



Pacific Horticultural & Agricultural Market Access Plus Program

Supported by Australia and New Zealand

Coconut Sector Review

Review of PHAMA Plus's Strategy for Engagement with the Coconut Sector in the Pacific Islands



Coconut Sector Review

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Acronyms

ACIAR	Australian Centre for International Agricultural Research
ACO	Australian Certified Organic
ACP	The African, Caribbean and Pacific Group of States
CIE	Centre for International Economics
CIDP	Coconut Industry Development Project
CNO	Crude coconut oil from crushed copra
CRB	Coconut Rhinoceros Beetle
DAWR	Australian Department of Agriculture and Water Resources
DFAT	Australian Department of Foreign Affairs and Trade
EU	European Union
FACT	Facilitating Agricultural Commodity Trade
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HACCP	Hazard Analysis and Critical Control Point
IACT	Increasing Agricultural Commodity Trade
IFAD	International Fund for Agricultural Development
IWG	Industry Working Group
MAWG	Market Access Working Group
MFAT	New Zealand Ministry of Foreign Affairs and Trade
NASAA	National Association for Sustainable Agriculture Australia
PAIS	Pacific Agricultural Information System
PARDI	Pacific Agribusiness Research and Development Initiative
PHAMA	The Pacific Horticultural and Agricultural Market Access Program
PIC	Pacific Island Country
PIFON	Pacific Island Farmers Organisation Network
POETCom	Pacific Organic and Ethical Trade Committee
PPPO	Pacific Plant Protection Organisation
PTI	Pacific Trade and Invest
QDAF	Queensland Department of Agriculture and Fisheries
RBD	Refined, bleached and deodorized coconut oil
SPC	The Pacific Community
SOPAC	South Pacific Applied Geoscience Commission
TNYC	Tonga National Youth Congress
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
VCO	Virgin Coconut Oil

1 Background

This review assesses the potential for PHAMA Plus to contribute to improvements in the performance of the coconut sector in the PHAMA Plus countries (Fiji, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga and Vanuatu). The purpose of the work is to inform the development of intervention plans for the coconut sector in ways that improve the livelihoods of the PHAMA Plus target groups, with a focus on assessment of:

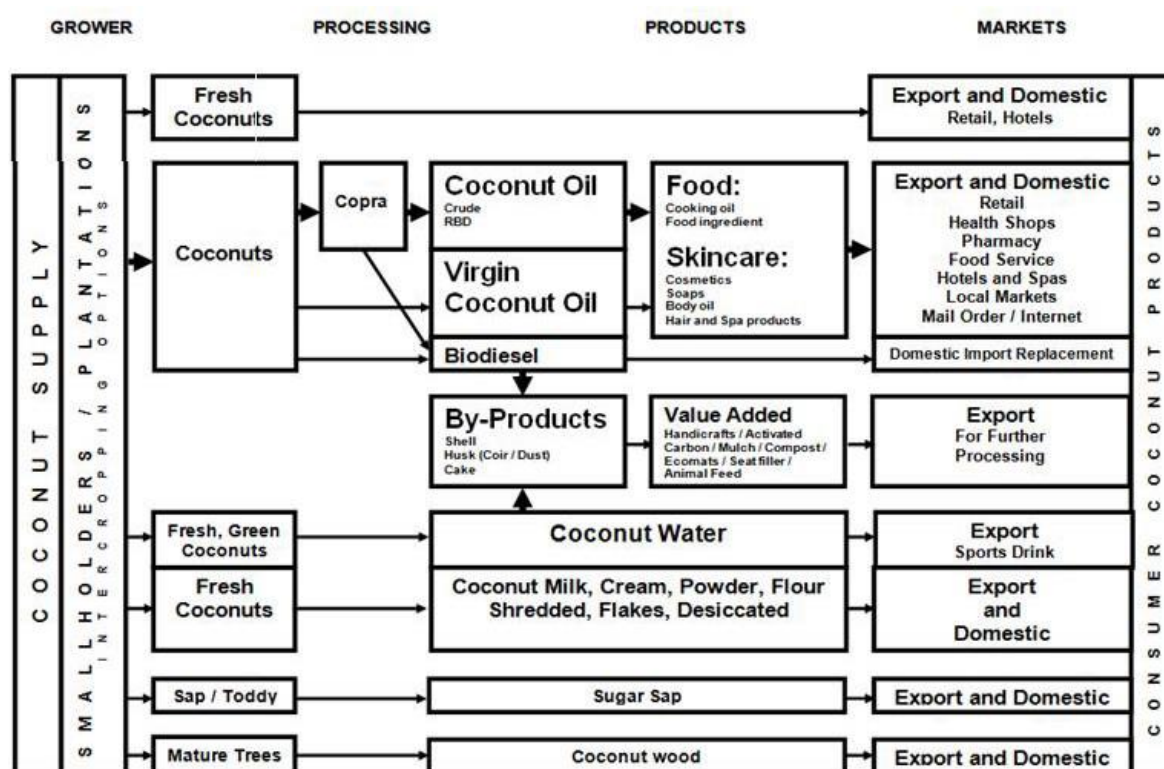
1. The opportunities for adding value to existing coconut production by moving from low value products (principally copra) to higher value coconut products including certified organic product lines;
2. How to increase the incentives for replanting of senile and unproductive coconut plantations; and
3. How to engage the private sector in stimulating re-development of the coconut sector.

1.1 Introduction

1.1.1 Status of pacific coconut industries

The coconut sector is very important to the economies and livelihoods of people in all Pacific Island Countries (PICs). It encompasses a wide range of uses, products and markets as reflected in the diagram below.

Figure 1 Value chain map of the pacific coconut industry



Source: PARDI (2011)

Copra and crude coconut oil (CNO) continue to be the main commodities produced by the coconut industry in the Pacific. Both are exported to a few large processing companies, primarily in Asia, for manufacture into refined oil which is then included in a range of food and cosmetic products. In these markets, coconut oil competes with other vegetable oils such as palm, canola, soya and sunflower oil. Prices are determined by a number of factors outside the control of Pacific producers, such as the availability of competitor oils, supply of coconut oil from the Philippines and other larger producer countries, and changing consumer demand for various types of vegetable oil.

As a result of these factors, coconut oil has been declining in prominence relative to other oil sources, especially palm oil, and exports of copra and coconut oil have declined globally as well as in most Pacific countries. McGregor and Sheehy (2017) found that factors influencing the decline of copra/coconut oil in the Pacific include:

- Coconut palms are much less productive than oil palm, which is the main competing oil product;
- Aging coconut palms are becoming less productive and not being replaced; and
- Major losses to plantations are occurring due to cyclones.

Adding to these factors in some locations, notably in Solomon Islands, is the impact of the invasive strains of Coconut Rhinoceros Beetle (CRB).

In this context, pacific producers have explored a range of other coconut products with Virgin Coconut Oil (VCO) the most successful and widely traded. McGregor and Sheehy (2017) observe that VCO has transitioned from a highly priced niche product to one that can achieve price premiums provided quality requirements and certifications (such as HACCP, Organic, Fairtrade) are met. To remain competitive, pacific VCO producers need to produce a premium quality product that can be differentiated in the market through certification and/or a strong branding image.

