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partners
IN RESEARCH FOR DEVELOPMENT

BUILDING RESILIENCE
IN THE PACIFIC ISLANDS

SUPPORTING RESEARCH FOR ECONOMIC DEVELOPMENT IN THE PACIFIC

BY **RIC WELLS**
Deputy Secretary, Department of Foreign Affairs and Trade

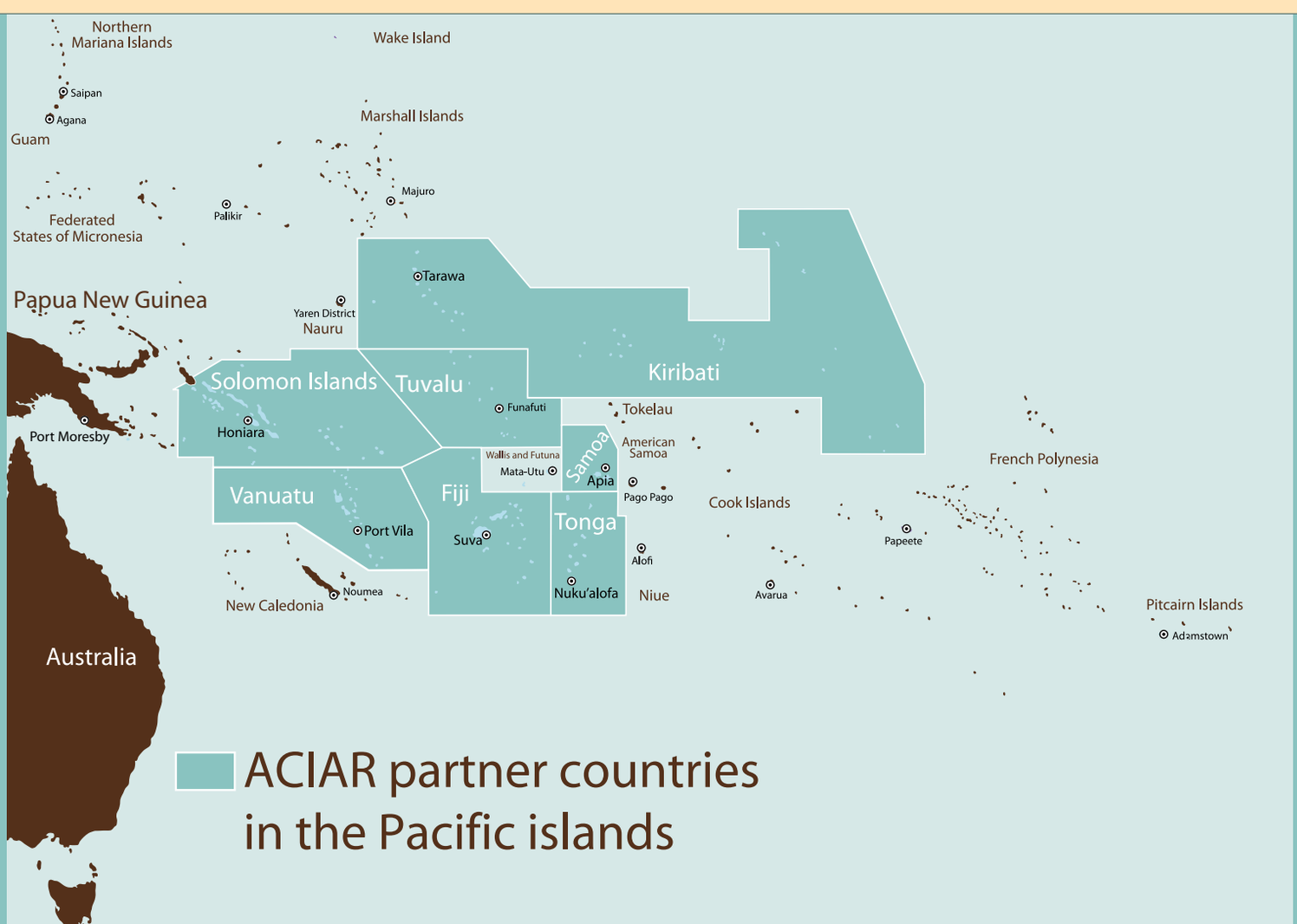
More than 90% of Australia's country and regional overseas development will be delivered in the Indo-Pacific region. The Australian Government is committed to maintaining our development assistance to the smaller Pacific countries in Australia's direct neighbourhood.

With this policy focus on the Indo-Pacific region, it is particularly appropriate that this issue of ACIAR's *Partners in Research for Development* magazine should highlight current work in the Pacific islands. ACIAR's work with some of our closest neighbours in the Pacific region exemplifies many of the key features of the new development paradigm. Stories in this magazine provide examples of how innovative research, in partnership with the private sector, can play a catalytic role in the development process.

Agriculture and fisheries still support the lives and livelihoods of the majority of Pacific islanders, so innovation in this sector should help drive economic growth. Women have traditionally had a strong and respected role in Pacific island culture and societies but, as social and economic forces change our world, it is essential to have models of investment in training and innovation that empower women and girls to take a leading role in enterprise development and in the new economic opportunities that emerge.

THE BEAUTY AND FRAGILITY OF THE PACIFIC ISLAND ENVIRONMENT EMPHASISES THE NEED FOR ECONOMIC DEVELOPMENT THAT SUSTAINS THE INTEGRITY OF THE NATURAL RESOURCE BASE.

Poverty is not perhaps as obvious in the Pacific islands as in some other regions—and this may



be because it tends to be hidden in the rural areas and remote coastal communities, which are at risk of being excluded from conventional economic development. It is therefore fitting that ACIAR's research for development is highlighting innovative ways of including such communities and bringing them into the economic mainstream.

The beauty and fragility of the Pacific island environment emphasises the need for economic development that sustains the integrity of the natural resource base. The linked imperatives of economic and environmental sustainability are captured in the term 'resilience', which is a recurrent theme in the experiences recounted here. And, as a reminder of what resilience means in practice, the story of Tropical Cyclone Pam's devastating assault on Vanuatu and what communities and research partners are doing to recover from it exemplifies the extraordinary tenacity of Pacific islanders.

In sum, I am delighted to commend to readers this edition of *Partners* magazine for the insights it provides into the role that research can play in the economic development of our region. ■

PHOTO: CONOR ASHLEIGH

The Sigatoka Valley in Fiji.

PHOTO: CONOR ASHLEIGH

Farmers on Taveuni, Fiji.

PHOTO: CONOR ASHLEIGH

PARTNERS FOR DEVELOPMENT IN THE PACIFIC

BY **DR COLIN TUKUITONGA**

Director-General of the Secretariat of the Pacific Community

Pacific communities are among the most vulnerable to the risks posed by climate change and disasters, as well as economic shocks, and the need to build their resilience is becoming increasingly urgent. The projected changes to the climate in the Pacific over the coming decades are likely to have a profoundly negative impact on the development aspirations of all 22 Pacific island countries and territories, which are already under pressure from globalisation and other economic forces.

Necessity being the mother of invention, these challenges have seen innovation in many fields, especially in the agricultural and forestry sectors. To ensure greater efficiency and sustainability of these efforts, international, regional and local partnerships have been formed, and the Secretariat of the Pacific Community (SPC) is proud to be among the active participants as we combine our respective areas of expertise in support of Pacific islands' development.

SPC has a long-standing relationship with ACIAR and our partnership has brought many diverse benefits to the Pacific. Currently, our collaboration with ACIAR and the Queensland Department of Agriculture and Fisheries is researching ways to improve soil health to underpin the intensification of crop production for export. Farmers in Fiji, Samoa and Kiribati are benefiting from research into the best agronomic practices for production of nutritious vegetables and staple root crops, in the expectation that the soil improvement treatments will lead to improved crop protection, higher yields and fewer pests and diseases. A partnership with the International Fund for Agricultural Development (IFAD) is ensuring that the benefits of these innovations reach communities in the outer islands of Kiribati.

In a similar partnership with SPC and IFAD, the Pacific Organic and Ethical Trade Community is combining ancient farming pathways with new developments in organic practices, such as the recycling of organic waste and agroforestry farming systems. These systems help maintain tight nutrient and energy cycles and protect the soil from erosion and associated loss of organic matter in Cook Islands, Niue and Marshall Islands. Agroforestry and the principles of natural resource conservation also underpin a new project with ACIAR to reforest watersheds and improve community livelihoods in Fiji and Vanuatu.

Growing good-quality crops in sustainable ways is one thing; bringing them to market is another. SPC also partners with ACIAR, Australia's Department of Foreign Affairs and Trade (DFAT), and the European Union (EU) to improve the export capacity of Pacific enterprises, under the umbrella of strengthening Pacific economic integration and cooperation through trade. Forty-two enterprises across 13 Pacific island countries are benefiting from improved export capacity through the EU-funded project Increasing Agricultural Commodity Trade, as well as many more through ACIAR's Pacific Agribusiness Research for Development Initiative and the DFAT-funded Pacific Horticultural and Agricultural Market Access program. Together these initiatives form a powerful alliance for agribusiness development across the horticulture, forestry and fisheries sectors.

SPC HAS A LONGSTANDING RELATIONSHIP WITH ACIAR AND OUR PARTNERSHIP HAS BROUGHT MANY DIVERSE BENEFITS TO THE PACIFIC.

This issue of *Partners in Research for Development* brings encouraging news of innovation that is turning the tide in strengthening resilience in the Pacific and, coincidentally, echoes the theme chosen by the Government of Niue for its hosting of the Pacific Community Conference in November. With the camaraderie and strength of spirit the people of the Pacific are renowned for, backed by committed partnerships and such new ideas, we know we are not navigating the difficult journey alone. ■

ACIAR is promoting agribusiness development in the Pacific islands.

BUILDING RESILIENCE IN THE PACIFIC ISLANDS

The Pacific islands and Australia have a special relationship based on long-standing economic, political and cultural ties. This close relationship is reflected by the prominence of the region in ACIAR's research-for-development portfolio, which encompasses seven Pacific island nations—Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

The combined populations of these seven countries amount to only two million people and they are spread over a vast area of ocean—some 8.58 million square kilometres. This presents a unique challenge for partner governments in meeting their development objectives—and for agencies such as ACIAR that seek to support them in their mission.

These small and fragile economies were particularly hard hit by the global financial crisis of 2008 and the associated sharp rise in the prices of food and transport. Rapid urbanisation is leaving many farming and fishing communities short of labour, while the emigration of skilled people makes it harder to build modern, competitive economies. Extreme weather events and natural disasters—tropical cyclones, floods, earthquakes and tsunamis—exacerbate the erosion of the islands' fragile natural resource base and provide further setbacks to these vulnerable developing economies. Building resilience is therefore a recurring theme in ACIAR's strategy for the region.

ACIAR has been supporting research, capacity building and thereby the development process in the Pacific islands for more than three decades. This issue of *Partners* looks at our work in the region, as we enter a new phase of research for development that is closely aligned with the Australian Government's goals of economic development and empowerment of women.

In 2009, as part of a whole-of-government initiative on 'Food Security through Rural Development', ACIAR embarked with its Pacific partners on a regionally targeted initiative "exploiting opportunities for developing high-value agriculture, forestry and fisheries products in the Pacific nations". The following year saw the launch of our flagship project, the Pacific Agribusiness Research for Development Initiative (PARDI), which was designed to complement the Pacific Horticultural and Agricultural Market Access program launched in parallel by the Australian aid program.

At the same time, ACIAR established new projects in forestry, fisheries, aquaculture and horticulture, working closely with the Secretariat of the Pacific Community, our key development partner in the region. We also greatly increased our investment in ACIAR's postgraduate scholarship scheme at the University of the South Pacific, offering young people the opportunity to gain hands-on experience of problem-solving research in the context of ACIAR projects.

Over the past five years we have gained a rich store of experiences, learning with our partners how to turn the vulnerabilities of the region into strengths. This foundation can help the Pacific's nascent agribusinesses compete in a global marketplace and at the same time build the resilience of communities and the natural resources on which they depend.

Our round-up begins with the story of PARDI itself and its innovative approach of using 'value chain analysis' to identify the bottlenecks in supply chains, and then investing in research to alleviate those constraints. Next, we look at some of the products and industries on which PARDI has focused its research activities: pearls in Fiji and Tonga—iconic Pacific island products, unique in their quality, small to transport and high in value—but in this research, giving special attention to opportunities for communities, and especially women, to engage in and benefit from the industry; canarium nuts in Solomon Islands and Vanuatu, where better processing and new markets are transforming the prospects for a traditional, wild-harvested Pacific product; and vegetables in Fiji and Samoa, where a mix of technical innovation and improved skills and organisation are helping farming communities to supply demanding, high-value markets in the tourism and hospitality sector.

OVER THE PAST FIVE YEARS WE HAVE GAINED A RICH STORE OF EXPERIENCES, LEARNING WITH OUR PARTNERS HOW TO TURN THE VULNERABILITIES OF THE REGION INTO STRENGTHS.

