



# ANNUAL REPORT 2012-2013



Australian Government  
Australian Centre for  
International Agricultural Research

**PARDI**

# Report Details

project	Pacific Agribusiness Research for Development Initiative (PARDI)
project number	PC/2008/044
period of report	1 June 2012 to 30 May 2013
date due	31 <sup>st</sup> May 2013
date submitted	30 May 2013
prepared by	Assoc. Prof. Steven Underhill (The University of Queensland)

## co-authors/contributors/collaborators

Mr Craig Johns (University of Adelaide)  
Prof. Paul Southgate (James Cook University)  
Dr Richard Beyer (PARDI Advisory Group)  
Dr Elio Jovicich (DAFF Qld)  
Mr Tim Martyn (Secretariat of the Pacific Community)  
Dr Anand Chand (University of the South Pacific)  
Prof. Robin South (University of the South Pacific)  
Prof. Helen Wallace (University Sunshine Coast)  
Mr Shane Dullahide (The University of Queensland)  
Prof. Randy Stringer (University of Adelaide)  
Ms Valerie S. Tuia (Secretariat of the Pacific Community)

# Contents

01.	Progress summary	<b>4</b>
02.	Achievements	<b>11</b>
2.1	Achievements against activities and outputs/milestones	<b>12</b>
2.2	Project contribution to the Australian Aid Program	<b>28</b>
03.	Impacts	<b>29</b>
3.1	Scientific impacts	<b>29</b>
3.2	Capacity impacts	<b>34</b>
3.3	Community impacts	<b>35</b>
3.4	Communication and dissemination activities	<b>36</b>
04.	Training activities	<b>42</b>
05.	Intellectual property	<b>43</b>
06.	Variations to future activities	<b>44</b>
07.	Variations to personnel	<b>45</b>
08.	Problems and opportunities	<b>46</b>
09.	Budget	<b>47</b>

## Background

PARDI activities are based on eleven commodity-focussed research projects, a series of integrated market and consumer studies and targeted agribusiness/supply chain support initiatives. Our commodity-based research projects were identified and developed as a consequence of rapid supply chain reviews conducted in the first 12 months of the project, informed stakeholder consultation, and investment priorities (best-bets) identified by ACIAR. Most of our resultant portfolio of crops, fisheries and forestry research projects are Pacific-led (six projects) and all have a common agribusiness element.

The point of difference with the PARDI model is an integrated approach based on learning and expertise being shared across projects, ongoing market and consumer supply chain research used to refine research effort and strengthen industry application and adoption, and a strong partnership approach with concurrent donor initiatives (such as PHAMA and other ACIAR projects in the region).

## Key achievements

PARDI research achievements are listed below according to key activities and sectors. Copies of PARDI publications, reports, newsletters and e-news are available on-line: <http://www.spc.int/lrd>

### Capacity building

- Building on the effort of previous years, there has been an increased focus on regional capacity building. PARDI projects have undertaken 16 technical training workshops<sup>1</sup> in the last 12 months, with the Tamarind and Breadfruit linked workshops involving significant community engagement (101 villagers in Vanuatu- Tamarind; and 116 villagers in Fiji - Breadfruit).
- We have placed particular priority on capacity building those within the Pacific agri-supply chains most likely to drive long-term efficiency gains (28 industry and Government stakeholders<sup>2</sup> are currently receiving support).
- There are a further 17 higher degree students<sup>3</sup> linked to PARDI projects (the majority of students from the Pacific).

### Supply chain and market studies

- In the last 12 months, the University of Adelaide in partnership with the University of the South Pacific and Pacific Island Government Ministries and Departments of Agriculture, have undertaken three major consumer and market place studies in Fiji, Vanuatu and Solomon Islands.

<sup>1</sup> A list of specific PARDI capacity building workshops held in the last 12 months is included in section 4.

<sup>2</sup> A list of names is included in section 3.2

<sup>3</sup> A list of HRD students receiving PARDI supervisory support is included in section 3.2

## 01 Project summary continued

1. Retail transformation market study in Fiji – 1000 households.
2. Vanuatu tourist consumer research study for canarium and chocolate products – 400 tourists.
3. Solomon Islands teak supply capabilities and global market analysis is well advanced.

These targeted market studies not only directly support concurrent PARDI-commodity projects (high-value vegetable crops, cocoa, pearl handcraft, and canarium nut), but provide important information on domestic markets and underlying consumer purchasing behaviour (including the high-value tourist markets). For example, the recently-completed Fiji Retail Transformation Study involved surveying 1000 urban Fijian households and all major Fiji food retailers, processors and hotels/resorts, thus identifying valuable insights into the hotelier and resort food purchasing. This information is now being used in our USC-led vegetable project to assist its objective to better connect smallholder farmers to the hotel/resort market. Data is currently being analysed for this work and when complete, reports will be uploaded onto the PARDI website.

- PARDI and staff from the Scientific Research Organisation of Samoa (SROS) recently (Dec – May 2013) undertook a large market-based consumer-acceptance study of selected varieties of Taro amongst Samoans living in Auckland, New Zealand. This work is part of wider effort to assist in the re-building of the Samoan taro export industry. Assessing consumer acceptance and taste preferences of new varietal taro lines is essential information in support of the ongoing Samoan taro breeding program. To create added capacity building outcomes, training in product sensory evaluation was also provided to SROS staff.



Taro consumer taste panel evaluation

- PARDI has continued to work with cocoa value chain stakeholders in Vanuatu and the Solomon Islands. The collaboration has so far expanded to include the Vanuatu Statistics offices, two new chocolate importers in Australia, PHAMA and facilitation for an annual Vanuatu Cocoa Industry Strategic Workshop. Following PARDI support of a business case, market analysts of tourists and local capacity building, AusAID and DFAT staff visited the cocoa lab in Port Vila (with representatives of Australian Foreign Minister) and have agreed to provide funds for chocolate factory in Vila before the end of the financial year.

### **PARDI-led cocoa capacity building activities:**

- Support for the Cocoa Industry Strategic Workshop (in partnership with the Pacific Horticultural and Agricultural Market Access Program – PHAMA.)
- Capacity building for the Vanuatu Bureau of Statistics on tourist surveys and specific producer survey techniques.

## 01 Project summary continued

- Business linkages (assisting with niche market Australian and US-based chocolate manufacturers, cocoa exporter training visits to Singapore, initial linkages with Carnival Group to discuss potential collaboration, market linkage to established chocolate retail outlets in Australia and Singapore)
- Technical training – chocolate making training, assessment for quality testing capacity in Vanuatu and the Solomon Islands, facilitated chocolate tasting session for six grower groups on the islands of Malekula and Epi.
- Completed 500 household cocoa producer surveys on Malekula, focusing on adoption practices related to production, processing and track and trace systems.



Cocoa growers discussing trail chocolate samples

### Commodity-specific PARDI research projects - Pacific Crops

- **Breadfruit.** Research trials and infrastructure associated with the PARDI breadfruit project were significantly impacted by severe flooding in Fiji in early 2012. While recovery efforts dominated much of last year, 2000 root suckers and marcotts are now ready for field trials and orchard development. Recent fieldwork in Cakaudrove Province has enabled the characterization of 20 breadfruit varieties and the establishment of four village-based breadfruit nurseries. The project team have now developed 24 characterization sheets for breadfruit trees in line with the “FAO-IPGRI multi-crop passport descriptors”. Based on this characterisation work, a breadfruit fruiting pattern calendar has been developed. The SPC-based Centre for Pacific Crops and Trees - CePaCT has released nearly 200 tissue cultured trees to be utilised in project trials. Three orchards have been established and intercropping trials have commenced. Two more sites have been identified and are being prepared for planting. Two orchards have now been established in Nadi area and one on Seqaqa research station on Vanua Levu. A further two sites in the Ba area are about to be developed. A total of 350 trees have been planted in orchards.

In March 2013, the PARDI Breadfruit project team also visited the national breadfruit collection held at the Vanuatu Agricultural Research and Technical Centre (VARTC) in Santo and surveyed the Breadfruit varieties in Malo Island. An in-depth investigation on the characterization methodology used in Vanuatu was undertaken, including documentation and comparison of current husbandry practices, breadfruit diversity and local varieties and fruiting patterns with those used in Fiji.



Mrs Mackenzie (middle) with Dr Roger Malapa and Kaitu at Santo.

- **Taro.** CePaCT has continued working on taro virus indexing and elimination, in support for the Samoan TLB breeding program. Production of planting material for the research continues. Two virus-elimination methods have been selected, namely *meristem culture* and *heat therapy*.

## 01 Project summary continued

These two methods have already proved effective to eliminate some TaBV and DsMV infecting C7 taros. The research will start in June and will focus on 15 to 20 different accessions of C7 line. There has been some success with *Xanthosoma sp.* using 38°C for 16h (light) and 28°C for 8h (no light). Most of Samoan breeding lines have been virus tested. Of interest is the cycle 7, but all are infected with *Taro badna virus* (TaBV). SPC will continue virus indexing of the Samoan breeding lines, especially the new ones that come in from cycle 8.

The Samoan component of the project implemented by SROS has now established field plots. Plant agronomic assessments are being undertaken monthly, with soil tests on selected soil parameters almost completed. Corms will be harvested from all 13 taro lines at 5, 6 and 7 months after planting via sequential harvesting to determine the optimum month for harvesting of each taro line using sensory evaluation results as verifiable indicators. Further sensory evaluation work simulating the export value chain of fresh and frozen corms will be conducted in collaboration with MAF and USP to assess four selected cycle 7 taro lines against the two promising taro varieties (Maagiagi and Tanumalala). These lines were identified during the recently-completed consumer studies in Auckland New Zealand.

- **Vegetables.** This project seeks to improve smallholder vegetable farmers (Fiji and Solomon Islands) access to high-value domestic markets through the development of a participatory guarantee scheme (PGS). Two target resort partners (Warwick Resort and the Shangri-La Fijian Resort) and four core PGS grower groups have been identified (with a further four affiliated grower groups also involved). An industry stakeholder workshop was held on November 2012 in Sigatoka to provide preliminary PGS training, present market insights, initiate dialogue between hoteliers and growers, and build consensus on how to establish a PGS model between growers and buyers. In terms of staff working on this project, a suitable replacement for Ms Suzanne Neave has not yet been identified. Mr Mua Vamarasi has been appointed to replace Raju Govind.



Workshop participants visit a local hotel to see how vegetables are handled to understand specifications needed to produce high-quality food.

An assessment of postharvest loss and associated contributing factors has been undertaken for the west-bank Sigatoka PGS farmer groups (east-bank grower analysis will occur in late July). Most of the current postharvest wastage has been attributed to poor on-farm ripening practices. Remedial strategies are being developed. Similar postharvest assessments in the Solomon Islands are planned for later this year. Also in the Solomon Islands, an audit of farm business management skills has been undertaken for the two PGS communities (Areatakiki, in the Central Guadalcanal and Aruligo in Western Guadalcanal). Resultant training commenced in February 2013 focussed on book keeping [how to manage farm records and accounts], business planning [including costing and pricing] and contract negotiating [determining pricing strategy].

## 01 Project summary continued

- **Protective cropping systems.** This Queensland DAFF-led project commenced in March 2013 and seeks to address current supply chain disconnects relating to poor product quality and short seasonality through the development and application of protective cropping systems in Fiji and Samoa. A preliminary assessment of pre-existing protective cropping infrastructure has been completed, with current effort focussed on establishing four trial sites (Koronivia and Sigatoka Research Stations, Fiji, a commercial site at Tapatapao and the Research Station at Nu'u, Samoa).

### Commodity-specific research projects - Fisheries

- **Pearls.** Development plans for pearl industries in Fiji and Tonga have been completed to draft stage. A national spat collection deployment program was initiated in Fiji in late 2012. In partnership with Fiji Fisheries, project staff deployed spat collection equipment adjacent to pearl farms throughout Fiji. Spat that recruit to these collectors will provide an on-going supply of oysters for current pearl farms addressing a key bottleneck for the industry. In the last 12 months, a series of pearl industry capacity building workshops have been held, including a business skilling workshop held for pearl farmers in Fiji and half-pearl (mabé) production workshops in Fiji and Tonga.



Fisheries and Project staff deploy spat collectors near Rakiraki.

A survey of the mother-of-pearl (MOP) handicraft industry in Fiji showed that this sector had an annual value of more than F\$10 million of which more than 85% is based on MOP items imported from Asia. This huge potential for import replacement will be assessed in a new initiative in 2013 that will teach MOP handicraft skills to Fijian communities and assess the market potential of resulting handicraft items.