At a regional level, the fundamental status of the coconut sector has not changed significantly in the last decade. Reflecting this, most of the elements in the below SWOT analysis by PARDI in 2011 continue to apply and the opportunities identified remain relevant to PHAMA Plus and its partners in considering interventions in the sector, it is anticipated that PHAMA Plus would review and update this SWOT analysis as it further develops its work in the coconut sector.

Figure 2 SWOT analysis on the pacific coconut sector

Strengths	Weaknesses	Opportunities	Threats
Abundance of established trees suited to local conditions	Poor market understanding across the industry	Target higher value buyers with more valuable and convenient products	Domination of natural oil markets by lower cost nut and vegetable oils from large scale production
Subsistence and famine food with cultural importance	Reliant on mature markets for commodity products	Improve quality and food safety to meet growing world quality standards	Aging trees, declining supply
Low maintenance, suites intercropping	Regions lack infrastructure for manufacture and transport	Add value across entire product line to motivate replanting	Poor tree management promoting pests and disease
Multiple products and uses.	Lack of finance	Investigate potential health benefits from consumption and usage	Changes in government policy
	Lack of incentive to replant for future supply	Harvest senile palms for flooring and other timber uses	Rising quality standards of markets and competing countries
	An unproven image of being unhealthy to consume, being high in saturated fats	Coconut oil is high in lauric acid which offers health benefits	
		Research the nutritional and beneficial properties of coconut consumption	

Source: PARDI (2011)

1.1.2 PHAMA's support to the sector

Between 2011 and 2018 PHAMA's support to the coconut sector has been oriented towards technical assistance to facilitate value adding and in meeting market access requirements, this has included:

- Assistance with achieving Hazard Analysis and Critical Control Point (HACCP) certification for coconut processors, through the provision of gap assessments and training and co-funding the cost of certification audits;
- Assistance with achieving organic certification, through co-funding certification audits for selected processing businesses and awareness activities for farmers on the certification process;
- Support for individual enterprises to establish market linkages and develop new markets through marketing advice and visits;
- Facilitating and co-funding trial shipments of value-added products to new markets;
- Developing quality standards for high value coconut products, working with industry and regulators;
- Assisting industry to improve private sector representation and engage in issues affecting their sector through Industry Working Groups; and
- Facilitation of the management response to the Coconut Rhinoceros Beetle (CRB) in Solomon Islands, through the engagement and management of the CRB Response Coordinator.

Appendix 1 contains a summary of the nature of the coconut industry in the PHAMA countries and the engagement that the program had with these industries.

Building on this previous work with the sector, PHAMA Plus is now assessing options for further support that would be implemented between 2019 and 2022. In consultation with the PHAMA Plus team and partners, this review will inform this process with reference to other development programs, previous technical studies and with a focus on opportunities to add value through utilisation of senile coconut stems.

1.1.3 Report outline

This report contains the following sections:

- An overview of previous and current coconut industry development programs in the Pacific;
- A summary of technical reports relating to coconuts in the Pacific and their implications for PHAMA Plus;
- Consideration of the potential to add value through the utilization of coconut stems as timber or veneer;
- Recommendations for PHAMA Plus initiatives in the coconut sector with consideration given to partnerships that could support delivery; and
- A bibliography of literature on the Pacific coconut sector which is included as an Appendix 3.

2 Development Programs in the Coconut Industry

This section describes some of the key development programs working with coconuts in the PHAMA Plus countries and regionally. It is intended to outline some examples of the programs most relevant to the work of PHAMA Plus.

Project/program name	Donor/s	Timing (approx.)	Description	Website/Page URL
Regional				
Coconut Industry Development for the Pacific (CIDP)	EU – SPC ACP	2016 - 2018	Regional program working in 15 PICTs including the 6 PHAMA Plus countries. Seeking to improve the competitiveness of small producers, strengthen regional integration of related markets and intensification of production. Has developed some useful value chain assessments and market studies for specific products and markets, some of which are referred to in this report.	Coconut Industry Development for the Pacific
Coconut Wood Project <i>Improving value and marketability of coconut wood</i>	ACIAR	2007 – 2010	An ACIAR project to improve understanding of physical properties of coconut wood and develop methods and technology for the sawing, drying and preservation of coconut timber and investigation of potential end products and markets. Key project partners were in Fiji and Queensland, Australia.	Cocowood Project
Coconut Veneer Project <i>Development of advanced veneer and other product from coconut wood to enhance livelihoods in South Pacific communities</i>	ACIAR	2012 – 2016	Building on the coconut wood project, the coconut veneer project demonstrated proof of concept for the production of veneer from coconut stems. It helped to develop the technologies, processes and expertise to produce veneer and associated products from senile coconut stems. An operational veneer lathe and associated equipment was installed at the Fiji Timber Utilization Division at Nasinu, near Suva in Fiji. This equipment is in place and is still operational.	Cocoveneer Project
Facilitating Agricultural Commodity Trade (FACT)	EU – SPC	2008 – 2011	FACT, and IACT were agribusiness support programs that assisted individual enterprises in the forestry and agriculture sectors to engage with and sell into export markets.	Facilitating Agricultural Commodity Trade
Increasing Agricultural Commodity Trade (IACT)	EU – SPC	2011 – 2015	Under IACT the program scope was expanded to include fisheries and aquaculture and to broaden the project approach to encompass the whole of supply chain. Both programs operated in the 15-member countries of the ACP, including all the PHAMA Plus countries.	Increasing Agricultural Commodity Trade
Pacific Agribusiness Research for Development Initiative	ACIAR	2010 – 2014 (Phase 1)	Phase 1 of PARDI was coordinated by the University of Queensland and operated in all the PHAMA Plus countries with the exception of PNG, working in the sectors of cropping, fisheries and forestry. PARDI undertook a range of	Pacific Agribusiness Research for Development

Project/program name	Donor/s	Timing (approx.)	Description	Website/Page URL
(PARDI) Phases 1 and 2		2017 – 2021 (Phase 2)	discreet projects to support local agribusiness. Several studies were completed encompassing, value chain assessments, market studies and scoping the development of new markets and products. The coconut sector was not a specific focus of PARDI, but it did interact with coconut processing enterprises in PHAMA countries. PARDI 2 is currently operating in Fiji, Vanuatu and Tonga under the four pillars of: (1) identifying successful agribusiness development opportunities; (2) identifying value chain and market opportunities and constraints; (3) evaluating participator guarantee systems to improve value chain linkages; and (4) increasing agribusiness information availability.	Initiative
Papua New Guinea				
Coconut Nursery Establishment and Seed Distribution Project	Government of PNG Public Investment Program (PIP)	2015 – ongoing	Government funded program to rehabilitate the coconut industry particularly focusing on replanting.	
Coconut Market Development and Trade	Government of PNG PIP	2014-ongoing	Focused on coconut SME development and product diversification particularly high value cocoa products (HVCP).	
Bougainville Cocoa and Copra Dryer Rehabilitation Project	AusAID	Early-mid 2000's	A copra drier rehabilitation and drier fabrication program. Two important features of the project were that growers had to make a significant initial cash contribution to the cost of the drier and local fabrication enterprises were supported to manufacture drier components.	
Coconut Disease Containment (Bogia Coconut Syndrome – BCS) and International Coconut Genebank Relocation	Government of PNG	2016	Funded by GoPNG in response to BCS and the threat on the genebank in Madang.	
Development of Coconut Bio-security framework	Government of PNG PIP	2019-2022	To develop a framework and response plan for the industry regarding pests and diseases	
Development of a Bogia Coconut Syndrome (BCS) diagnostic tool kit (in conjunction with CIDP)	ACIAR-UQ	2016		