Our Pacific review continues with other experiences from the wider ACIAR portfolio, including how communities are learning to transform familiar resources into commercial products for local and international markets, generating income and employment, without degrading the fragile natural resource base. We look at whether old coconut palms, left over from the heyday of the copra industry, can be turned into valuable laminates—and help to fund the renewal of tree-crop plantations. We look at ways in which communities, first in Solomon Islands and then more widely, can adapt traditional management of coastal marine resources to cope with modern economic pressures and opportunities, and how farmers can relearn their approach to producing taro, the quintessential Pacific food crop, so that it can become a leading export of Fiji and Samoa, while sustaining the health and fertility of island soils. We also look at experiences and prospects for developing the value chain for sea cucumbers in a way that can support the development of remote coastal communities with few other economic options, without destroying the pristine environments on which both people and products depend.

We look at the capacity building effort at the University of the South Pacific, with some specific examples of how thesis research has brought talented young people into this wide-ranging effort to build Pacific institutions, economies and industries.

We complete our review with a real-life example of the vulnerability of the Pacific islands to natural disasters and a glimpse into the prospects and strategy for recovery. When, in mid-March 2015, Cyclone Pam ripped through the islands of Vanuatu with unprecedented ferocity, the initial attention of the island's government and international partners was focused on emergency supplies of food, water and medicine. However, in the following months, the emphasis has shifted to rebuilding the industries on which future prosperity and resilience depends—fisheries and aquaculture, timber and tree crops, livestock and food crops. We look at the part that ACIAR and its research partners can play in this process.

We do not claim to have found all the answers. However, based on the lessons we have learned and the partnerships we have built, ACIAR is surely in a stronger position: to mainstream these lessons into the next phase of PARDI and our broader project portfolio, and to increase the effectiveness of our contribution to achieving sustainable economic development goals in the Pacific islands. ■

Dr Nick Austin
CEO of ACIAR

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IN RESEARCH FOR DEVELOPMENT

Partners in Research for Development is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* presents articles that summarise results from ACIAR-sponsored research projects and puts ACIAR research initiatives into perspective. Technical enquiries will be passed on to the appropriate researchers for reply. Reprinting of articles, either whole or in part, is welcomed, provided that the source is acknowledged.
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THIS ISSUE...

PARDI has funded the development of commercial breadfruit orchards. Here, Kaitu Erasito of KokoSiga Ltd inspects a young tree.

PHOTO: CONOR ASHLEIGH

PARDI

THE PACIFIC AGRIBUSINESS RESEARCH FOR DEVELOPMENT INITIATIVE

PARDI represents a new and innovative approach for ACIAR's work in the Pacific, where markets and value chains drive the R&D agenda

BY **ANNE MOORHEAD**

In the early 2000s, the emphasis for development aid to the Pacific islands moved towards building economic resilience. In aligning with this, the key question for ACIAR became how to better link its research work with agribusiness development.

"Setting up viable agribusinesses in the Pacific islands isn't at all easy," explains ACIAR's agribusiness research program manager Dr Rodd Dyer. "Remote islands with small economies are at a severe disadvantage in trying to compete in most global markets. The challenge is to find those unusual opportunities that play to the islands' 'comparative advantage'—and then find ways to overcome constraints that limit success, wherever they occur along the value chain."

This was the principle behind PARDI. The A$12 million initiative, launched in early 2010 and completing its first phase in June 2015, placed value chain analysis at the heart of the research agenda. In an innovative and somewhat experimental approach, ACIAR built flexibility into the project design by allowing PARDI to hold some funds in reserve, and to direct them to support new, problem-solving research as the need was identified.

As a first step, the PARDI process used value chain analysis as a tool to identify constraints and prioritise interventions in the supply chains of selected high-value products from fisheries, forestry and crops. This was followed by commodity-focused projects that aimed to address the constraints and strengthen the chains. The emphasis throughout has been on developing equitable chains that support Pacific communities and improve livelihoods, with special emphasis on the inclusion of women.

Associate Professor Steven Underhill, from the University of Queensland, led the initiative through the first five years. "PARDI was a bold strategy to better connect research activities and outcomes with Pacific agribusiness development. Normally

PARDI is supporting sustainable production of high-value vegetable crops through various research activities.

PHOTO: CONOR ASHLEIGH

we develop research proposals in response to current problems. But what happens when the problems and opportunities are not self-evident? PARDI had a process to identify these needs based on value chain assessments. What was unique was then having the capacity to rapidly respond through internally commissioned, highly targeted research and development projects."

EMBRACING DIVERSITY

PARDI was designed to be diverse. With projects in six of the seven Pacific island countries under ACIAR's mandate (Fiji, Kiribati, Samoa, Solomon Islands, Tonga and Vanuatu), research activities covered all of the primary industry sectors (except livestock).

At the time of writing, there were 17 active PARDI research activities covering pearls, mother-of-pearl handicrafts, tilapia, sea cucumbers and seaweeds (all under the fisheries program); canarium nuts, tamarind and teak (under the forestry program); and breadfruit, taro, high-value vegetables, cocoa, papaya and kava (under the horticulture program).

As well as researchers in each of the six countries and Australia, PARDI drew on international expertise from, for example, the UK and Taiwan. The initiative has also provided a platform for the different and diverse actors in agribusiness development—private sector, government and researchers—to share and learn about each other's interests and priorities.

This diversity was another aspect of the PARDI experiment, and it has worked. Fisheries, forestry and horticulture projects, formerly clearly delineated into different research programs, have found common ground in the marketing of their high-value products, and been able to share valuable knowledge and lessons.

"We thought that having value chain directed research was highly innovative," says Associate Professor Underhill. "But we found what made the real difference was having agribusiness and commodity experts working in partnership throughout, and linking learnings from one project with another.

"PARDI brought together a range of technical skills and expertise that would normally operate in relative isolation. These partnerships were initially challenging. An agribusiness expert, a technical commodity specialist and a social scientist all see

Like any lessons, the ones hardest learned tend to be the most enduring. I think we need to spend more time exploring cross-initiative collaborations and linkage. In the end, the issues and challenges facing agribusiness are so diverse that we can only start to effectively seek impact where there is strong inter-project and multi-donor partnerships.

– Associate Professor Steven Underhill, leader of PARDI Phase I

the world through completely different lenses. As we move forward, it is rewarding to see that this research collaboration is enduring."

A COORDINATED REGIONAL EFFORT

PARDI has not operated in isolation—rather, it is part of a coherent regional effort to boost agribusiness. This was in response to a call from the 2009 Pacific Island Forum meeting for development partners to work together in targeting economic development.

The Australian aid-funded Pacific Horticultural and Agricultural Market Access (PHAMA) program was launched alongside PARDI in 2010. PHAMA's mandate was to improve access to key markets for high-value products, many of them the same as those under research by PARDI.

Working closely with government agencies (such as quarantine and biosecurity) and critical private-sector partners (agricultural exporters), PHAMA's focus has been on the bottleneck that national borders often present to high-value exports.

Other closely aligned programs include the Australian aid program's Market Development Facility, and the European Union-funded Increasing Agricultural Commodity Trade program, implemented by the Secretariat of the Pacific Community (SPC). Sharing similar ultimate goals, the different programs have complementary approaches to tackling the issue.

"PARDI brought a unique research dimension to the table," Associate Professor Underhill says. "The Pacific is crowded space in terms of donor-funded activities, but very few have the core research-for-development agenda that is intrinsic to ACIAR projects."

SPC hosted the PHAMA program as well as ACIAR's Pacific Crops program office, while SPC is a key partner in several PARDI activities. "The role of SPC in anchoring our work in the region, and aligning it with national and regional priorities, was important to its success," said Dr Richard Markham, the ACIAR program manager for Pacific Crops at the time.

PHOTO: CONOR ASHLEIGH

Yan Diczbalis (right), from the Queensland Department of Agriculture and Fisheries, and staff of the PARDI red papaya project.

PARDI PROJECTS, 2010–15

CROPS

- Fiji retail market transformation study (PRA/2012/02)
- Development of a mass propagation system for elite varieties of *Piper methysticum* (kava) (PRA/2014/01)
- Developing commercial breadfruit production systems for the Pacific islands (PRA/2010/05)
- Facilitating improved livelihoods for Pacific cocoa producer networks through premium market access (PRA/2011/01)
- Developing an integrated participatory guarantee scheme in the Pacific islands in support of sustainable production of high-value vegetable crops (PRA/2011/03)
- Developing a clean seed system for market-ready taro cultivars in Samoa (PRA/2011/04)
- Developing protected cropping systems for production of high-value vegetables in the South Pacific islands (Fiji and Samoa) and Australia (PRA/2012/05)
- Red papaya export market analysis (PRA/2014/01)
- Taro improvement program: sensory evaluation of Samoan taro varieties (PRA/2011/04)

FISHERIES

- Tilapia farm adoption study (PRA/2014/03)
- Supporting development of the cultured pearl industries in Fiji and Tonga (PRA/2010/01)
- Value-adding and supply chain development for fisheries products in Fiji, Samoa and Tonga (PRA/2010/02)
- Assessing the potential for developing the mother-of-pearl (MOP) handicraft sector in Fiji (PRA/2013/02)
- Improving biosecurity measures in pearl oyster farming in Fiji (Savusavu Bay, Vanua Levu) (PRA/2014/02)

FORESTRY

- Developing markets and products for the Pacific island and PNG canarium nut industry (PRA/2010/03)
- Development of a market mechanism for teak and other high-value timber in the Western Province of the Solomon Islands (PRA/2011/06)
- Improving processing and marketing to improve the tamarind value chain in Vanuatu (PRA/2012/03)

Through PARDI efforts, Fiji vegetable farmers are now better connected to the high-value resort and hotel sector; a range of value-added forestry products has been developed in Vanuatu, creating new income opportunities for villages; improved understanding of export market demands and consumer taste preference is helping to further expand Fiji papaya and Samoa taro exports; and an increasing range of high-value locally produced products (mother-of-pearl jewellery, better chocolate) are now a reality.

PHOTO: CONOR ASHLEIGH

PARDI is helping to build inclusive value chains that support Pacific communities and livelihoods.

NEXT PHASE

At the time of going to press, ACIAR is in the process of analysing the lessons learned from the PARDI project and consulting with its partners, in the Pacific and Australia, to decide how best to pursue this theme of work. The design team is still in the field but some elements of the continuing program are already emerging.

Some of the lessons learned from PARDI are being 'mainstreamed' into a series of projects that are at various stages in ACIAR's project development pipeline. They will use a focus on markets and market analysis to identify opportunities that can really improve the livelihoods of Pacific people, and this will guide the biophysical research. In ACIAR's horticulture program, for instance, three projects—on cocoa, tropical fruit and high-value vegetables—are building on previous PARDI research activities and will be launched in the region during 2015 under the banner of PARDI II.

Dr Dyer is enthusiastic for the future prospects of the initiative. "We have learned so much about the special challenges of doing business in the Pacific. We now have a great deal of experience about what works well and which approaches are less successful. In the next phase of PARDI we need to better understand which market and agribusiness development opportunities can deliver greatest benefit to Pacific islanders, and where technical research can best be focused. We have an infusion of new ideas that we want to try out, with our Pacific partners in governments and in the private sector."

Certainly ACIAR will be monitoring the initiative closely, to learn new lessons and become even more effective in supporting economic development that is economically resilient and socially inclusive. ■

MORE INFORMATION: Dr Rodd Dyer, agribusiness research program manager, ACIAR, rodd.dyer@aciar.gov.au

I was surprised by the willingness of the retailers to spend time with us and help with the research. They are obviously interested in helping to develop good-quality, unique Pacific products—but they were also genuinely interested in contributing to our projects, supporting Pacific communities and building livelihoods.

– Professor Randy Stringer

THE VALUE OF VALUE CHAIN ANALYSIS

What exactly is value chain analysis? Professor Randy Stringer of the University of Adelaide, who led the PARDI value chain team, explains. "Twenty years ago we were talking about supply chains, and the emphasis was very much on efficiency—moving products through the chain at minimal cost, to produce the cheapest product. Today, thinking has changed, and we talk instead about value chains. The emphasis is on the market, and the consumer, and the value of a product—we know now that chain costs can be higher if the consumer is willing to pay for them."

With an understanding of a particular market, and the value-added products that consumers are interested in buying, researchers can then 'step back' to work out how to produce and deliver those products—and in ACIAR's case, how to do that in an inclusive way that supports Pacific communities and livelihoods, as well as boosting national economies.

