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CIRCULAR ECONOMY EDITION

partners
IN RESEARCH FOR DEVELOPMENT

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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: Farmers with the Chameleon Soil Water Sensor during field trials in Kiwere, Tanzania. Photo: ANU| TISA project team

Back cover: Pepper and coffee trees interplanted in a sustainable farming systems trial in Vietnam. Photo: ACIAR

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From the CEO

Wendy Umberger

Welcome to this issue of Partners, which explores the concept of circular economy; an approach to global sustainability that encourages us to seek opportunities to not only reduce waste but use it to create new products, add value, stimulate employment opportunities and improve livelihoods.

Professor Wendy Umberger

Circular economy principles are an increasingly important part of research and development for sustainable food systems and are beginning to feature both explicitly and implicitly in many ACIAR-supported projects.

Eliminating waste and pollution through more efficient farming systems, and protecting and regenerating natural resources to sustain production and protect human health are circular economy concepts integral to much of the work done by ACIAR.

One example is the partnership between ACIAR and the International Centre of Insect Physiology and Ecology supporting research into the use of black soldier flies to reduce waste and transform it into economic products.

It is a clear example of a circular economy initiative that is creating life-changing business and job opportunities, particularly for women and young people, tapping into the entrepreneurial drive of a new generation.

Other long-term research in Africa has focused on reducing water losses in irrigation systems, helping smallholders and other stakeholders increase the productivity of these systems.

In the latest iteration of this research just getting underway, the focus expands to the food supply chain and a more circular approach to food systems for local communities.

In the Pacific region, which is one of the most vulnerable to climate change impacts, ACIAR is supporting research into biogas and biochar systems, which both use waste in ways that increase agricultural productivity. The ability to reduce dependence on imported farm inputs and to increase the resilience of food systems exposed to climate challenges is a clear gain for these communities.

In this issue, we also celebrate 30 years of ACIAR agricultural research collaboration with Vietnam, and 50 years of diplomatic relations between the Vietnamese and Australian governments.

Vietnam, too, is focused on driving circular initiatives across its economy and is partnering with ACIAR on diverse projects to achieve this.

These include capacity-building initiatives through several ACIAR fellowships. ACIAR is also supporting a new aquaculture project in the Mekong Delta, to reduce waste and increase the productivity of catfish production and processing systems.

In all these projects and more, we continue to focus on a sustainable future and improved livelihoods, with benefits that accrue not just for smallholders, but also for households, communities, countries and the planet as a whole.

Professor Wendy Umberger
Chief Executive Officer, ACIAR

Maintaining biological cycles and building the productivity of our natural resources and farming systems is part of circular economy thinking. Photo: Jeoffrey Maitem

What is the circular economy?

As the circular economy concept gains momentum, we take a closer look at what's involved, and how its strategies contribute to a new model of economic development and sustainability.

Key points

1. The key principles of the circular economy are eliminating waste, maximising the use of materials and regenerating nature.
2. The circular economy has evolved from an isolated project-based approach to an international framework to support the sustainability of life on Earth.
3. It is expected to become an important element of development programs for funders.

Creating new value and jobs from waste streams may be the most recognised form of the circular economy in action, but it is a much broader concept that aims to keep the global consumption of resources within planetary limits.

The first key principle of the circular economy is preventing waste in the first place; recycling is effectively a last resort.

At the simplest level, a circular economy is based on 3 key principles:

- eliminate waste and pollution
- circulate materials at their highest value, for as long as possible
- regenerate nature.

The Ellen MacArthur Foundation, a leading international advocate for the circular economy, extends on this to distinguish between technical and biological resource cycles, which require different responses.

The technical cycle refers to goods manufactured from finite resources, everything from cars and houses to clothes, electronics and plastics.

These are the primary focus of strategies to keep products circulating for as long as possible – designing goods with end-of-life re-use in mind, extending use by refurbishing, remanufacturing or repairing products, through rental or shared ownership schemes to maximise use, and recycling materials at the end of their life.

The biological cycle refers to materials that can biodegrade and safely return to the earth and is the primary focus of regeneration strategies – building natural capital, rebuilding soils and increasing biodiversity.

Farming, forestry and fisheries practices that create positive outcomes for nature are at the heart of the regeneration strategies, along with the regenerative use of by-products or 'waste'. This might include value-adding to create new products, composting or producing biogas and other biochemical feedstocks, all of which will eventually biodegrade.

Circular development

Dr Andrew Noble has spent more than 30 years developing and delivering agriculturally focused development programs around the world, for a range of international organisations including ACIAR and most recently for the United Nations.

For the past decade, the circular economy has been an important part of his own thinking, although projects have often been developed in response to local issues, and not as part of a larger coordinated approach.

At the simplest level, a circular economy is based on 3 key principles: eliminate waste and pollution, circulate materials at their highest value, for as long as possible and regenerate nature.

Co-composting human and organic waste to create fertiliser for farmers in India was a solution to water pollution caused by the dumping of septic tank waste in local rivers.

Another project in northern Vietnam used simple biodigesters to generate power for homes from human and animal waste.

This was only one part of a solution to the problem of eroding soils on steep slopes in the region. Grasses selected to stabilise slopes also provided fodder for livestock. Livestock helped households to increase their incomes, but also produced more waste, in the form of manure.

'This project was actually a real light-bulb moment for me,' said Dr Noble.

'Instead of just looking at the problem we wanted to solve, we took a step back to look at the households we were working with, to see what they needed. The most obvious need was power for heating and cooking, and that became our entry point to working with them.

'I think circularity has emerged as people have broadened their view, to think beyond their own capabilities, drawing in experts from different areas, who have the same agenda – it's all about sustainability in the long term.

'For me, the circular economy in practice has been about taking waste, or something that doesn't really have a value, and adding value to it.

'The big thing is the creation of jobs that go with a circular economy and creating opportunities for small entrepreneurs. There are a whole lot of smart young people that just need to be given an opportunity.'

He said it is also important to focus on the largest high-value returns. Composting is a solution for organic waste, but it's a low-value return from high-value horticultural produce, for example.

Systems that use black soldier flies and biodigesters to process organic waste have the potential to create more products, support greater economic activity and provide greater social and environmental benefits.

From puzzle pieces to policy

ACIAR Director of Multilateral Engagement, Dr Julianne Biddle said within the scope of its operations, ACIAR was already working on various 'pieces of the puzzle' that fit in with the higher aspirations of the circular economy.

This includes projects to help partner countries improve soils, reduce chemical and fertiliser inputs, reduce waste in the supply chain, and re-use agricultural and food processing by-products in ways that support both job creation and improved agricultural productivity.

'As a concept, the circular economy is still evolving in Australia, and in agriculture generally,' said Dr Biddle.

'But I see it as an emerging priority for us and for other funders of development programs, in the same way that climate and gender have become priorities that are integrated across all our programs.

'We'll need to bring a higher-level perspective together with the work we are already doing in a comprehensive way that looks at producing more from less, and reducing waste and impacts on the environment from cradle to grave.'

Read on to find out more about some of the circular economy projects ACIAR is supporting.

Mature black soldier fly larvae. Photo: ACIAR

Meet the tiny superheroes of the circular economy

Black soldier flies are turning around the fortunes of farmers and the health of the broader community in eastern Africa, creating jobs and wealth from waste, while strengthening food security and mitigating climate change.

Frustrated by the lack of jobs for young people in Kenya, Ms Roseanne Mwangi left her job in child and youth development to pursue new enterprises that could better support young people with business and employment opportunities.

Today she works at the centre of the circular economy, heading a dynamic company that has grown from an idea hatched 5 years ago, growing black soldier fly larvae on organic waste.

Her company, The Insectary Ltd, creates value from waste streams, and dozens of jobs in the process. And she is teaching thousands of other farmers and food producers in Kenya and other parts of Africa how to do the same.

The success of her new enterprise is largely thanks to comprehensive research into black soldier fly production by the International Centre of Insect Physiology and Ecology (*icipe*) in Kenya, supported by ACIAR and Canada's International Development Research Centre (IDRC) as part of the Cultivate Africa's Future Fund (CultiAF) project.