John Allwright Fellowship holder and PhD student, Pranesh Kishore, is nearing completion of a comprehensive study into the impacts of physio-chemical factors and husbandry methods on pearl formation and pearl quality. Collaboration with the Applied Geoscience and Technology Division of SPC (SOPAC) has, for the first time, allowed comparison of growing environment and product yield/quality. Results will provide a basis for modification to current farming practices that will support improved pearl quality and value.



Anand Chand (background) is pictured Suwastika Naidu (university of the South Pacific) in the foreground and local farm workers during a field visit to Decsi Malolo Pearls Ltd In Namarai Village.

## 01 Project summary continued

- **Value-added fisheries.** Marketing strategy supply and market chains have been developed and tested for tilapia in Fiji and Samoa, and for *caulerpa* (locally known as sea grapes) in Fiji, Samoa and Tonga. In Fiji, there is a need for a Cold-Chain Hazard Analysis and Critical Control Points (HACCP) Analysis of the *caulerpa* supply chain. Biomass surveys of key harvesting sites in Fiji have shown how the crop is vulnerable to cyclones and coastal development.

Value-adding of *caulerpa* has led to extension of shelf-life for up to 12 days, and for a much longer preservation period (up to 12 months). Public taste evaluation indicated acceptability of the 12-day-old samples. A research partnership with the private sector (Pacific Seaweeds Limited) is assessing the incorporation of shelf life extension into the supply chain (for the export market) for *caulerpa*. The two public taste evaluation events have also been held for tilapia (Samoa and Fiji) and showed preference for smoked fillets and smoked whole fish. The preservation methods have been refined over the past several months.

ACIAR Masters Student, Janice Natasha, has completed her thesis on value-adding tilapia.

### Commodity-specific research projects - Forestry

- **Tamarind.** The value chain map has been completed and consumer research has been designed for surveys to be undertaken later this year. The first tamarind processing trials have been completed. Scientific trials in Vanuatu have been conducted at the Department of Forests and in partnership with the Department of Industry. To date, the project team has demonstrated that the solar drier was more efficient for drying tamarind than passive sun drying, and that tamarind fruit dries to a commercially acceptable water activity level after two days of fine weather in the solar dryer. Temperature of drying is critical as drying at temperatures 65°C and above for 5h produces water activity levels in tamarind fruit that are sufficiently low for shelf-stability. However, at higher temperatures (80°C) colour and firmness deteriorate to an unacceptable level. Microbiological test results indicated that all samples were acceptable for Australian food standards. These findings will direct further research activity to elucidate the relationship between moisture content and water activity (water sorption isotherm) and acceptability of colour, texture and firmness to consumers. Two tamarind processing skills training workshops were conducted in two different locations on Efate Island. Over 100 participants were involved in the workshops, and most participants were women.
- **Canarium.** The industry has increased since the start of the project with Lapita Café and product is now for sale on supermarket shelves. Lapita commenced processing in 2011 and processed 500 kg of kernel in 2012. The group plans to triple production to 1.5 tonnes in the coming year.

Research on tree selection has shown that the profitability of the industry could be greatly increased by selecting trees with large kernels and high kernel recovery. In some cases the kernels of the best selections are around twice the size of the worst.

## 01 Project summary continued

Trials looking at new drying methods show that temperatures above 60°C reduce kernel moisture content to below 5% in only 1h whereas drying at 50°C does not reduce moisture substantially below 10%. These results highlight the need for efficient drying systems at the correct temperature. Results also indicate that the nuts need to be drier (than current practices) when packaged to prolong shelf life. Microbiological test results of samples taken through the processing chain indicated that samples were mostly acceptable for Australian food standards, although many were marginal.



Nangai tree propagation in Vanuatu.

- **Teak.** The social research team visited collaborating villages in January to document any grower concerns. Grower and plantation operations were also assessed to identify market drivers for teak and their effect on grower participation. Discussions were held with Priceworth sawmill, a Malaysian milling and veneering operation being established at Noro, Western Province on the potential to buy thinned timber from local growers; Lagoon Eco Timbers, a Honiara-based timber operation will be purchasing timber in Munda, Western Province, within a few months. Initial visits with village groups in Rendova, Vonavona and Roviana areas to discuss participation in project activities have been completed. Four training workshops were held at Mauru and Mandali (Rendova) Tamboka (Vonavona Lagoon) and on the New Georgia mainland adjacent to Munda. These were self-assessment workshops where growers were introduced to key concepts regarding the identification of commercial trees and log grading rules. Teak buyers and industry experts have been engaged in India, China and Vietnam as part of a global teak market analysis that will be completed in 2013.



Tim Blumfield and Munda Forestry Officers practising the 'sticky' method of forest inventory.

PARDI's achievements and output are accomplished through research projects, market and consumer chain studies, and capacity building.

Currently active projects include:

### Cross-sectoral

- PRA 2012. 02 Fiji retail market transformation study. (Gurmeet Singh USP).

### Pacific Crops

- PRA 2010.005 Developing commercial breadfruit production systems for the Pacific islands (Andrew McGregor, Kokosiga Fiji).
- PRA 2011.01 Facilitating improved livelihoods for Pacific cocoa producer networks through premium market access (Tim Martyn, SPC)<sup>1</sup>.
- PRA 2011.03 Developing an integrated participatory guarantee scheme in the Pacific Islands in support of sustainable production of high-value vegetable crops (Jen Carter, USC).
- PRA 2011.04 Developing a clean seed system for market-ready taro cultivars in Samoa (Siosuia Halavatau, SPC)<sup>2</sup>.
- SRA 2011.04 Taro improvement programme sensory evaluation of Samoan taro varieties (Richard Beyer, FIJ).
- PRA 2012.05 Developing protected cropping systems for production of high-value vegetables in the South Pacific Islands and Australia (Elio Jovicich, QDAFF).

### Fisheries

- PRA 2010.01 –Cultured pearl production capacity and improve quality in the Fiji and Tongan cultured pearl industries. (Paul Southgate, JCU)<sup>3</sup>.
- PRA 2010.02– New value adding products and technologies for Tilapia and *Caulerpa* for commercial application in Fiji, Samoa and Tonga. (Robin South, USP).

### Forestry

- PRA 2010.03 – Consumer-driven value-adding strategies and process techniques to support an emerging Canarium nut industry (Helen Wallace, USC).
- PRA 2011.06 Development of a market mechanism for Teak and other high value timber in the Western Province of the Solomon Islands. (Tim Blumfield, Griffith University).

<sup>1</sup> Tim has recently left the PARDI project and a new SPC project manager is yet to be appointed

<sup>2</sup> Siosa replaced Mary Taylor as the project leader

<sup>3</sup> There is a supplementary pearl project led by Anand Chand, reporting has been included within PRA 2010.01

## 2.1 Achievements against activities and outputs/milestones

### Performance against milestones

#### Objective 1: Develop value chain analysis as a means to prioritise R&D interventions in agribusiness development (led by Adelaide University)

No.	Activity	Outputs/ milestones	Completion date	Comments
<b>1.1</b>	<b>Identify markets and supply chains that have the potential to deliver substantial livelihood benefits to Pacific Island people.</b>			
1.1.1	Undertake a desk study highlighting past experiences with similar commodity-focused projects in the PICs and reasons for their success or failure.	Report produced.	March 2010	University of Adelaide's (UoA) involvement in projects is ongoing. Rather than just providing initial direction for PARDI and a rapid analysis of best bets, UoA has dedicated resources and funding to play an ongoing role in a majority of the projects being undertaken by PARDI.  It is anticipated that this imbedded approach will result in a much more whole-of-chain and market-led understanding of the opportunities, researchable issues and lessons learnt. This will help direct existing projects as well as future ACIAR work in the Pacific.
		Updated Report covering additional lessons learnt, including an inventory of on-going efforts and more rigorous value chain assessments on 3 key chains.	March 2013	An Objective 1 Summary report was presented to ACIAR in August 2012 covering the approach used in the different stages of PARDI, the strategic framework adopted, selection criteria used and the progress of various market and value chain activities across all of the PRA and SRA's.  Methodology, assessments and a detailed project example was shared and presented at a Pacific value chain conference entitled 'Agri-food Value Chain Development in the South Pacific'. Details of Pacific value chain projects can be found on the website <a href="http://www.pacificAglinks.net">www.pacificAglinks.net</a> .
1.1.2	Perform rapid market and chain appraisal on the 'best bet' basis, selecting the most appropriate method to assess the sector or product.	Inception workshop and stakeholder engagement to choose best bet sectors.	August 2010	The inception workshop was used to agree on selection criteria to identify best bet commodities and sectors. Selection criteria details are described in the Aug 2012 Objective 1 report.
		Rapid sector analysis of best bets.	December 2011	Rapid sector analysis and industry mapping of 'best bets' has contributed to the development and ongoing activities of nine PRA's and three of the completed SRA's.
1.1.3	Build on sector and market analysis carried out in the selection process, focusing on specific chains relevant to that market and identifying potential domestic and export markets.	Selection of specific chains and target markets.	Ongoing	Value chain and market analysis activities are included in PRA milestones for projects on pearls, fisheries value adding, sea cucumber, canarium, teak, tamarind, cocoa and PGS vegetable projects. More details are available in the adjoining PRA tables.  These activities build on the initial rapid appraisal and mapping activity used to identify private sector partners, target markets and consumer and market research needed to drive interventions along the whole chain.

## 02 Achievements continued

1.1.4	Rank, assess and choose supply chains and associated priority interventions (i), review relevant project documents (ii) external expert input (iii) reach a consensus (the project team and relevant partners).	PRA proposal development and approval.	Ongoing	This activity is at different stages for different projects. For example, the Tamarind PRA 2012.03 will only have its inception workshop in mid-2013, whereas the other 8 PRA's we have been involved with are already well underway. Supply chain selection and interventions are discussed and agreed upon by the wider project team and described within each PRA.
1.1.5	Conduct more detailed consumer research to understand consumer drivers and market requirements for both domestic and export markets.	Consumer, household and producer surveys in PIC.	Conducted by December 2012 Analysed by June 2013	A number of surveys and interviews involving consumers, households, producers, retailers, food service providers, processors and traders have either been undertaken or are planned for the near future. The insights gained from these studies will feed directly into PRA-based interventions and identify trends in buying patterns which will highlight future opportunities. Examples of research include: <ul style="list-style-type: none"> <li>• Consumer research undertaken in the Suva Municipal market in April/May 2011</li> <li>• Consumer research in Samoa on value added Tilapia products in July 2011</li> <li>• Tourist &amp; local consumer research in the Solomon Islands for canarium in October 2011</li> <li>• Tourist and local consumer research undertaken in Vanuatu for cocoa and canarium in Aug 2011</li> <li>• Consumer research in Fiji on value added tilapia and <i>caulterpa</i> in Fiji in April 2012</li> <li>• Presentation of consumer research was given to canarium nut processors in Vanuatu in April 2012</li> <li>• Household consumer research undertaken in Fiji for the Retail Transformation Project in June 2012</li> <li>• Tourist and locals consumer research undertaken in Vanuatu for cocoa and canarium in July 2012</li> <li>• Producer surveys undertaken in Vanuatu for cocoa in July 2012.</li> </ul>
		Research across retailers, food service and processors in PIC.	Conducted by December 2012 Analysed by June 2013	<ul style="list-style-type: none"> <li>• Producer survey as part of the retail transformation project is due to be undertaken in Fiji in August 2013</li> <li>• Restaurants and hotels interviews completed in Solomon Islands for canarium in October 2011</li> <li>• Processor and retailer interviews completed in Vanuatu for tamarind in October 2011</li> <li>• Key stakeholder interviews undertaken in Solomon's for teak in February 2012</li> <li>• Vendor research &amp; training in Vanuatu municipal and roadside markets in March 2012</li> <li>• Retailer interviews as part of the retail transformation project conducted in Fiji in July 2012</li> <li>• Food service interviews for the retail transformation and PGS projects completed in Fiji in October 2012 and presented at a workshop in Nov 2012</li> <li>• Teak value chain interviews including saw mill owners and transport operators undertaken in the Solomon's in December 2012</li> <li>• Processor interviews as part of the retail transformation project conducted in Fiji in Feb 2013.</li> <li>• Tamarind retailer interviews in Vanuatu are due later in 2013</li> <li>• Trader survey as part of the retail transformation project are due to be undertaken in Fiji in October 2013.</li> </ul>