Project/program name	Donor/s	Timing (approx.)	Description	Website/Page URL
Coconut Plantation Management	KIK / ICC (Sri Lanka Coconut Ministry)	2018	Supported by KIK and attended by 2 KIK officers to date, 1 was supported CIDP	
PNG Agriculture Commercialisation and Diversification Project (PACD)	World Bank and GOPNG	2020 onwards	Project to increase the productivity and access to markets of targeted smallholder farmers and SMEs for selected agricultural value-chains in targeted economic corridors, including coconuts. Based on agribusiness partnerships model successfully applied to coffee and cocoa under the Productive Partnerships in Agriculture Project (PPAP).	
Solomon Islands				
Rural Development Program (RDP) II	World Bank, DFAT, IFAD, EU	Phase 1 2008 – 2014 Phase 2 2015 – 2020	RDP II takes a partnership approach with the private sector to promote development in agricultural supply chains. It has partnerships with 4-5 of the coconut processors and exporters in Solomon Islands, working with them to for example, improve efficiencies in their supply chains, provide access to processing equipment for farmers, and develop and expand processing operations.	Rural Development Program Solomon Islands
Strongim Bisnis	DFAT	2017 – 2021	A market systems development program focused on the cocoa and coconut sectors in Solomon Islands. Primarily working with individual enterprises to facilitate value adding and the development/expansion of new businesses. Also working with partners on a communications program for CRB management.	Strongim Bisnis
Solomon Islands Biosecurity Development Program (SIBDP) Phase 2	DAWR/ DFAT	Phase 1 2013 - 2016 Phase 2 2017 - 2019	Implemented by the Australian Department of Agriculture and Water Resources (DAWR) the SIBDP programs seeks to build the capacity of Biosecurity Solomon Islands (BSI). The current Phase 2 is developing market access plans and biosecurity protocols for coconut, cocoa and coffee between Solomon Islands and Australia. It is also engaging with the Coconut IWG to enhance public-private collaboration in the context of biosecurity.	
Vanuatu				
Vanuatu Value Chain Program (VaVaC)	EU	Current 2019 – 2023	Capacity building and technical support to enhance the performance of public and private actors in the coconut, livestock and fruit and vegetable value chains in Vanuatu.	

Project/program name	Donor/s	Timing (approx.)	Description	Website/Page URL
			Implemented in partnership with the Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity (MALFFB) and the Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business (MTTNCVB).	
Fiji				
Coconut Development Program	Ministry of Agriculture, Copra Millers Fiji	2018 – current	Encouraging replanting of coconut plantations by providing seedlings to farmers, implemented through Copra Millers Fiji.	
Tonga				
Future Organic Farmers of Tonga	Tonga National Youth Congress (TNYC) Oxfam NZ MFAT	Ongoing	Working with communities and youth groups to undertake VCO production and facilitate export sales.	
Samoa				
Improving access for smallholder coconut farmers in Samoa	Business Partnerships Platform (DFAT) Fairtrade ANZ Krissy Co.	2012 - current	Supporting Savai'i coconut farmer groups to supply Fairtrade certified coconuts to Krissy Co., a local manufacturer that is processing and exporting coconut cream.	

3 Technical Information and Literature

The literature on coconuts in the Pacific Islands is extensive and this review does not claim to provide a complete and comprehensive review. This section provides a summary of key technical and project reports relating to coconuts and their implications for possible PHAMA Plus interventions in each country. The table focuses on the areas in which PHAMA Plus might engage. A more detailed reference list of technical reports on coconuts in the individual PHAMA Plus countries is provided as Appendix 3. Another important resource not included in this table are national coconut industry strategies, these are in place in various forms for all the PHAMA Plus countries and have generally been developed with input from industry or stakeholder advisory groups.

#	Report	Summary of findings	Implications for PHAMA Plus	
1	<p>McGregor, A. and Sheehy, M (2017) An overview of the market for Pacific Island coconut products and the ability of industries to respond</p> <p>CIDP, SPC, EU, ACP, PIFON</p>	<p>An overview of the Pacific coconut sector, international markets and trade. Analysis of status of main coconut products in PIC and why they are are/are not being traded. Statistics on PIC production relative to other producer countries which demonstrates that the decline in copra oil trade has led to the focus on alternate coconut products including VCO.</p> <p>Four priority coconut value chains were identified for follow-up investigation by CIDP:</p> <ul style="list-style-type: none"> • <i>Virgin coconut oil</i> for the domestic market – the specific value chain case study selected was the Banaban VCO from (Rabi Island) in Fiji. • Small-scale, <i>high quality copra oil</i> for the domestic market – the specific value chain case study selected was Chottu Coconut Products (CCP) in Solomon Islands. • <i>Coconut cream freeze/yogurt</i> – the specific case study selected was the Samoa Coconut Cluster. • <i>Coconut timber veneer</i> – focusing on the Valebasoga Tropical Board Ltd (VTB), in Labasa, Vanua Levu, Fiji. 	<p>The most recent and comprehensive assessment that can be used to guide the work of PHAMA Plus.</p> <p>PHAMA Plus could consider providing supporting in the 4 priority areas identified by this report (see left). The related reports on high quality copra oil and coconut timber veneer are discussed below, see reports # 2 and 3.</p>	<p>An overview of the market for Pacific Island coconut products and the ability of industries to respond</p>
2	<p>McGregor, A. and Pelomo, M. (2018) The Solomon Islands Quality Copra Oil Value Chain for the</p>	<p>A detailed investigation into the feasibility of using high quality copra oil (CNO) as cooking oil in domestic markets, based on the case study of Chottu Coconut Products (CCP) in Solomon Islands. Key findings were:</p> <ul style="list-style-type: none"> • Most pacific countries import large amounts of 	<p>There is scope to produce improved quality CNO for use as cooking oil in domestic markets and this trade can be profitable for local producers and retailers.</p> <p>Developing the market for high quality CNO</p>	<p>The Solomon Islands Quality Copra Oil Value Chain for the domestic market: The Chottu Coconut Products Case</p>