Wealth from waste

Heroes of the circular economy, the fast-growing black soldier fly larvae feast on organic waste such as food scraps and manure, adding value to previously worthless waste streams.

Within 18 days of hatching, the larvae can be fed to livestock such as chickens, pigs and fish, replacing more expensive and scarce sources of conventional protein feeds such as soybean or fishmeal.

The residue or 'frass' that remains after larvae production is proving to be a nutrient-rich fertiliser, helping farmers to supercharge crop yields. The frass can also help supress pathogens and disease in the soil.

And the production cycle continues as any unsold crops or produce deemed unfit for market, along with livestock manure, becomes the food source for a new generation of black soldier fly larvae.

'Through the research we've birthed a completely new sector in waste management and unlocked a way of bringing real value from waste,' said Ms Mwangi.

And that 'real value' has come from creating jobs while helping to address some big issues of the modern era. These include food security, by providing cheaper and higher quality feed for farmers to produce more nutritious meats, eggs, fish and crops more efficiently. Recycling or upcycling waste also reduces greenhouse emissions, helping to mitigate climate change.

Research scientist at *icipe* Dr Chrysantus Tanga led the CultiAF 'Insect feed for poultry, fish and pig production in Sub-Saharan Africa' (INSFEED) projects. He said it takes 6 months to break down waste through conventional composting. Black soldier flies do the same job in just 5 weeks.

'So if we are able to recycle more waste using insects, we will be reducing the greenhouse emissions several folds while producing millions of tonnes of frass fertiliser and insect protein to meet ever-increasing demand from the growing population,' said Dr Tanga.

Better livestock feed

Ms Mwangi first turned to the black soldier fly when she faced a problem with food waste.

To reduce food waste at her sister's potato processing factory, she began using potato peels as a feed in her pig production business. But she was still faced with the issue of dealing with the manure from her pigs. Seeking other options for waste management, she approached *icipe*. There she found researchers deep into the second of 2 INSFEED projects that have laid the groundwork for a circular economy model of waste management based on black soldier fly farming.

'Through the research we've birthed a completely new sector in waste management and unlocked a way of bringing real value from waste.'

icipe's extensive research and testing established the safety and efficacy of using both manure and potato waste to feed black soldier fly larvae, and then to feed these nutrient-rich insects to the livestock. Ms Mwangi's pigs now grow faster on their new feed, and are ready for market a month earlier than when they were fed on potato scraps.

'We get a higher value from the black soldier flies eating the potato waste than we were getting from just the pigs eating it,' said Ms Mwangi.

ACIAR Research Program Manager, Livestock Systems, Dr Anna Okello said Ms Mwangi's venture epitomises how the circular economy can add value to existing resources and create jobs through an innovative and sustainable approach to food production and the environment.

'The circular economy is a bit of a buzzword at the moment, but this is a solid example of what it actually looks like in action,' said Dr Okello.

Policy and employment

Dr Tanga said the INSFEED initiative engaged a range of stakeholders from the beginning to ensure ownership on the ground and rapid adoption of the technology.

Working with policymakers, it developed Kenya and Uganda's first standards for the use of insect feed in the human food chain.

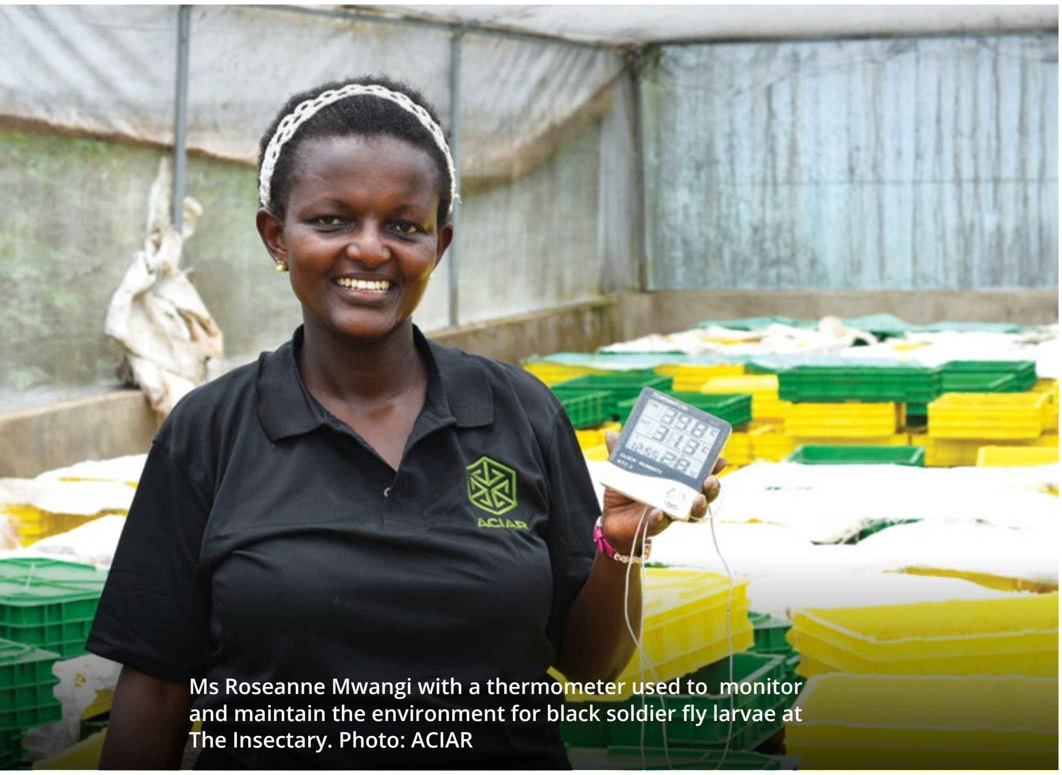
There is also widespread acceptance for insect-based products from farmers, millers and consumers.

'Working with farmers, many of them women and youths under smallholder farming settings, insect-based technologies prove to be highly suitable and easily managed by people of all age groups,' said Dr Tanga.

More than 60,000 farmers have been trained in black soldier fly technology and code of practices – some

Key points

1. Black soldier fly larvae consume food scraps and manure before being fed to livestock as a high-protein feed, and their own waste or 'frass' provides a nutrient-rich fertiliser for crops.
2. Thousands of jobs are being created through industries associated with black soldier fly production.
3. ACIAR has worked with the International Centre of Insect Physiology and Ecology (*icipe*) for a decade developing the black soldier fly industry.


Ms Roseanne Mwangi with a thermometer used to monitor and maintain the environment for black soldier fly larvae at The Insectary. Photo: ACIAR


Ms Roseanne Mwangi provides training for entrepreneurs keen to start their own black soldier fly operations. Photo: The Insectary

through the INSFEED projects, others by producers such as Ms Mwangi.

'So farmers are not only making money from the protein that they give their livestock but also from the training,' said Dr Tanga. 'There is a very high multiplier effect of this technology across the community.'

Thousands of other jobs have spun-off from the technology, including enterprises led by youth and women, building shelves, nets, containers and other insect-rearing infrastructure.

'There are multiple value chains, and it benefits people from all age groups, genders and education levels,' said Dr Tanga.

Dr Okello said the INSFEED projects represent the longest running investment for ACIAR in the circular economy. It is also 'probably the best' example she has seen of policy and private enterprise aligning with research.

And this has helped to achieve broad uptake, and impact, in the community. 'It's a perfect research pathway and a testament to the scientists at *icipe* and the relationships they have with their partners in government and the private sector,' said Dr Okello.

Scaling up production

Dr Tanga said there is significant interest from the private sector and consumers in other products and applications the *icipe* team have been developing using black soldier fly and other insects.

These include cosmetics and soaps made with larvae oil that is rich in lauric acid and could help treat fungal and bacterial infections.

New projects are also looking at using insect oil as a feedstock in biodiesel production. Insect oil is also being evaluated as a feed additive for dairy cows that could improve milk production and quality, and potentially boost the immunity of the people who consume that milk.