## 02 Achievements continued

	Conduct more detailed consumer research to understand consumer drivers and market requirements for both domestic and export markets.	Consumer research in key target export markets.	Conducted by June 2013	<ul style="list-style-type: none"> <li>• Australian Nut enterprises survey of buyer requirements and consumer preferences undertaken in Dec 2012. Analysis has started.</li> <li>• China Guangzhou province market and export pathway assessment for sea cucumber in 2012</li> <li>• Attended the world teak conference in Thailand in March 2013 to gain market insights and interview key teak buyers.</li> <li>• Global Teak market analysis has begun and will be completed by the end of 2013.</li> </ul>
		PRA-specific consumer and market research.	Analysed by December 2013  Ongoing	Included above
1.1.6	Produce value chain mapping and analysis integrating market analysis and consumer studies.	Reports within PRA milestones	Ongoing	<p>Regular PRA project meetings are conducted and reports are generated as required within those PRA's.</p> <ul style="list-style-type: none"> <li>• Forestry team met in Adelaide in May 2012 to review analysis of market segments and discuss next steps.</li> <li>• Marine team met in Fiji in June 2012 to do likewise.</li> <li>• Marine team met again in Adelaide in April 2013.</li> <li>• Forestry team is meeting in Brisbane in June 2013.</li> <li>• USP meeting in Adelaide in May 2013.</li> </ul> <p>Relevant reports have been provided for specific PRA-based activities and cross- sector research projects.</p>
		Separate reports for PIC consumer research, export markets and broad chain research	June 2014	
1.1.7	Review international market access requirement and consider bio-security challenges likely to be encountered by PICs, providing relevant information to PHAMA.	<p>Review any market access issues in target markets for sector based PRA's.</p> <p>Review any market access issues for the two export markets.</p>	Ongoing  December 2013	<p>Potential market access and bio-security issues within PRA's will be identified and passed onto PHAMA.</p> <p>A number of PRA's with UoA involvement will have an initial focus on the domestic market, but cocoa is one that has sought collaboration with PHAMA to the extent they now share project staff.</p> <p>Teak is another project that has engaged fully with PHAMA. We have and will continue to share teak value chain and market information with the URS team based in Honiara and we will look to get market access information on key target markets as the project progresses.</p> <p>Pending milestone.</p>
1.1.8	In collaboration with all project partners, evaluate the results and evidence from the market analysis and value chain study, ranking the potential researchable to scope intervention projects.	<p>Reports within PRA milestones.</p> <p>Separate reports for PIC consumer research, export markets and broad chain research.</p>	Ongoing  June 2014	<p>University of Adelaide has been actively collaborating with PARDI partners, Govt departments, NGO's, key private sector companies and other Pacific projects like PHAMA, MDF and IKSA. Market, consumer and value chain analysis activities have been imbedded into the PRA's and linked between projects (i.e. Fiji food service insights are being used for the PGS and RTP projects / Vanuatu tourist surveys are being conducted jointly for both the cocoa and Canarium projects). This information is then being evaluated within the project teams and used to drive researchable interventions.</p> <p>Relevant reports have been provided for specific PRA-based activities and cross- sector research projects.</p>

## 02 Achievements continued

1.2	<b>Enhance supply chain management expertise in the Pacific in ways that assist PARDI project goals and long-term success of agricultural value chains.</b>			
1.2.1	Provide capacity building support at the individual, group and organisational levels through participation in PARDI project activities.	Incorporate capacity building support activities into PRA's and SRA's.	Ongoing	<p>Capacity building activities are built into each PRA and interlinked across PRA's. To illustrate some of the key recipients of these activities a matrix has been provided in the capacity impacts section below.</p> <p>An excellent example of capacity building support is our relationship with UN Women and PIM (Partners for Improving Markets) with whom we are working to improve central and roadside markets across Fiji, Vanuatu and Solomon Islands. The University of Adelaide / PARDI has been asked by UNWomen / PIM to help with the capacity building of women vendors and vendor organisations in collaboration with municipal governments and improvement committees. Further development of the program components will occur during 2013 / 2014.</p> <p>The Pacific value chain conference had a key focus on value chain capacity building at all levels of the private and public sectors. PARDI contributed to the conference and will continue to aid in the development of the website <a href="http://www.pacificAgLinks.net">www.pacificAgLinks.net</a>, which is being used to store and communicate a range of information about Pacific value chains.</p>
1.2.2	Undertake mentoring and training activities for research, extension and policy groups using a value chain framework to improve institutional knowledge and expertise in supply chain methodology and analysis.	Use SRA's to mentor and train PIC staff on value chain methodology and analysis.	Ongoing	<p>Capacity building is taking a number of different forms. For many value chain analyses, UoA has been proactive in ensuring relevant local personnel are involved in interviews and surveys within the PRA's.</p> <ul style="list-style-type: none"> <li>• In the case of tamarind in Vanuatu, the process was formalised into an SRA where staff at the Department of Industry were trained and then mentored on value chain techniques. Staff are now working on their own projects in the cattle and kava industries.</li> <li>• The retail transformation project in Fiji is allowing PhD students to 'shadow' analysts while they are collecting information from key members along the chain. In addition to developing the students skills, there has been capacity building and joint learning between the RTP project team and the Fiji Bureau of Statistics and Dept of Ag on survey development, enumerator training, survey implementation and data entry. Similar capacity building is also occurring with the Vanuatu Bureau of Stats and our private sector partners on our producer and tourists surveys for the cocoa and canarium projects.</li> <li>• The marine component has been responsible for a range of capacity building activities with USP, JCU as well as private sector and government partners across pearls, tilapia, <i>caulerpa</i> and sea cucumber. Future capacity building will focus on new farming technologies, village spat and pearl handicraft training. Numerous USP staff and students have been building their capacity within these projects under Theo and Paul's guidance.</li> <li>• The forestry component has also been active in capacity building and has worked closely with government departments and the private sector in both Vanuatu and the Solomon Islands. Value chain analyses have led to canarium quality and shelf life trials to provide guidelines to processors and the wider industry. Value adding opportunities have led to drying ovens and other equipment being installed for use on a range of products requiring food or seed drying.</li> <li>• The capacity building between PARDI project partners should also not be underestimated. The University of Adelaide team has learnt a great deal from our partners from USC, JCU, QDAFF, USP and SPC and we would like to think that we have added some value to not only existing PARDI PRA's but also influenced the way these researchers will conduct future ACIAR- and Pacific-based projects.</li> </ul>

## 02 Achievements continued

1.2.3	Coordinate, facilitate or provide target skill development of Pacific supply chain participants associated with PARDI project activities, including promoting supply chain champions, enhancing retail linkages, engaging with certification programs, networking with industry associations.	Involve chain members in value chain intervention activities to help develop their skills.	Ongoing	<p>This activity is built into the way we approach these types of projects. Chain champions are identified during the initial analysis and then PARDI works with the chain champions and the rest of the chain to identify opportunities and researchable issues.</p> <p>The PARDI team collaborates in this work, but ultimately it is the chain members who will drive the intervention activities for their own benefit and that of the wider industry.</p> <p>Votausi at Lapita Cafe is a great example of a chain champion for the canarium industry. She has worked with us to identify researchable issues, opportunities and target markets for the whole industry.</p> <p>More details are provided in the Capacity Impacts section of the report.</p>
-------	---	--	---------	---

### Objective 2: Strengthen value chains for selected high-value fisheries products through the effective development and delivery of the commissioned projects; (led by James Cook University)

No.	Activity	Outputs/ milestones	Completion date	Comments
2.1	Identify, priorities and develop interventions to strengthen fisheries value chains.	Chain reviews completed.	December 2011	Chain reviews were completed and reports for fisheries projects were finalised as scheduled by July 2012.
		Chain reports for pearls, sea cucumbers, Tilapia and Caulerpa.	July 2012	Chain reports completed for all targeted commodities as scheduled.
2.2a	PRA 2010.01a: Support development of cultured pearl industries in Fiji and Tonga (Southgate, JCU).	Draft pearl industry development plans for Fiji and Tonga.	July 2012	<p>First draft for Fiji was completed by July 2012 and further consultation continued with stakeholders to November 2012 when the draft was completed.</p> <p>The first draft for Tonga was completed in early 2013 and forwarded to stakeholders in April 2013. Stakeholder meetings will take place in Tonga in June 2013 for final inputs and the draft will be finalised by end July 2013.</p>
		Expansion of village spat collection program (Fiji).	June 2012	<p>Considerable delay was experienced in sourcing and delivery of spat collection equipment from China.</p> <p>For logistic reasons, spat collector deployment was divided into two phases. The first deployed spat collectors close to existing pearl farms and was completed in December 2012. Maintenance of spat collectors and extension activities will be conducted by Fisheries and PARDI staff. Spat collectors will be harvested in mid 2013.</p> <p>The second phase of spat collector deployment will begin in July 2013. It will expand spat collection in high recruitment sites and deploy spat collectors to new sites within Fiji. This will provide livelihood opportunities to communities not yet involved with the pearl industry.</p>
		Upgrade capacity of hatchery facility in Tonga.	June 2012	<p>A new filter system has been installed and the seawater system upgraded. These changes supported hatchery production in 2012 and 2013.</p> <p>An ACIAR/USP scholarship holder (Jerome Taio) continued his research into the use of micro-algae pastes as a food for hatchery culture of pearl oysters. His results will help develop cheaper and more productive hatchery culture methods.</p>

## 02 Achievements continued

		Extension materials	December 2012	Extension materials were developed to support project activities (business planning and product improvement – see below). They will be fine-tuned as the project progresses and others will be developed as required.
		Business planning workshop in Fiji.	December 2012	<p>A business planning workshop was undertaken for Fijian pearl farmers in September 2012. It was organised and run by Bill Johnson (DAFF Qld) and Damian Hine (UQ) and involved a group of postgraduate MBA students from UQ who provided one-on-one consultation with pearl farmers. This exercise provided detailed information and operational costs for a broad range of pearl farming models in Fiji. These data support development of more sensitive economic modelling for pearl farming in Fiji which can be used by farmers (and prospective farmers) to make informed business decisions.</p> <p>Two follow-up workshops are planned for August 2013 to address the 'domestic' and 'export' components of the industry. An application for joint funding of these workshops was been made to the European Union-funded Increasing Agricultural Commodity Trade (IACT) project and was successful.</p>
		Business planning workshop in Tonga.	June 2012	A business planning workshop similar to that described above, is planned for Tonga in August 2013. It too will be co-funded by the European Union funded Increasing Agricultural Commodity Trade (IACT) project.
		Improved product quality, product diversity and value adding.	December 2013	<p>Half-pearl production workshops were held in Fiji and Tonga for all pearl farmers during 2012. Formal training of farmers will improve pearl yield and quality. Workshops were supported by extension materials developed specifically. They will be translated into local languages during 2013.</p> <p>JAF student Pranesh Kishore from Fiji is nearing completion of a number of experiments to determine factors affecting the quality of round pearls. Assessment of the quality of pearls harvested later in 2013 should help identify these factors and in turn indicate modification to current farming practices that will support improved pearl quality and value.</p> <p>Supplementing planned project activities, a joint project was initiated in Savusavu Bay to monitor physico-chemical factors that influence pearl farming and pearl production and quality. Water quality monitoring equipment was deployed in August 2012.</p>
		Finalise pearl industry development plans for Fiji and Tonga.	December 2013	Milestone pending.
2.2b	PRA 2010.01b: Support development of cultured pearl industries in Fiji and Tonga (A. Chand, USP).	Complete industry 'snapshot' review for Fiji.	May 2011	Research and snapshot of Fiji pearl industry completed in May 2011. Report submitted.
		Complete industry 'snapshot' review for Tonga.	August 2011	Research and snapshot of Tongan pearl industry completed in May 2011. Report submitted.
		Overview of mother-of-pearl (MOP) handicraft sector in Fiji.	December 2011	Research on MOP (Fiji) completed and report submitted. A paper was presented at the Australasian Aquaculture Conference in Melbourne, Australia (1-4 May 2012), and a manuscript on this work was submitted for publication to the Journal of Marine Policy in May 2013.
		Industry development strategy for the Fijian MOP handicraft sector.	December 2012	This milestone was delayed pending further consultation with stakeholders. A MOP handicraft case-study will begin in August 2013. It will involve training of a dedicated handicraft group, marketing of MOP products and market assessment. This initiative will run concurrently with increased availability of oysters shells from the spat-collection program (see above).
		Revised industry 'snapshot' review for Fiji.	December 2013	Milestone pending.
		Revised industry 'snapshot' review for Tonga.	December 2013	Milestone pending.