#	Report	Summary of findings	Implications for PHAMA Plus	
	<p>Domestic Market: The Chottu Coconut Products Case Study</p> <p>CIDP</p>	<p>cooking oil and there is a large under-exploited market for locally produced cooking oils.</p> <ul style="list-style-type: none"> • VCO is recognized as better-tasting but CNO can be used if it is cold pressed and made with well-dried and stored copra with no smoke contamination i.e. of good quality. • CNO can be produced more cheaply and at higher volumes than VCO. • Micro copra oil mills are relatively affordable and require less labor than the Direct Micro Expelling (DME) process that is used with VCO. • CNO is currently mainly sold at the Honiara market and is used for skin and hair treatments. It is not yet sold in larger grocery stores. • CNO is currently more expensive than imported oils. The cost of CNO could be reduced through greater efficiency and scale but imported oils would likely remain cheaper. • Consumer and market education is needed to make people aware of the uses of CNO in cooking and to better understand its health benefits. • CNO could be profitable for local producers and retailers. • There would be scope in future for high quality CNO to be sold in export markets for cosmetics and related uses. 	<p>requires:</p> <ul style="list-style-type: none"> • Decreased price of CNO through greater efficiencies; • Increased consumer appreciation of the health benefits of the product; and • Increased consistency of supply and quality. <p>PHAMA Plus and partners could progress work in these areas.</p>	<p>Study</p>
3	<p>McGregor, A. and Tawake, S. (2018) The Coco Veneer Value Chain: The Fiji Case Study</p> <p>CIDP (SPC/EU)</p>	<p>This builds on the work of ACIAR projects and the 2017 CIDP sector review (report #1 above), it takes a value chain approach to assess the feasibility of coconut veneer production in Fiji.</p> <p>Fiji was chosen for the case study as the ACIAR project's work was mainly based in Fiji and there are 4 substantial veneer/plywood companies located on Vanua Levu in</p>	<p>The report recommends activities to be undertaken with the different value chain actors. These have informed the recommended PHAMA Plus initiatives that are described in the below section on utilization of coconut stems.</p> <p>The report identifies private sector enterprises in Fiji (primarily) as well as PNG and Solomon</p>	

#	Report	Summary of findings	Implications for PHAMA Plus	
		<p>reasonable proximity to the coconut timber resource, these are:</p> <ul style="list-style-type: none"> • Valebasoga Tropikboards Ltd. Labasa; • Tropik Wood Industries Ltd. Malau; • Taiwan Timber Co, (Fiji) Ltd. Dreketi; and • Long Investment (Fiji) Ltd., Savusavu. <p>The study found that coconut veneer products could be produced profitably and sold into domestic and export markets as well as markets for by-products. These products and markets are in early stages of development and there is some uncertainty around the scale of returns to the different value chain actors.</p>	Islands that may have interest in progressing with coconut veneer products.	
4	<p>Cegumalua, A. and Lesi, V. (2017) Assessment of Coconut Industry Training Manuals for the Pacific</p> <p>CIDP</p>	<p>This work aimed to establish where training manuals are located, how they could be accessed and who has access to them. Where procedures and standards are available:</p> <ul style="list-style-type: none"> • Whether they are relevant to the Pacific situation; and • Whether they are being followed and implemented. 	<p>Provides a list of technical information and manuals relating to coconut growing and processing that are relevant to the Pacific. Identifies needs for further training materials that apply to local contexts and the need for better coordination and dissemination of information to industry and growers.</p>	Assessment of Coconut Industry Training Manuals for the Pacific
5	<p>Bawalan, D, D. (2011) Processing Manual for Virgin Coconut Oil, its Products and By-products for Pacific Island Countries and Territories. Secretariat of the Pacific Community.</p> <p>EU-FACT, SPC</p>	<p>Technical manual for production of VCO and by-products in the pacific.</p>	<p>An example of the technical information on production methods and practical guidance that is available.</p>	Processing Manual for Virgin Coconut Oil, its Products and By-products for Pacific Island Countries and Territories
6	<p>PARDI (2011) Coconut Value Chain Review</p>	<p>A brief overview of the pacific coconut sectors and the scope for support to strengthen the sector. This was</p>	<p>Identified opportunities for research and development in the coconut sector in 4 areas:</p>	Coconut Value Chain Review

#	Report	Summary of findings	Implications for PHAMA Plus	
	PARDI, ACIAR	conducted in the early stages of PARDI with a similar intent to this review for PHAMA Plus. PARDI ultimately focused its resources in other sectors.	<ul style="list-style-type: none"> • Market focus; • Value adding products and processes; • Smallholder engagement; and • Medicinal uses of coconut oil and the effect of lauric acid. 	
7	Nolan, G., McGavin, R., Blackburn, D, and Bulai, S. (2016) Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific Communities. Final report ACIAR	End of project report for the ACIAR coconut veneer project. It demonstrates proof of concept for veneer production from coconut stems with the key developments that: <ul style="list-style-type: none"> • High quality veneer products can be produced from senile coconut stems. • Equipment for veneer production is available and is increasingly affordable. • Economic analyses indicate that production could be profitable for existing veneer producers and other small-scale processors. 	Additional work to develop a coconut veneer industry that PHAMA could support includes: <ul style="list-style-type: none"> • Technical support for processors to adapt their equipment for coconut veneer. • Comprehensive value chain study for specific locations and processors. • Product development and marketing support. • Development of options for utilization of by-products. • Replanting programs. 	Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific Communities
8	Bailleres H, Hopewell G, House S, Redman A, Francis L, and Ferhrmann, J (2010). Cocowood processing manual. From coconut wood to quality flooring. Department of Employment, Economic Development and Innovation, Brisbane. ACIAR	Describes techniques and processes for production of timber from coconut stems, among other things it covers: <ul style="list-style-type: none"> • Sawing techniques • Drying • Grading • Treatment for preservation • Product specifications for end-markets. 	A technical manual that can be utilized if providing support for production of coconut timber (as opposed to veneer).	Cocowood processing manual. From coconut wood to quality flooring
9	Foale, M. (2003) Coconut Odyssey: The Bounteous	Describes the origin and distribution of coconut, varieties, ecology, propagation, cultivation, harvesting, uses, and preparation. It describes the way in which the full	A comprehensive reference on all aspects of coconut growing and use.	Coconut Odyssey: The Bounteous Possibilities of the Tree of Life

#	Report	Summary of findings	Implications for PHAMA Plus	
	Possibilities of the Tree of Life ACIAR	potential of coconut and its benefits can be realized for better health, food and the environment.		
10	Warner, B., Quirke, D. and Longmore, C. (2007) A review of the future prospects for the world coconut industry and past research in coconut production and product. ACIAR, Centre for International Economics (CIE)	Reviews the coconut sector and identifies opportunities for future research and development support from ACIAR. It analyses the incentives for smallholders to replant coconuts and finds that there is little incentive to adopt new technologies to increase productivity if it requires replanting. This finding is primarily because it is difficult for farmers to absorb the loss of income in the lag-time between planting and new palms becoming productive. They find that productivity declines in coconut plantations have not yet affected household incomes or welfare.	Good reference for PHAMA Plus in considering the design and approach for replanting programs, recognizing this report was done in 2007 and conditions have changed.	A review of the future prospects for the world coconut industry and past research in coconut production and product
11	Jiang, Y. and Fu, Z. (2016) Exploring the potential for developing exports of coconut products to China: Virgin Coconut Oil, Coconut Oil, Whole Fresh Coconut. PHAMA	A feasibility study conducted under the PHAMA Fiji program in 2016 by the Pacific Islands Trade and Invest (PTI) Beijing office, looking at the export potential for coconut oil and other products. While identifying a range of possible opportunities for premium value-added coconut products (e.g. skin care), it was apparent that exports of lower value products (e.g. mature or green coconuts) to China were not viable.	There are more opportunities associated with higher value coconut products in export markets than with lower value or bulk products.	Report in draft (2016)
12	Gravelroads (2017) Coconut markets for PNG. PHAMA Technical Report 113 PHAMA	A detailed market study for the PNG coconut sector with the findings that: <ul style="list-style-type: none"> • The PNG coconut industry is a large contributor to the agriculture sector and rural livelihoods. • The PNG coconut industry is dominated by copra and other lower value products. • Current exports of High Value Coconut Products (HVCPs) by PNG companies is limited. 	Opportunities for PHAMA Plus support in improving the quality of HVCPs, product diversification, trade and buyer linkages, standards and certification and SME development.	Coconut markets for PNG

