, along with her impressive academic



Meryl Williams Fellow Maria Cecilia Alaban manages research and development projects for mangoes and various other tropical fruits.

and professional experience, earned her a place as a 2021 Meryl Williams Fellowship (MWF) recipient. The ACIAR-funded fellowship supports female agricultural researchers across the Indo-Pacific to improve their leadership and management skills.

Dr Rebecca Spence, MWF Program Coordinator at the University of New England (UNE), says Ms Alaban's enthusiasm and commitment to leading projects and programs in horticulture makes her an ideal Meryl Williams Fellow.

'Her position in DOST-PCAARRD gives her the opportunity to contribute to shaping agriculture policy for the Philippines,' she says. 'The MWF program comprising a suite of training and mentoring activities will build her leadership skills and support her capacity to influence.'

The 2021 Meryl Williams Fellows officially started their program in February. So far, all activities have been online due to COVID-19 but Ms Alaban says she hopes the planned face-to-face gathering at UNE will go ahead later. In any case, she's excited to be part of the program.

'I am a junior staff; it's the right time to be in a leadership program,' she says. 'I hope the program will enable me to learn a deeper understanding of myself and the people around me. I think that would be a great takeaway from the program. If I am able to understand myself, it will be a good thing to learn to address problems and come up with better solutions.'

Ms Alaban says she also hopes to gain some clarity about potential PhD projects. Project managers at DOST-PCAARRD are encouraged to do a PhD and Ms Alaban plans to take study leave in the next few years. She says her PhD will definitely be in horticulture, but she hasn't decided on specifics yet.

'I hope my mentors in the MWF will help me to narrow down a project,' Ms Alaban says. 'I am keen to learn more and to improve myself professionally.'

Key points

- 1 Meryl Williams Fellowship recipient Maria Cecilia Alaban manages mango research and development projects in the Philippines.
- 2 She says she hopes the leadership training she will participate in as part of the fellowship will help her address problems and come up with better solutions to support Philippine horticulture.

Managing mango R&D

In her day-to-day job at DOST-PCAARRD capacity, Ms Alaban manages the mango research and development projects, which include the mango breeding program at the University of the Philippines Los Baños (UPLB). This project is seeking to enhance varietal selection of mangoes for various traits.

'One project is looking for resistance to diseases for mangoes, working with the whole mango genome,' Ms Alaban says.

'A huge part of my day is communicating with clients, farmers and researchers in the R&D network. I also facilitate and manage ACIAR projects on horticulture.'

'I really want to work in and serve the horticulture industry.'

Maria Cecilia Alaban,
2021 MWF recipient

'I get to travel a lot through the ACIAR projects. I get to interact with growers and researchers in the field, although COVID has limited access with stakeholders.'

Ms Alaban says her job is interesting and she thoroughly enjoys it.

One of the ACIAR projects that has most excited Ms Alaban is the mango fruit fly project, which has been a joint project with the Queensland Department of Agriculture and Fisheries and several research institutions in the Philippines such as UPLB, UP Mindanao and the Province of Davao Del Norte.

'The mango fruit fly project is an area-wide management program started in the Philippines in 2018,' Ms Alaban says. 'Mango fruit fly is a problem for the Philippines because fruits for export have to go through vapour heat treatment.'

'The partnership of DOST-PCAARRD and ACIAR is support to improve not only R&D but also the capacity building it extends. The partnership is more than 30 years and I've seen the support of ACIAR for the Philippines and it is really great.'

'We really appreciate the partnership with ACIAR and research organisations in Australia. We have access to technology that we would not otherwise have.'

MORE INFORMATION: Meryl Williams Fellowship, www.aciar.gov.au/fellowships/meryl-williams-fellowship



Modernising Pakistan's horticulture sector by making policy changes identified through research is supporting market development improvements for growers and sellers alike. Photo: Nauman Ejaz.

Modernising horticulture inspires legislative change in Pakistan

An ACIAR-funded project to assist the modernisation of Pakistan's horticultural sector has resulted in legislative change in the country's breadbasket state of Punjab and drawn support from the office of Pakistani Prime Minister Imran Khan, raising hopes that this could be replicated throughout the rest of the country.