## 02 Achievements continued

2.3	PRA 2010.02: Value-adding and supply chain development for fisheries products in Fiji, Samoa and Tonga (South, USP).	Scoping studies on all commodities in the three target countries.	May 2010	Scoping studies for <i>Caulerpa</i> and tilapia completed, and reports published as USP/IMR Technical Reports (see list of publications in the Annex (above)).
		Supply chain and market chain analyses for two commodities in three target countries.	December 2011	These have been completed and are now available as USP Institute of Marine Resources Technical Reports (see appended list; Ms Koila Valamei, project publications assistant.). A manuscript describing the supply chain work on <i>caulerpa</i> has been prepared and will be submitted for publication in a suitable international journal. Some of the work was also reported at the 21 <sup>st</sup> International Seaweed Symposium held in Bali, Indonesia in May 2013 (see appended list). A cold chain and HACCP analysis of the <i>caulerpa</i> supply chain is being planned, and this hopefully will lead to training of harvesters and middle-men, to improve quality of the crop reaching the market (J. Lako, C. Morris, & S. Bala). The different forms of <i>caulerpa</i> sold in Fiji's markets were studied by Amit Kumar (undergraduate student). He found that 2 varieties of <i>caulerpa racemosa</i> were involved, var. <i>occidentalis</i> and var. <i>turbinata</i> .
		New value-added products are identified and tested, and subjected to cost-benefit analyses.	December 2012	Value-adding of <i>caulerpa</i> (J. Lako) has led to extension of shelf-life for up to 12 days, and for a much longer preservation period (up to 12 months). Public taste evaluation indicated acceptability of the 12-day extension. Further testing of this for the export market is on-going. The two public taste evaluation events for tilapia (Samoa and Fiji) showed preference for smoked fillets and smoked whole fish, and the preservation methods have been refined over the past several months. Janice Natasha has completed her master's thesis on value-adding of tilapia. Cost-benefit analyses are on-going; undergraduate student Madeline Solo did some preliminary work on cost-benefit analysis of tilapia smoking.
2.4	PRA 2010.04: Improving income of Pacific island fishers through better post-harvesting processing of sea cucumber: scoping study (Purcell, SCU).	Report on current information sources on processing methods in the Pacific.	February 2011	A report has been completed. Of note is the fact that postharvest handling quality is commonly poor. A large number of fishers and even some processors in both Kiribati and Tonga commented that they wanted information and training on processing methods.
		Report including separate assessments for each of the 3 target countries on the current use of value-adding.	October 2011	Report completed. Based on the number of sea cucumber fishers in villages visited and the number of fishing villages in the countries, we estimate that there are 3000-5000 sea cucumber fishers in Kiribati, around 1500 in Tonga and about 3000-5000 in Fiji.
		Report of supply chain structures existing in trade from Fiji, Tonga and Kiribati to Asian markets.	July 2011	Report completed. The project team have conducted questionnaire-based interviews with 84 sea cucumber fishers and 21 processors in Kiribati, 134 sea cucumber fishers and 13 processors in Tonga and 4 processors in Fiji. The surveys were spread among 5 atolls in Kiribati and 4 island groups in Tonga.
		Desk study of emerging market opportunities.	October 2011	Desk-top study completed. A large amount of data on price vs length and weight of a range of species was taken from various retail and wholesale shops in Hong Kong and Guangzhou. Concomitantly, the cut (made to the gut of the animal), colour and odour of each specimen was recorded.
		Best practice methods identified for processing various sea cucumber species.	August 2011	Completed and outlined in final report.
		Report on cost-benefit analysis.	October 2011	All associated reports and studies have been completed.

## 02 Achievements continued

		Final report.	May 2012	Final report submitted on 7/5/2012.  Recommendations from this project report provided the basis for a new project within the ACIAR Fisheries Program; "Benefits of improving postharvest processing of sea cucumbers in the Western Pacific" is a four-year project that will begin in 2013. The project will incorporate the PhD studies of JAF student Ravinesh Ram from Fiji who will study at James Cook University. Ravinesh worked on PRA 2010.04.
2.5	Development and delivery of additional targeted small research projects that address key knowledge or skill gaps, or provide supplemental support.	SRA applications where appropriate.	On-going	Paralleling Steven Purcell's project a UoA-led SRA – Refinement of the sea cucumber China marketing study was undertaken. This project reported in 2012.  An SRA to assess the potential for development of the MOP handicraft sector in Fiji is being developed to begin in 2013.  A farmer-adoption survey (for Tilapia) in Fiji and Solomon Islands will be developed as an SRA in 2013.
2.6	Ensure effective coordination and knowledge sharing between commissioned PARDI fisheries projects. Synthesise lessons relating to strengthening fisheries value chains.	Annual PARDI Fisheries component meetings.	May 2011 May 2012	Annual fisheries component workshops were held in 2011 and 2012 in Suva to review project progress and undertake forward planning. A similar workshop was not held in 2013 because of the completion of PRA 2010.04 and pending completion of PRA 2010.03.  A smaller meeting between personnel from PRA 2010.01a and PRA 2010.01b is planned for July 2013.

### Objective 3: Strengthen value chains for selected high-value forestry products through the effective development and delivery of the commissioned projects; (led by Sunshine Coast University)

No.	Activity	Outputs/ milestones	Completion date	Comments
3.1	PRA 2010.003 Developing markets and products for the Pacific Island and PNG Canarium nut industry (Helen Wallace USC).	To conduct consumer and customer research to understand the markets and the market segments.  To develop processing techniques.  To analyse drivers and barriers to stakeholder industry participation and capacity.	Dec 2014  Dec 2014  Dec 2014	Consumer surveys have been conducted in Vanuatu and early results found that consumers were most interested in raw, roasted/salted and chocolate coated products. Further analysis on tourist consumer preferences is currently underway.  Chain champions have been picked in Vanuatu and the Solomon Islands and are working with project staff to improve processing methods.  Dec 2012 Australian Nut enterprises were given canarium samples and surveyed to assess their interest in canarium nuts, buyer requirements and general consumer preferences. Analysis of results is currently underway.  Drying practices for kernels are being developed. Canarium oil is being produced in both Vanuatu and the Solomon Islands. Rancidity testing for oil is planned for the coming season.  A shelf-life trial was established in the Vanuatu. Initial and three monthly samples have been analysed.  Processors have indicated problems with shelf life when drying has not been adequate. Processors currently have no consistent drying protocols. Water activity meters and an absorption curve for canarium kernel is being established and it is planned to provide processors with water activity meters for the next season.  Samples from Solomon Islands and Vanuatu have been brought to Australia for microbial testing.  The FACT trial in Kolombangara, Solomon Islands has been measured and early fruiting assessed during two seasons.  Travel to the Solomon Islands in October 2011 and April 2012, has been undertaken to explore the challenges and logistics of large scale supply and quality management including impacts of market and product development; and gain an understanding of the challenges for adoption and capacity building through the supply chain.  Pending milestone.

## 02 Achievements continued

3.2	PRA 2011.06 Development of a market mechanism for Teak and other high value timber in the Western Province of the Solomon Islands. (Tim Blumfield Griffith University).	<p>To introduce strategies for grower cooperatives for the purposes of harvesting and timber marketing under FSC guidelines.</p> <p>To establish a resource inventory with a centralised database of timber resources.</p> <p>To identify market drivers and other mechanisms for adding value to teak thinnings, thereby promoting appropriate silvicultural management.</p> <p>To promote a pilot programme for the collection and purchase of community grown timber within Western Province and demonstrate other uses for timber not suitable for thinning.</p>	<p>Jan 2013</p> <p>March 2013</p> <p>2014</p> <p>2014</p>	<p>Identified growers who wish to participate in the project. We have visited a number of villages and family groups within the Vonavona, Roviana and Rendova areas. Meetings held with Gideon Bouro, working for SPC on certification.</p> <p>The first step in this process is gaining the trust of growers. We have had a series of meetings with growers and are actively working with them.</p> <p>Pending milestone.</p> <p>Have had initial discussions with KFPL and Eagon. Both are currently reluctant to accept timber as these are thinnings and are not high quality timber. Both accept timber from neighbouring communities.</p> <p>The appearance of two potential buyers in Western Province has reduced the necessity of bargaining, though logistical problems still have to be overcome.</p> <p>A series of discussions and workshops are currently underway looking at the process of thinning and how decisions are made based on the quality of timber and on growers needs and expectations.</p>
3.3	PRA 2012.03 Improving processing and marketing to improve the Tamarind value chain in Vanuatu (Helen Wallace USC)	<p>Conduct consumer and customer research to understand the markets and potential products for tamarind in Vanuatu.</p> <p>Refine processing methods for tamarind.</p> <p>Provide training, awareness raising, planting material and capacity building for tamarind production and processing.</p>	Jun 2013	<p>In collaboration with the Vanuatu Department of Industry the value chain map and process flow diagrams have been developed.</p> <p>Consumer surveys have been conducted in Vanuatu and early results found that consumers were most interested in raw, roasted/salted and chocolate coated products. Further analysis on tourist consumer preferences is currently underway.</p> <p>Preliminary research on primary processing including moisture content, drying times and temperatures, and solar dryer performance has been conducted and analysed. Different drying methods (sun and solar drying) were analysed for moisture content.</p> <p>Microbiological load tests have been conducted on primary and secondary Tamarind products. All samples were acceptable for Australian food standards.</p> <p>Two training workshops have been conducted on Efate Island Dec 2012.</p>
3.4	Development and delivery of additional targeted small research projects that address key knowledge or skill gaps,	Key knowledge gaps identified and assist with the development of SRA-related activities to provide remedial action.	ongoing	There have been a series of additional research activities in support of the forestry component –undertaken by Adelaide university (outlined in objective 1.1.5).
3.5	Ensure the effective coordination and knowledge sharing between commissioned PARDI forestry projects	<p>Coordination and undertake meetings, workshops with project stakeholders.</p> <p>Undertake or support annual PIC government communications .</p>	Ongoing Ongoing	<p>Forestry team met in Adelaide in May 2012 to review analysis of market segments and discuss next steps.</p> <p>Forestry team is meeting in Brisbane in June 2013.</p> <p>Forestry briefing meetings held with the Vanuatu Government in Dec 2012.</p>

## 02 Achievements continued

### Objective 4: Strengthen value chains for selected high-value horticulture and agriculture products through the effective development and delivery of the commissioned projects; (led by DAFF)

No.	Activity	Outputs/ milestones	Completion date	Comments
4.1	Identify, prioritise and develop interventions to strengthen horticulture value chains in the Pacific	Hort chain reviews completed. Four hort chain reports.	Dec 2011 July 2012	All the chain reviews have been completed. Completed.
4.2	PRA 2010.005 Developing commercial breadfruit production systems for the Pacific islands (Andrew McGregor -Kokosiga Fiji)	Identify varieties for year-round production and develop propagation systems.  Develop orchard management systems.  Establish post-harvest systems for export.	Dec 2013  Dec 2012  Dec 2013	Developed twenty (20) characterization sheets for breadfruit in Natewa Bay, Vanua Levu (the hot spot for genetic diversity) in agreement and in line with the "FAO-IPGRI multi-crop passport descriptors". Twenty-four characterisation sheets have been developed from which a fruiting pattern calendar has been derived. The PBP breadfruit technical officer travelled to Vanuatu for a technical exchange visit and documented the work that has been done on breadfruit. CePaCT have provided 200 tissue culture breadfruit plants. Evaluation completed in terms of different marcotting media mixes, most appropriate branch size and branch location for marcotting, management practices for removed marcott, most appropriate shade conditions. Evaluation commenced to determine the differences in growth for breadfruit propagated by root suckers vs. tissue culture vs. marcotts.  Two orchards have been established in Nadi area and one on Seqaqa research station on Vanua Levu. A further two sites in Ba area about to be developed. A total of 350 trees have been planted in orchards. Village visitations in the Cakudrove province have provided villagers the skills to propagate breadfruit.  Four (4) village breadfruit nurseries have been established to provide the basis of a regular supply of planting materials.  Pending objective.