A new $3 million ACIAR-supported project, PROTeinAfrica, will see *icipe* partner with private enterprise and community-led agribusiness to scale up and commercialise production of insect-based feed to meet demand in Kenya, Rwanda and Uganda.

'Our key focus now is to increase availability of the insect protein and its derived products, both in quantity and quality. And also, to increase employment opportunities across the value chain, particularly for women and youths,' said Dr Tanga.

An Emerging Insect Technology Hub, partnered by *icipe*, ACIAR and AgriFutures Australia, has also been established to share knowledge and produce a 'gold standard' manual for black soldier fly technologies.

This will support the development of insect-based waste management strategies and other applications in Australia and the Pacific region.

ACIAR PROJECT: 'Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa (PROTeinAfrica)' (LS/2020/154)

Catfish analysis targets food loss in the Mekong Basin

From fingerlings to final product, new ACIAR-supported research aims to improve the use of resources and reduce food loss in the Pangasius catfish industries in Cambodia, Laos and Vietnam.

For thousands of years, freshwater Pangasius catfish have been a staple source of nutritious food for the people of the Mekong River Delta Region. As the industry has developed, the farming of catfish has helped to improve food security, build livelihoods and even establish significant export industries. In 2022, Vietnam's catfish exports were valued at US$2.5 billion.

Now, new ACIAR-supported research is putting the catfish production and processing value chains under the microscope in Cambodia, Laos and Vietnam, with the aim of improving resource use and reducing waste in the system.

Value-chain analysis

Launched earlier this year, this project will analyse the entire value chain for Pangasius catfish and fingerling (young catfish) production in all 3 countries. It will identify the main bottlenecks that contribute to waste and food loss, investigate the causes and trial potential solutions.

Project leader is Dr Van Kien Nguyen, from Health and Agricultural Policy Research Institute (HAPRI) at the University of Economics Ho Chi Minh City, Vietnam. Dr Nguyen said there are significant differences in how the catfish industry operates in the project's 3 partner countries.

Vietnam has a highly developed aquaculture and processing industry, while Cambodia and Laos have smaller and mostly domestic aquaculture and wild-caught value chains.

The Vietnamese industry has introduced many innovations to reduce waste by using all parts of the fish while Laos and Cambodia currently use the waste products as fishmeal.

'Vietnam has become very advanced in applying innovative technology to diversify products and use all parts of the fish to make medicines and food, instead of throwing the blood and guts back into the river,' said Dr Nguyen. 'There are a lot of innovations that can be shared with Cambodia and Laos.'

Despite this sophistication in Vietnam's processing sector and the value of its export industry, Dr Nguyen noted there are still many losses that lead individual farmers to sell their land or go bankrupt.

'We want to reduce losses and make sure the industry is sustainable for smallholder farmers growing catfish,' said Dr Nguyen.

This project is the first in the region to focus on food loss and waste across the whole Pangasius value chain.

The research will be carried out in collaboration with HAPRI and An Giang University in Vietnam, the National University of Laos, the Royal University of Agriculture in Cambodia and the University of New England, Australia.

It will also partner with government and commercial stakeholders to help identify issues that lead to losses and create solutions.

Value-chain modelling and economic analysis, water quality analysis in fish transport and production, and gender analysis and capacity building in farming systems are all elements of the project.

Key points

1. The Pangasius catfish is a culturally and economically significant food source for people in the Mekong River Delta Region.
2. An ACIAR-supported project will holistically analyse the Pangasius catfish production and value chains in Cambodia, Laos and Vietnam.
3. The project aims to find where losses are occurring and trial solutions to help both smallholders and commercial operators reduce waste, improve yields and add value to production.

Catfish processing in Vietnam makes use of every part of the fish. Photo: ACIAR

Resource efficiency

Project co-leader in Cambodia, Dr Kimchhin Sok from the Royal University of Agriculture, said this project is a unique opportunity to gain better holistic data on the Pangasius value chain, as well as qualitative data from stakeholders, to better inform government on investment and policy decisions.

'This is an exciting project because the Cambodian Government is currently implementing a lot of support for Pangasius catfish production for domestic consumption and export, and this research can produce significant evidence for government decisions,' said Dr Sok.

'Catfish is really valuable for Cambodia, we consider it one of our traditional fish species.

'It also has a lot of economic value in Cambodia, particularly in aquaculture as it is a relatively easy fish to raise compared to other fish.'

While the project is in its early stages, 3 areas have been highlighted for improvement: aquaculture water quality, transportation and fingerling quality.

Cambodia and Laos import many of their catfish fingerlings from neighbouring countries, but significant numbers die during transportation.

Dr Sok said improving local production practices among smallholders, as well as larger commercial farmers, could reduce the need to import fingerlings, which in turn would reduce the waste that occurs in transportation.

ACIAR Research Program Manager, Agribusiness, Mr David Shearer said fingerlings represent a large input cost for producers, but current production processes were inefficient; with 30 to 60% of fingerlings dying in the production process.

'Resources are being wasted, with such a large percentage of fingerling loss,' said Mr Shearer.

Mr Shearer sees reducing fingerling loss and increasing resource efficiency as the main aspects of the project that will contribute to broader circular economy objectives.

'Commercial catfish processing factories in Vietnam are very much part of the circular economy, they use every part of the fish,' said Mr Shearer. 'But I see the circular economy not just as re-use, but also resource efficiency. And that's where this research can contribute to a more sustainable system.'

ACIAR PROJECT: 'Food loss in the Pangasius catfish value chain of the Mekong River Basin' (CS/2020/209)

Biochar to build soils and growth opportunities in the Pacific region

Improved soils, healthier crops and new income streams are among the potential benefits to emerge from ACIAR-supported biochar research in Timor-Leste and Papua New Guinea.

Charcoal has been an essential tool for millennia. Made from plant waste that is burned under low oxygen conditions, we cook and heat with it, use it in cosmetics, in medicine and metallurgy, and in horticulture, where it is known as 'biochar'.

Made mostly of carbon, biochar also contains valuable traces of nitrogen, potassium, zinc and phosphorous, all of which help to improve the physical, chemical and biological characteristics of soils.

During the charring process, called 'pyrolysis', pores develop and these provide habitats for important soil microbes and fungi and increase the soil's water-holding capacity.

As a country with inherently poor soils, Timor-Leste is in urgent need of all the benefits that biochar offers, as it transitions from 'slash-and-burn' agriculture to permanent farm production.

Slash-and-burn clearing of rainforest to grow crops for 2 to 4 years before moving on essentially mines the soil of nutrients and results in low crop yields.

ACIAR Timor-Leste Country Manager, Mr Luis Almeida said the combination of low production with a rapidly growing population has led Timor-Leste to import 60–80% of its food.

'As a result, increasing on-farm production and on-farm income have become key national policies for the Timor-Leste Government,' said Mr Almeida.

And biochar has the potential to do both, exemplifying the circular economy by creating new value and enhanced productivity from waste streams.

In a previous role, Mr Almeida was part of the ACIAR-supported project investigating agricultural innovations for small farms, including biochar's effect on soil productivity, on a wide range of crops and soils.

He said the success of the original research led to a follow-on project now underway. This has been designed to better understand the country's soils, to identify the extent of potential for biochar production and to share the learnings of the initial project.

The amount of biomass available for conversion to biochar – in a sustainable manner – will provide a natural limit on the area that can be improved by biochar, with future use expected to focus on high-value and high-nutrition crops such as vegetables, fruits and pulses.

Low-tech innovation to improve soils

The original project ran from 2017 to 2022, as a collaboration with the National University of Timor Larosa'e (UNTL), the Timor-Leste Ministry of Agriculture and Fisheries, University of Western Australia (UWA), University of the Sunshine Coast and World Vision.

The project pioneered a simple, effective, chimney-based pyrolysis method that smallholders could easily replicate, using rice or coffee hulls, or sawdust, as biochar feedstock, thanks to UNTL lecturer Dr Antonio da Costa.