#	Report	Summary of findings	Implications for PHAMA Plus	
		<ul style="list-style-type: none"> • There is increasing price competition for HVCPs despite increasing demand in many markets. • PNG production of HVCPs does not match capability of SE Asian exporters. 		
13	Laven, A. (2016) Cocoa and Coconut in the Solomon Islands: A Family Affair. Technical Report 96 PHAMA	A value chain and gender analysis for the Solomon Islands coconut and cocoa sectors.	Identifies entry points to improve outcomes for all people involved in the value chain, some of which have been initiated under PHAMA.	Cocoa and Coconut in the Solomon Islands: A Family Affair
14	Wilkinson, B. (2018) Kamaimai (Coconut Sap Syrup) Business Plan 2019 and report Strongim Bisnis (DFAT)	Report and business plan for 2019 on the development of Kamaimai Products, which is a small Solomon Islands business producing coconut sap syrup and associated products. The full report is confidential.	An example of an enterprise that is commercializing new products and the type of business planning support that is commonly needed.	Confidential
15	Young, D. and Pelomo, M. (2014) Solomon Islands Coconut Value Chain Analysis. World Bank Rural Development Program World Bank, DFAT, IFAD	This report was completed ahead of the start of RDP Phase II in 2015. It is a comprehensive assessment of the coconut value chain in Solomon Islands and makes recommendations for the work of RDP, most of which have been undertaken to some extent.	Recommendations that continue to be relevant for PHAMA Plus are: <ul style="list-style-type: none"> • Improve the profitability of the copra value chain mainly through improvement of copra quality using a combination of regulatory measures, the strengthening of linkages between the commercial actors and the regulatory and technical support agencies. • Strengthen the institutional framework of the coconut sector. • Improve the availability of financial services to value chain actors. • Initiate a long-term coconut replanting program. 	Solomon Islands Coconut Value Chain Analysis
16	Young, D. (2013)	This study was completed in the early stages of PHAMA in	Coconut and chilies were identified as priority	Feasibility Study on

#	Report	Summary of findings	Implications for PHAMA Plus	
	<p>Feasibility Study on Developing Exports of Selected Products from Solomon Islands to Australia.</p> <p>PHAMA</p>	<p>Solomon Islands to identify those commodities with good prospects in export markets, where there was a reasonable likelihood of market access procedures being developed. Eleven commodities were assessed of which coconuts and fresh chilies were identified as high priority for further development. The support recommended for PHAMA was with HACCP certification, marketing, and business support and training for exporters.</p>	<p>cash crops that could be exported from Solomon Islands to Australian markets.</p> <p>While focused on Solomon Islands and the Australian markets, the analysis has some relevance to all PHAMA Plus countries.</p>	<p>Developing Exports of Selected Products from Solomon Islands to Australia</p>
17	<p>UNCTAD (2016)</p> <p>National Green Export Review of Vanuatu: Copra-Coconut, Cocoa-Chocolate and Sandalwood</p> <p>UNCTAD</p>	<p>National Green Export Review report developed by the Vanuatu Government and the United Nations Commission on Trade and Development (UNCTAD). A national plan of action for the coconut sector is proposed which contains 4 broad recommendations:</p> <ul style="list-style-type: none"> • Harness existing capacity of coconut farmers, industries and private sector to increase and sustain market related production. • Strengthen institutional capacity of the Department of Agriculture and the Department of Industry to monitor the speedy recovery of the sector. • Create conducive and enabling environment for the coconut sector to flourish. • Provide support services for enhancing coconut farmers, MSMEs and private sector within the coconut sector. 	<p>It will be important to understand the implementation status of the more detailed actions in this plan when considering PHAMA Plus work in Vanuatu.</p> <p>Also contains information and recommended actions for the Vanuatu cocoa and sandalwood industries.</p>	<p>National Green Export Review of Vanuatu: Copra-Coconut, Cocoa-Chocolate and Sandalwood</p>
18	<p>McGregor, A. and Hopa, D. (2007)</p> <p>Strategic Review of the Coconut Industry and Commodities Marketing in Vanuatu:</p> <p>The actual and potential contributions of coconut-based</p>	<p>This report assessed the sustainability of the coconut industry in Vanuatu and how the sector could become more competitive. The main overall finding was that the coconut industry, with emphasis on value added products, could continue to contribute to broad based economic growth and livelihoods in Vanuatu. It recommended that the Vanuatu Government progress with the design of a Coconut Industry Development Program with six elements:</p>	<p>This work was a precursor to subsequent industry development initiatives that are ongoing.</p>	

#	Report	Summary of findings	Implications for PHAMA Plus	
	industries to broad-based growth AusAID	<ul style="list-style-type: none"> • Improving the coconut industry information base • Improving information flows to rural areas • Coconut replanting and maintenance • Copra production improvement • Improved industry access to working and investment capital • Reducing unnecessary transaction costs. 		
19	Wilkinson, B. (2017) Tonga National Youth Congress Virgin Coconut Oil & Dried Vanilla Bean Market study Oxfam	A study of consumer buying trends; global import and export trends; existing coconut oil and vanilla brands; and an analysis of products available to determine whether there were viable markets for TNYC to create an ongoing business from VCO exports. The full report is confidential.	To recognize that such work has been done recently and engage with those involved if pursuing work in this area.	Confidential
20	SOPAC (2005) Cocogen: Feasibility study into the use of coconut oil fuel in EPC power generation SOPAC, UNDP	Demonstrates the viability of cogeneration, particularly in rural areas of Samoa. It is less viable in urban areas where imported diesel is more easily available and affordable.	A reference that could be used in the context of biofuel development.	Cocogen: Feasibility study into the use of coconut oil fuel in EPC power generation

4 Utilisation of Coconut Stems

This section discusses the potential for commercial use of coconut stems to fund and motivate, replanting of senile coconut plantations.

4.1 The context of un-productive coconut plantations

The last decade has seen a global increase in demand for coconut products, however at the same time the productive capacity of the coconut plantations has been in decline. In the Pacific, more than 50% of the 1.3 million coconut trees are regarded as senile and unproductive (McGregor and Sheehy 2017). Very little replanting has occurred in the last 3-4 decades which must be addressed if communities are to take advantage of growing market opportunities, or indeed, to maintain existing industries and markets.

The key question to be addressed is: why are PIC landholders not replanting their aging coconut plantations to cater for their ongoing needs and the needs of future generations? Whilst the literature consistently identifies replanting as an important requirement, and makes various recommendations for promoting it, analysis of the reasons for lack of replanting is lacking. Most likely there are multiple causes of the apparent disinterest in replanting including, but not necessarily limited to, the following:

- The perceived benefits (cultural, cash income, subsistence consumption, by-products and environmental) are insufficient to justify the costs.
- The owners or custodians of ageing coconut plantations recognize the benefits of replanting but are unable to finance it considering the long gestation period before new plantings become productive.