As a tool, value chain analysis studies the key actors, institutions, relationships and information flows in a value chain in order to identify challenges to, or opportunities for, improving the functioning of the chain. The PARDI value chain analysis team drew on expertise from the Global Food Studies program at the University of Adelaide, the University of the South Pacific, the University of the Sunshine Coast, and key national partners in departments of agriculture and industry, to apply this tool to diverse Pacific products. Detailed value chain analyses have, for example, been carried out and published for Solomon Islands teak, canarium nuts from Vanuatu and Solomon Islands, and tamarind from Vanuatu. Shorter, focused studies were also done for sea cucumber, pearls, cocoa, taro and red papaya. A comprehensive study of the Fiji food retail market was also carried out, providing insights into consumer preferences at the 'high end' of the food market, and opening up new opportunities for Fijian growers of high-quality fruit and vegetables.

In keeping with ACIAR philosophy, building capacity in value chain analysis was an important part of the team's work. "Value chain analysis isn't something you do once and then it's done," says Professor Stringer. "It needs to be ongoing—markets are always changing, and need to be monitored. It's important to have the skills within the countries, so that value chain analysis can become an integral part of agribusiness development."

Following the analysis stage, a suite of PARDI research activities were developed that addressed the identified challenges. The following three stories in this magazine, on pearls in Fiji and Tonga, canarium nuts in Vanuatu, and vegetables for high-value markets in Fiji, illustrate the next steps in the PARDI process—carrying out targeted research to overcome constraints and open up new opportunities along the value chains.

PHOTO: CONOR ASHLEIGH

PARDI has several activities focusing on pearl production, with an emphasis on building livelihoods for communities.

Tongan half-pearls from the winged pearl oyster.

PHOTO: PAUL SOUTHGATE

PEARLS ARE THE BUSINESS

With support from ACIAR, the pearl industry in Fiji and Tonga is growing, and local communities are getting in on the act

BY **ANNE MOORHEAD**

Coloured pearls are a multimillion-dollar industry in the South Pacific, with French Polynesia and the Cook Islands by far the dominant producers. Can Fiji and Tonga stake a greater claim in this lucrative market, and can the value chains be developed in a way that allows local communities to participate? These are questions that Professor Paul Southgate of the University of the Sunshine Coast and his project team have been trying to answer under a Pacific Agribusiness Research for Development Initiative (PARDI) research activity and related ACIAR projects.

Several years into the research, the results are very promising. Fijian pearls are gaining recognition regionally and internationally for their spectacular range of colours and their high quality. Communities are getting involved at various stages, from collecting the young black-lip oysters (known as 'spat') from the ocean for sale to pearl farmers, to making mother-of-pearl handicrafts and jewellery from the left-over oyster shells. In Tonga, the 'half-pearl' industry is also gaining momentum with growing domestic and export markets for half-pearls from the winged pearl oyster, and communities are also heavily involved.

VALUE CHAIN ANALYSIS

Before PARDI, ACIAR work focused mainly on the technical aspects of pearl production. PARDI brought a new perspective—analysis of markets for the pearls, the value chains, and the identification of constraints or bottlenecks in the chains. This change in approach quickly opened up some new opportunities.

"The key constraints that we identified in the value chain analysis were a shortage of oysters, limited types of products, and a lack of local skills," Professor Southgate explains. "These then became our opportunities for engaging communities, and especially women and young people."

Pearl farmers need as many oysters as they can get, and that provides a great livelihood opportunity for communities living around Fiji's pristine bays. Oysters are collected from the ocean using long ropes ('collectors') that are suspended in the bays for at least a year. The ropes, encrusted with young oysters, are then hauled to shore and the oysters harvested and sold.

Seventeen communities around Fiji are currently growing and collecting spat, with support from ACIAR and the Fiji Department of Fisheries. Taniela Nayasi, of Yaroi village on Savusavu Bay, describes his village's experience.

"We were given 13 line collectors in 2009, each 100 metres long. We deployed them, but then Cyclone Tomas came in early 2010 and seven of the lines were destroyed. We harvested the remaining six in 2011 and we earned more than F$4,000 (A$2,490).

"With some of the profit we bought more lines, and in 2012 we deployed 20 lines. We've

harvested nine of those so far, and earned F$7,000 (A$4,360). We still have 11 to harvest.

"We've also bought 20 more lines, so we now have 40 lines and we're planning to deploy them all in September this year."

Yaroi village is ideally situated close to the largest pearl farm in Fiji—Justin Hunter Pearls. Owner Justin Hunter is one of three pearl farmers in Fiji who target the international market with high-quality pearls. All three farmers still face a shortfall in oysters, so there is room for more communities to get involved as spat suppliers. As they become more experienced, the communities can grow on the juvenile oysters and sell them when they are larger and worth more.

TARGETING THE MARKET

The high level of technical expertise needed to produce export-quality pearls and pearl jewellery puts this activity out of reach for most local communities, but there are some excellent alternatives within the domestic market, in particular those linked to tourism. The value chain analysis found that in Fiji this market, including jewellery and handicrafts made from lower-value pearls, half-pearls and mother-of-pearl, could be worth about F$10 million (A$6.2 million) a year. As reported in the previous issue of *Partners*, ACIAR and project partners are working with communities, and especially women, to help develop the skills needed to build and supply this market with quality local products (see 'A craft of their own for Fijian women', page 20 in *Partners* Issue 1, 2015).

Professor Southgate believes that coastal communities currently collecting spat can increase their share of the profits from this lucrative local market by learning to seed the oysters and farming the pearls themselves. Leading the way, a group of women from Raviravi village on Vanua Levu's north coast have set up the first community pearl farm in Fiji, and are learning the essential technical skills.

The easier-to-grow half-pearls offer even more opportunities for communities, as demonstrated in Tonga. While round-pearl production requires particular expertise for pearl seeding that is usually provided by a technician from overseas, winged pearl oysters are easier to seed and local people can produce high-quality half-pearls with appropriate training.

Furthermore, half-pearls can be produced in 6 to 9 months (compared with 18 to 24 months for round pearls), so income can be generated relatively quickly—and multiple half-pearls (four or five) can be made in one oyster at the same time compared with one round pearl per black-lip oyster. This is the basis of the industry in Tonga, and half-pearl farming has recently been introduced to Fiji through the PARDI project.

Despite the recent market focus, the science of pearl production has not been forgotten. "Fijian pearls are known for their extraordinary range of colours, and that is at least partly down to the genetics of the black-lip oysters. It's important that, as we develop the industry, we understand and manage the genetic diversity of the oysters around the islands of Fiji, so that we don't lose this fundamental characteristic," explains Professor Southgate.

This is the rationale behind the locations trialled for spat collection in the current work, which are spread around Fiji's main islands, facilitating studies on the oysters' genetics and relationships with, for example, ocean currents. Until better understood, it is prudent to keep the oyster populations distinct, which also favours the development of small community pearl farms in these locations. Spreading out the pearl farms also mitigates potential weather impacts on the industry.

"I think we could eventually have at least one or two round-pearl farms on each of the main islands of Fiji, providing great livelihood opportunities while keeping the 'colours of Fiji' alive," concludes Professor Southgate. ■

ACIAR PROJECT: PRA/2010/01, Supporting development of the cultured pearl industries in Fiji and Tonga

MORE INFORMATION: Professor Paul Southgate, University of the Sunshine Coast, psouthgate@usc.edu.au

PHOTO: PAUL SOUTHGATE

A woman from Namarai village on Viti Levu, Fiji, collects spat.

PHOTO: POASI NGALUAFE

Locally made pearl jewellery on sale at the Tonga agricultural show.

PHOTO: ANNE MOORHEAD

Taniela Nayasi (right) harvesting spat at Yaroi village, Vanua Levu, Fiji.

PHOTO: ANNE MOORHEAD

Hauling in collector lines in Savusavu Bay, Fiji.

Canarium nut products on sale in Vanuatu.

PHOTO: HELEN WALLACE

PHOTO: HELEN WALLACE

Traditional canarium nut processing.

CANARIUM NUT—THE NEXT

Commercialisation of a Melanesian nut is underway, drawing on expertise acquired in developing Australia's macadamia nut industry

BY **GIO BRAIDOTTI**

Among the must-try delicacies when in Melanesia is the canarium nut, called 'nangai' in Vanuatu, 'ngali' in Solomon Islands and 'galip' in Papua New Guinea. A treasure trove of cultural lore dating back thousands of years exists for this nut. Like cocoa in the Americas, it is traditionally a prestige food with nutritional and putative medicinal value.

Drawing on a decade of ACIAR research, a new chapter is being written for the canarium nut. A value chain analysis carried out under the Pacific Agribusiness Research for Development Initiative (PARDI) has provided an overarching pathway to develop new trade opportunities, and farmers and processors are rising to the challenge.

Assisting them for the past four years is Professor Helen Wallace of the University of the Sunshine Coast. She says the PARDI team's goal is to facilitate the development of an international brand that is owned and driven by local villages. Professor Wallace describes the taste of canarium nut as similar to almond but with a soft, distinctive texture.

The project commenced in October 2011 with extensive stakeholder analysis. Researchers spent up to three weeks with canarium nut producers, examining barriers and opportunities for the canarium nut industry. Consumer analysis was also undertaken, with an initial focus on hotels and restaurants.

One of the early findings was a need for more basic equipment and improved transport. For example, it was found that nut production could immediately be increased under the current system if women—who dominate nut harvesting and kernel preparation—had more buckets.

Other activities under the current system needed to change; for example, manual cracking was greatly disliked. In traditional production systems, women crack nuts from dawn to dusk, one nut at a time, taking two days to fill a 20-litre bucket, which sells for about A$80. Mechanical crackers were clearly needed, and the PARDI team addressed this by introducing nut-cracking technology developed for Australia's macadamia industry, which they adapted for local conditions. Innovation was also needed to extend the quality and shelf life of the harvested nuts, since canarium kernels are easily broken and their high oil content means they can deteriorate quickly. The team brought in solar dryers that naturally and affordably preserve the kernels.

Producers such as Steven Atunesia from Nguna Island, Vanuatu, are now able to crack and dry the nuts much more easily thanks to the simple but well-designed technology. Training programs described as "very helpful" by farmers have disseminated the productivity-boosting techniques, with assistance also provided on food-safety considerations.

As a result, farmers such as Mr Atunesia report an increase in nuts harvested and sold. He sold a recent harvest of 72 kilograms of solar-dried and bottled nuts to Pacific Nuts for VUV72,000 (about A$890). "That's the value of sales of nangai grown on my farm as a result of applying new skills from the PARDI workshops," he says.

PHOTO: HELEN WALLACE

Canarium nuts before processing.

PHOTO: HELEN WALLACE

Canarium nut kernels in the solar dryer.

MACADAMIA?

EXTENDING THE MARKET

Speaking from Papua New Guinea—where the canarium nut industry is also being developed with ACIAR assistance, and large-scale plantings of the *Canarium indicum* tree are underway—Professor Wallace is excited by the progress achieved and is keen to see the initiative extended to further solidify promising linkages to international markets.

"An industry with international potential has definitely grown during the life of the project," says Professor Wallace, who has worked for many years within the Australian macadamia industry.

She is especially impressed with progress in Vanuatu where the number of processors buying the nuts harvested by villagers has increased to five, and products from the nut include oil sold to cosmetic manufacturers that capitalise on reputed anti-inflammatory properties.

"We are seeing processors who are making raw, roasted and honey-coated nuts—even canarium nut cookies—along with new and expanding market outlets," Professor Wallace says. "This growth is important because it is the processors who drive demand for the smallholders' nuts."

The processors and outlets include: Lapita Café in Port Vila, a business producing snack nuts and oil to strong consumer demand; Charles Long Wah, who trades as Pacific Nuts (formerly Kava Store) and is buying solar-dried nuts from people he has trained, such as Mr Atunesia; the Alternative Communities Trade in Vanuatu (ACTIV) Association, which is buying nuts for oil and is planning to conduct trials on snack nuts; and Volcanic Earth and Summit Estate, which are buying oil for cosmetics, with the latter cold-pressing their own oil.

Professor Wallace says the foundations now exist to develop a reliable and consistent supply of canarium nuts and nut products to domestic markets and to target export markets. The capacity of the industry is growing, new markets for canarium nut products are opening up, and more processors are buying larger quantities of product from farmers. Lapita Café, for example, has expanded its supply base from a few family farmers on Malo Island in 2010 to more than 100 farmers spread across four districts in 2014.

The PARDI team also organised for samples of canarium kernels to be flown to Australia for storage experiments, oil analysis and microbial testing. This was followed up with a survey of 22 Australian nut processors, which found that two-thirds of them believed that canarium nuts have commercial appeal in the Australian market. The most suitable market segments suggested were health stores, gourmet food stores and boutique stores. Meanwhile, tourists to the Melanesian nations are already buying and enjoying canarium nuts and an increasing range of nut products.

ACIAR PROJECT: PRA/2010/003, Developing markets and products for the Pacific island and PNG canarium nut industry

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SALAD DAYS FOR LOCAL FARMERS

A better understanding of the demand for good-quality vegetables, combined with targeted research for development, is helping producers in Fiji, Samoa and Solomon Islands meet the high-end market

PHOTO: CONOR ASHLEIGH

BY **ANNE MOORHEAD**

Fiji has a well-established high-value vegetable market. More than half a million visiting tourists a year mean that hotels need regular supplies of good-quality produce such as tomatoes, cucumbers, capsicums and lettuce, while growing urban centres represent a second significant demand. Importers have been supplying a large proportion of this market from overseas—reducing the opportunities for local producers and adversely affecting trade balances. The story is similar, though on a smaller scale, in Samoa and Solomon Islands.