The burning process ran at a relatively cool 350°C, to preserve nutrient content, and the chimney system was easy to construct. The resulting biochar increased yields in 95% of soils tested, with production increasing up to 230% on some acidic soils.

Also working in Timor-Leste on this project was Mr Rob Williams, an adjunct senior research fellow at UWA,

Key points

1. A low-technology process has been developed to convert rice hull waste into biochar in Timor-Leste.
2. The biochar was then used to improve soils, boost crop yields and farmer incomes.
3. Papua New Guinea trials have also converted diseased oil palms to biochar, potentially for use in potting mixes.

Above: Women farmers in Papua New Guinea learn about using biochar for coconut disease management. Photo: University of Queensland

Below: A simple chimney-based system has been developed to help smallholders turn rice hulls into biochar in Timor-Leste. Photo: University of Western Australia

who said the trials succeeded because the country's soils are so inherently poor.

'Communities are now asking: "What can we turn into charcoal and use in our fields?",' said Mr Williams. He noted one community that, on hearing about the trials, converted an invasive weed to biochar for their vegetable gardens.

Mr Williams said several rice millers have also scaled up production, making and selling both rice husk biochar and a version fortified with phosphorous and nitrogen (Biochar Plus) to expanding local markets to improve horticultural productivity.

However, there is still a long way to go before biochar use is widely adopted throughout Timor-Leste.

This is a goal that is supported by the follow-on project that started in 2022 and which Mr Williams is also working on.

This more recent 5-year project is being led by his UWA colleague Dr Louise Barton.

The creation of a Timor-Leste Biochar Collective is a central component of the new project, bringing together NGOs, government, rice millers and biochar makers and users to share ideas over the project's lifetime.

Disease control in Papua New Guinea

New research in Papua New Guinea examined biochar's potential for controlling the spread of basal stem rot, a fungal disease threatening smallholder and commercial oil palm plantations.

The Papua New Guinea Oil Palm Research Association (PNG-OPRA) and University of Queensland (UQ) recently completed a 2-year ACIAR-supported pilot project, turning infected, dead oil palms into biochar.

UQ project leader Dr Agnieszka Mudge said the biochar process reduced fungal infection, thus reducing risk of disease spread.

It also created a new product that could generate additional income streams for oil palm farmers.

'The biochar supported capsicums and cos lettuce growth during trials and there is also potential to use the oil palm biochar combined with compost to raise new oil palm seedlings,' said Dr Mudge.

'The project made and used a relatively low-cost, mobile pyrolysis unit, possibly the first of many such units to combat the disease in PNG.'

The key will be sharing the trial results and opportunities with PNG farmers. 'Our partners at OPRA are well-placed to disseminate this information at all levels,' noted Dr Mudge.

ACIAR PROJECTS: 'Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)' (CIM/2014/082); 'Agricultural innovations for communities – Intensified and diverse farming systems for Timor-Leste (AI-Com 2)' (CROP/2021/131); 'Managing basal stem rot in oil palm by converting infected logs to biochar' (CROP/2019/147)

More value flows from irrigation in southern Africa

A long-term research project to improve the profitability of smallholder irrigation farmers in Tanzania, Mozambique and Zimbabwe evolves its focus from water use on farms to food systems, supply chains and community.

In Tanzania, Mozambique and Zimbabwe, irrigation schemes represent a major infrastructure investment to improve the productivity of farming systems and food security.

Some schemes were built by governments, others by international donors, but many struggled to realise their potential to produce better yields and more profitable farming.

For the past decade, an ACIAR-supported project has been working with smallholder farmers in these countries to identify and overcome issues hindering production.

The 'Transforming irrigation in southern Africa' project began in 2013 and focused on improving the effectiveness of irrigation schemes in Tanzania, Mozambique and Zimbabwe.

The second phase, which began in 2017 and is being finalised this year, tested the scalability of water use efficiency tools developed in the first phase.

A new project will begin next year, with support from the Australian Government Department of Foreign Affairs and Trade. The new project will build on the momentum of the first 2 phases, expanding its focus to circular food systems, value-adding to crops and improving the local economies of farming communities.

Transforming irrigation

Project leader Professor Jamie Pittock, at the Australian National University, said that despite the large investment in infrastructure in southern Africa, there were initially many inefficiencies in the way the irrigation schemes were being used.

'Governments and donors had spent billions building dams, canals and levelling fields, but most of the schemes were producing the same amount of food as the surrounding dryland,' said Professor Pittock.

Many schemes were stuck in a cycle of rebuilding the infrastructure and only addressing the physical symptoms of failure. Professor Pittock said the ACIAR-supported project aimed to address not only the technical issues, but also the social issues.

The first 2 phases of the project have developed and trialled 2 main interventions to meet this goal: accessible and easy-to-use technologies for farmers, and the development of agricultural innovation platforms (AIPs).

Technical interventions

Technologies introduced through the project included a wetting front detector, a probe that indicates the depth to which water has infiltrated the soil and monitors the soil nutrients, and a moisture probe that shows farmers when the soil has the right amount of moisture. These soil tools were invented by Dr Richard Stirzaker at CSIRO with ACIAR support and are available at VIA Farm.

'These simple technologies are relatively cheap to produce and easy to use, and can help farmers massively improve the efficient use of irrigation resources,' said Professor Pittock.

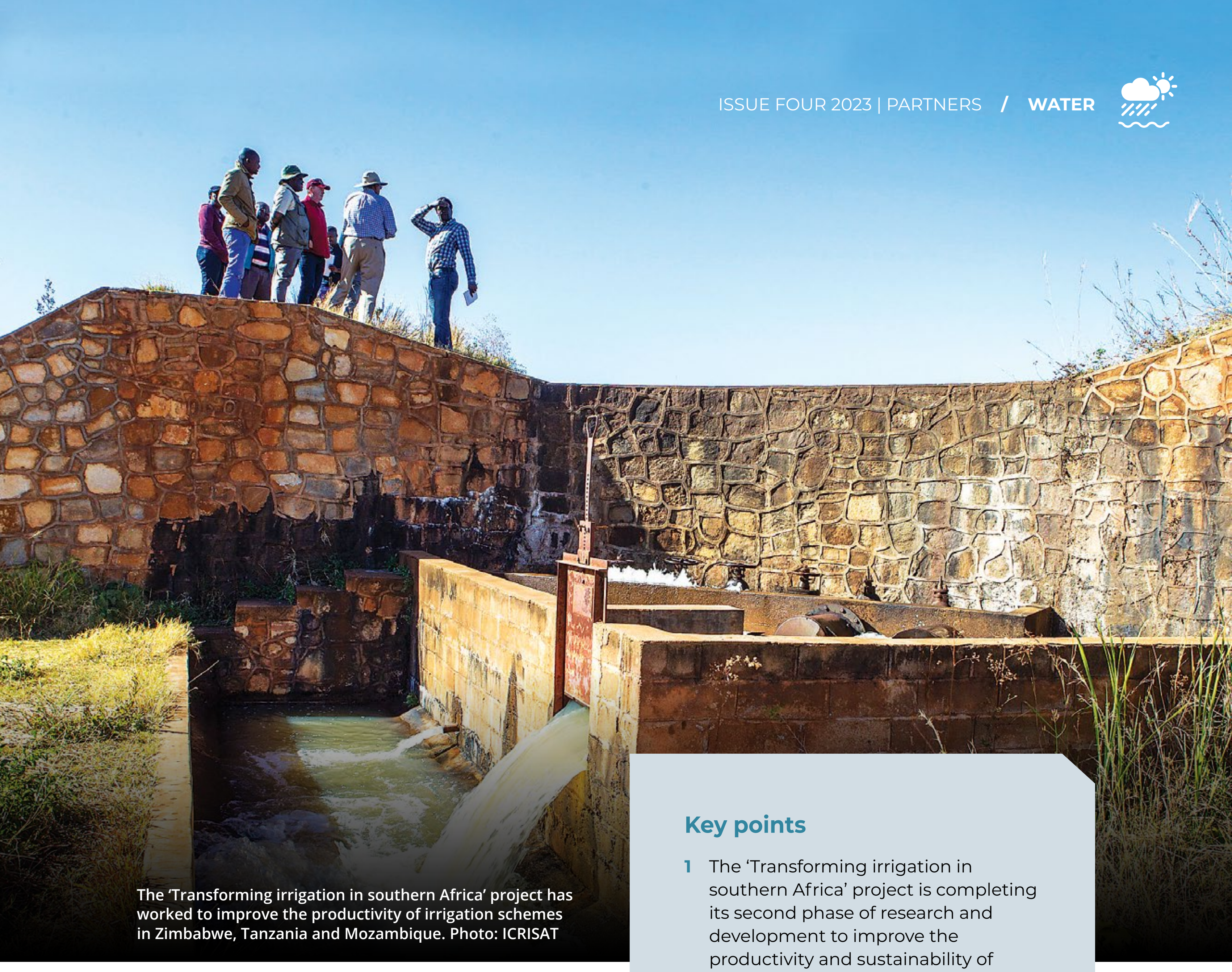
'There was an issue with farmers practically drowning their crops and washing away their fertilisers. So when we provided farmers with these tools, they very quickly learned they only had to apply half as much water and, in turn, saw a significant improvement in yields.