There have been a number of replanting initiatives involving subsidies and other incentives but none of these have been sufficient to address the full magnitude of the problem, and the initiatives have not been sustained once the subsidies/incentives end. For replanting to occur on a sustainable basis, both of the above issues need to be addressed by: (i) improving the profitability of coconuts by moving towards higher value products; and (ii) facilitating investment by making it easier to finance the replanting process including the removal of existing senile palms. Coconut timber has long been seen as a product that could help provide a return for senile stems, and more recently the technology to produce coconut veneer has become more accessible and affordable.

PHAMA Plus can support both the transition to higher value products and measures to make replanting a more attractive and affordable investment by developing commercial products from senile coconut stems. This has the potential to:

- Develop a productive use for the large resource of senile palms that are currently under-utilised.
- Contribute to diversification and value adding along the coconut supply chain.
- Contribute to coconut plantation health and sanitation, improving biosecurity practices.
- Facilitate development of more climate change resilient cropping systems.
- Contribute to conservation of natural forests by reducing demand for wood products.
- Improve rural livelihoods (Bulai 2017).

4.1.1 Previous programs

Work to understand the properties and uses of coconut wood in the Pacific was initially conducted during the 1970's and 80's. More recently, The Australian Centre for International Agricultural Research (ACIAR) completed two projects to support the commercial production of coconut timber and coconut veneer. The most recent of these was; Development of advanced veneer and other product from coconut wood to enhance livelihoods in South Pacific communities. The project was implemented predominantly in Fiji with some activities undertaken in Solomon Islands and Samoa and the main partners were the University of Tasmania, Queensland Department of Agriculture and Fisheries (QDAF), SPC and the Fijian Ministry of Forestry Timber Utilisation Division.

PHAMA, through its Forestry Adviser based in Solomon Islands, participated in some of the project activities and has continuing links with the project partners. Private sector partners from the timber and coconut industries also participated in the project and may have interest in continuing some of the project initiatives.

4.2 Coconut timber and veneer

Coconut stems can be used to make coconut timber (using normal timber production equipment) or coconut veneer (using a veneer lathe and associated equipment). In coconut stems the highest density sections are on the outside while the middle part is very porous, veneer peeling allows maximum utilisation of the higher density and higher value outside sections of the stem. By comparison, sawing coconut stems for timber results in a high level of wastage.

Coconut veneer can be used in a range of applications but appears to have more competitive advantage in higher value products such as: flooring; lining, joinery surfaces (tops and solids), bench tops and special light plywood. It is likely to be less competitive in the lower volume, higher value markets for products like form ply and structural ply and as a component in laminated veneer lumber (LVL).

The main by-product of peeling logs for veneer is the unpeeled inner section of the log. This could be used for firewood, timber (in non-structural uses), charcoal, compost (with appropriate management to avoid spread of coconut beetle) and as a biofuel.

4.2.1 Status of development of coconut veneer

The ACIAR projects demonstrated proof of concept to produce coconut veneer and tested the economic feasibility of business models for its manufacture, specifically they:

- Showed techniques for peeling old coconut stems with high density and the equipment required. Normal timber plywood production is done with a lathe that has spindles at each end to grip the centre of the log while it is peeled, peeling coconut stems requires a spindle-less lathe due to the soft inner part of coconut stems.
- Developed a range of products and demonstrated their physical properties.
- Confirmed market interest with selected potential buyers.
- Tested the financial feasibility of coconut veneer under different production scenarios. Economic modelling was conducted of the investment and operating costs of several production scenarios (refer report # 7 above). The key conclusion was that the costs of establishing a greenfield coconut veneer operation were very high but that it could be a feasible investment for existing veneer processors. An excerpt of this analysis is provided in Appendix 2, such analyses could be review and updated by PHAMA Plus in relation to specific partners or scenarios.
- Identified options for the use of waste products.

To build on this technical work there is now a need to extend industry engagement. Recent consultations by CIDP in 2018 indicated that Fiji's four plywood processing companies were interested to develop coconut veneer but required technical support to conduct further commercial trials in order to gain enough confidence in the process to make the substantial follow-up investment needed.

4.2.2 Next steps

Programs have so far focussed on technical elements of the production and use of coconut wood and veneer. There is scope to build on this work by progressing engagement with industry and by better understanding the feasibility of production in specific contexts. Activities that could be progressed by PHAMA Plus could involve veneer/timber processors and coconut industry operators and could include:

- Financial analysis
 - To understand the resource (size, location, ownership) and feasibility of processing veneer or coconut wood in a given location with private sector partners.
- Product development
 - Working with processors to develop and test products for specific markets (ideas include the development of coconut veneer bench tops, wall panels, doors with a balsa core for the marine industry, and others).
- Testing the value chain
 - Working with potential value chain actors to trial the process of harvesting, transport, processing and marketing and to understand the incentives required and barriers to peoples ongoing participation.

- Trial consignments
 - Facilitating commercial trials of coconut veneer production and export, to confirm commercial feasibility and provide practical experience in processing and engagement with markets.

5 Conclusion

The coconut sector continues to be critical to livelihoods and rural economies in the Pacific. It will remain important for PHAMA Plus to engage with the sector whether it provides direct support or not. Some general conclusions on the state of the Pacific coconut industry are below.

- Due to the importance of the sector, there has been much donor and government interest and subsequently many modes of support have been considered and tried before, with varying success.
- A range of technical analyses of the coconut sector and its value chains have been done. Future work should be targeted to the context of specific products, markets or individual enterprises.
- Despite there being investor interest in Pacific coconut industries, private investment has generally been directed to other producer countries such as those in South East Asia.
- A viable and resilient coconut sector is most likely where the whole value chain works effectively, where there are a range of products and industries that draw on the coconut plantation resource.
- The diversity of the coconut sector and its products makes it difficult to identify those sub-sectors or business models that warrant further development. In the PHAMA countries, processors of VCO and coconut cream have had some success in the last 5-10 years but only some enterprises have thrived and most of these have had significant donor assistance.
- PHAMA has developed experience in the coconut sector and has had extensive engagement with private sector, government and grower partners which can be drawn on in PHAMA Plus.

Within this context there continues to be scope for PHAMA Plus involvement with the coconut sector. Three broad intervention areas should be considered:

5.1 Biosecurity

Invasive strains of Coconut Rhinoceros Beetle (CRB) are a serious biosecurity threat to the coconut sector and livelihoods in all Pacific countries. PHAMA played a valuable facilitatory role in the management response in Solomon Islands and this could be expanded to other countries in partnership with regional organisations and national biosecurity agencies.

5.2 Stem utilisation

Encourage replanting of coconut plantations by creating / adding value to old stems that are under-utilized and declining in productivity. Facilitate the further development of products including coconut veneer, timber, charcoal, coir and others. Identify ways to incentivize replanting so that the benefits of doing this can be realized.