It is easy to see why local producers are struggling to supply this market. Hotel operators are extremely demanding, expecting consistently high-quality produce in volumes that vary with the season—but according to the number of tourist arrivals, not the suitability of the weather for growing vegetables. They are used to having the produce delivered to their door, and they like to deal with a small number of suppliers who can deliver a wide range of produce. The high-value urban markets are not much easier to provide for, with similar requirements for quality and consistent supply, compounded by changing consumer preferences.

In recent years there have been many projects aimed at increasing the local share of this market. For the Pacific Agribusiness Research for Development Initiative (PARDI) team, this was an obvious fit with PARDI objectives—targeting high-value agricultural products, with researchable constraints limiting the development of the value chain from small-scale farmers to potentially highly profitable markets.

PARDI research activities have approached the problem from different directions. Studies on the market itself are providing a better understanding of market expectations and changing preferences. Participatory guarantee systems (PGS) have been developed to help farmers work together to produce the quality and volumes demanded by the market. And a third PARDI research activity has brought specially designed greenhouses to Fiji and Samoa, allowing year-round production of good-quality vegetables.

THE FIJI MARKET STUDY

'Know your market' is the starting point for any business in any part of the world, and a comprehensive study of the high-end vegetable market in Fiji laid this groundwork. Led by Craig Johns of the Global Food Studies unit at the University of Adelaide, the study covered the major supermarkets in the country, a selection of hotels and resorts, and a survey of 1,000 households in the two main towns of Suva and Nadi.

The findings are helping to build a better picture of the value chain for high-value vegetables in Fiji—the shopping behaviours and preferences of consumers at one end of the chain, and the requirements and constraints facing the 'market channels', the supermarkets and hotels, and the middlemen. This better understanding of the market is providing a sound basis for targeted interventions on the supply side.

PARTICIPATORY GUARANTEE SCHEME

Individual farmers have little chance of supplying the quantities of high-quality produce hotels and supermarkets demand—but if they work together, it's a different story. Participatory guarantee schemes unite farmers in formal groups, vastly strengthening their negotiating position as well as providing a platform for building skills and developing and sharing new ideas and technologies. These schemes are described as 'participatory' because the farmers themselves guarantee particular standards (which may, for instance, include minimal use of pesticides, as well as volume and timing of deliveries) rather than depending on an expensive, third-party certification system.

PARDI has helped set up four PGS groups in Fiji and two in Solomon Islands. An early activity organised by the team was a two-day workshop in Fiji in 2012 that brought together the farmers and buyers from the hotels and resorts to share and learn about each others' priorities and constraints. This was a first for both sides, and an eye opener.

"A critical element of building value chains is improving information flows between the key

PHOTO: CONOR ASHLEIGH

Jone Kunatui from the Nawamagi PGS talks with chef Ganeshan Naicker of Shangri-la's Fijian Resort and Spa.

PHOTO: CONOR ASHLEIGH

Aloesi Hicks works on the PGS project with farmer groups in Fiji. She recently received an ACIAR scholarship to study for a higher degree in Australia.

PHOTO: CONOR ASHLEIGH

Husband and wife farming team Adi Vani and Moses Naiove check their tomato crop. Adi and Moses are both members in the PGS farmers' group in Qereqere village, near Sigatoka, Fiji.

PHOTO: RICHARD MARKHAM

Dr Elio Jovicich (centre) explains the 'protected cropping' project to vegetable supplier Edwin Tamasese (right) in Samoa.

PHOTO: ELIO JOVICICH

Trellising makes the most of the space available in one of the demonstration greenhouses in Sigatoka, Fiji.

actors," says value chain expert Professor Randy Stringer, also from the Global Food Studies unit at the University of Adelaide. In a small country such as Fiji, face-to-face exchange is both a feasible and a highly effective way to do this.

"I don't have to be looking elsewhere but at my doorstep for the supply of the hotel," said an enlightened Nitesh Kumar, purchasing manager for one of Fiji's largest hotels, Shangri-la's Fijian Resort and Spa, at the close of the workshop. Just over a year later, Shangri-la's Fijian Resort and Spa was the first hotel to reach an agreement with one of the PGS groups and begin regular purchases of local produce from the group.

The PGS platform has also facilitated training for the farmers in market-oriented business skills, helped develop quality protocols that form the basis of agreements between farmer groups and hotels, and is working to develop a local brand to enhance marketing. After the PARDI team withdraws, a Business Support Service self-funded by the groups will ensure continuation and sustainability.

PROTECTED CROPPING

Practical interventions in the field are also needed if the farmers are going to have enough high-quality vegetables to supply the market throughout the year. The third PARDI research activity sought to address this aspect. The climate is the main challenge—during the rainy season, roughly November to April in Fiji, it is too wet to produce crops such as tomatoes and capsicums. The solution seems a simple one—greenhouses that keep off the rain—and this is the intervention introduced by PARDI. But adapting the design for local conditions, developing appropriate irrigation, managing insects and diseases, finding the right seeds and building farmer knowledge of the system means it has been far from simple.

Led by Dr Elio Jovicich from the Queensland Department of Agriculture and Fisheries, the project has installed five demonstration greenhouses in Fiji and Samoa. "We've adapted the usual tunnel design, which is too low for these conditions," says Dr Jovicich. "Our structures are much taller, and have improved ventilation, to prevent temperatures getting too high in the tropical climate."

The greenhouses have drip irrigation and trellis systems to maximise the space available. Trials with tomato, capsicum, cucumber, coriander (cilantro) and red cabbage have had good results. "Growers have really seen the difference. They are getting good quality and can see the year-round potential," Dr Jovicich says.

Australian growers are also looking on and taking interest, particularly in the tropical region where protected cropping is not common, and the Pacific work complements research in Queensland.

The next phase of this work is a full-scale ACIAR project to expand and develop protected cropping, and to extend trials to the PGS farmer groups. As the technical problems of protected cropping are resolved, a key issue will be to help farmers with the investment decisions surrounding the purchase of greenhouses and of mitigating the risk of cyclone damage. Once again, the need is for a strategy that is resilient in the face of an uncertain economic and natural environment. ■

ACIAR PROJECTS: PRA/2012/02, Fiji retail market transformation study
PRA/2011/03, Developing an integrated participatory guarantee scheme in the Pacific islands in support of sustainable production of high-value vegetable crops
PRA/2012/05, Developing protected cropping systems for production of high-value vegetables in the South Pacific islands (Fiji and Samoa) and Australia

MORE INFORMATION: Dr Richard Markham, horticulture research program manager, ACIAR, richard.markham@aciar.gov.au

COMMISSIONERS MEET IN PNG

PHOTO: SUPPLIED BY JOHN COOK

ACIAR's Commission during their meeting in PNG.

PHOTO: JOHN COOK

PNG mudmen entertained the visiting Commission.

From 11 to 15 May 2015, the Commission for International Agricultural Research gathered for its 31st meeting in Papua New Guinea (PNG). While there, the Commission members met with key stakeholders, including Sir Brown Bai (ACIAR's policy advisory committee representative of PNG), H.E. Deborah Stokes (Australian High Commissioner to PNG) and Dr Sergie Bang (director-general of the National Agricultural Research Institute). The Commission also met with ACIAR scholarship alumni, including Fredah Wantum, one of ACIAR's 2015 John Dillon Fellows. Along the way, the Commission stopped in to visit project sites at the Fresh Produce Development Agency, the National Fisheries Authority, the City Pharmacy vegetable processing facility and the Coffee Industry Corporation.

JOHN DILLON FELLOW INTRODUCES 'MARIA'S FAMILY' BOOKS AT CANBERRA PRESCHOOL

PHOTO: ACIAR

Fredah Wantum, ACIAR John Dillon Fellow from Papua New Guinea (PNG), and Dr Barbara Pamphilon, project leader of the 'liklik bisnis thinking' women's project in PNG, visited the Wiradjuri Preschool Centre at the University of Canberra to share the 'Maria's Family' book series with a group of Australian children. The 'Maria's Family' books were developed as part of an ACIAR-funded project on women's business acumen in PNG. The 'Maria's Family' series aims to teach key agricultural messages to women smallholders, help mothers engage in reading activities with their children, and help develop literacy skills for both mothers and children. Ms Wantum read *Maria's Family Goes to Market* to a group of enthusiastic preschoolers, both in English and in Pidgin. The children were very interested to hear Ms Wantum speaking in Pidgin and to find out about the different way of life for children living in rural villages in PNG.

A video of Fredah Wantum's visit can be viewed at the ACIAR YouTube channel: www.youtube.com/user/ACIARprojects

WHAT A PEARLER!

PHOTO: SARAH STOREY

(From left): Poasi Ngaluafe, head of aquaculture, Ministry for Agriculture, Food, Forests and Fisheries, Tonga; the Hon. Julie Bishop MP; Max Wingfield, senior project scientist—ACIAR Pearl Industry Development, University of the Sunshine Coast; and the Hon. Semisi Fakahau, Minister for Agriculture, Food, Forests and Fisheries, Tonga.

The Minister for Foreign Affairs, the Hon. Julie Bishop MP, visited Tonga in March and participated in a roundtable discussion with government, business and industry stakeholders on how to encourage private-sector development in the region. While in Tonga, she spent some time learning about an ACIAR project in the western Pacific. Led by the University of the Sunshine Coast's Professor Paul Southgate, the project aims to provide a sustainable basis for the development of cultured-pearl industries—specifically in Fiji, Tonga and, eventually, Papua New Guinea.

THE TRANSFORMATIVE AGRICULTURE AND ENTERPRISE DEVELOPMENT PROGRAM

PHOTO: SUPPLIED BY ACIAR

Participants at the TADEP stakeholder meeting held at ACIAR in May 2015.

The Transformative Agriculture and Enterprise Development Program (TADEP) is a new and innovative initiative being established in Papua New Guinea (PNG) and the Autonomous Region of Bougainville. TADEP aims to foster private-sector-led development, increase agricultural productivity and capacity, and improve access to markets for farmers, particularly women farmers. *Transformation* and *enterprise* development, especially though women's groups and the private sector, are the essence of TADEP. With a six-year funding commitment from the Australian Department of Foreign Affairs and Trade and ACIAR, TADEP will commission five research projects working across seven provinces of PNG and the Autonomous Region of Bougainville. The broad geographical spread is in part to ensure that benefits are widely applied, but also to provide an opportunity to learn how to adapt processes and technologies to varied social and economic circumstances.

The generous timeframe recognises public and private sector collaboration is essential, and that creating new and strengthening existing partnerships takes time and resources. A key to the success of this program is a flexible 'Program Umbrella', managed by ACIAR, under which all five projects will sit. The role of the Program Umbrella is to ensure that capacity building, gender equality, and monitoring and evaluation are supported and integrated into project implementation at every stage. Stakeholders from PNG and Australia met in Canberra in May to discuss the program and prepare for its rollout in June 2015.

PHOTO: JOHN COOK

The development of market chains and small-scale enterprises is transforming the rural economy of PNG.

LAUNCH OF THE INNOVATIONXCHANGE

On 23 March 2015, the Minister for Foreign Affairs, the Hon. Julie Bishop MP, launched the Australian Government's new development innovation hub, InnovationXchange. Through the Australian Department of Foreign Affairs and Trade, InnovationXchange provides a platform to catalyse and support innovation across the Australian aid program. InnovationXchange will identify, trial and upscale successful approaches using five key principles: openness, leadership, collaboration, agility and engagement with risk.

MORE INFORMATION: https://innovationxchange.dfat.gov.au

NEPAL EARTHQUAKE APPEAL

The Nepal earthquake, which occurred on 25 April, killed more than 7,000 people and injured more than twice that number. Sindhupalchok and Kabhre Palanchok—regions where Australian Government-funded forestry projects have operated for 30 years—are two of the most severely affected districts. Nepalese partners are in a state of shock.

The International Union for Conservation of Nature (IUCN) staff have toured the Kabhre district and indicate that the most pressing need is to support the families whose houses have been damaged and who are being forced to live in the open air. An account has been set up to receive funds to support the relief work being undertaken by the IUCN Nepal country office.