## 02 Achievements continued

4.3	PRA 2011.01 Facilitating Improved livelihoods for Pacific Cocoa Producer Networks through Premium Market Access (Tim Martyn, SPC)	<p>Identify premium market opportunities for each of the farmer networks through market intelligence linked to specific chocolate retailers; facilitate these private sector.</p> <p>Improve the capacity of cocoa producers to access niche market opportunities through better quality control incentives, product traceability training and management skills customized to premium markets</p> <p>Progress the capacity of the domestic cocoa industry to add value to cocoa products, investigating opportunities for local manufacturing, branding and retailing.</p>	Dec 2012	<ul style="list-style-type: none"> <li>• Established partner private sector champion relationship for each of Vanuatu (Bahen and Co., Australian company) and Solomons (Zokoko).</li> <li>• Bahen and Co received cocoa samples from 8 different cocoa co-operatives on Vanuatu in July 2012; Zokoko received cocoa samples from 5 different cocoa co-operatives in the Solomons, in March 2013.</li> <li>• Bahen and Co produced chocolate from samples and accompanied PARDI team to Vanuatu in August 2013, to carry out taste testing sessions with the farmer co-operatives. Spent time analysing the operations of the Cocoa Growers Alliance. Helped farmers to identify quality deficits resulting from smoke taint and under fermentation.</li> <li>• Zokoko visited Solomons in September 2012, met the representatives identified quality issues with their driers; smokiness of beans and under-fermentation of beans was also identified as a major barrier to selling into quality niche market.</li> <li>• Developed solar drying strategy with Vanuatu stakeholders - CGA, ACTIV and Department of Trade and Industry - to address smokiness of their beans. With assistance from DTI and the ACIAR Cocoa rehabilitation project, constructing 60 solar tunnel dryers on Malekula and Epi. Working with CGA and Embassy of Japan for construction of large solar dryer and grading facility on Malekula.</li> <li>• Provided proper bean fermentation training with SolKom stakeholders in Honiara in March 2013.</li> <li>• Assisted stakeholders from Vanuatu and Solomon Is. to visit Singapore to visit major bean buyers, receive their feedback on bean quality. Established direct purchasing relationship between SolKom and CGA and respective Singapore buyers, which allows them to earn 20% margin on FOB price.</li> <li>• Held the 2<sup>nd</sup> Vanuatu Cocoa Industry stakeholder meeting in March 2013, identified progress made on addressing quality deficits, developing domestic quality testing capacity, and value-adding.</li> <li>• AusAID and DFAT staff visited cocoa lab in Port Vila, with representatives of Australian Foreign Minister. Agreed to (finally) provide funds for chocolate factory in Vila before the end of the financial year.</li> <li>• Developed cocoa quality control and chocolate –making training for ACTIV with Bahen and Co. in Margaret River, WA, March 2013.</li> <li>• Developed cocoa quality control and chocolate –making training for SolKom with Zokoko In Sydney, NSW March 2013.</li> <li>• Tourist chocolate survey completed in September 2012. Data entry and analysis of results completed May 2013. Results will be presented to Vanuatu stakeholders during next reporting year.</li> </ul>
-----	---	---	----------	---

## 02 Achievements continued

4.4	PRA 2011.03 Developing an integrated participatory guarantee scheme in the Pacific Islands in support of sustainable production of high-value vegetable crops (Jen Carter USC)	<p>Identify local consumer trends by market and consumer analyses.</p> <p>Improve coordination and collaboration of vegetable growers in Fiji and the Solomon Islands.</p> <p>Strengthen key support services for growers to enhance long-term PGS adoption.</p>	<p>Jan 2013</p> <p>Jan 2014</p> <p>Jan 2015</p>	<p>The PGS project is sourcing this information from the PARDI Fiji retail transformation project (RTP).</p> <p>Semi structured interviews were conducted with hotel/resort managers, F&amp;B buyers, Purchasing Managers and Exec chefs across Suva, Nadi and the Coral Coast between Aug – Oct 2012. Detailed market, consumer trends and purchasing behaviour was collected for each hotel and analysed to provide an overview of opportunities for local high value vegetable crops. The most viable hotel / resort partners for the PGS pilot in Fiji are the Warwick Resort and the Shangri-La Fijian Resort.</p> <p>A stakeholder workshop conducted in Fiji in Nov. 2012. An action plan with performance deadlines and targets was devised with different stakeholder groups in Fiji, and a workplan in the Solomon Islands. Key supply chain champions include Rose Sese for the Areatakiki community and John Maeli at Aruligo. Key supply chain champions in Fiji will be identified when new staff are appointed to replace staff absences.</p> <p>Existing agreements between PGS communities and Heritage Hotel in Honiara reviewed.</p> <p>Postharvest supply chain assessments completed Aug 2012 and May 2013 for Fiji.</p> <p>Training on market-oriented business skills for two PGS communities in Solomon Islands started in Feb. 2013, and will commence in Fiji when staff are appointed.</p> <p>Three HRD students enrolled and supporting project. Negotiations with FNU for student involvement in July postharvest field work has commenced.</p> <p>Contact made with Hop Tiy &amp; Co Ltd. in Suva re seed supply.</p>
-----	--	--	---	---

## 02 Achievements continued

4.5	PRA 2011.04 Developing a clean seed system for market-ready taro cultivars in Samoa (Siosia Halavatau, SPC)	<p>Screen taro varieties for defined market opportunities.</p> <p>Improved multiplication of disease- and pest-free planting material.</p> <p>Improved information flow along the taro supply chain.</p>	<p>Dec 2012</p> <p>July 2013</p> <p>July 2014</p>	<p>SROS has now established field plots on SROS research compound using the completely randomised design with 3 replicates per taro line. The overall aim of this project is to assess the acceptability of 11 new taro lines from Cycles 6 and 7 provided by the USP/SPC taro breeding programme using sensory and nutritional evaluations. Samoa 1 and Samoa 2 varieties which have been recommended by Samoa MAF for the export market are included as controls for comparison purposes.</p> <p>Plant agronomic assessments are being undertaken monthly, with soil tests on selected soil parameters almost completed for potentially useful correlation analysis with plant agronomic data. Corms will be harvested from all 13 taro lines at 5, 6 and 7 months after planting, via sequential harvesting of the 3 replicates of each taro line, to determine the optimum month for harvesting of each taro line using sensory evaluation results, as verifiable indicators.</p> <p>A literature review has identified some effective micropropagation systems that fit in the timeframe of the project were selected.</p> <p>CePaCT technician (Ulamila Lutu) has been bulking up a lot planting material enough for five different research experiments using varieties already with CePaCT. Over 500 tissue culture plantlets were produced from five varieties selected. Five varieties selected are BL/SM/200 (Nuu 15), BL/SM/201 (Nuu 20), BL/SM/202 (Talo Meamata), BL/SM/203 (Samoa 2- Talo Mumu) and BL/SM/204 (Samoa 1 -Talo Uliuli).</p> <p>Amit Sukal (CePaCT virus indexing technician) has been working on the virus indexing of taro and virus elimination, the latter as his Masters' thesis. Two virus elimination methods have been selected, meristem culture and heat therapy which have proved effective to eliminate some TaBV and DsMV infecting C7 taros already at CePaCT . The research will start in June of next month focusing on 15 to 20 different accessions of C7 lines with 4 replicates per accession for each treatment. There has been some success with Xanthosoma sp. using 38°C for 16hrs (light) and 28°C for 8hrs (no light) so this will be used to try and clean cycle 7 Samoan breeding lines. Most of Samoan breeding lines have been virus tested. Of interest is the cycle 7 but all are infected with Taro badna virus (TaBV).</p> <p>Pending milestone.</p>
-----	---	--	---	--

## 02 Achievements continued

4.6	2012.05 Developing protected cropping systems for production of high-value vegetables in the South Pacific Islands (Fiji and Samoa) and Australia (Elio Jovicich, DAFF).	<p>Identify market opportunity for high value vegetables.</p> <p>Screen vegetables in protective cropping system.</p> <p>Improved supply chain for high value vegetables.</p>	<p>July 2013</p> <p>July 2014</p> <p>Jan 2015</p>	<p>The high-value vegetable crop opportunities for production under protective structures were identified from collaboration with the PARDI Fiji Retail Transformation Project from analysis of market, consumer trends and purchasing behaviour of hotels.</p> <p>A review of protective cropping infrastructure has been undertaken in Samoa and Fiji.</p> <p>Sites in Fiji (MPI/SPC at Koronivia and Sigatoka) with possibly an additional commercial farm in Tavua, Ba, and in Samoa (Farm at Tapatapao and MAF at Nu'u). Structure to be setup after expected arrival in August.</p> <p>The passively ventilated structure design identified is considered suitable for growing vegetables under warm environmental conditions. Combined project funds (PARDI PRA/2012/05 and ACIAR PC/2010/090) will source the 360-m<sup>2</sup> structures from China to grow cultivars of three main high-value crops and conduct collaborative research and demonstration activities. Trials are expected to commence in Sept.-Oct. 2013.</p> <p>Pending milestone</p> <p>Pending milestone</p>
4.7	PRA 2012.02 'The Implications of Evolving Food Retail Markets on Small Producers Livelihoods (Gurmeet USP).	<p>Chain review of retail markets.</p> <p>Facilitation of information flows to small producers.</p> <p>Improved supply chain for small producers.</p>	<p>July 2013</p> <p>July 2014</p> <p>Jan 2015</p>	<p>Surveys on 1000 urban Fijian households have been completed and early analysis has begun.</p> <p>All major Fiji food retailers, processors and hotels / resorts have been interviewed to understand current constraints and future opportunities.</p> <p>Plans are well underway to conduct large-scale producer and trader surveys in 2013 to understand their perspective in the chain and complete our picture of Fiji's agricultural industry. This work is being conducted in partnership with the Fiji Dept. of Ag, Fisheries and Forests.</p> <p>Pending milestone.</p> <p>Pending milestone.</p>
4.8	Development and delivery of additional targeted small research projects that address key knowledge or skill gaps, or provide supplement support for ongoing projects.	<p>Identify supply chain interventions by value chain analysis.</p> <p>Project opportunity for intervention identified.</p> <p>Crops value chain improvement.</p>	<p>July 2013</p> <p>Dec 2013</p> <p>Jan 2015</p>	<p>PARDI and staff from the Scientific Research Organisation of Samoa (SROS) recently undertook a market-based consumer-acceptance study of selected varieties of taro amongst Samoans living in Auckland, New Zealand. This work provided important marketing information to refine the current Samoa Taro breeding program and capacity building benefits. Further sensory evaluation work is being planned in collaboration with MAF and USP to assess 4 selected cycle 7 taro lines and 3 of MAFs C7 selected lines against the 2 promising taro varieties (Maagiagi and Tanumalala.)</p> <p>A red papaya market focussed project is under discussion with QDAFF.</p> <p>Ongoing.</p>

## 02 Achievements continued

4.9	Ensure the effective coordination and knowledge sharing between commissioned PARDI horticultural projects and synthesize lessons relating to strengthening horticulture value chains	<p>Identify networks of appropriate skills to conduct value chain identified interventions and capacity building.</p> <p>Organise annual meeting of crops and horticulture project leaders.</p> <p>Provide project reports to PARDI component leaders annual meeting and ACIAR RPMs.</p>	<p>Dec 2012</p> <p>Dec 2012 ongoing</p> <p>Dec 2012 ongoing</p>	<p>PARDI travel, meetings and discussions that have:</p> <ul style="list-style-type: none"> <li>- strengthened PARDI collaborative networks and relationships with Pacific stakeholders such as SPC, FNU, USP, commercial horticulture business leaders and government bodies in Fiji and Samoa;</li> <li>- ensured value chains improvements by providing advice and reports that outline deficiencies in horticulture systems to PARDI project leaders.</li> </ul> <p>Organised over 40 meetings with project leaders, collaborators and stakeholders to negotiate, develop or promote PARDI research activities.</p> <p>March 2013 - ACIAR hosted a Taro Planning and Review Workshop.</p> <p>PARDI horticulture coordination meeting was delayed until 2013.</p> <p>Provided travel reports to ACIAR and horticulture reports to PARDI/ACIAR meetings.</p>
-----	--	--	---	--

**Objective 5: Develop and apply appropriate methodologies to evaluate how PARDI activities and interventions: (i) contribute to sustainable and efficient supply chains, (ii) improve livelihoods and (iii) increase our understanding of the factors underpinning competitiveness in Pacific Island supply chains. (Led by UQ-QAAFI)**

No.	Activity	Outputs/ milestones	Completion date	Comments
5.1	Establish and apply a framework for monitoring, comparison and evaluation project progress & guide project management	<p>PARDI advisory group (PAG) established.</p> <p>Documented protocol for project review.</p> <p>Reviews of commissioned project performance.</p>	<p>June 2010</p> <p>Sept 2010</p> <p>Dec 2012 Dec 2013</p> <p>Dec 2014</p>	<p>The PARDI advisory group (PAG) and its associated TOR were established in June 2010, under the chairmanship of Dr Richard Beyer.</p> <p>To date PAG has assisted in the review of 22 submitted PRA and SRAs. All reviews have been completed and those endorsed are currently operational.</p> <p>All projects provide a six-monthly update which is included in the PARDI newsletter. The component leaders hold regular discussion and briefing with project leaders within their sectoral portfolio. The component leaders meet every 3-4 months. The PARDI project is in constant dialogue with project leaders and well as with relevant ACIAR RPMs.</p>