'We have demonstrated how to achieve sustainable intensification of agriculture in these systems. This is crucial knowledge if the world is to feed a population of 10 billion people with limited land and water while minimising greenhouse gas emissions.

'Reducing the amount of water applied also saved time and labour. Farmers had more time to spend on building off-farm businesses, intensifying their farming, or spending time with family.'

One knock-on effect was to reduce conflicts between farmers in the same irrigation scheme, as those at the head of the canal had been using too much water, leaving not enough water for those at the end of the canal.

'Because farmers were fighting with each other over water, a lot of cooperative things were not happening to help the irrigation scheme work well, such as maintaining the infrastructure and buying inputs in bulk,' said Professor Pittock.



The 'Transforming irrigation in southern Africa' project has worked to improve the productivity of irrigation schemes in Zimbabwe, Tanzania and Mozambique. Photo: ICRISAT

Key points

1. The 'Transforming irrigation in southern Africa' project is completing its second phase of research and development to improve the productivity and sustainability of irrigation schemes.
2. The project has developed agricultural innovation platforms to help smallholder farmers identify and work together to improve the efficiency of water use within irrigation schemes.
3. The follow-on circular food systems project will focus on improving local economies with better access for women and youth, and reducing the carbon footprint of food production.

Agricultural innovation platforms

Improving the water usage in these systems meant that yields increased significantly, but this created another potential issue: flooding the market with too much produce.

'This is where the development of AIPs became crucial,' said Professor Pittock. 'We sat down with farming communities and asked them to draw a picture of where they wanted their community to be in 5 years, and then a second picture of where it is now, and then to list the barriers and opportunities to get where they wanted to be.'

Tanzania project co-lead Dr Makarius Mdemu, Ardhi University, said the AIPs brought together the various stakeholders of these schemes. These included farmers and agricultural officers from local government, government agencies that were responsible for regulations and non-government organisations.

This process identified 2 main issues: the high cost of inputs and the lack of markets. The AIPs provided networks and communication streams to help farmers resolve these issues.

It helped farmers to connect with agricultural supply businesses to set up bulk sales and reduce the price of inputs. It also connected them with end users of the crop produce so farmers could get a better sense of what buyers were looking for and plant the appropriate crops with preferred timings for markets.

'They may have different interests, but they share a common vision,' said Dr Mdemu. 'We saw that with some of the barriers, farmers had the capability to address it themselves, which greatly improved the social cohesion.

'Some barriers were issues with the system itself, and they could then bring in the appropriate experts to assist them.'

For example, 2 schemes involved in the project identified that they did not have a big enough budget assigned to irrigation infrastructure maintenance, so they brought in a lawyer to help them change their constitution.

'Our government put a lot of investment into the irrigation infrastructures, but less into building the capacity of farmers,' said Dr Mdemu.

'One of the big successes of this project has been the organisational capacity building that has occurred through these AIPs, which means farmers have networks and are now able to manage the irrigation schemes sustainably.'

Circular food systems

As the second phase of the project finishes this year, a new project has been approved to expand the scope of the overall project, moving further down the value chain to create applied outcomes for rural communities.

Dr Neil Lazarow, ACIAR Research Program Manager, Water, said this was essentially a circular food systems project that would build on elements of the transforming irrigation projects, but with a new focus.

'The circular food systems project keeps the goal of productive management and allocation of water for smallholders, but it has the new goal of developing small to medium enterprises to add to the value of the products produced, giving farmers more economic control and opportunities,' said Dr Lazarow.

This will include improving opportunities for women and youth, improving access to finance for them and encouraging youth to work in rural areas.

The new project will also explore how the carbon footprint can be reduced while improving the local economy, reducing the amount of product sent away for processing and finding ways to turn waste products into by-products with other uses.

'This means more food, more income, more jobs and no increase in greenhouse gas emissions from the same natural resources,' said Dr Lazarow.

Dr Lazarow is optimistic about how this project can apply the principles of circular economy.

'This project is exciting because it takes the theory and actually trials durable solutions to improve, not just productivity, but economic outcomes.'

ACIAR PROJECT: 'Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa' (LWR/2016/137); VIA Farm tools: https://via.farm/

Discussing irrigation, soil moisture and crops with smallholder farmers. Photo: Australian National University

Vietnam's circular strategies

The circular economy is a hot topic in Vietnam where development and climate policies are setting the agenda.

Economic development, climate change and environmental sustainability are all key elements underpinning the Vietnam Government's drive to develop its circular economy.

The Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) sits within the Vietnam Ministry of Agriculture and Rural Development and has a relatively independent think-tank role as an advocate for policy change. It is also a long-term partner with ACIAR on agricultural and forestry projects.

Over the past decade, these projects have focused on farmer responses to climate change, agricultural development and food security policy, and agricultural finance.

Recent projects on sustainable production systems for vegetables, coffee and black pepper incorporate circular economy principles.

Government priorities

IPSARD Director-General Dr Tran Cong Thang said there was a big push to develop the circular economy across Vietnam's economy as a whole, particularly after a government decision in mid-2022 to develop national initiatives.

However, IPSARD has been actively promoting a circular economy approach to government for several years, and it is now a priority within the new national *Strategy for Sustainable Agriculture and Rural Development to 2030 and vision to 2050.*

'Our first objective is to increase the value of agricultural by-products to increase incomes,' explained Dr Thang. 'We also expect that we can create more jobs by extending the value chain of by-products.

'Our second objective is to use the circular economy to stimulate "green agriculture", to improve the environment and reduce emissions.'

Circular economy initiatives are integrated into Vietnam's *National Climate Change Strategy to 2050*, with the country committed to achieving net-zero by 2050. Agriculture contributes 33% to national greenhouse gas emissions and targets under the climate strategy will reduce carbon dioxide equivalent emissions from agriculture by 43% by 2030 and by 63.1% by 2050.

Priorities for doing this include making better use of the estimated 100 million tonnes of rice by-products (husk and straw) (see story, page 10) and 75 million tonnes of by-products (mostly manure) produced by the livestock sector each year.

Science and technology program

Dr Thang said IPSARD has worked with the Ministry of Agriculture to develop a science and technology program to stimulate the circular economy for agriculture and guide government investment.

'Capacity building is also an important part of the program. We need people who understand circular systems and thinking, as well as people who can produce the science and technology.'

This is something ACIAR has assisted with through John Dillon Fellowships awarded to researchers in Vietnam (see story, page 16).

To support the science and technology program, IPSARD advocates for cooperation in research, both nationally and internationally, to facilitate the transfer of appropriate technologies.

It also recommends standardising technologies and practices to implement new circular systems at national, provincial and local levels.

ACIAR PROJECTS: 'Towards more profitable and sustainable vegetable production systems in north-western Vietnam' (AGB/2012/059); 'Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam' (AGB/2018/175)

More than 100 million tonnes of rice husks and straw produced each year represent a resource for the circular economy in Vietnam. Photo: ACIAR

Fellowship project drives interest in biochar

A project that aims to reduce the impact of crop residues in Vietnam and increase their value has helped both researchers and smallholder farmers to build skills in circular economy initiatives such as biochar production.