5.3 Value adding and diversification

Support a range of activities with the objective of adding value and diversifying coconut value chains. This could include understanding social perspectives and barriers to industry development; assistance to meet certification and other market requirements; understanding the economic viability of SME processors; and measures to add value to copra production.

Revitalisation of the coconut sector in the Pacific will require interventions in all three of the above areas – to protect against damage by a dangerous pest; to make coconut production more profitable; and to restore productive capacity by facilitating replanting. Initiatives to stimulate replanting alone are unlikely to succeed unless the other two issues are also addressed.

There continue to be a number of initiatives in value adding and diversification of coconut products and PHAMA Plus could provide selective support in this area, with the production of high-quality copra to produce coconut oil as an import substitute being amongst the most promising, along with further expansion of VCO production and other high value niche products. However, the two areas where PHAMA Plus could play a

leading role are in biosecurity/CRB control and coconut stem utilization, both of which are receiving limited support from other development partners. Successful development of profitable systems for stem utilization has the potential to catalyse re-development of this important sector provided it is accompanied by measures to protect it against exotic pests and diseases and transition towards higher value coconut products.

Higher-level influences on industry development

Like many others, this review has reiterated the overarching factors limiting the development of the coconut industry in the Pacific. To help address these PHAMA Plus can continue to work with partners to:

- Ensure appropriate policy settings and an enabling environment for business and investment.
- Improve access to infrastructure and logistics services.
- Increase availability of information and understanding of supply chains among all value chain actors.
- Enhance research and development of coconut growing and products for a changing climate.

6 Recommended Interventions for PHAMA Plus in the Coconut Sector

This table outlines recommended intervention areas and associated activities in the coconut sector, it is intended to provide a menu of options for consideration and further development by PHAMA Plus and partners.

Intervention areas and activities	Activity description	Countries	Partners	Relative priority for PHAMA Plus ¹
Biosecurity				
1	<p>Management of Coconut Rhinoceros Beetle</p> <p>Build on PHAMA work in Solomon Islands to promote awareness of the threat of new and existing strains of CRB. Work with national biosecurity agencies and SPC to facilitate management response and/or prevention measures as well as communications initiatives to increase public awareness. Conduct pathway analysis on potential spread of new strains of CRB.</p> <p>This would link with activities under the stem utilization initiative.</p>	Regional	<p>SPC</p> <p>National biosecurity agencies</p> <p>DFAT</p> <p>ACIAR (forthcoming coconut livelihoods project)</p> <p>PPPO</p>	<p>HIGH</p> <p>Important for industry and livelihoods. Links with PHAMA Plus biosecurity focus.</p>
Stem utilization				
2	<p>Coconut replanting</p> <p>Investigate and trial approaches to create incentives to replant coconut plantations. Work with commercial partners and government to:</p> <ul style="list-style-type: none"> • Consider household economics and incentives for replanting; • Trial approaches to harvest and replanting that allow landowners to maintain production and returns from coconuts or copra; and • Identify appropriate varieties (dwarf, tall etc) and cultivation techniques. <p>Small coconut seedling nurseries could be established in growing areas, these nurseries would be operated as micro enterprises by lead farmers.</p>	Regional approach but tailored to national/local context	<p>Government agencies</p> <p>Private sector including MAWGs and IWGs</p> <p>Farmer associations</p> <p>Other donor programs</p>	<p>MEDIUM</p> <p>Large scope to add value but success is dependent on farmer interest. Need to manage the risk of creating incentives to remove palms without associated replanting.</p>
3	<p>Coconut charcoal for domestic</p> <p>Work with local processors of coconut charcoal to improve product quality and production efficiencies for sales in domestic markets.</p>	Samoa Solomon Islands	Charcoal processors and sellers	<p>MEDIUM</p> <p>Charcoal is a low value product. The</p>

¹ Priority of high, medium, low is an initial ranking based on the alignment with PHAMA Plus criteria (opportunities, relevance and feasibility) for each activity.

Intervention areas and activities		Activity description	Countries	Partners	Relative priority for PHAMA Plus ¹
	markets	Facilitate the substitution of charcoal imports in some countries. Could contribute to the CRB control efforts in Solomon Islands through utilization of CRB affected stems that have been removed.	Others	PIFON Pacific Biochar Initiative	scope to improve commercial returns is unknown.
4	Handicrafts	Work with handicraft vendor associations to ensure sustainable access and use of coconut products for handicrafts and cultural purposes.	PNG Solomon Islands Vanuatu Samoa	Handicraft associations Handicraft IWGs Coconut processors	LOW Most likely a complementary activity to CRB or other stem utilization measures
5	Coconut veneer ² (could also apply to timber)	<p>1. <u>Economic analysis</u> To understand the resource (size, location, ownership) and feasibility of processing veneer or coconut wood in a given location with private sector partners. Necessary to complete this before activities 2-4 below.</p> <p>2. <u>Testing the value chain</u> Working with potential value chain actors to trial the process of harvesting, transport, processing and marketing and to understand the incentives required, expected returns, and barriers to peoples ongoing participation.</p> <p>3. <u>Product development</u> To understand the resource (size, location, ownership) and feasibility of processing veneer or coconut wood in a given location with private sector partners</p> <p>4. <u>Trial consignments</u> Facilitating commercial trails of coconut veneer production and export, to confirm commercial feasibility and provide practical experience in processing and engagement with markets.</p>	Fiji Solomon Islands PNG	Coconut plantation owners ACIAR SPC Fiji Ministry of Forestry Queensland DAF University of Tasmania Veneer producers (identified in report #3 and ACIAR reports)	HIGH Potential to add value and incentivize replanting. Timing would follow the sequence of activities 1-4 (to left).

² These activities are focussed on coconut veneer in the first instance but could equally apply to the production of coconut timber.

Intervention areas and activities		Activity description	Countries	Partners	Relative priority for PHAMA Plus ¹
Value adding and diversification					
6	Certification for the coconut industry	Continue activities initiated by PHAMA to provide coordination and technical support for industries to comply with certification standards where this can add market value. Certification standards that commonly apply to the coconut sector are HACCP, Organic and Fairtrade.	Regional	Processors and farmer groups Certification providers: ACO, NASAA (Organic), Fairtrade, HACCP Australia Importers and end-market buyers POETCom	HIGH Important for market access. Links with thematic area to implement and maintain quality and risk management systems
7	Improving the value of copra	<i>High quality copra oil for domestic markets</i> Higher quality copra oil for domestic markets Work with processors, growers and retailers to improve production and develop domestic markets for high quality copra oil. Build on pilot work by CIDP in Solomon Islands with a view to expanding to other countries (see report #2).	Solomon Islands initially	CIDP Chottu's Coconut Products (Solomon Islands) Retailers	HIGH Scope to make improvements and need for donor support. Existing linkages with partners.
		<i>Assisting processors to transition to higher value products</i> If there is interest, assist larger scale copra businesses to transition equipment and machinery towards production of higher value products.	All, depending on interest	Larger scale copra and coconut processors	LOW Scope to facilitate added value but dependent on processors changing their business model.
8	Social analysis of coconut production	Investigate social and cultural aspects of the pacific coconut industry to better understand: <ul style="list-style-type: none"> • Perceptions of work in coconut plantations and copra production; • Barriers to engagement in such work for different groups; and • Household economics and incentives required for people to engage in nut collection, replanting, copra drying and similar tasks. <p>Would inform activities under the stem utilization intervention area, particularly coconut replanting.</p>	All	SPC Government agencies Farmer organisations	MEDIUM Dependent on further assessment of the need for such work.