## 02 Achievements continued

No.	Activity	Outputs/ milestones	Completion date	Comments
5.2	Identify opportunities for new partnerships to strengthen or grow chains	Joint stakeholder meetings and workshops with PHAMA and other PIC initiatives	Ongoing	<p><u>PARDI+PHAMA</u></p> <p>Support for Cocoa Industry Strategic Workshop (led by PHAMA)</p> <p><u>PARDI+ other PIC initiatives</u></p> <p>PARDI continues to collaborate with UN WOMEN with research and capacity building activities. A total of four studies have been completed with UN WOMEN staff and local government staff to assess opportunities for improving livelihood outcomes with female traders working in wet markets and road side stall in Fiji and Vanuatu.</p> <ul style="list-style-type: none"> <li>• Training UN WOMEN staff on value chain analysis.</li> <li>• Designing market analysis studies for ring road development in Vanuatu</li> <li>• Analysis and business plan development for the Marobe Livestock market.</li> <li>• PARDI appointed to the UN WOMEN Consultative Group for the AusAID Partners Improving Markets project (PIM). PARDI is collaborating with UN WOMEN on the value chain research and consumer research activities for PIM.</li> </ul>
5.3	Develop effective communication tools and products to disseminate PARDI outputs and ensure long terms information accessibility.	<p>Communication strategy developed,</p> <p>six-monthly project newsletters.</p> <p>PARDI reports, documents and associated written outputs posted on the SPC website portal.</p> <p>Regular PARDI news stories and project updates.</p> <p>PARDI component leader meetings.</p>	<p>Dec 2010</p> <p>Ongoing</p> <p>6 monthly throughout</p>	<p>PARDI produces a technical newsletter every 6 months which is now circulated widely throughout the Pacific, NZ and Australia. The last newsletter was released March 2013.</p> <p>PARDI has also prepared a series of factsheets for its major projects for external stakeholders and members of the general public who are interested in Pacific agribusiness.</p> <p>An activity map outlining PARDI project activities was released in March 2012.</p> <p>PARDI has established a web-portal on the SPC-LRD website. The SPC site is being utilised to store and distribute PARDI publications, reports, newsletters and a proposed activity calendar. SPC coms staff have been very proactive in supporting this activity. By using SPC's website, which also hosts other donor-funded project, our intent is to support a more coordinated approach to project information management. <a href="http://www.spc.int/lrd/index.php?option=com_content&amp;view=article&amp;id=942&amp;Itemid=611">http://www.spc.int/lrd/index.php?option=com_content&amp;view=article&amp;id=942&amp;Itemid=611</a></p> <p>The PARDI component leaders now meet every 6 months. The last meeting was 24<sup>th</sup> April 2013 as well as a PARDI-ACIAR RPM annual meeting held 5<sup>th</sup> Dec 2012.</p>
5.4	Document and analysis the key learnings from PARDI inclusive of effective supply chain and agribusiness development strategies, stakeholder engagement, enduring impact.	<p>Supply chain reviews documents.</p> <p>Report on the overall impact of PARDI inclusive of case studies.</p>	<p>Ongoing</p> <p>Dec 2014</p>	<p>Reviews have been completed posted on the SPC-LRD (PARDI) website.</p> <p>Our intent is to use a series of workshops in early 2014 to formalise this project and develop a series of recommendations.</p> <p>Pending milestone.</p>

## 2.2 Project contribution to the Australian aid program

Number of poor women and men who gain access to and use agricultural technologies:

- **28 Pacific Island** supply chain leaders and associated government staff receiving capacity building. (11 women: 39%)
- **101 participants (Vanuatu)** have been trained in tamarind processing skills and techniques for value-addition<sup>1</sup>. Most participants were women. Training was undertaken at two villages on the Island of Efate, identified as key potential production areas of tamarind by the Tamarind Supply Chain Review of 2011 conducted by the Department of Industry with financial and technical support from PARDI. At the end of the training workshop conducted at Gideon's Landing, North Efate, the Director of the Department of Industry, Mr. Jimmy Rantes, donated two solar dryers to producers including the Lelepa/Mangaliliu Farmers Association and the Moso Association for Sandalwood Growers.
- **116 people (Fiji)** were trained by project staff from the PARDI breadfruit project in partnership with the Tutu Rural Training Centre in breadfruit propagation techniques. Approximately 40% of attendees were female. Enterprise opportunities have been created for these communities to supply planting material to the emerging breadfruit export industry in western Viti Levu. Four (4) village breadfruit nurseries have been established to provide the basis of a regular supply of planting materials.

Value of additional agricultural production in US dollars

- While there is evidence of increased agricultural production resulting from some PARDI interventions, many issues beyond current PARDI activities, including market proclivities, supporting policy shifts and other tenuous influences, dictate further expansion. In the case of PARDI, **research on tamarind and canarium nuts**, our collaboration with the local villages, processes and the Vanuatu Government **has directly assisted in raising the commercial profile of these crops**.
- The **canarium industry in Vanuatu is growing** and currently five organisations have expressed an interest in processing canarium products, and most are already actively processing. The industry has increased since the start of the project with a new processor now selling product in supermarket shelves. They commenced processing in 2011 and processed 500 kg of kernel in 2012 and are planning to triple production to 1.5 tonnes in the coming year.



Villagers from the Vanua Levi region in Fiji are now actively involved in the PARDI Pacific Breadfruit Project.

<sup>1</sup> Two workshops held in December 2013; the first Efate Island - Gideon's Landing, North Efate and the second in Epau Village, North East Efate.

### 3.1 Scientific impacts

#### **Fiji Household consumer market Study (A Uni, USP)**

##### **Major findings**

- Forty-nine percent of food expenditure is through Supermarkets, 39% through the main town market and the remaining 12% through roadside stalls, corner shops, fish market, restaurants, service station and fast food outlets.
- Urban shoppers are more likely to shop 2-6 times per week at roadside stalls and corner stores and once a week for supermarkets, fish markets and main town markets. There is a large portion of the population that never purchase food from restaurants, fast food or service stations.
- Public transport is the favoured mode of transport to most food outlets, except for roadside stalls and corner shops where travelling by foot is preferred
- The four most important characteristic when choosing where to shop is food safety 91%, freshness 89%, quality 81%, and price 80%.
- The 3 biggest food concerns were food quality 89%, food safety 82% and price 89%.

#### **Developing commercial breadfruit production systems for the Pacific islands**

##### **Major findings**

- The Vanua Levu field trip enabled the team to identify breadfruit varieties that have never been characterized. Some of this material has now been transferred to Viti Levu for commercial development.
- The effectiveness of marcotting as a propagation technique for breadfruit has been documented.
- The bioreactor technology demonstrated as appropriate for breadfruit micro propagation.

#### **Developing a clean seed system for market-ready taro cultivars in Samoa (SPC, SROS, MAF, SFA, USP)**

##### **Major findings**

- CePaCT technician (Ulamila Lutu) has been bulking up over 500 tissue culture plantlets from the five varieties [BL/SM/200 (Nuu 15), BL/SM/201 (Nuu 20), BL/SM/202 (Talo Meamata), BL/SM/203 (Samoa 2- Talo Mumu) and BL/SM/204 (Samoa 1 -Talo Uliuli)].

### 03 Impacts continued

- Five different micro-propagation methods selected are based on literature review and current SPC CePaCT research. The methods selected aim to screen optimum micro-propagation systems available, its efficiency in terms of sucker production, absent of abnormality and healthy status of plantlets produced, good root systems, vigorous growth and good establishment in the screen-house.
- Two virus elimination methods have been selected for CePaCT; *meristem culture* and *heat therapy*. These two methods proved effective to eliminate some TaBV and DsMV infecting C7 taros already at CePaCT.
- Four macro-propagation methods agreed on for evaluation to be based at Nuu (1) corm piece method, (2) bud multiplication method (3) use of gibberellic acid (GA) to induce suckering and (4) shallow planting method.

#### **Facilitating improved livelihoods for Pacific cocoa producer networks through premium market access (SPC)**

##### **Major findings**

- Cocoa samples have been sourced from cocoa co-operatives in Vanuatu and the Solomon Islands and used to produce a range of commercial chocolate samples through collaboration with Bahen and Co, and Zokoko. Joint quality evaluations undertaken with farmer co-operative (July 2012 and March 2013 in Vanuatu and the Solomon Islands) have identified problems with the driers, smokiness of beans and under-fermentation of beans, all major barriers to selling into quality niche market.
- Solar drying strategies have been developed with Vanuatu stakeholders - CGA, ACTIV and Department of Trade and Industry - to address smokiness of their beans.
- Tourist chocolate survey completed in September 2012. Data entry and analysis of results completed May 2013.
- PARDI has also assisted stakeholders from Vanuatu and the Solomon Islands to visit Singapore to visit major bean buyers to solicit feedback on bean quality. Direct purchasing relationships between SolKom and CGA and respective Singapore buyers, which allows them to earn 20% margin on FOB price were established.



## 03 Impacts continued

### **Developing an integrated participatory guarantee scheme in the Pacific Islands in support of sustainable production of high-value vegetable crops (USC, AVRDC, FNU, MPI)**

#### **Major findings**

- The major incentive for buying local vegetables is price and freshness. The main reason for using imported produce is more about the overall service (volume, supply reliability and quality consistency) afforded to the hotel/resort.
- Postharvest knowledge and expertise amongst growers and supply chain stakeholders was poor, but there is compelling interest in implementing improvements.
- Current postharvest losses associated with Fiji vegetable supply chains are around 32%, most of which (24%) occurs on-farm due to both poor hygiene practices and limited temperature management during ripening. Current harvesting practices of picking the fruit hard-green provide a contributor effect in terms of product quality. If product is appropriately packed (preferable in cleaned plastic crates) much of the potential in-transit damage can be avoided. Grower collaboration has been very good and there is increasing interest from participating growers to improve the postharvest handling systems.

### **Developing protected cropping systems for production of high-value vegetables in the South Pacific Islands (Fiji and Samoa) and Australia (QDAFF, PIC Govt)**

#### **Major findings**

- An assessment of commercial vegetable production in Fiji and Samoa identified eight farms (Fiji) and two farms (Samoa) currently using protective cropping structures such as greenhouses, tunnels and screened or shaded areas. It was estimated that the visited farms have a total of 2-3 ha under cover, which accounts for approximately 95% of the area using protective cropping technologies in the two main islands. Structures are used to protect crops from rain and to decrease solar radiation. In two sites, nettings were used to exclude insect pests. Ventilation and high temperature management is difficult under low tunnels. These structures do not allow for vertical crop trellising to higher levels which would extend the harvest season. Chinese farming methods are used in the largest area under cover, where vegetables are grown year-round under multiple structures with open-sides.

### Value-adding and supply chain development for fisheries and aquaculture products in Fiji, Samoa and Tonga,

#### Major findings

- The involvement of postgraduate students in the project (tilapia value-adding and socio-economic aspects of *caulerpa* harvesting and sales in Fiji) is broadening the outputs from the project; studies of the biomass of harvested *caulerpa* beds will, for the first time provide information on how environmental impacts can affect the overall harvesting.
- The scientific aspects of value-adding for both tilapia and *caulerpa* have resulted in production of scientific reports in the international literature.
- Preservation methods for *caulerpa* to increase the shelf-life will allow for reduction in losses between harvesting and sales, and to the development of an export market to New Zealand. Very long term preservation (up to 12 months).
- Details of the supply chain for both tilapia and *caulerpa* have resulted in the preparation of manuscripts for publication.

### Support development of cultured pearl industries in Fiji and Tonga

#### Major findings

- Long-term water quality data being collected from Savusavu Bay will allow assessment of the influence of a range of physio-chemical factors on growth and survival of cultured pearl oysters and on pearl quality. The data will assist in pearl farm site selection and in development of more effective culture methods.
- Economic models developed for pearl farming in Fiji will assist farmers in business decisions relating to product selection, farm size and farm economics; they will assist in extension activities and assessment and development of loan applications from pearl farmers.
- Research to assess the major factors determining half-pearl (mabé) quality has resulted in a publication in an international journal (Kishore *et al.*, in press). The results are utilised in half-pearl production workshops to train pearl farmers in Fiji and Tonga and, on this basis, are utilised directly to improve yield and quality of cultured half-pearls.
- Involvement of multiple postgraduate students in this project not only broadens research outputs from the project and increases scientific rigour, but the resulting publications in international journals, raise the profile of the project, of ACIAR and Pacific science in general.