To support this relief work, please go to: http://aciar.gov.au/news-and-media/nepal-earthquake-appeal

MORE INFORMATION: Dr Yam Malla, country representative, IUCN, PO Box 3923, Kupondole, Lalitpur, Kathmandu, Nepal, (phone) +977 1 5528781, (fax) +977 1 5536786, www.iucnnepal.org, www.iucn.org

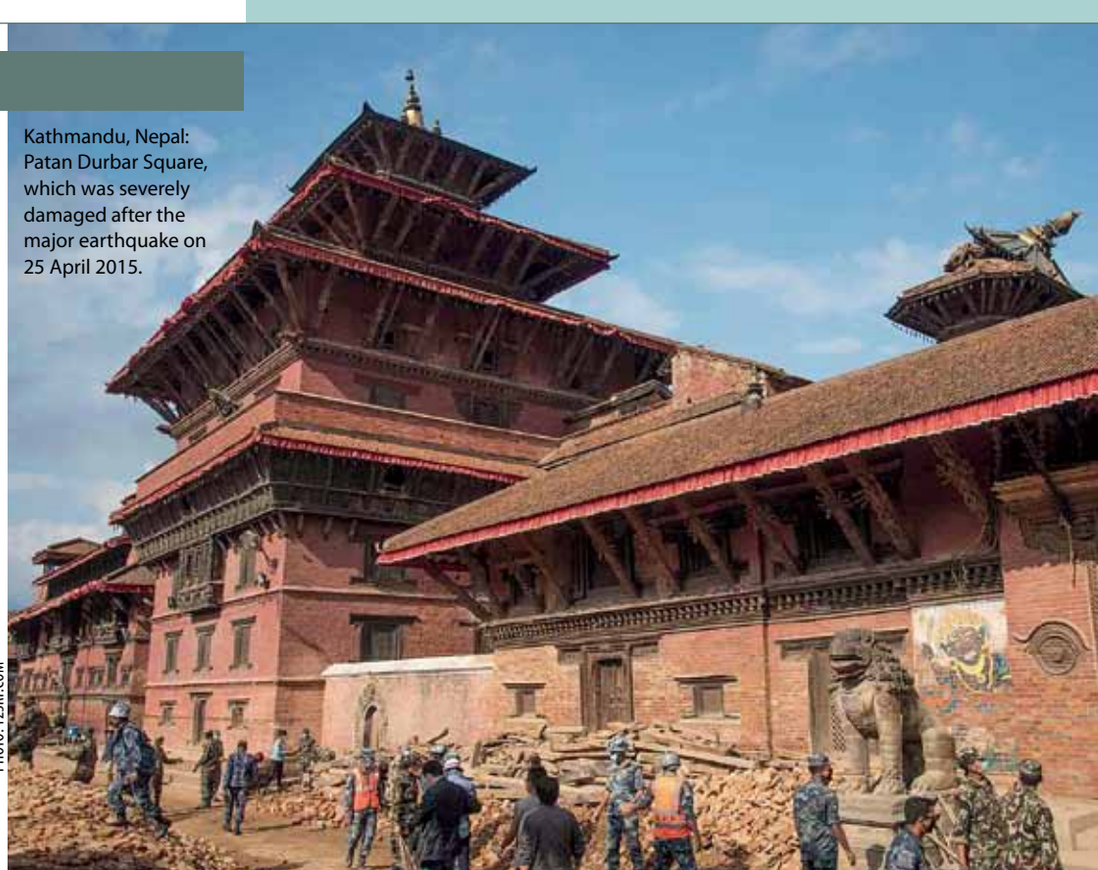


PHOTO: 123RF.COM

Kathmandu, Nepal: Patan Durbar Square, which was severely damaged after the major earthquake on 25 April 2015.

A NEW USE FOR OLD COCONUTS

Introducing cocoveneer, a new Pacific product that could stimulate renewal of the coconut industry

BY **ANNE MOORHEAD**

Who knew you could peel a coconut palm? That's the technology underpinning an ACIAR project that aims to turn the stems of old, non-productive coconut palms into a high-value product—cocoveneer—with potential benefits along the supply chain, from coastal communities who own the plantations, to timber mills, furniture makers, retailers and exporters.

Old coconut trees are the legacy of the global copra trade, which peaked in the early 20th century. As the industry declined there was little incentive to replant, despite governments' and development agencies' best efforts to find new uses for coconut and provide seedlings.

Today many coastal plantations are characterised by row upon row of tall, spindly trees that produce very few nuts—an estimated 120,000 hectares of precious coastal land across the Pacific is thus occupied, roughly equivalent to the area of Samoa's main island of Upolu. The palms do perform some useful services—protecting vulnerable coasts from erosion, for example—and the challenge is to preserve these benefits while encouraging the transition to more productive uses of the land.

"We've been looking for a way to add value to old coconut palms for decades," says Semi Dranibaka of the Timber Utilization Division of Fiji's Department of Forestry. "We've studied the properties of the wood, and experimented with milling, and various products. Cocoveneer is a new product for us, and it seems to have real potential."

THE CHALLENGES OF COCOWOOD

Wood from the coconut palm has characteristics that make it less than easy to work with. Its variable density is one of the biggest challenges—stems are dense and hard on the outside, but have a soft core, so that they cannot be sawn into uniform planks of useful size. Also the fibres that give the wood its strength tend to spiral up the trunk, causing conventional planks to warp and twist as they dry. An earlier ACIAR project looked at the technical and economic feasibility of producing cocowood timber, and veneer began to shine through as a 'best bet'. In theory at least, the hard outside of the stems can be peeled into uniform thin layers that can then be used to 'finish' products made of less attractive or softer woods. Because of its hardness, as well as its attractive appearance, cocoveneer particularly lends itself to flooring.

"The project is still in the experimental stage," explains Associate Professor Gregory Nolan, project leader and director of the Centre for Sustainable Architecture with Wood at the University of Tasmania. "We are trying to address the many components that need to ultimately come together for success. We're looking at the technical side of producing the veneer—the equipment, the skills and training, and the industry partnerships—and at the same time we're studying the market potential and broader economics. There's also the supply side—working with the communities to source the old coconut palms, and making sure they benefit from the process. Finally, we're also looking at uses for the soft core left behind after peeling. If we can find a use for that as well, the project will definitely be a win–win."

On the technical side, a major achievement in 2014 was the acquisition and modification

Old, non-productive coconut trees are a common sight in the Pacific islands—here near Savusavu in Fiji.
PHOTO: ALEX MARKHAM

PHOTO: GREGORY NOLAN

PHOTO: TONY BARTLETT

Measuring the thickness of the cocoveneer—Eric Littee of the Queensland Department of Agriculture and Fisheries with team members from Fiji's Department of Forestry.

of a lathe for peeling coconut stems, and its installation at the Timber Utilization Division's headquarters in Suva. Sourced from Malaysia, the 'spindleless' lathe was modified by project partners at the Queensland's Department of Agriculture and Fisheries, and shipped to Fiji. Demonstrations during 2014 drew a great deal of interest, and at least one commercial company in Fiji has already invested in a similar lathe, with several others expressing an interest.

At about US$60,000 for the basic unit, the lathes are affordable for small and medium processors, which is how industry growth is envisaged in the Pacific islands.

Ideas for the soft core include chipping it to use as packing material, or turning it into 'biochar', which can be used to improve soils. To explore this latter potential use, collaborative trials are underway with the ACIAR 'soil health' project (see page 24).

COCOVENEER MARKETS

At the other end of the value chain, the project is assessing the potential markets for cocoveneer and its products. Export markets are the most lucrative, and building these is an ultimate aim. A survey in Australia gave promising indications, with positive feedback from designers and architects who liked the colour and even grain of the cocowood. The wood has an 'exotic' appeal, and cocowood from other sources is already building a market in France, a country known for its sophisticated tastes. A less glamorous market is large cement projects, which need one very hard 'face' on the wooden frame used for pouring the cement—with rapid urbanisation in Asia, this could potentially be a very large market.

An additional marketing angle for Pacific cocoveneer and its products is its 'green' image. The clearing of old plantations will free up the land for more sustainable and profitable land uses, perhaps still including coconut palms but incorporating other fruits and food crops, and local communities will receive fair payment for the palms.

The next phase of the project, in June 2015, involves demonstrations of the entire process from harvesting of trees, to peeling trials by a commercial partner (an established plywood manufacturer) on Vanua Levu, and parallel composting trials with the residues. Project partners from Samoa and Solomon Islands will be there to witness the results, as well as many interested groups from Fiji and overseas.

"We still have a long way to go, and as with all experimental work there are many risks," Associate Professor Nolan says. "But if we can build a successful cocoveneer industry in the Pacific islands, there are potentially great benefits at all levels of the economy. We'd have finally solved the senile coconut problem and provided an incentive for renewal—that would be quite a result." ■

ACIAR PROJECT: FST/2009/062, Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific communities

MORE INFORMATION: Associate Professor Gregory Nolan, University of Tasmania, gregory.nolan@utas.edu.au

ADDING VALUE THAT COUNTS FOR SEA CUCUMBER FISHERS

An ACIAR project is spreading knowledge on improved processing of sea cucumbers and assessing the benefits for fishers and their communities

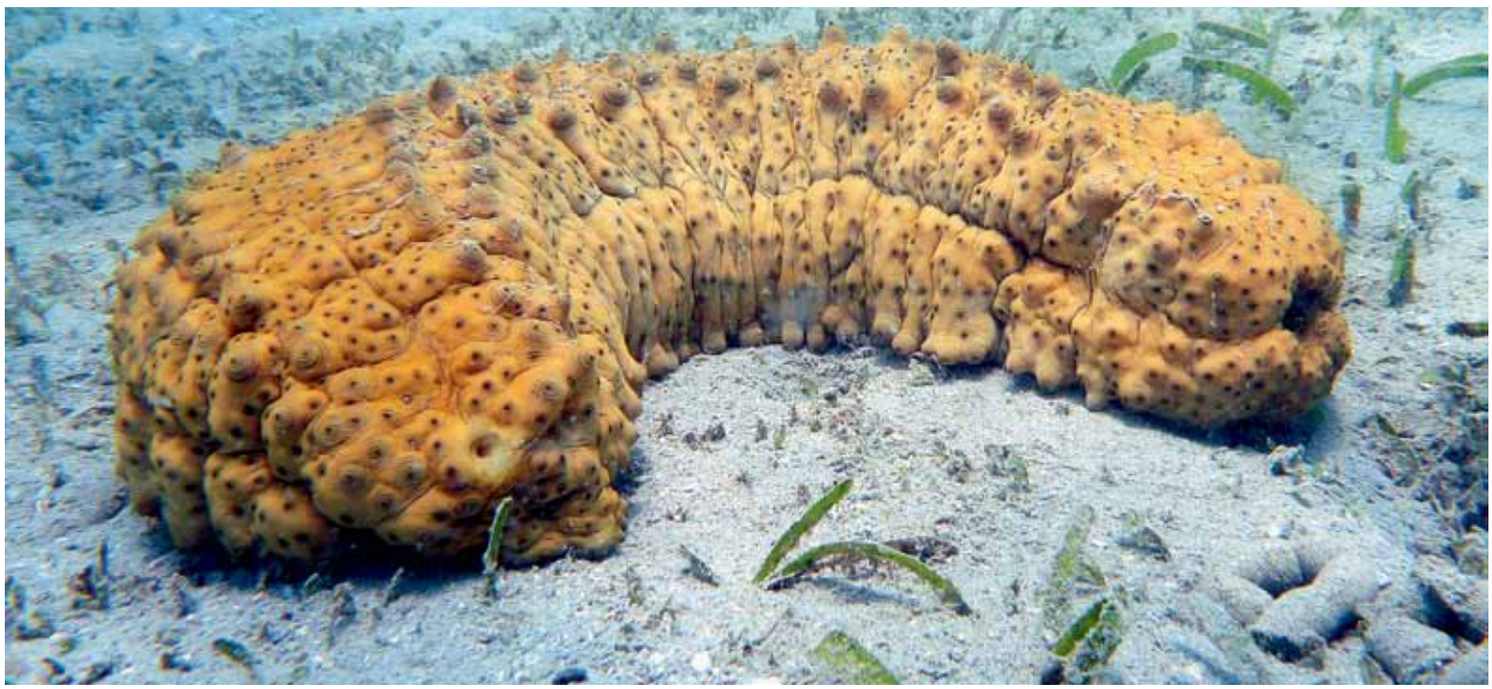


PHOTO: STEVEN PURCELL

BY **KATE LANGFORD**

The sea cucumber market is booming in many parts of Asia such as China (including Hong Kong), Vietnam and Malaysia. Every year, Pacific island countries export between A$20 million and A$50 million worth of sea cucumber, making it the second most valuable marine export from the region after tuna. Depending on the particular species and its size, dried sea cucumber (also known as beche-de-mer or trepang) can sell for up to A$1,000 per kilogram.

Dr Steven Purcell, a research fellow at Southern Cross University and a world expert on sea cucumbers, believes the 300,000 small-scale fishers in the western Pacific who collect and process sea cucumber from the wild could be earning a much larger slice of the profits from the industry.

One important factor that is limiting their returns is the quality of the processing. Poorly processed sea cucumbers fetch just a quarter to a half of the price of those that are properly processed. Particularly bad ones may fail to meet export standards and have to be discarded.

"In recent years, foreign traders have taken control of the sea cucumber market and artisanal fishers are missing out on making money from value-adding," Dr Purcell explains.