Intervention areas and activities		Activity description	Countries	Partners	Relative priority for PHAMA Plus ¹
9	Developing new coconut products	<p>Assist processors to investigate and trial new products that have been identified as having commercial potential e.g. VCO, high quality copra, coconut cream and yoghurt and timber veneer (as identified by CIDP 2017 in report #1).</p> <p>Work with interested businesses to develop products like kaffirs, some cosmetics, coconuts shells in handicrafts and accessories, coir fibre and possibly sugars and jams.</p> <p>Assist businesses to understand potential new export market applications such as the use of charcoal in industrial processes and other emerging uses of coconut products.</p>	Samoa Tonga Fiji	Coconut product processors and retailers CIDP and SPC Business support programs e.g. Pacific Trade and Invest Business Link Pacific, Business Partnerships Platform	<p>MEDIUM</p> <p>Other programs may be better placed to provide support in this area. Support should be based on an initial assessment of business and market viability.</p>
10	Improving viability of SME coconut processors	Understand the viability of SME coconut processors in the pacific to determine if they are likely to be viable on long term basis. Assist businesses to identify ways to reduce input costs and become more efficient.	All, depending on interest	Coconut processors Chambers of Commerce Business support programs e.g. Pacific Trade and Invest Business Link Pacific, Business Partnerships Platform	<p>LOW</p> <p>An important activity but dependent on interest of processors. Other programs can provide this sort of support.</p>

Appendix 1 The coconut industry in PHAMA Plus countries

Country	Industry description	PHAMA support to sector	Involvement in PHAMA supported industry groups
Papua New Guinea	<p>Industry earns USD 58.6M annually. Produces copra, crude natural oil (CNO) and VCO for exports. Increasing uses coconut leaves, shells and other parts for handicrafts. 465,000 households involved in production. 15 VCO producers, 12 copra exporters. 70% of coconuts are used for domestic purposes and 30 for commercial purpose.</p> <p>The coconut industry and trade is heavily regulated, mainly by Kokonas Industri Korpoerensen (KIK).</p>	<p>Market study (report #12) HACCP certification Quality improvements Marketing, promotion and buyer linkages Product diversification (coconut shell accessories) Policy inputs</p>	<p>High Value Coconut Products (HVCP) IWG is in place and has met 8 times. Hasn't in the last 1 year.</p>
Solomon Islands	<p>All plantations are currently owned by smallholders. Copra export the main trade, there are 2 main exporters. Copra meal also exported. Some export of dried whole nuts. 4-5 processors of VCO and other value added products, only 1 exports consistently.</p>	<p>HACCP certification Organic certification Industry body facilitation Marketing linkages and visits Coordination of CRB management and awareness programs</p>	<p>Coconut IWG is active and collaborates with PHAMA as well as other programs, notably RDP.</p>
Vanuatu	<p>Smallholder dominated industry but with some larger-scale plantation estates and processing operations.</p>	<p>PHAMA was involved in steps to form an industry association which ultimately did not eventuate. There is continuing interest in establishing an association and donor support through EU and the Government of Vanuatu.</p>	<p>Coconut businesses not directly represented on MAWG</p>
Fiji	<p>Mix of small holder growers / processors, one major processor and several producers of high end beauty products</p>	<p>Feasibility study for export to China HACCP certification (VCO producers)</p>	<p>Coconut businesses not directly represented on MAWG</p>
Tonga	<p>Smallholder dominated industry but with some larger-scale plantation estates and processing operations.</p> <p>Export of drinking nuts</p>	<p>HACCP certification Land clearing, removal of fallen trees and some utilisation (milling) as part of recovery from Tropical Cyclone Gita (Feb 2018)</p>	<p>Coconut businesses are represented on MAWG</p>
Samoa	<p>Smallholder growers Export of coconut oil, coconut cream, fresh drinking nuts and dry nuts</p>	<p>HACCP certification Export of coconut cream and coconut oil.</p>	<p>Coconut businesses are represented on MAWG.</p>

Appendix 2 Analysis of feasibility of coconut veneer production

Expert from Nolan, G., McGavin, R., Blackburn, D, and Bulai, S. (2016) *Development of advanced veneer and other products from coconut wood to enhance livelihoods in South Pacific Communities*. Final report, ACIAR. Further analysis is provided in the report.

PHAMA Plus could work with the ACIAR project partners to apply these analyses to specific production contexts with interested veneer processors.

Table 3: Five enterprise options with different production configurations.

Enterprise Options	Production Capacity	Product price required to achieve benchmark IRR at a 12% target at five-years. (AUD/m ³)
Option 1. A single low cost 8-foot (2.4 m) spindle-less rotary peeled veneer (RPV) processing line installed at an existing sawmill operating on a single day-shift.	Processing 15,000 m ³ of peeler logs to produce 8,250 m ³ of green coconut veneer product per annum.	\$174.5 (green veneer)
Option 2. One 8-foot (2.4 m) and one 4-foot (1.2 m) high-grade spindle-less RPV processing line installed at an existing sawmill and operating on two day-shifts.	Processing 50,000 m ³ of peeler logs to produce 27,500 m ³ of green coconut veneer product per annum.	\$176.5 (green veneer)
Option 3. Independent veneer drying and grading facility. At an existing peeler mill, with a quality built continuous veneer dryer and upgraded heat plant operating one day shifts.	Processing 35,000 m ³ of delivered green veneer to produce 28,000 m ³ of dried coconut veneer product per annum.	\$355 (dry veneer)
Option 4. An extra shift at an existing peeler mill. Costs have been included for staff night shift loadings and upgrading of the heat plant and buildings for the additional production output.	Processing 35,000 m ³ of delivered green veneer to produce 28,000 m ³ of dried coconut veneer product per annum.	\$291 (dry veneer)
Option 5. A new integrated mill installed at a greenfield site with an 8-foot (2.4 m) and a 4-foot (1.2 m) high-grade spindle-less RPV line, a new heat plant and one new quality build continuous dryer operating two shifts for peeling and one for drying. This is included mainly for the Solomon Island and Samoa.	Processing 50,000 m ³ of peeler logs to produce 27,500 m ³ of dried coconut veneer per annum.	\$396 (dry veneer) with a new boiler and heat plant. \$328 (dry veneer) with a refurbished boiler and heat plant.

Appendix 3 Bibliography of coconut literature from the Pacific Agricultural Information System

Bibliography of technical and project reports on coconuts in PHAMA Plus countries sourced from the Pacific Agricultural Information System (PAIS). Results are based on a search of “coconuts” for the 6 PHAMA Plus countries and are arranged in chronological order.

There is a total of 739 references, PNG and Solomon Islands have the most entries due to greater focus to date by PAIS in these countries. Work is ongoing to build the reference collection for all countries.

The PAIS can be accessed at <http://prestohost69.inmagic.com/Presto/home/home.aspx?ssid=Home>

Assistance from Peter Walton of PAIS is gratefully acknowledged.

PAPUA NEW GUINEA

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