### **Improving processing and marketing to improve the tamarind value chain in Vanuatu**

#### **Major findings**

- The approximate moisture content of fresh peeled tamarind fruit is 43% (dry matter basis).
- The moisture content of solar-dried fruit was approximately 3.5% lower than sun-dried fruit.
- Tamarind fruit dries to a commercially acceptable water activity level below 0.6 after two days of fine weather in the solar dryer.
- The water activity level of village-processed sun-dried fruit was above the commercially acceptable level with a measurement of  $0.67 \pm 0.0036$ .
- 75% of the moisture content was lost after 5h of drying fresh tamarind fruit at 65°C.
- Drying at temperatures 65°C and above for 5h produce commercially acceptable water activity levels in tamarind fruit. However, at higher temperatures (80°C) the quality features, including colour and firmness deteriorates.
- Microbiological test results indicated that all samples were acceptable for FSANZ Australian food standards. Yeast counts were low. Low mould counts were detected in the solar-dried Tamarind fruit and one Sample of village sun-dried fruit. Although there is no standard for rejection, mould growth will decrease storage capacity.

### **Developing markets and products for the Pacific islands and PNG canarium nut industries**

#### **Major findings**

- Data has collected on early tree growth, early flowering and early fruiting in plantation featuring trees from many different provenances in the Solomon Islands. Early results show that the best trees of canarium produce kernels that weigh twice as much as the poorest trees. Selecting the right trees could lead to double the production of kernels by weight. Kernel recovery and total nut weight was also much higher in the best selections compared to the worst selections.
- Consistent drying temperatures of above 60°C will reduce kernel moisture content to below 5% in only 1h. Further drying may be needed to further reduce moisture content. Temperatures of 50°C only reduce moisture content to around 10% even after 6h of drying. This is insufficient for long-term storage of canarium. These results highlight the need for efficient drying systems at the correct temperature.
- Shelf life testing is underway. Early results indicate that the nuts need to be drier in order to prolong storage and understating of adequate drying is a critical need of processors.
- Microbiological analyses have been undertaken on canarium samples. Results indicated that samples were mostly acceptable for Australian food standards, although many were marginal. Marginal results are within acceptable limits of microbial quality but may indicate possible hygiene problems during food preparation. Some results of unprocessed product were unsatisfactory for Australian food standards.

### 3.2 Capacity impacts

There are currently 17 higher degree students supporting PARDI research activities:

- **Ms Karishma Devi**, (USP-PhD student supporting work on the retail transformation project).
- **Ms Kritika Devi**, (USP-PhD student supporting work on the retail transformation project).
- **Ms Anna Finizio**, (UoA-PhD student supporting work on the retail transformation project).
- **Mr Sam Fargher**, (UoA Economics Graduate supporting work on the retail transformation project).
- **Ms Maria Raza**, UoA Masters student supporting work on the Cocoa PRA.
- **Mr Eternam Kosi Anku**, UoA Masters student working on the Cocoa PRA.
- **Ms Stephanie Hajaj**, UoA Master student supporting work on the Canarium PRA.
- **Mr Amit Sukal**, (CePaCT USP-MSc) has been working on the virus indexing of taro and virus elimination, the latter as his Masters' thesis.
- **Mr Pranesh Kishore**, (JCU-PhD student supporting work on the pearl project).
- **Mr Emanuel Ram**, (USP-MSc student supporting work on the pearl project).
- **Mr Monal Lal**, (JCU-PhD student supporting work on the pearl project).
- **Ms Janice Natasha**, (ACIAR/USP Post Graduate Scholarship for Masters degree supporting the value added fisheries project).
- **Kaione Loumoli**, (Tonga ACIAR/USP Post Graduate Scholarship for Masters degree supporting the value added fisheries project).
- **Mrs Laisene Tuioti-Mariner**, (USC-PhD student working on the PGS vegetable project).
- **Mr Salesh Kumar**, (USP-PhD student working on the PGS vegetable project).
- **Mr Binesh Prasad**, (USP-MSc student working on the PGS vegetable project).
- **Mr Jerome Taio**, (USP-MSc student supporting work on the pearl project).

#### **Additional higher degree training currently under negotiation**

- **Mr Edwin Tamasese** is strongly considering a PhD program to work on protective cropping and soil health through USC and linked to work under projects PARDI PRA 2012.05 and ACIAR PC/2009/003 and possibly ACIAR PC/2010/090. Edwin has enrolled in USC and plans to apply for an ACIAR funding support this year.

#### **PARDI is also providing targeted Government and private sector capacity building:**

- **Jimmy Rantes, Noel Kalo, Wensie Wesley**, (3) Department of Industry, Vanuatu through co-participation in supply chain reviews and attendance at workshops.

## 03 Impacts continued

- **Epeli Waqavonovono**, (1) Head of the Fiji Bureau of Statistics; survey development and enumerator training for the household consumer survey as part of the retail transformation project.
- **Vanuatu Bureau of Statistics team**, (5 people); survey development and enumerator training for the cocoa and canarium, producer and tourist surveys.
- **Mr Ilimeleki Kaiyanuynu**, (2) Chief Economist and Tevita Natasiwai, team leader at the Fiji Department of Agriculture, Fisheries and Forests; survey development and enumerator training for the producer and trader surveys as part of the retail transformation project.
- **Sandrine Wallez**, (1) ACTIV in Vanuatu involvement in co-delivery of the cocoa project.
- **Lapita café staff**, (3) to improve canarium nut processes for drying, moisture loss and shelf life (temperature data loggers to monitor the temperature during the drying procedures).
- **Staff at the Solomon Islands Ministry of Forests**, (4) trained in assessing early fruiting and flowering in support of the canarium nut project.
- **Salesh Kumar**, (1) intense training in Postharvest horticulture through funded attendance to the UC Davis Postharvest short course.
- **Votausi Mackenzie-Reur**, (1) Lapita Café in Vanuatu involvement in the canarium and tamarind projects.
- **Richard Pauku**, (1) Maraghoto Holdings in Solomon Islands involvement in the canarium PRA.
- Municipal market and roadside stall vendor training in market management in collaboration with UN Women and UoA.
- **Amena Banuve**, (MPI, Fiji) (1) Training in postharvest supply chain evaluation techniques.
- Training **UN WOMEN staff**, (5) on value chain analysis and UNWomen and UoA work with municipal markets and the retail transformation project.

### 3.3 Community impacts

- **Markets.** Collaboration with UN Women and the Partners Improving Markets with women market stallholders and road side stalls is leading to improved communication and networking activities between stall owners, market managers and municipal government officials.
- **PARDI breadfruit team** have been working with village in the Cakudrove province, where they have provided villagers with training skills to propagate breadfruit. Four (4) village breadfruit nurseries have now been established to provide the basis of a regular supply of planting materials. The project team have been also been rapidly extending its impact to village communities in Vanua Levu and Taveuni through its close affiliation with the Tutu Rural Training Center.

### 3.4 Communication and dissemination activities

PARDI communication outputs have been achieved through a combination of scientific and technical reports, presentations at relevant conferences and workshops, the PARDI newsletter, e-news alerts, radio interviews, and direct stakeholder dialogues.

There has been a deliberate effort to be proactive with communicating our activities and achievements to stakeholders, evidence by 1800 web-uploads of PARDI reports and 1622 web-uploads of the PARDI newsletter in the last 12 months.

#### Scientific Papers, Books and Thesis

- Chand, A. Southgate, P.C. and Naidu, S. (2013) Supply Chain of Mother of Pearl Jewellery Industry in the South Pacific Region: Empirical Findings from the Fiji Islands. [Submitted to the *Journal of Marine Policy*]
- Kishore, P., Hunter, J. & Southgate, P.C. (2013) The effects of different culture apparatus and current velocity on byssus production by the blacklip pearl oysters, *Pinctada margaritifera*. *Journal of Shellfish Research* [Submitted]
- Kishore, P., Seeto, J., Hunter, J. & Southgate, P.C. (2013) Factors influencing the quality of half-pearls (mabé) produced by the winged pearl oyster, *Pteria penguin* (Röding, 1758). *Aquaculture Research* [In press]
- Naidu, S., Chand, A. and Southgate, P.C. (2013) Should the Government of Fiji divert resources to the pearl industry or the coconut industry? : An empirical estimation using the general equilibrium model. [Submitted to *Aquaculture Economics & Management*]
- Natasha, J. (2013) Value-addition of Tilapia (*Oreochromis nilotica*). *MSc Thesis, University of the South Pacific* [Submitted].
- Purcell, S.W., Hair, C., Mills, D. (2012) Sea cucumber culture, farming and sea ranching in the tropics: progress, problems and opportunities. *Aquaculture* 368: 68–81
- Purcell, S.W., Mercier, A., Conand, C., Hamel, J.-F., Lovatelli, A., Toral-Granda, V., Uthicke, S., (2013) Sea cucumber fisheries: global analysis of stocks, management measures and drivers of overfishing. *Fish and Fisheries* 14: 34–59
- Purcell, S.W., Samyn, Y., Conand, C. (2012) *Commercially important sea cucumbers of the world*. FAO Species Catalogue for Fishery Purposes. No. 6. FAO, Rome, 150 pp. +30 colour plates. <http://www.fao.org/docrep/017/i1918e/i1918e00.htm>
- Underhill, S.J.R (2013) Quantifying postharvest horticultural losses along a commercial tomato supply chain in Fiji. [Submitted to the *Journal of Agricultural Science, UK*]

## 03 Impacts continued

### Scientific papers in preparation

Natasha, J., Lako, J. & South, G.R. (2013) Value-addition of aquacultured tilapia. A promising approach to building self-resilience to food issues in Samoa. *Journal of Sensory Studies* (in preparation).

South, G.R. Morris, C., Bala, S., Lober, M., & Simos, T. (2013). Supply chain and marketing of sea grapes *Caulerpa racemosa* (Forsskål) J. Agardh (Chlorophyta, Caulerpaceae) in Fiji, Samoa and Tonga. (manuscript complete and ready for submission).

### Technical papers, conferences and reports

Bala, S., Morris C., Simos, T., Lako, J. & South, G.R. (2013) Preliminary value-chain analysis and value-adding of cultured tilapia (*Oreochromis niloticus*) in Fiji. Abstract, 12<sup>th</sup> Pacific Science Inter-Congress, Suva, Fiji (abstract accepted for oral presentation). (8-12 July 2013)

Chand, A. (2011), Consumer perception and acceptance of new taro varieties in Auckland and Fiji, paper presented at the APHC/AuSHS/NZIAHS Horticulture for Future Conference, Lorne, Australia, September 2011).

Chand, A. (2012), Value Adding of Mother of Pearl (MOP) Shell Jewellery and Wooden Handicrafts in Fiji, paper presented at the Australasian Aquaculture Conference Melbourne, Australia, 1-4 May 2012).

Chand, A (2013). Linking Small-Holders to the Pearl, Mop Shell Jewellery & Wooden Handicrafts in Fiji. Pacific Value Chains Conference, organised by CTA (Rome) and SPC, held at Tanoa International Hotel, Nadi, Fiji (17-19 April 2013).

Lako, J. (2013). Seagrapes post-harvest and value-addition in Fiji. Progress Report. USP Institute of Marine Resources Technical Report 06/2012. 25 pp. [in press].

Lako, J. (2013). Tilapia products sensory evaluation report of Samoa. USP Institute of Marine Resources Technical Report 07/2013. 46 pp. [in press].

Morris, C. & Bala, S. (2012). Supply chain for sea grapes (*Caulerpa racemosa*) in Fiji. USP Institute of Marine Resources Technical Report 05/2012. 15 pp. ISBN 978-982-9143-11-2

Morris, C., Bala, S., South, G.R., Simos, T. & Paul, N. (2013). Green caviar or sea grapes (*Caulerpa racemosa*), an important seaweed crop in Fiji, Samoa and Tonga: its potential now and for the future. *Abstract*, 21<sup>st</sup> International Seaweed Symposium, Bali Indonesia. (April 21-26, 2013)

Naidu, S. (2011), Analysis of vegetable markets in Fiji, paper presented at the APHC/AuSHS/NZIAHS Horticulture for Future Conference, Lorne, Australia, September 2011).

Natasha, J., Lako, J. and South G.R. (2011) Consumer preference tasting of *Oreochromis niloticus* value-added products: cold smoked fish, surimi and fish paste. *Abstract International Conference on chemistry, Environment and Climate Change – focus on the Pacific*. September 17th, 2011.