Three years ago, there was little awareness among smallholder farmers in Vietnam that their crop residues had a hidden value that could increase farm productivity and boost their incomes. Both biochar and the circular economy were virtually unknown concepts.

However, a project developed through the ACIAR John Dillon Fellowship (JDF) program has introduced both concepts to ricegrowers in Vietnam's Thai Binh Province (in the Red River Delta Region) and coffee growers in the Dak Lak Province (in the Central Highlands Region), where they are gaining grassroots acceptance.

Key points

1. Smallholder farmers in Vietnam are learning how to produce biochar to harness more value from crop residues and reduce the environmental impacts of agriculture.
2. This capacity-building project focused on circular economy thinking and initiatives, and was supported by the ACIAR John Dillon Fellowship program.
3. This program provided leadership training, implemented through a collaborative project in the fellows' home country.

Project leader Dr Tran Van The, Vice-Director from the Institute for Agricultural Environment, said the need to reduce the environmental impacts of rice farming was an important driver for the collaborative project, which involved 6 John Dillon Fellows from across Vietnam.

Rice farmers typically burn their crop residues in the open field, creating a source of pollution and carbon emissions. Rice straw that is left to rot in flooded paddies also generates significant quantities of methane, a highly potent greenhouse gas.

Dr The said providing smallholder farmers with options to make better use of crop residues – such as biochar – would help them to move away from environmentally damaging practices. Biochar could positively contribute to farming enterprises as a fertiliser and soil conditioner that improves crop yields and soil health. It would also help to build broader circular economy practices in Vietnam.

Equipment challenge

A key challenge of the project was to develop a low-cost production system that farmers could easily make and use themselves, and then to train them in the biochar production process, as well as how to engage other farmers and family members as participants in the process.

Providing smallholder farmers with options to make better use of crop residues – such as biochar – would help them to move away from environmentally damaging practices.

'We used materials that were readily available to farmers in their local province to make kilns to produce the biochar,' said Dr The. 'We have a small system that can be used by a single household, and a larger version that can be shared by farming groups. We also have equipment that can be used for multiple types of crop residues – rice, or groundnuts, or coffee.

'And once we trained the farmers, they told us that it was very easy to make the biochar.'

In the Dak Lak Province, coffee farmers were happy to convert coffee bean husks to biochar for fertiliser as an alternative to composting, which can take up to 2 years to break down the hard husks.

And in Thai Binh Province, some rice farmers had taken the biochar process a step further, gathering oil released from rice husks during the burning process to make an organic pesticide.

Participation and policy

The project used a train-the-trainer approach and 100 participants, both farmers and local officials from both provinces, were trained in biochar production. In a follow-up survey, the ratio of farmers exposed to the project who wanted to apply biochar production from rice and coffee residues increased from 0% to 100%, taking advantage of benefits such as producing a fertiliser and soil conditioner to help improve crop yields.

To identify policies and strategies that would support the production of biochar, the project team used interviews and focus group discussions as participatory approaches learned through their fellowship training.

Policy links included responses to climate change; strengthening natural resource management and environmental protection; and promotion of renewable energy. The team developed a range of instructional materials for smallholders, as well as policy briefs for provincial and national governments to encourage the adoption of biochar initiatives.

Dr The said following the project, there have been requests to expand the biochar training model to other provinces, and for other crops including soybeans and groundnuts, and to investigate how biochar could improve saline soils in coastal areas.

ACIAR Assistant Director, Capacity Building, Dr Bosibori Bett said implementation of the biochar project was one of 3 components that form part of the 2021–23 fellowship program with the Vietnam cohort.

Vietnam fellows worked together across their different organisations to deliver a collaborative project. Their organisations included the Institute for Agricultural Environment, Vietnam Academy of Agricultural Sciences, Western Highlands Agriculture and Forestry Science Institute and the Regional Research and Development Institute.


John Dillon Fellows in the Vietnam biochar project team, from left Dr Tran Van The (IAE), Dr Bui Thi Phuong Loan (Biochar project leader, IAE), Ms Ta Thu Hang (RRDI), Dr Phan Viet Ha (WASI), and Dr Ngo Duc Minh (Biochar project coordinator, VAAS). Absent Ms Chau Thi Minh Long (WASI). Photo: ACIAR

Dr Bett said other JDF program components include a leadership workshop, which brings together fellows from different countries at the beginning of the program and is supported by a series of online learning modules, and another post-project reflective workshop for all participants.

'The aim of the project is to apply the leadership skills fellows have been learning, to work collaboratively and share their skills to address an agricultural challenge, which the Vietnam team has done well,' said Dr Bett.

'It's valuable to see researchers and farmers involved in learning and training together, as they are both important stakeholders in the agricultural value chain.'

MORE INFORMATION: John Dillon Fellowship program at www.aciar.gov.au


Training farmers in Thai Binh to make biochar from rice straw, using a larger unit designed for farmer groups.
Photo: Institute for Agricultural Environment

Project partners with eggplants grown with biodigester fertiliser output.
Photo: Dr Federico Dávila

Exploring potential benefits of biodigester technologies

A scoping study in Fiji is the starting point for research into ways the country can further coordinate its efforts to harness diverse benefits from biodigesters and better adapt to and mitigate the impacts of climate change.

Biodigesters exemplify a classic challenge of the circular food economy: how do we bring together the diverse actors in the food and agriculture system to coordinate investment, adoption and impact that considers the local context?

Diverse benefits

Biodigesters, through anaerobic digestion, help manage waste in the environment. By breaking down organic matter in a closed, controlled system, they can reduce the associated greenhouse gases produced by waste decomposing in open environments. That waste can be food scraps, crop residues, animal manure or human waste.

By removing manure and organic waste from farms, biodigesters can reduce the risk of pathogens such as leptospirosis spreading in soil and water, and affecting animal and human health.

The waste digestion process produces methane, which can be captured and used as a renewable source of energy to power home cooking and lighting systems. It is an alternative to wood and fossil fuels such as LPG, diesel and kerosene, and can help reduce household energy costs.

And after the organic matter has been broken down, the remaining material, called digestate (both liquid and solid material), can provide a nutrient-rich organic fertiliser to build soils and improve agricultural production.

This, in turn, improves livelihoods for households and smallholder farmers. It supports sustainable agriculture and food security for Fiji's growing population.

Coordinated approach

ACIAR Research Program Manager, Climate Change, Dr Veronica Doerr said the technology had the ability to contribute to many of Fiji's national goals, including its commitment to a low-carbon, low-emissions economy.

However, the responsibility for and interest in different benefits – for waste management, climate and the environment, health, energy and agriculture – was fragmented across different sectors.

'As a result, it's not a top priority for anyone, in terms of funding technical research or driving adoption,' noted Dr Doerr. 'Each sector might make a small investment, as they have funds available, that reflects their own priorities.

'But if you could sum all those benefits, and bring all those potential contributions together with everyone playing complementary roles, you end up with a really large benefit, a strategic investment and widespread adoption of the technology.'

The potential for a coordinated effort to make a significant impact underpins an ACIAR-supported scoping study underway with partners in Fiji to look at the roles of different actors – government, private sector and international development agencies – in promoting biodigester technology and its benefits.

Adoption challenges

Leading the scoping study is food systems and social scientist, Dr Federico Dávila, from the Institute for Sustainable Futures at the University of Technology Sydney.

He said waste management and energy tend to be the primary focus when biodigesters are installed. However, the scoping study will determine the potential value of all co-benefits, including climate benefits. It will also identify strategies to establish governance models to maximise those co-benefits.

Biodigesters operating in Fiji have been funded by government, international development agencies, or privately by individual families.

'While we are expanding our view of the benefits to agriculture, we're also looking at what's enabling either public or private investment, to support long-term adoption in the Pacific,' said Dr Dávila.

'Part of our review has been looking at previous biodigester trials in the Pacific.