Dr Purcell is leading a four-year ACIAR-funded project in Fiji, Kiribati and Tonga that is working with national organisations to train village fishers on the best post-harvest handling and processing methods for sea cucumber to meet market preferences. The project will also evaluate how this new knowledge impacts on the livelihoods of fishers and their communities, and on the sustainability of the resource.

"Fishers on these islands have been collecting sea cucumbers for more than 100 years, but their knowledge of the processing techniques that will earn them the best price is very limited," Dr Purcell says.

A CHINESE DELICACY

Chinese dried seafood markets are where the majority of the sea cucumber that is harvested and processed in the Pacific will end up. The dried product is rehydrated and eaten for its health and medicinal benefits, and as a luxury food for banquets. In traditional Chinese medicine, sea cucumber is believed to have healing properties, especially for joint ailments, urinary problems and certain cancers.

Consumers prefer sea cucumbers that are straight, not damaged, have only a mild smell, are cut in the right way and are not covered in salt. If sea cucumbers meet these criteria, buyers are willing to pay a high price.

However, too often sea cucumbers from the Pacific are physically damaged or poorly preserved. In 2010, a scoping study carried out by ACIAR's Pacific Agribusiness Research for Development Initiative found that the prices received by fishers from exporters varied greatly within and among

regions, largely due to differences in processing quality. The study found that a high proportion of fishers were improperly cutting sea cucumbers, undercooking or overcooking them, burning them during drying, or using less-than-ideal salting and drying methods.

"The study helped to identify the various elements of the processing cycle that could be improved to better meet the demands of the Chinese market," says Dr Chris Barlow, ACIAR's research program manager for fisheries. "It also concluded that support to fishers in post-harvest processing would have a substantial impact because it is largely the fishers who are carrying out the processing."

The project is nearing the end of its first phase. A training manual and DVD have been produced in English, Fijian, Kiribati and Tongan, providing step-by-step instructions on best-practice processing techniques for the different species of sea cucumber. These new knowledge products have been used in village-based workshops with fishers and fisheries officers.

ASSESSING IMPACT

The second phase of the project is set to commence towards the end of 2015, when the research team will test the success of the training resources and their socioeconomic impact. They will look at whether fishers earn more income from applying the best-practice methods, how the income from higher selling prices is distributed and spent within families and communities, and what types of communities are benefiting most.

In related research, the impact of the improved processing methods on product quality and nutritional value will be evaluated by Fijian scientist Ravinesh Ram, who is the recipient of a John Allwright Fellowship funded by ACIAR to enhance research capacity in partner-country institutions.

The Chinese market for sea cucumber is growing and it is no longer consumed only by the wealthy. Increased demand has led to overexploitation in some areas and bans being imposed on the harvesting of certain species. Another element being investigated in this project is how improved knowledge about processing impacts on the fishing pressures on the resource.

With some fisheries clearly overfished, Dr Purcell says there is no better time to help fishers make the most of this valuable resource. He is hopeful that increasing awareness about how to get higher prices for sea cucumber will see fishers placing more emphasis on improving their processing and less on harvesting large volumes. Although there is a contrary argument that higher prices will result in higher rates of fishing, the scoping study found that fishers have little spare time to fish more.

PHOTO: SUPPLIED BY STEVEN PURCELL

Project leader Steven Purcell and friend.

PHOTO: STEVEN PURCELL

Traditional drying of sea cucumbers on Onotoa atoll, Kiribati.

PHOTO: STEVEN PURCELL

Sea cucumbers from the Pacific islands on sale in Hong Kong.

It is expected that at least 3,000 households in Fiji, Kiribati and Tonga will benefit from this project, with anticipated improvements in household revenues totalling about A$800,000 per year for the three countries combined. ■

ACIAR PROJECT: FIS/2010/096, Evaluating the impacts of improving postharvest processing of sea cucumbers in the western Pacific region

MORE INFORMATION: Dr Steven Purcell, Southern Cross University, steven.purcell@scu.edu.au

Spear fishing off Sandfly Island, Nggela, Central Province, Solomon Islands.

VILLAGES TAKE ON FISHERIES MANAGEMENT CHALLENGE

Coastal communities in Solomon Islands, Kiribati and Vanuatu are combining new and traditional approaches to safeguard their fisheries resources

PHOTO: PIP COHEN

BY **CATHERINE NORWOOD**

Even in the remotest parts of Solomon Islands, fishers in many of the small coastal villages are finding that fish are not as easy to catch as they used to be. It is harder to feed their families and have something extra to sell, and some familiar species have all but disappeared.

Fisheries resources are clearly in decline, and with fish providing more than 70% of protein in diets, this indicates a serious food security threat for the region. But for remote Pacific islands, and where resources to improve fisheries management are limited, it is difficult to find and apply solutions.

'Community-based fisheries management' may be at least part of the solution for the long-term management and protection of fisheries. This approach builds on customary fishing rights, and incorporates new scientific information to help communities become more effective stewards of their resources.

Community-based resource management has been practised in the South Pacific for more than 30 years, and during the past decade ACIAR and WorldFish have adopted and refined the approach to assist with fisheries management. Working initially in Solomon Islands, they have partnered with national and provincial governments, non-government organisations and almost 40 villages. In the latest three-year project, WorldFish and national partners are sharing the principles and lessons with another four communities in Solomon Islands, five communities in Kiribati and four in Vanuatu.

"Community-based fisheries management involves all the partners in the project working, managing and learning together—learning what the community priorities are, and which solutions fit best locally," explains WorldFish Pacific regional director Dr Neil Andrew. "It also means sharing lessons about fisheries management to help other small-island communities address fisheries management concerns, and regional and national priorities."

Protecting fisheries is critical to the food security of local communities, and to South Pacific nations as a whole, with a potential food security crisis looming in the next 15 to 20 years if fisheries resources continue to decline. Population growth and greater demands from global market economies are increasing the pressure on the fisheries.

Dr Andrew says that community-based management is not a simple approach, but in rural and remote communities building local stewardship is the most fitting solution.

'NO SET RECIPE'

WorldFish scientist Dr Pip Cohen leads the Solomon Islands component of the ACIAR project. She says there is no set recipe for successful community-based fisheries management, and not every community that takes it up is able to maintain it. Experience has shown that strong community leadership is essential, and only communities that have actively sought assistance have been involved in ACIAR projects. Villages have ranged in size from 25 to 150 households, or 150 to 1000 people.

It has also been essential to have some continuing framework of customary management practices. Customary practices commonly include the use of a 'tabu' or 'tambu' (the origin of the world taboo)—the closure of an area to fishing for a set period. In the past this was often put in place for 100 days or so, to allow fisheries resources to accumulate in preparation for a specific event, such as a community celebration.

This traditional practice is widely used throughout the Pacific and has been adapted as a valuable contemporary management practice, with an increasingly science-based rationale to support the timing, length of closure and the intensity of fishing during open periods.

Research has built a better understanding of the dynamic and complex interaction of marine resources with community needs. For example, the closure and reopening of a fishery is more likely to reflect changing pressures on local communities than ecological targets—today, as well as providing for a celebration, the need to raise funds for school fees or to build a health clinic might be reflected in the fisheries management.

"Or one fisher might decide to take a boat to the nearest fish market because he needs to raise money by selling fish, and other fishers then increase their own fishing efforts to take advantage of the opportunity to sell fish too," Dr Cohen says.

"Short-term priorities can, at times, outweigh a community's longer term aims to maintain fisheries resources for the future. Understanding where the balance is between short-term and long-term objectives is something we are trying to do, alongside the fishers themselves."

Catch from fishing off Vella Lavella Island, Western Province, Solomon Islands.

PHOTO: PIP COHEN

PARTICIPATORY ACTION RESEARCH

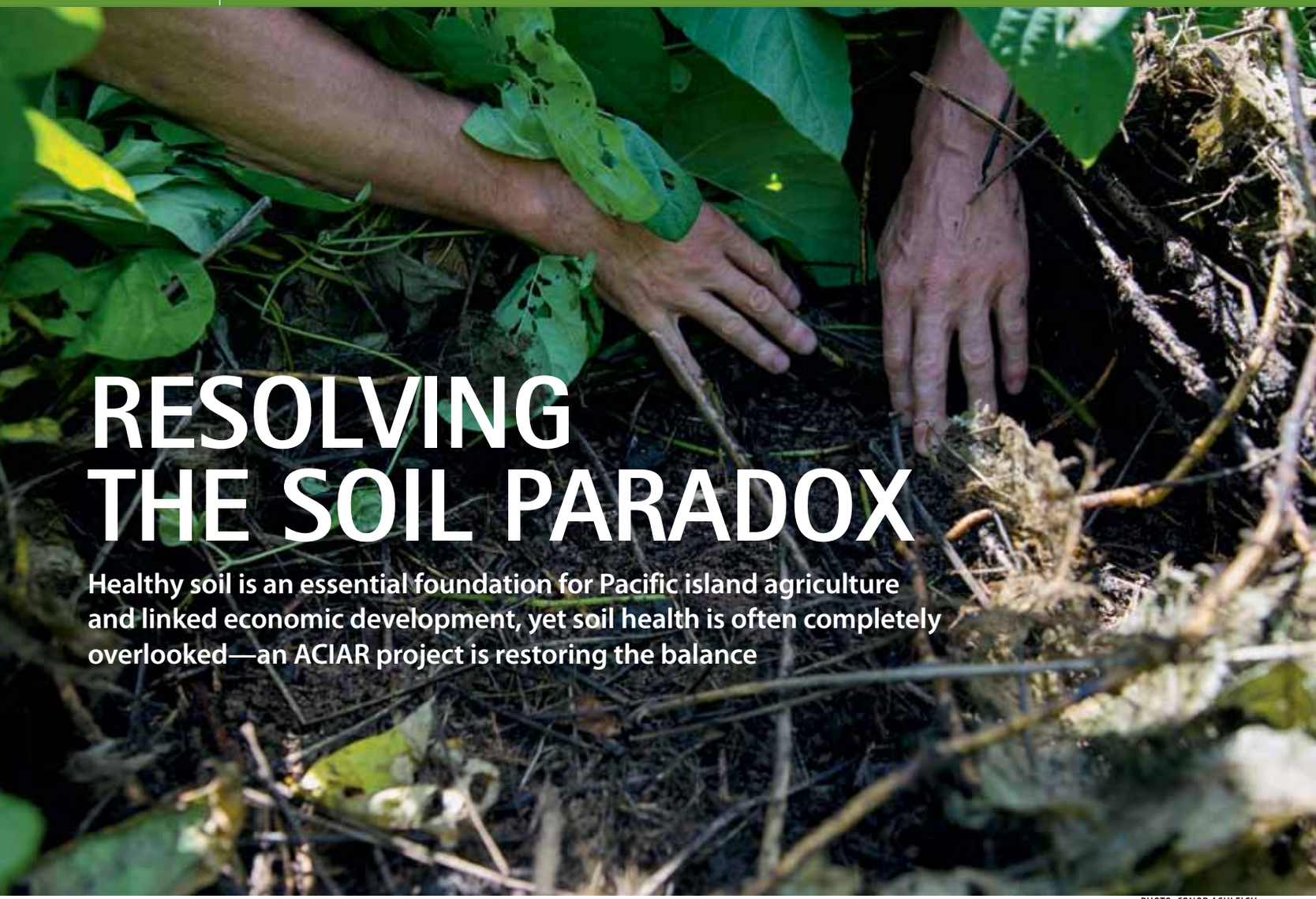
The local community and the project team work together to combine fishers' observations with quantitative approaches such as monitoring catch levels to make management decisions. Fishers provide information about how long it takes to catch a certain number of fish, or how many fish are caught within a specified period, the mix of species caught, and the size and weight of their catch. This information is combined with observations and information about breeding and life cycles of different species to determine which management practices will best meet the community's objectives.

Each community is different in terms of what it needs and wants its fisheries resources and management to deliver, and also in terms of broader context—habitats, access to markets and other development concerns. Reef communities might protect a specific commercial species such as giant clams with a temporary fishing ban to preserve a highly 'bankable' resource. In other regions where there are large areas of mangroves from which people harvest fish, shells and firewood, there may be a greater focus on protecting the mangrove habitat as part of fisheries management.

"The science around the biology and ecology of fish is often just a small part of community decision-making. Our research increasingly focuses on understanding local decision-making and how organisations such as WorldFish and ACIAR can prompt community-wide discussion and decision-making for fisheries, and for broader community development," Dr Cohen says. ■

ACIAR PROJECT: FIS/2012/074, Improving community-based fisheries management in Pacific island countries

MORE INFORMATION: Dr Neil Andrew, WorldFish, n.andrew@cgiar.org



RESOLVING THE SOIL PARADOX

Healthy soil is an essential foundation for Pacific island agriculture and linked economic development, yet soil health is often completely overlooked—an ACIAR project is restoring the balance

Mucuna growing in Taveuni soil.