### 03 Impacts continued

- Purcell, S. (2011) Processing cultured tropical sea cucumber into export product: issues and opportunities. Asia-Pacific Tropical Sea Cucumber Aquaculture Symposium. 15-17 February 2011, Nouméa, New Caledonia
- Purcell, S.W. (2013) Increasing the value of sea cucumber harvests by improving postharvest processing of fishers. Working Paper for 8th Heads of Fisheries, SPC, Noumea. <http://www.spc.int/fame/en/meetings/167-eighth-spc-heads-of-fisheries-meeting>
- Simos, T (2011) Understanding the beche de mer Value Chain (Fiji and Tonga) In: Asia-Pacific Tropical Sea Cucumber Aquaculture Symposium. 15-17 February 2011, Nouméa, New Caledonia 189-194
- South, G.R., Morris, C. & Bala, S. (2012). Annotated Bibliography on the current status and product development of *Caulerpa* in Fiji, Samoa and Tonga. USP Institute of Marine Resources Technical Report 01/2012, 20 pp. ISBN 978-982-9143-02-0.
- South, G.R., Morris, C., & Bala, S. (2012). Annotated Bibliography of the current status and product development of tilapia in Fiji, Samoa and Tonga. USP Institute of Marine Resources Technical Report 02/2012/ 36 pp. ISBN 978-982-9143-12-9
- South, G.R., Morris, C., Bala S. & Lober, M. (2012) Scoping study for tilapia (*Oreochromis sp.*) in Fiji, Samoa and Tonga. USP Institute of Marine Resources Technical Report 04/2012. 18 pp. ISBN 978-982-9143-10-5.
- South, G.R., Morris, C., Bala, S., & Lober, M. (2012). Scoping study for *Caulerpa* (sea grapes) in Fiji, Samoa and Tonga. USP institute of Marine Resources Technical Report 03/212 (19 pp.) ISBN 978-982-9143-09-9.
- South, G.R. (2012). Exploring the *Caulerpa racemosa* niche market in Fiji, Samoa and Tonga. *Australasian Society for Phycology and Aquatic Botany Newsletter* 30:4-5.
- Underhill, S.J.R (2013) Developing Horticultural Quality Management Systems in Fiji. *Acta Horticulturae* 989: 225-229.
- Underhill, S.J.R (2013) An overview of postharvest research, extension and education capacity in the Pacific with a focus on Western Samoa, Tonga and the Fiji Islands. *Acta Horticulturae* (in press)
- Underhill, S.J.R (2013) Improving the effectiveness of small-holder farm postharvest practices in Fiji. *Acta Horticulturae* (in press)
- Underhill, S.J.R., Stringer, R., Bryceson, K., Prasad, B.C. and Shearer, D. (2010) The Pacific Agribusiness Research for Development Initiative (PARDI): a Novel Approach to Horticultural Development in the Pacific. *Acta Horticulturae* 921:17-24.

#### **PARDI internal reports including supply chain studies**

- Anon (2012) INFORMATION SHEETS on *Caulerpa* and tilapia in Fiji and Samoa (in collaboration with the Fiji Fisheries Division and Samoa Fisheries).
- Beyer, R. (2011) Vanuatu Chocolate Factory Proposal

### 03 Impacts continued

- Beyer, R. (2012) Fiji retailer report: R Beyer Fiji retailer report 'The supply of fresh fruits and vegetables to Supermarkets, retail transformation project.
- Beyer, R. (2013) Taro improvement programme sensory evaluation of Samoan taro varieties
- Beyer, R. (2013) Fiji processor report 'The supply of fruits and vegetables to Processors', retail transformation project.
- Chand, A. (2011) Main Research Finding: Comparative Analysis of Fiji and Auckland Taro Sensory Research (PARDI project report) (2pp.)
- Chand, A., Naidu, S, Southgate, P. and Simos, T. (2011) Pearl Industry Value Chain Review for Fiji: 2011.
- Chand, A., Naidu, S, Southgate, P. and Simos, T. (2011) Pearl Industry Value Chain Review for Tonga: 2011.
- Finizio, A. and Begum, Z. (2012) The Invisible Worker; Women in Agriculture in Fiji – A Case Study
- Flanagan, Z. (2011) PIM Project, Scoping Mission of Vanuatu Markets Report<sup>1</sup>
- Flanagan, Z. (2011) Suva Market Research Study Report, Vendor Focus Group Discussions, Summary and Recommendations
- Lako, J. (2011) *Samoa Sensory Products Evaluation Report*. University of the South Pacific. 62 pp.
- Lober, M. (2011) Tilapia in Samoa. Manuscript report, University of the South Pacific, Alafua, Samoa. 6 pp.
- Lober, M. (2011) Limu fuafua (sea grapes) in Samoa. Manuscript report, University of the South Pacific, Alafua, Samoa 20 pp.
- Morris, C. (2011). *Caulerpa* sp. scoping exercise in Tonga. Manuscript Report, Institute of Marine Resources, University of the South Pacific, Suva. 2 pp
- Rantes, J., Kalo, N., Naki, W., Lauko, J. (2011) Tamarind supply chain review, Vanuatu Dept of Industry,
- Rashimah, K. (2012) Product Development to Increase Women Market vendors income, Vanuatu
- Reverchon, F and Blumfield (2013) How to measure your tree 9pp.
- Szamier, M. (2012) Partnerships to Improve Markets, Stakeholder engagement and Project Planning Workshop Report, Shefa Province, Vanuatu
- Value Chain Reviews for Canarium, Coconut, Cocoa, Tamarind, Teak, Tilapia, Caulerpa, Pearls Fiji, Half-Pearls Tonga, MOP Fiji, Sea Cucumber (China Trip)

---

<sup>1</sup> Joint research with AoU (PARDI)

## 03 Impacts continued

### Supplementary publications

- The Manual “Growing and Marketing of Breadfruit for Export” (2005) is being updated by the PARDI breadfruit fruit project team

### Supply chain presentations at seminars and workshops

- Craig Johns presentation at the 'Pacific Value Chain Conference, Agri-food Value Chain Development in the South Pacific' in Fiji entitled 'Pacific PARDI Project; Whole of Chain Research on the Fiji Food Industry', [www.pacificAgLinks.net](http://www.pacificAgLinks.net) (April 2013)
- Craig Johns attended the 'World Teak Conference 2013, Sharing our Planet: Teak Model Development towards the Improvement of Mankind' in Thailand to assess market opportunities and buyer requirements for teak, [www.worldteak2013.org](http://www.worldteak2013.org) (March 2013)
- Sandrine Wallez from ACTIV in Vanuatu visited Adelaide to progress the cocoa project and continue negotiations with Haighs with Randy Stringer and Craig Johns (March 2013)
- Craig Johns and Anna Finizio presentation to UNWomen in Fiji to progress capacity building activities and future collaboration (Feb 2013)
- Craig Johns and Anna Finizio presentation to Dept of Ag in Fiji to progress the retail transformation project (Feb 2013)
- Craig Johns presentation of hotel and resort insights at the 'whole-of-chain' PGS workshop in Sigatoka, Fiji (Nov 2012)

### PARDI Newsletters

PARDI has continued to produce an extensive six monthly newsletter which is uploaded onto the PARDI website, hosted by SPC (<http://www.spc.int/>). To date, there have been 1622 newsletter internet downloads (South Pacific region, Australia, New Zealand, Germany, Cook Islands and China), and a further 200 hardcopies are also distributed in the region. PARDI communication outputs also including PARDI brochures and maps, chain reviews, annual report and our news stories e-alerts. In 2012-213 there were an additional 1800 downloads of PARDI communication material.



PARDI news and stories are constantly being uploaded onto the SPC-LRD website. Our intent is to ensure PARDI communication is integrated with wider Pacific communications

## 03 Impacts continued

### General media

PARDI has also aims to ensure its research activities and achievements are actively promoted in the general media, through radio interviews and news article submissions.

For example:

<http://www.radioaustralia.net.au/international/radio/program/pacific-beat/improved-taro-reestablishing-samoan-exports/1135574>



Sixteen PARDI training and capacity building workshops were held in the last 12 months. These were:

- (2012) Half-pearl (mabé) production workshop for farmers, Vava'u, Tonga
- (2012) Training in using data loggers to monitor the temperature during the drying procedures of canarium in Vanuatu.
- (Aug, 2012) Business skilling workshop for pearl farmers, Savusavu, Fiji
- (Oct 2012) Half-pearl (mabé) production workshop for farmers in Savusavu,
- (Nov 2012) Vegetable participatory guarantee training workshop held in Sigatoka
- (Dec 2012) Half-pearl (mabé) production workshops for farmers in Rankiraki,
- (Dec 2012) Two Tamarind training workshops have been conducted on Efate Island. Over 100 participants were involved in the workshops, and most participants were women<sup>1</sup>.
- (March 2013) Bean fermentation training with SolKom stakeholders in Honiara.
- (March 2013) Cocoa quality control and chocolate –making training for ACTIV with Bahen and Co. in Margaret River, WA,
- (March 2013) Cocoa quality control and chocolate –making training for SolKom with Zokoko In Sydney, NSW March 2013
- (April 2013) Four teak workshops held at Mauru and Mandali (Rendova) Tamboka (Vonavona Lagoon) and New Georgia mainland.in support of the Teak project
- (2012/2013) PARDI Breadfruit team have been working with the Tutu Rural Training Centre training staff on best practice marcotting and best practice root sucker collection.

### Example of PARDI technical training workshop

#### **(December 2012) PARDI Tamarind Processing Skills**

**Training Workshops** were conducted by Charles Longwah to train farmers on improved primary processing skills and techniques for value-addition of products. The first was held at Gideon's Landing, North Efate (10-14 Dec 2012). Women comprised more of the 55 participants of the workshops. The second training workshop was held in Epau Village, North East Efate, (17-20 Dec 2012), with 46 participants attending. These two locations were identified as strategic production areas of Tamarind by the Supply Chain Review (2011) conducted by the Department of Industry. The workshops aimed to improve farmers processing skills and techniques to assist with value-adding to their farm produce, including Tamarind. The supply chain review identified a need to improve primary processing skills that affected the quality of products and incomes produced from sales.



Participants at the tamarind workshop.

<sup>1</sup> At the end of the training workshop conducted at Gideon's Landing, North Efate, the Director of the Department of Industry, Mr. Jimmy Rantes, donated two solar dryers to producers including the Lelepa/Mangaliliu Farmers Association and the Moso Association for Sandalwood Growers.

UQ in consultation and adherence of formal ACIAR approval has extended the licence to Southern Cross University for its Project IP associated with its PARDI research activities in support of a sea cucumber industry in the Pacific.

No other IP issue or actions are current consideration.

Major structural, budgetary and staff variations were undertaken in 2011/12. These have been fully implemented, in close consultation with ACIAR. A 12 month no cost extension was also approved by ACIAR in 2010, with the current project end date being January 2015.

There were no additional amendments nor are there any anticipated in 2013.

## Staff to leave the project in last 12 months

- **Tim Martyn** (SPC) who was significantly involved the cocoa project. Tim has taken another position with FAO, Samoa in May 2013. PARDI has yet to be advised by SPC who will be replacing Tim's project activities.
- **Dr Mary Taylor** (SPC) who led the taro project as was a key collaborator on the PARDI breadfruit project. SPC has advised that staff supporting these projects will continue research activities and that Dr Siosuia Halavatau (SPC) will take over project leadership.
- **Raju Govind** unfortunately passed away early this year. Raju was providing excellent local support for PGS vegetable project in Fiji.

## New project staff

- **Dr Elio Jovicich** – QDAFF has joined the team as the project leader of the new protective cropping system project.
- **Mr Binesh Prasad** (USP Master degree student) has commenced a USP-ACIAR scholarship linked to the vegetable postharvest research activities.
- **Ms Heidi Wiggense** was appointed (0.5 FTE) as technical officer in DAFF to support the research work on protective cropping within the Australian project component in January 2013. Heidi is rapidly gaining knowledge from working with farmers that use the technology in North Queensland.

Following the implementation of major structural, budgetary and staffing changes to PARDI in early 2012 following our mid-term review, there have been relatively few issues.

Our current challenge has been project staffing. While any initiative such as PARDI will experience constant staff changes, this issue has been particularly acute within the SPC-led projects with the loss of both of the SPC-PARDI project leaders (Dr Mary Taylor, Tim Martyn). The loss of two core staff in the PGS vegetable project has also caused some delays. Collectively, this challenge is being addressed at the project level.

With PARDI now 1.5 years out from its scheduled project end date, there have been a series of internal discussions at the PARDI component leader level in terms of possible future activities.

More budget details to be supplied by QAAFI-UQ

---

**Steven Underhill**

**PARDI — Project Leader**

Queensland Alliance for Agriculture and Food Innovation

The University of Queensland

St Lucia, Qld

**E.** *s.underhill@uq.edu.au*

**M.** +0412 140 032

Professor — Trees and Horticulture

Faculty of Science, Health and Education

University of the Sunshine Coast

MAROOCHYDORE DC, Q, 4558

**E:** *sunderhi@usc.edu.au*

**T.** 075 4565142 (or extension 5142)