'We are interviewing farmers about their experiences, the benefits and challenges, to understand how to address the underlying factors that determine long-term success of biodigester systems.

'There are lessons to be learned from the challenges of maintenance and enabling the users to understand the systems and maximise their benefits. And a lot of that revolves around learning and capacity-building questions.'

Dr Dávila said the scoping study would help develop a larger project looking at a governance structure for circular agri-food-energy systems (biodigesters) and climate co-benefits in Fiji.

Project partners with ACIAR and the University of Technology Sydney include Pacific Grow, Wildlife Conservation Society and Eco-Grow Fiji.

Local knowledge and impact

Mr Mesake Cataki is the founder of Eco-Grow Fiji, a home biogas system supplier who is providing technical support and local knowledge about farmer challenges for the scoping study.

He said the systems-based approach of the ACIAR-supported study could provide a potential trigger for a transformative mind shift in the way the country perceives waste, elevating it as 'a crucial element that yields renewable energy and enriching resources'.

'It is also timely, given the multitude of challenges facing Fiji and the broader Pacific region, including the intensifying impacts of climate change, non-communicable diseases, nutritional food shortages and inflation,' said Mr Cataki.

'Smallholder farmers have been severely affected by the rising cost of fertiliser, drastic changes in weather patterns and declining soil health. Making more of waste is a matter of utmost importance in our pursuit of sustainability and resourcefulness.

'It is important for Fiji to see waste as a resource, a vital input that is upcycled into the economy. It is available locally and, if used effectively, can help us to protect our biodiversity, build our economy, make us more independent and resilient.'

ACIAR PROJECT: 'Scoping the governance and co-benefits of circular food-energy systems in Pacific Islands Countries' (CLIM/2022/174)

Key points

1. Biodigester technologies that turn organic waste into energy and fertiliser offer a range of other socioeconomic benefits that can help tackle climate and health risks.
2. Because of the many types of benefits, interest in implementing the technology is diverse and governance is fragmented across different sectors.
3. A scoping study is investigating the potential for more coordinated approaches to facilitate adoption.

The role of people and social systems are critical in improving sustainable farming and improving the consumption of fresh fruit and vegetables. Photo: Jeoffrey Maitem

Future horticulture systems: good for you, good for the planet

ACIAR Research Program Manager, Horticulture, Irene Kernot reflects on future directions for research in horticulture.

Key points

1. Horticultural research projects must deliver innovation within the context of sustainable food systems.
2. This requires greater collaboration across disciplines, especially social systems, to understand the drivers of adoption by farmers and consumers.
3. With limited resources, future production systems will reduce environmental costs, delivering more to consumers with reduced inputs and minimised waste.

Everyone knows there is a gap between how much fruit and vegetables most people should eat and what they do eat. Changing consumer behaviour is never easy so the ACIAR Horticulture Program addresses barriers to availability, affordability and desirability.

But producing more to supply a demand for a healthy diet should not come at any cost. Our food systems need to reward the farmers who deliver the safe, healthy and sustainable food we need to keep the industry growing along with demand.

ACIAR works with smallholder farmers and their traditional farming systems that are often diverse, low-input and productive.

To increase production and meet demand from more urbanised populations, farmers are using more chemical inputs. This has reduced the risk that their crops will fail and that they will lose their income, but has come with costs to health and the environment.

To tackle this complex challenge, the Horticulture Program collaborates with partner countries and supports projects that look at different perspectives all along the food chain, from growing the produce, getting it to market and helping consumers choose healthy options.

Managing inputs

Protected cropping systems are a focus for projects in the Philippines, Fiji, Samoa, Tonga, Cambodia and Laos. These projects show how managing the growing environment can improve yield and quality, leading to improved returns.

However, protected systems require infrastructure to achieve that yield – plastic, shade cloth and irrigation are new inputs. A new protected cropping project in Cambodia and Laos will include a life cycle assessment of the equipment used in the production system, which commonly includes plastic coverings and mulches.

It will look at the types of materials, how long they last and how they can be re-used and recycled at the end of their life, including the supply chain for packaging, and eliminating plastics as much as possible. We need to consider the legacy of the equipment and infrastructure.

Protected cropping systems also require new knowledge for farmers. Extension support and access to pest and disease diagnostics is necessary.

Good knowledge on what to grow and how to grow it to meet market demand will be addressed in the Pacific region where abandoned structures from past projects present an opportunity to redesign a different approach, more responsive to markets.

This is part of the bigger picture of horticultural production practices that consider the planet's finite resources and the need for a holistic approach to sustainability.

By following the supply chain, we can target better returns to growers, identifying and working to remove barriers that might compromise their ability to meet that market demand. Increasingly, it is going to be about circular economies as part of broader sustainability goals.

ACIAR-supported horticultural research takes a food systems approach and engages with diverse stakeholders, including women as farmers and decision-makers. Photo: ACIAR

Harnessing nature

We need to be working with nature wherever we can, harnessing the power of beneficial insects and organisms in pest and disease control, including soil microbes to build the health and productivity of our farming soils.

Our projects underway in this space are looking at integrated pest and disease management, including crop hygiene and biological pest controls and the role of soil health in the control of disease in bananas.

Biological management practices can help reduce chemical use, reduce inputs for growers and reduce the flow-on effects of chemicals in the environment, which can potentially compromise human health and safety.

We know that technical solutions to some of the production challenges are not enough. We have often worked on the assumption that if we can come up with solutions to an issue, farmers or markets will naturally adopt them. But that is often not the case. We need to recognise the social systems in which production and consumption occur.

People power

We need to reach the right people, those who are making decisions, with the best information.

Recent projects taking this kind of approach are highlighting the important role of women in farm financial decision-making as well as in production and supply chains.

There is a growing awareness among researchers and project managers on the importance of actively catering for the diversity of stakeholders. Working with social scientists is also helping to identify the motivation of growers and of markets, which can influence the uptake of new practices, or demand for produce.

Tweaking the systems

In systems, sometimes it is not so much the big challenges but the need to find solutions for the next question, the one that is holding back change on a larger scale. The one that can involve pulling the system to pieces and working on it bit by bit, while also working towards the main aim of wellbeing in smallholder farming communities.

This is where projects that consider food loss in the chain can play an important role. Reducing loss along the chain can be achieved by simple changes. Harvesting when it is cool and covering produce can reduce the temperature and increase shelf life for perishable fruits and vegetables so more is sold and less is thrown away.

As we continue to support the emerging fruit and vegetable sectors in our lower and middle-income partner countries, we are focused on how these less-resourced systems can develop their economies while also proving their sustainability.

Vietnam's agricultural journey – 30-year partnership with ACIAR

ACIAR has played a key role in helping Vietnam modernise its smallholder farming systems, creating at the same time a strong bilateral relationship benefiting both Vietnam and Australia.

For the past 30 years, Vietnam's agriculture sector has been steadily modernising, progressing from an initial focus on food security to a robust, increasingly diverse agricultural economy. The country today is confident of achieving its goal of being one of the world's leading food producers by 2030.

The story of development from largely subsistence farming to a food-exporting nation is a classic case study of what targeted agricultural research and extension can achieve. It also reaffirms the value and importance of the ACIAR 'sleeves up' approach to this enduring objective.

Australia also celebrates 50 years of diplomatic relationship with Vietnam, developing comprehensive cooperation that has included partnerships with ACIAR over the past 3 decades.

Accelerating development

Dr Nguyen Van Bo, a member of Australia's Commission for International Agricultural Research and former President of the Vietnam Academy of Agricultural Sciences, said Vietnam's relationship with ACIAR had helped to accelerate the country's economic development.

'Developing countries like Vietnam are in dire need of technology. Through cooperation with Australian scientists, we have gained access to the world's advanced science and technology,' said Dr Bo.

Key points

1. Australian-supported research has helped Vietnam's agriculture sector progress from a food security focus to a diversifying agricultural economy.
2. ACIAR has been a key partner with Vietnam in this endeavour for the past 30 years.
3. Research has increasingly become a professional partnership as Vietnam's own technical capacity has increased.