PHOTO: CONOR ASHLEIGH

BY **ANNE MOORHEAD**

Looking at the lush tropical vegetation of the Pacific islands, it is easy to take the fertility of the soil for granted. But changing agricultural practices, and particularly more intense farming to meet commercial goals, are threatening this vital resource—as well as the goals themselves.

"Soil is our most neglected natural asset," says Dr Siosiua Halavatau, head of crop production and extension at the Secretariat of the Pacific Community (SPC) and leader of ACIAR's 'soil health' project. "We've coined the term 'soil security' because soil is such a vital underpinning factor for both food security and agricultural profitability."

In the Melanesian islands (Solomon Islands, Vanuatu and Fiji) farmers traditionally farmed a plot of land for a few seasons and then allowed the forest to grow back. The resulting 'bush fallow' restored soil organic matter and other vital nutrients. But commercial farming has meant rapid changes in farming practices, with the focus on supplying the markets in the short term rather than longer term sustainability. Farmers tend to plant the same crop, season after season, without realising that vital nutrients are being depleted—with disastrous consequences.

GETTING TO THE ROOT OF THE PROBLEM

Depleted soils can masquerade as a host of other problems, which can confuse both farmers and researchers. Dr Mike Smith of the Queensland Department of Agriculture and Fisheries describes an earlier ACIAR project that worked on Fijian ginger for the export market. "The project was set up to address problems of soil-borne diseases. As the research progressed, however, we realised that the underlying problem was the soil itself."

As soil organic matter is depleted, the natural microbial processes that assure the biological functions of a healthy soil—nutrient recycling and the biological control of pests and diseases—start to break down. The results that farmers noticed were root rots. The researchers diagnosed these as caused by fungi such as *Pythium*; they also found excessive numbers of nematodes, tiny worm-like creatures that attack the roots of crops, causing direct damage and reducing the uptake of nutrients.

The current soil health project built on the findings of the ginger project. Working in Fiji, Samoa and Kiribati, the project is using a 'participatory action research' approach to increase farmers' understanding of soil, soil processes and ways to maintain healthy soils.

On the island of Taveuni, the project is working with taro farmers who are supplying Fiji's export market, and who themselves realised that a crisis was approaching. Taveuni provides 70% of the country's exports of this crop, but as the farmers repeatedly cropped the land, the size of roots fell and the quality was failing to meet export standards. The farmers' first solution was to cut into the rainforest to reach more fertile soil, but they soon realised this was not the best approach. Instead, they formed a group called Tei Tei Taveuni, and looked to ACIAR and partners for technical and practical help.

When you are used to Mother Nature, in the form of bush fallow, taking care of the soil, it requires a complete change of thinking

PHOTO: CONOR ASHLEIGH

Malaki Vukinawanua, a senior technical assistant at the Fiji Ministry of Agriculture, who works closely with Tei Tei Taveuni farmer group.

PHOTO: CONOR ASHLEIGH

The chipper-mulcher in action.

PHOTO: RICHARD MARKHAM

Mike Smith (left) and Geoff Dean (second from left) help collect soil samples.

PHOTO: CONOR ASHLEIGH

Composting on the farm of one of the Tei Tei Taveuni member farmers.

for farmers to take responsibility for actively managing it themselves. The transformation in Taveuni began with 'Soil Schools', provided by Australian non-government organisation Organic Matters Foundation. Farmers learned about the ecological processing that occurs in healthy soil and were encouraged to experiment with organic fertilisers to maintain soil fertility on their farms.

ACIAR's project followed up with formal experiments, with farmers on their farms and on the island's research station, involving the researchers and extension workers of Fiji's Department of Agriculture. The project tested different combinations of purchased fertilisers and various forms of locally available organic matter to restore soil fertility.

"One of our key tactics, based on previous experience in Tonga and elsewhere in the Pacific, was the use of *Mucuna*, or velvet bean," explains Dr Halavatau. This vine can be planted after the harvest of the commercial crop and quickly covers the ground, smothering weeds. The plant also fixes nitrogen; when the *Mucuna* is cut back and dies, the nitrogen is released and, along with the abundance of organic matter from the remains of *Mucuna*, helps to nourish the growing crop.

The *Mucuna* fallow was a great success. After a single six-month fallow period, the majority of the taro roots in the subsequent crop were restored to export size and quality. The root rots that had plagued the exporters were substantially reduced, and nematodes were also reduced below damaging levels. The benefits continued to accrue with subsequent cycles of crop and fallow.

A TOOLBOX OF OPTIONS

Maintaining healthy soils needs a toolbox full of options, which farmers can draw on and adapt for their own conditions and needs. Having gained a basic understanding of soil processes, the farmers of Taveuni are enthusiastically trialling different ways to improve their soils, some new ideas, others based on traditional practice. Chipper-mulcher machines provided through co-funding from Australian aid are allowing the farmers to reduce wood and coconut husks to useful mulch and soil amendments. Also thanks to the Australian aid grant, farmers are experimenting with 'biochar'—coarsely ground particles of charcoal that last for years in the soil, trapping nutrients and releasing them to crops over an extended period. The farmers are also trialling by-products from the ACIAR cocoveneer project (see page 18).

Australian volunteer Geoff Dean, from the University of Tasmania, has worked closely with Taveuni's farmers, helping and encouraging them to experiment with different materials. "The more we understand about the soil, the needs of the crop and the properties of various organic materials available, the more options farmers have for tackling their soil fertility problems," he says. As well as trialling composts, lime, fish wastes and ash from cooking fires, Mr Dean has encouraged farmers to experiment with the abundant seaweeds that wash up on the shores of Taveuni.

The sea is always part of life in and around the Pacific Ocean. Some of the ideas for the 'soil-health' approach originated in Queensland, where researchers and farmers were concerned by negative impacts on the Great Barrier Reef caused by the run-off of fertilisers and eroded soil from intensive agriculture, in this case from the banana industry. Some of the benefits may now come back to Queensland, if ground covers and other soil-health measures can help to provide a solution to the emergent Panama disease problem, caused by another widespread soil-borne fungus, *Fusarium*. Meanwhile, in the Pacific islands, the soil health team are going on to focus on the unique challenges of atoll agriculture in Kiribati and Tuvalu in a major new project. ■

ACIAR PROJECT: PC/2009/003, Improving soil health in support of sustainable development in the Pacific

MORE INFORMATION: Dr Siosiua Halavatau, Secretariat of the Pacific Community, siosiuah@spc.int

THE ACIAR–USP POSTGRADUATE SCHOLARSHIP SCHEME

Bringing the Pacific's best young minds to bear on the region's agricultural development challenges

BY **ANNE MOORHEAD**

Agriculture, forestry and fisheries have sustained rural and coastal communities in the Pacific since time immemorial and still form the backbone of most Pacific island economies. However, it is a modern tragedy—and a serious challenge for the economic development of the region—that working in these sectors is held in low regard by many young people today.

To compete in the global marketplace, Pacific agribusinesses need to be 'smart' and innovative, developing unique products and finding new places and ways to market them. Yet the young people who could provide this infusion of new ideas, energy and enthusiasm are 'voting with their feet': they are leaving the rural areas, getting out of agriculture and in many cases leaving the islands altogether.

ACIAR is working to reverse this 'brain drain'. Most ACIAR projects include a training component, imparting technical or business skills at various levels—in farms and other businesses, in government research organisations and extension services, and in specialist agencies such as biosecurity services. However, as an organisation that believes passionately in the value of research in agricultural innovation and economic development, ACIAR has placed special emphasis over the past five years on supporting problem-solving research at postgraduate level.

In 2008, ACIAR launched its postgraduate scholarship scheme at the University of the South Pacific (USP) by awarding scholarships to six exceptional Pacific islanders, three women and three men, to study for master of science (MSc) and postgraduate diplomas (three of each). One candidate was obliged to defer his studies but the others have already gone on to considerable achievements. The three MSc students in fisheries exemplify particularly vividly the kind of outcomes that ACIAR hoped to achieve: Marilyn Vilisoni and Pranesh Kishore both studied different aspects of oyster culture for their theses and both went on to contribute to the development of the pearl industry in their home country, Fiji. Mr Kishore is now involved in his third ACIAR-funded pearl project and is currently studying for his doctorate in Australia under a John Allwright Fellowship. The third MSc candidate, Shalini Singh, worked on prawn aquaculture for her thesis and is now a lecturer in the Fisheries Department at Fiji National University, where she is imparting her knowledge and enthusiasm to a new generation of students.

In the following years, as part of Australia's increased engagement in the Pacific under the 'Food Security through Rural Development' initiative, ACIAR increased its allocation to the USP scholarship scheme, first to A$200,000 per year, and then to A$500,000 per year for the four years 2011 to 2014. Over this period, an additional 38 scholarships were awarded at postgraduate diploma level, 33 at MSc level and five for PhD studies. Many of these students have gone on to make tremendous contributions, to ACIAR projects and to their national organisations and industries—not just in fisheries and aquaculture but also in horticulture and agribusiness in general.

The USP campus in Suva, Fiji.

PHOTO: ANNE MOORHEAD

PHOTO: SUPPLIED BY PRANESH KISHORE

PHOTO: RICHARD MARKHAM

Building capacity in pearl research and development: Pranesh Kishore (far left, with pearl project colleagues) and Marilyn Vilisoni (far right) both received MSc scholarships in 2008 and studied aspects of oyster biology, in association with ACIAR projects, for their thesis work. Both went on to work with Fiji's leading pearl farmer Justin Hunter (second from right) and with ACIAR pearl projects. Mr Kishore is now studying for his PhD under ACIAR's John Allwright Fellowship scheme.

PHOTO: RICHARD MARKHAM

Contributing to national government research and extension capacity: Ami Sharma (centre) and Rohit Lal (right) both work for Fiji's Ministry of Agriculture, Mr Sharma in the analytical services laboratory of the research division, Mr Lal in the extension division on Taveuni island. Both received first a Postgraduate Diploma Scholarship to refresh their academic skills and then an MSc scholarship to conduct field research with ACIAR's 'soil health' project. Here they are working with one of the collaborating farmers to prepare taro planting material for a field experiment.

PHOTO: RICHARD MARKHAM

Building research networks across the region: Pitakia 'Pita' Tikai (right) received a scholarship in 2010 to conduct MSc thesis research in association with an ACIAR sweetpotato project in Solomon Islands. He has subsequently worked with the World Vegetable Centre on an ACIAR project that is helping farmers around the region to grow high-value vegetables more successfully. Here he works with farmers near Honiara to evaluate new varieties of tomato and multiply seed of the most promising ones.

PHOTO: SUPPLIED BY SHALINI SINGH

Training a new generation: Shalini Singh conducted her MSc thesis research on freshwater prawns in 2009–10, in the context of an ACIAR aquaculture project. She is now a lecturer at Fiji National University, where she served as the head of the Department of Fisheries from 2012 to 2014, and is inspiring more young women and men towards a career in research and development.

LESSONS LEARNED

ACIAR has learned many lessons along the way. The need for a thorough orientation to USP, to postgraduate study and the ACIAR scheme in particular, was perhaps an obvious one. Many students found the support provided by the full-time graduate assistants employed by the scheme to be invaluable in negotiating the challenges of student life.

The students studying at the School of Agriculture and Food Technology at Alafua in Samoa benefited especially from the 'mentoring' generously provided by a researcher and semi-retired academic of long experience, Professor Robin South (himself the leader of an ACIAR research activity on adding value to aquaculture products). The students themselves asked for—and received through the scholarship scheme—some additional workshops on key skills: experimental design and statistical analysis, for instance, and scientific writing.

ACIAR will apply these and other lessons in designing the next phase of the scholarship scheme, planned to continue with the coming academic year (2016). A new idea under discussion is to support the 'twinning' of USP with an Australian university for the exchange of experiences—and perhaps staff and students as well. ACIAR will also be looking for innovative ways to bring more students into some fields where recruits are badly needed, such as agribusiness and agricultural economics, food processing and forestry.

Above all, what students, university supervisors and ACIAR researchers involved in the scheme applauded as a unique feature (and one that will certainly continue) was the opportunity it has given the students, as an integral part of their degree-related research, to gain hands-on experience. This included both the challenges and satisfaction of conducting problem-solving research as part of a multidisciplinary and multicultural team, addressing the development needs of their country and region. For the future of the Pacific islands, it is very much hoped that these gifted young people will continue to exercise their newly gained skills with energy and enthusiasm—and infect the next generation of agricultural researchers and innovators with the same passion. ■

MORE INFORMATION: Dr Richard Markham, horticulture research program manager, ACIAR, richard.markham@aciar.gov.au

Destruction on Tanna island following Cyclone Pam

PHOTO: PHILIPPE MÉTOIS

RESILIENCE IN ACTION

VANUATU AND CYCLONE PAM

ACIAR's projects in Vanuatu took a pounding from Cyclone Pam in March 2015; now being restored, they also have a key role to play in the nation's recovery

BY **ANNE MOORHEAD**

Cyclone Pam struck Vanuatu on 13 March 2015 at category 5 intensity—the highest on the scale—and caused one of the worst natural disasters in the country's history. Vanuatu's National Disaster Management Office and regional disaster relief agencies put emergency plans into action, and the low loss of life attests to their 'preparedness', but there was, inevitably, a massive amount of damage on the islands that lay in the cyclone's path. Here, we look at how ACIAR's projects in Vanuatu fared and their role in the country's recovery process.