In March 2020, the *Punjab Agricultural Marketing Regulatory Authority Act 2018* was amended to include some of the project's key recommendations, including reducing the monopolistic hold of traders in Pakistan's horticultural industry, enabling entry of more progressive-minded firms into the market, modernising value chains through increased investment in technology and innovation, and prioritising smallholder farmers in any modernisation efforts.

'I think we couldn't expect more—in fact, it's very, very rare for a research project to achieve policy legislative changes even before the final project report is

done,' says Professor Sisira Jayasuriya, an economics professor at Monash Business School and co-leader of the project.

Securing policy change

In Pakistan agriculture is regulated at the state level so any policy changes need to come from state governments, but Professor Jayasuriya says that having federal support 'tends to push the process along' for other states to adopt legislative changes. The federal government hasn't been shy in showing its support for the project. When Punjab was in the middle of its legislative processes back



in July 2019, the Prime Minister's Office unveiled a national agricultural 'emergency' program featuring a PKR 23.6 billion (A\$223 million) scheme to transform Punjab's agricultural produce markets. That included the creation of four new markets and revamping infrastructure in 54 existing markets.

The federal government has also incorporated some of the researchers' findings into the country's national export development strategy. That includes the importance of investment in strict quality control and health and safety protocols, among other improvements, which could help Pakistan to tap into its hugely under-exploited export growth potential. While the South Asian country has one of the world's biggest horticultural industries, producing roughly 13.7 million tonnes of fruits and vegetables annually, very little of the crop is exported.

'This project—unlike many other projects that make long lists of impractical, obvious and generic recommendations—made some clear, concrete, practical policy recommendations that could be actually implemented by changing legislation, reforming institutions. Sometimes it was as simple as changing our growing habits to different varieties,' says Mr Moeen Abbas, a Senior Associate in Economic Affairs at the Pakistani Prime Minister's Office.

Key to the project's success has been fostering relationships with all relevant stakeholders, from government officials to industry and academia, says project co-leader, Professor Jeffrey LaFrance, another economics professor at Monash Business School.

'You need to pay close attention to everyone involved in the market you're looking at as well as their cultural background and institutional ranks, because if you

don't respect those, you can't make any progress whatsoever—they'll just ignore you,' Professor LaFrance says.

To illustrate his point, he cites the key leadership role played by Mr Arif Nadeem and the Pakistan Agricultural Coalition (an industry body that was a project partner), as well as the involvement of leading Pakistani universities and scientific research institutions.

ACIAR also credits Pakistan authorities for supporting and advancing the work.

Applying policy on-ground

ACIAR has a long history of research in Pakistan's citrus sector. From 2005 to 2016, ACIAR in collaboration with Australia's Department of Foreign Affairs and Trade focused on improving productivity and quality in Pakistan's citrus industry and also recognised the need for improved value chain efficiencies. That led to the launch of a four-year ACIAR-funded project in 2016 focused on the marketing of mangoes, tomatoes and chillies in two of Pakistan's largest and most horticulturally important provinces, Punjab and Sindh.

The researchers have found that total domestic demand for all three crops is projected to increase due to population growth and rising incomes. Also, consumers are willing to pay more for higher quality. However, growth is being hampered by the regulatory settings of Pakistan's agricultural marketing institutions, which haven't been updated since the British Colonial period.

In Punjab and Sindh, much like in other Pakistani states, the horticulture market is dominated by a handful of licensed traders and dealers who profit handsomely off the status quo so have little incentive to modernise. With minimal market competition in place, Pakistan's overwhelming number of smallholder farmers are forced to not only sell their produce at low prices but also depend on these dealers and traders for much-needed small business loans, thereby reinforcing the cycle of dependence.