A key feature of the relationship between ACIAR and Vietnam has been investment and support for capacity building in ways that not only build technical expertise in Vietnam, but also have value for Australia.

'While building diplomatic relationships through science, the knowledge and experience gained by both Australian and Vietnamese researchers will help Australia prepare well for pests and diseases it has not yet encountered,' said Dr Bo.

In terms of research leadership, there are now many heads of agencies and senior people in Vietnam who are ACIAR alumni through scholarships such as the John Allwright, Meryl Williams and John Dillon fellowships.

Dr Bo also highlighted the important role of agriculture in providing social and political stability for Vietnam, which ACIAR activities have made a significant contribution to, and which was demonstrated during the COVID-19 pandemic.

Growth and sustainability

ACIAR Acting Chief Scientist, Dr James Quilty, said Vietnam's agriculture sector was now moving from volume to a quality and product diversification strategy.

'Agricultural research for development has really taken Vietnam from the point where it was all about food security, to economic growth,' said Dr Quilty.

'They haven't taken their eye off food security, but without that agricultural development, Vietnam would not be the tiger economy of Asia that it now is.'

Australian support for agricultural research in Vietnam is also expected to have wider benefits in reducing farming's greenhouse gas emissions.

In South-East Asia, the main agricultural greenhouse gas is methane from rice fields, and it is a critical challenge to reduce these emissions in the Mekong River Delta, which is one of the largest rice-growing areas in the world.

Dr Quilty noted that Vietnam's commitment to reducing greenhouse emissions, plus the diminishing viability of dry-season rice farming, was a major impetus for the Vietnamese Government's push for less volume but higher quality rice, coupled with more crop diversification.

Ambassador Andrew Goledzinowski (second from right) met farmers and researchers participating in ACIAR-funded projects at ACIAR Vietnam stakeholder meeting in Hanoi. Photo: ACIAR

10-year strategy

Vietnam is now implementing a 10-year strategy that has the stated ambition of having world-class agriculture able to supply to premium markets, and for living standards in rural areas to be on par with urban communities.

Advances in food production and quality will come largely from agronomy improvements and technology to improve irrigation efficiency, reduce methane emissions from rice and maintain forests.

These objectives are reflected in the current ACIAR–Vietnam strategy, which is also focused on helping the smallholder agriculture sector to become more commercial, and increasing private sector partnerships with farmers and researchers.

Commercial drive

Australian Ambassador to Vietnam Mr Andrew Goledzinowski said he has been impressed by the drive and confidence of Vietnamese farmers he has met who have entered high-value vegetable markets as a result of ACIAR-supported research.

They have transitioned from growing vegetables for their household to reaching high-demand markets and have transformed their livelihoods.

'I see a strong impact of capacity building and market linkages for farmers on the ground through ACIAR-funded projects, even though ACIAR doesn't necessarily work directly with them,' said Mr Goledzinowski.

He also highlighted the major 4-year, ACIAR-supported public–private partnership with the SunRice Group to help connect smallholder rice farmers in Vietnam to the premium, high-value and well-established global markets.

Mr Goledzinowski said this new partnership was a great example of how good research outcomes could be used by the private sector, which is able to provide adoption pathways.

ACIAR currently supports 25 projects in Vietnam; 13 specific to Vietnam and 12 that are part of broader regional projects.

Areas of research cover agribusiness development, climate change impacts, fisheries, forestry, livestock systems, social systems that support gender equity and ethnic minorities, and soil and land management.

'As Vietnam and Australia are moving to the next level of bilateral relations, ACIAR will continue to play an important role in helping Vietnam shape their rural and agriculture development agenda through more effective research collaboration,' said Mr Goledzinowski.

'Australia wants to support Vietnam's socioeconomic development through ACIAR and other ongoing works with our Vietnamese partners. Agriculture plays a pivotal role in this picture.'

The ACIAR alumni and staff at the CGIAR Gender Impact Platform Conference. Photo: ACIAR

Gender impact conference in India

The CGIAR Gender Impact Platform Conference took place in New Delhi in October. Eleanor Dean, ACIAR General Manager, Outreach and Capacity Building delivered a plenary speech on the ACIAR journey to progress gender equity and social inclusion in research, which generated much discussion.

ACIAR also supported 15 alumni from across the region to participate in the conference with 10 presenting on their ACIAR-funded work.

ACIAR alumni and staff gathering in Sri Lanka. Photo: ACIAR

South Asia alumni in Sri Lanka

ACIAR alumni and partners from Bhutan, India, Nepal, Pakistan and Bangladesh came together in Sri Lanka for a week of reflection, learning and collaboration in September. The diverse group visited the Gannoruwa Agro-Technology Park near Kandy, a hub of agricultural ingenuity, and met vegetable farmers in Marassana village who are adopting novel solutions to combat pests.

Participants also joined a 3-day training session on partnership brokering and collaborative leadership to help drive change through strategic partnerships that align with shared development goals.

Dr Leah Ndungu congratulates Dr Jean-Claude Rubyogo, bean program leader and director at the Pan-Africa Bean Research Alliance (PABRA), for winning the Africa Food Prize. Photo: ACIAR

ACIAR partner wins Africa Food Prize

President of Tanzania, Mrs Samia Suluhu Hassan, hosted the Africa Food Systems (AFS) Forum in the city of Dar es Salaam in September, promoting the sustainability and resilience of African food systems. More than 5,400 delegates attended the event, which had the theme of 'Recover, Regenerate, Act'. Diverse voices stressed empowering women and youth, cross-border trade policies, catalytic climate investments, and stakeholder capacity building.

At the forum, the Africa Food Prize was awarded to the Pan-Africa Bean Research Alliance (PABRA), which has delivered projects in partnership with ACIAR.

Participants in ACIAR-supported projects in Cambodia met to share lessons across their respective projects and institutions. Photo: ACIAR

Agricultural researchers and practitioners meet in Cambodia

In November, the ACIAR South-East Asia regional office hosted a gathering of about 30 researchers and development practitioners in Cambodia to share research findings, new knowledge, technology and innovation and lessons emerging from 10 ACIAR-supported projects.

Participants discussed how to better facilitate the research-to-policy interface and spread knowledge about the significance of research-based solutions to the problems facing Cambodia's agriculture industry.

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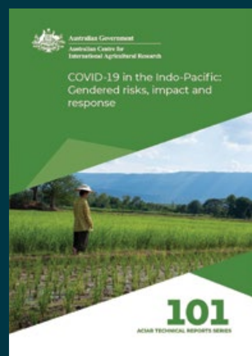
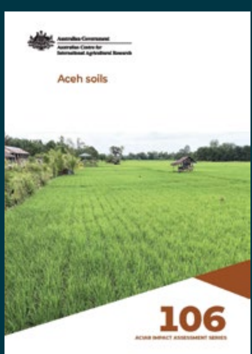
COVID-19 impacts on wet markets

Case studies from Vietnam, Kenya and the Philippines explore stakeholders' perceptions of the safety of traditional wet markets, which became the focus of international media attention early in the pandemic. It provides an understanding of the different contexts in which the COVID-19 pandemic restrictions were enacted.



Gendered impacts of COVID-19 in the Indo-Pacific

This report highlights the differing experiences of women during a health crisis and the importance of considering the gendered nature of the effects of pandemic response measures when implementing policies.



Aceh soils projects improve incomes

Reflections on 4 ACIAR projects in post-tsunami Aceh Province, Indonesia, highlight how optimised fertiliser and chemical use has helped to improve income and living standards among smallholder farmers, also improving community resiliency and local capabilities.

Partners Magazine update

In the New Year, ACIAR is going to take some time to explore the best way to engage with our stakeholders to share the work of ACIAR and its partners. While we do this, all of our articles will be moving online and the physical *Partners* Magazine will be paused – make sure you stay up to date by signing up to the electronic newsletter by scanning the QR code below and if you have any feedback on Partners that you want to share, please let us know by emailing partners@aciar.gov.au

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Australian Centre for International Agricultural Research

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Australian Centre for International Agricultural Research

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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.