"We think about risk, but mostly in the abstract," says ACIAR horticulture research program manager (RPM) Dr Richard Markham. "When something like Cyclone Pam happens, we have to address the reality." During project design and development, RPMs carry out a risk assessment on proposed projects, identifying potential risks and strategies to manage the risk wherever possible. In the Pacific, tropical cyclones are up near the top of the risk list—but the harsh reality is that it is hard to mitigate this particular risk.

Damage to infrastructure is unavoidable when a category 5 cyclone passes overhead. Reports from ACIAR's aquaculture project in Vanuatu are of loss of the hatcheries and equipment in the capital Port Vila and on the island of Espiritu Santo. Broodstock of the main aquaculture species tilapia and freshwater prawns was destroyed. In another fisheries project, communities involved in the coastal resource-management project lost fishing equipment, boats and canoes.

"Natural disaster recovery is not our normal mandate, but where loss of facilities impacts on project implementation, then it can be within ACIAR's charter to respond," says Dr Chris Barlow, fisheries RPM. As a starting point, project partners on the ground have been assessing damage to project infrastructure and, with the RPMs, identifying priorities for ACIAR assistance, taking into account other partners in the recovery and rehabilitation effort.

For the aquaculture project, ACIAR's priority is to support repairs to the hatchery facility in Port Vila. Robert Jimmy, aquaculture adviser at the Secretariat of the Pacific Community (SPC), explains that this is critical not only to restoring project activities, but also to addressing national food security in the medium term. "The hatchery is the main facility supplying tilapia and prawns for aquaculture across the country. After a disaster such as this, aquaculture takes on a more important role as a food source, because other options have been destroyed."

RECOVERING STABILITY

In the immediate aftermath of a cyclone, social and economic systems are destabilised along with natural systems. Crop plants may have been

PHOTO: PHILIPPE MÉTOIS

Aftermath of the cyclone in the Blacksands area, close to Port Vila.

PHOTO: PHILIPPE MÉTOIS

Defoliated trees on Tanna island.

destroyed but some—notably root crops—are still good to eat. Left in the waterlogged ground they will rot, so farmers quickly harvest them. Combined with food aid, this can result in a food glut immediately after the crisis. Food shortages then become a reality weeks or months later.

"For this reason, medium-term recovery is vital," Dr Markham says. "That's why it's so important to get projects such as ours back up and running as soon as possible. The industries we are supporting are part of the economic and social resilience of the country, and of the communities."

ACIAR's cocoa project in Vanuatu provides a good example. The project is working with smallholder cocoa farmers on some of the outer islands to improve the quality of their cocoa beans, and to link them with high-value chocolate markets overseas. The Alternative Communities Trade in Vanuatu (ACTIV) Association is a key partner based in the capital Port Vila, assisting with export of the cocoa as well as running a small chocolate-making operation to demonstrate the final product and supply a small domestic market.

Assessment post-cyclone found damage to seedling nurseries, sheds and equipment such as solar dryers, and to the trees themselves. Many farmers also lost their stores of processed cocoa beans, which were waiting for shipment to Port Vila—and represented their next 'pay cheque'. The immediate ACIAR response is to support repairs and replacement of lost equipment and nurseries. Most of the cocoa trees are likely to survive and, ironically, to thrive in the coming months as a cyclone provides a severe pruning, which usually leads to a flush of flowering. "If the trees recover as expected, and we can give a helping hand with repairing dryers and other processing equipment, then the farmers should have regular income again within a few months," Dr Markham says.

However, as Sandrine Wallez of ACTIV points out, in the meantime her cocoa suppliers on the outer islands face real hardship. One strategy that SPC is investigating, as part of the recovery effort, is some form of group insurance scheme. Insurance is taken for granted in prosperous countries such as Australia as a vital part of post-cyclone recovery but is hard to organise for Pacific island smallholders and rural communities—who arguably need it more.

To reduce loss and damage in future events, the project team is also considering introducing a simple technology that has proven practical and effective as a cyclone-resilience measure—shipping containers. "They are strong and heavy and can be waterproofed, so anything inside them should stay safe even in a category 5 event," says Dr Markham. ACTIV Association's offices and chocolate factory in Port Vila have been built around modified shipping containers, and although there was damage to the external decks and roofing, the equipment inside remained intact through the cyclone. Installed in the villages, they could protect stored cocoa beans and small equipment, as well as household valuables and even people.

The impact on forestry on the islands of Vanuatu that were hardest hit by Cyclone Pam was variable depending on the species of tree and the location in which they were growing. "While all trees are vulnerable to extreme cyclone conditions, in less severe conditions some species are inherently more resilient than others; for example, they may lose their leaves but sustain little damage to the main trunk and branches so that they can recover," says Tony Bartlett, forestry RPM. These are important considerations for farmers when deciding what species to use for plantations in cyclone-prone countries. Often, though not always, native trees show more resilience.

ACIAR has three forestry projects in Vanuatu that all focus on high-value native trees—one works on genetic improvement of whitewood and sandalwood, another is developing value-added products for nangai (canarium) nuts, while the third is concerned with adding value to whitewood trees grown by farmers. Fortunately most of the long-term forestry trial sites, which are mainly located in northern Vanuatu, did not suffer serious damage. In the south the biggest damage is to the tree nursery facilities and solar dryers that farmers use to dry nangai nuts.

NEXT STEPS

Based on these ideas, ACIAR is working with SPC and other project partners to develop and implement a six-month project to support the rehabilitation effort. The investment will focus on repairing research facilities and restoring infrastructure at community level that will help to get key industries back in action—hatcheries and nurseries, boats and fishing equipment, chainsaws and pruners, new covers for solar dryers and new roofs for stores.

"Thereafter, we plan to get back to our normal business—with renewed focus and energy," declares ACIAR's CEO, Dr Nick Austin. Projects scheduled for launch during 2015–16 include a new initiative to bring smallholder farmers into the beef supply chain, another to use agroforestry to protect watersheds while boosting community incomes, and the next phase of market-oriented cocoa development. Sometimes a calamity like this can remind the research-for-development community of its mission, and what resilience means in practice. ■

ACIAR PROJECTS: FIS/2012/074, Improving community-based fisheries management in Pacific island countries
FIS/2012/076, Improving community-based aquaculture in Fiji, Kiribati, Samoa and Vanuatu
HORT/2008/046, Rehabilitating cocoa for improving livelihoods in the South Pacific
PRA/2011/01, Facilitating improved livelihoods for Pacific cocoa producer networks through premium market access
PRA/2010/003, Developing markets and products for the Pacific island and PNG canarium nut industry
FST/2012/042, Enhancing management and processing systems for value-adding in plantation-grown whitewood in Vanuatu
FST/2008/010, Development and delivery of germplasm for sandalwood and whitewood in Vanuatu and northern Australia

MORE INFORMATION: Dr Chris Barlow, fisheries research program manager, ACIAR, chris.barlow@aciar.gov.au

ACTIV Association's building is constructed around a shipping container, visible on the right. (This photo was taken before the cyclone.)

PHOTO: CHERREE WEBECK

Phonesavanh Latmany, or Ki, is our new assistant manager for the Lao PDR Country Office.

NEW APPOINTMENT

Welcome Ki

Phonesavanh Latmany, or Ki, is our new assistant manager for the Lao PDR Country Office, which also covers the Burma, Cambodia and Thailand region. Ki comes to ACIAR from the Development Cooperation Section in the Australian Embassy in Lao PDR, where he managed the Rural Development Program. Prior to that, he worked for the International Center for Tropical Agriculture as a research assistant based in Lao PDR. His qualifications include a Masters of Environmental Management (first-class honours) from the University of Auckland, New Zealand, and a Master of Agricultural and Resources Economics degree from Kyushu University, Japan. Ki has completed two master's theses: one looking at farmer adaptation to climate change and variability in lowland areas and the other on farm mechanisation in upland areas.

NEW VIDEOS

- ACIAR's John Dillon Fellows met with John Dillon's family while visiting Canberra: https://youtu.be/_9VD4lre-ig
- John Dillon Fellow Fredah Wantum reads 'Maria's Family' books to Australian preschoolers: https://youtu.be/nQekpl3gVxY

PHOTO: RICHARD MARKHAM

Intensive agriculture on the north coast of Viti Levu, Fiji.

NEW PUBLICATIONS

For details on ACIAR's scientific publications series and corporate publications please visit: http://aciar.gov.au/publication/latest

CORPORATE PUBLICATIONS

Position paper—ACIAR's engagement with the private sector
http://aciar.gov.au/node/24828

SCIENTIFIC PUBLICATIONS

Adoption of ACIAR project outputs 2014
http://aciar.gov.au/publication/as011

Planted teak: global production and markets, with reference to Solomon Islands
http://aciar.gov.au/publication/tr085

PHOTO: RICHARD MARKHAM

Preparing taro for export from Fiji.

SOURCE: SCOPE GLOBAL

The three volunteers: (from left) Alex Basford, Luke Barron and Randal Toonen.

Volunteers set sail with Scope Global

In May 2015, ACIAR and Scope Global mobilised our first three volunteers under our strategic alliance. The volunteers are part of the Australian Volunteers for International Development program, an Australian Government initiative.

Two volunteers, Luke Barron and Alex Basford, will be working on the 'From Fishing Village to Aquarium' project with MARS Symbioscience in Indonesia. The volunteers will establish a network of sustainable fish production units, small enough to manage at home, to supply the global aquarium market with ornamental fish. This will provide economic opportunities to local communities, while reducing pressure on native stocks, ameliorating the devastating effects of cyanide fishing and allowing coral reef rehabilitation to take place.

Randal Toonen will be heading to Kiribati on the 'Healthy Gardens in the Pacific' project. Randall will be working with local communities and looking for opportunities to pilot agricultural innovations to improve the health of both soils and people in Kiribati. Through projects such as home and school gardens, and linked awareness-raising programs to promote the production and consumption of leafy vegetables, Randal and future volunteers on this project will have the opportunity to make a huge impact on health in Kiribati.

ACIAR and Scope Global wish our volunteers successful and enjoyable experiences through their placements.

Information about international volunteering with Scope Global can be found through its website: www.volunteering.scopeglobal.com/assignments

Partnerships for food solutions in Kiribati: volunteering in action

BY **RANDAL TOONEN**

Kiribati is a small, remote island state in the Pacific region that is doing it tough. In particular, poor soil quality associated with dramatic climatic events such as droughts and increasing salination of groundwater have led to meagre food production in much of Kiribati.

My partner and I have been posted here with the Australian Department of Foreign Affairs and Trade for the past eight months. As a trailing spouse, I have had the time to pursue my personal interests in community-based agriculture. Numerous people have warmly invited me to view their small garden plots, hidden gems among the densely populated communities of the capital Tarawa. Their crops are generally sold, rather than consumed, to generate what is at times their sole source of income. This can further impact on an often already poor diet, when processed goods are bought to replace the fresh produce. In the outer communities, land is more abundant but subject to harsh growing conditions, which has a direct negative impact on families' health and wellbeing. This cemented my resolve to become involved.

I am passionate about working with families at the community level to help bring about positive, lasting changes. I am volunteering with Australian Volunteers for International Development (AVID) in a joint venture with ACIAR to assist the host organisation, Ministry of Environment, Lands and Agriculture Development (MELAD), to address food security. The initial part of my assignment at MELAD will be to identify organisational strengths and limitations in developing and implementing food-security strategies to best feed hungry families and build the host organisation's capacity. While I am the first volunteer working on this project, it is likely to be a longer-term partnership between AVID, MELAD and ACIAR, with the possibility of future volunteer positions.

I look forward to the challenges ahead and working with a team of people motivated in supporting others towards a positive change.

PHOTO: RANDAL TOONEN

PHOTO: RANDAL TOONEN

Hydroponic garden in Kiribati Islands using hollowed out pandanas trunks and a liquid solution made from compost. (Right) Sekoia prepares coconut on the island of Onotoa, southern Kiribati islands.

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Stallholders in Savusavu Market, Fiji.

PHOTO: CONOR ASHLEIGH

ACIAR'S VISION

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved, through more productive and sustainable agriculture emerging from collaborative international research.

The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission 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. It also administers Australia's contribution to the International Agricultural Research Centres.

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Front cover: Waisake Bole examines young breadfruit trees. Waisake, a trained nurseryman, worked with the ACIAR breadfruit project in Fiji, supporting propagation trials and training activities. He is now running his own nursery full time.

PHOTO: CONOR ASHLEIGH