Gender at the fore

Rural women are also being vastly undervalued and left out of the horticulture market, despite being a key player in agricultural production. 'This is a big cultural challenge, not so much a uniquely religious challenge, because other Muslim countries like Indonesia, Malaysia and even Bangladesh don't have this issue,' says Professor Jayasuriya. In Pakistan, women working outside the home in mixed-gender settings

Key points

- 1 ACIAR-supported projects focused on policy are contributing to the modernisation of Pakistan's horticultural sector.
- 2 Pakistan's federal government has incorporated research recommendations into the country's national export development strategy, with the state of Punjab leading the way in policy changes.
- 3 These policy changes underpin the market development of mangoes, tomatoes and chillies.



For both vendors and buyers such as these participants in a fruit auction at a wholesale market in Badami Bagh, Lahore, understanding limitations across the entire supply chain and involving multiple stakeholders in an ACIAR project has led to helpful policy changes to advance Pakistan's horticulture sector. Photo: Nauman Ejaz.

is simply considered 'not the right thing', he adds. But, the exclusion of most women from Pakistan's formal sector labour force presents a big problem for the modernisation of the country's horticulture industry. 'If you want to have large-scale horticultural processing, you need a labour force—and in most countries women contribute a lot of that labour,' Professor Jayasuriya says.

Research by Pakistani project team member Dr Aneela Afzal has found that if the markets can be reformed and start to allow some of the more progressive firms to enter, the prospect of higher profits will naturally lead them to invest in processing facilities, which in turn will generate demand for labour in rural areas. This increased need for labour combined with the untapped female labour force could lead to innovative ways to bypass gender norms.

That's how Nestlé, the multinational food and beverage firm, overcame gender bias in Pakistan's dairy sector.

'We can't prescribe a specific approach to getting women to come to work, but once the firms have sufficient incentives they will find ways to get around some of these things and over time that will create a dynamic of its own that will facilitate women to acquire more skills, to play a bigger role in these markets and to become more empowered,' says Dr Afzal.

Overcoming hurdles

While the project has achieved impressive outcomes, security issues made it difficult for the Australians to travel to Pakistan and to participate in field work. The team overcame this with visits and workshops in both Pakistan and Australia as well as regular 'virtual' meetings that enabled the team members to interact with each other and establish relationships with key Pakistani stakeholders.

COVID-19 has presented another hurdle. The researchers had planned to hold a roadshow to present their project findings to other Pakistani states that might be interested in modernising their horticultural industries but that has been put on hold as Pakistan struggles to contain the deadly virus. However, Professors Jayasuriya and LaFrance say their research will be even more relevant in the future. 'For a country like Pakistan, improving exports utilising the potential of the agricultural sectors, including horticulture, will become really important [post COVID] because they will be now faced with all the issues they've been postponing, but in a more acute form,' Professor Jayasuriya says. 🌱

ACIAR PROJECT: Policy and Institutional Reforms to Improve Horticultural Markets in Pakistan, ADP/2014/043



ACIAR and the UN Food Systems Summit 2021

The UN Food Systems Summit (FSS) 2021 supports the Decade of Action to achieve the Sustainable Development Goals (SDGs) by 2030.

The Summit will take place in September 2021 and is supported by a series of pre-event activities including Dialogues.

The Dialogues bring together diverse stakeholders and give participants an opportunity to debate, collaborate, and take action towards a better future. The ideas, solutions, partnerships and action plans generated in the Dialogues are critical to the Summit's success.

ACIAR has convened two UN FSS Dialogues:

Multi-stakeholder Partnerships for Scaling Agricultural Innovation

25 May 2021

The Dialogue covered partnerships in agricultural research, highlighting Australian innovation and investment that, with the right partnerships, could be scaled for significant impact globally.

Co-convened with the Australian Government Department of Foreign Affairs and Trade.



Food Loss Research

3 June 2021

Participants discussed the different dimensions to food loss globally and how we can facilitate the development of locally relevant solutions to reduce food loss.

Co-convened with Canada's International Development Research Centre.



Find more information about ACIAR engagement in the UN Food Systems Summit and view the Dialogues at www.aciar.gov.au/food-systems-summit:





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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.