

Kingdom of Tonga: Infrastructure Requirements for Processing and Packaging Horticultural Products for Export

Technical Report #109

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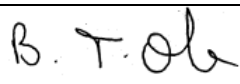

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Acronyms

Abbreviation	Description
AFAS	Australian Fumigation Accreditation Scheme
ASGC	Agricultural Sector Growth Committee
BQA	Bilateral Quarantine Agreement
DFAT	Department of Foreign Affairs and Trade (Australia)
EDMF	Eastern District Packhouse Facility
EOI	Expression of Interest
FOB	Free on Board
GAPs	Good Agricultural Practices
GroCom	Growers Commodities Marketing Group Ltd (Tonga)
GroFed	Growers Federation of Tonga (Inc)
GXN	Grower's Export Network
HACCP	Hazard and Critical Control Point
HTFA	High Temperature Forced Air
MAFFF	Ministry of Agriculture, Food, Forestry and Fisheries
MCTL	Ministry of Commerce, Tourism and Labour
MOF	Ministry of Finance
NMAC	National Market Access Coordinator
NRBT	National Reserve Bank of Tonga
NWC	Nature's Way Cooperative (Fiji) Ltd
NZ MPI	New Zealand Ministry of Primary Industries
PHAMA	Pacific Horticultural and Agricultural Market Access Program
PICs	Pacific Island Countries
PPP	Public-Private Partnership
SPC	Secretariat of the Pacific Community
TASP	Tonga Agricultural Sector Plan
TEQM	Tonga Export Quality Management Ltd
TMAWG	Tonga Market Access Working Group (PHAMA)
TOP	Tonga Pa'anga (Tongan currency)

EXCHANGE RATES

(June 2016)

Tonga Pa'anga (TOP) 1.00 = Australian Dollars (AUD) 0.58

Tonga Pa'anga (TOP) 1.00 = New Zealand Dollars (NZD) 0.61

Tonga Pa'anga (TOP) 1.00 = United States Dollars (USD) 0.44

Executive Summary

Background

The Pacific Horticultural and Agricultural Market Access Program (PHAMA) Technical Report #45 was completed in April 2013 and included a range of recommendations on priority export marketing infrastructure. The three priority infrastructure needs identified were: (i) improvements to the Ministry of Agriculture, Food, Forestry and Fisheries (MAFFF) export processing facility to increase its capacity and enable it to operate more efficiently; (ii) overhaul and improvement of the airport High Temperature Forced Air (HTFA) treatment facility; and (iii) establishment of two decentralised general-purpose processing facilities on Tongatapu.

Over the last three years recommendations relating to (i) and (ii) have been substantially completed. The proposed decentralised processing facilities are still under consideration. However the establishment of a modern Hazard and Critical Control Point (HACCP)-certified export packhouse by Nishi Trading Ltd. provides a facility that is readily accessible to growers and exporters in the Central and Western parts of Tongatapu. Nishi has plans to upgrade the facility to process root crops in addition to its current use for processing cucurbits for export. Therefore the focus has now turned to the proposed Eastern District Packing Facility (EDPF). However, the specific needs and viability of the proposed new processing facility needed to be reconsidered in light of new information that was available since Technical Report #45 was completed.

In the past, most export processing was undertaken in small, decentralised and makeshift premises, with consolidation taking place into reefer containers prior to export. More recently establishment of the MAFFF post-harvest facility at Nuku'alofa and the Nishi packhouse have led to greater centralisation and improved quality control. However Tonga's capacity to process and package fresh produce to export standards is limiting the expansion of export-based agriculture.

Existing Marketing Infrastructure

The MAFFF facility in Nuku'alofa is well located with paved roads on two sides and is only about 500m from the international wharf. There is abundant land available to expand the facilities if needed. About a third of the complex is used for MAFFF offices, for work not necessarily related to export marketing. All other parts of the facility are available for use by exporters without charge other than payment for electricity used. Five exporters are using the facility on a regular basis to process root crops for export, both frozen and chilled. The MAFFF facility is functioning reasonably well and is regularly processing 2-3 container loads of mainly root crops per week.

The airport facility is equipped to perform HTFA treatment of fresh produce for fruit fly host species. The facility is well located and has all of the necessary equipment for HTFA treatment and cold storage chambers in an insect-proof area. It is also suitable for packing and cold storage of non-fruit fly host products prior to export. Ownership of the facility was transferred to a parastatal company, Tonga Export Quality Management (TEQM) in 2013 and the equipment has been extensively overhauled. However the facility is struggling to operate viably due to technical problems and the low/variable level of throughput.

The established exporters handling squash, pumpkins, coconuts and watermelons have packhouse and storage facilities which are adequate to handle the current volumes exported, but with little scope for expansion. The most notable development has been the establishment of a large modern packhouse facility by Nishi Trading Ltd. During 2013-14 the company built Tonga's first international standard export packhouse and food processing plant. The design of the packhouse is adaptable and enables it to potentially process a wide range of root crops and other fresh produce for export in a variety of forms including both chilled and frozen. Nishi Trading uses the packhouse to process its own produce for export, but also makes the facility available on a fee-for-service (toll) basis for other growers and exporters. Currently the Nishi packhouse is only used for dry processing of cucurbits, but the company is planning to upgrade it to also process fresh and frozen root crops for export.

Priority Infrastructure and Equipment Needs

Complete implementation of the Technical Report #45 recommendations for the MAFFF Nuku'alofa facility would enable capacity to increase from 2-3 20-foot containers per week to 3-4 per week; and if volumes are sufficient, to increase the capacity of the fumigation facility from 60 tonnes per shipment to 120 tonnes.

The airport HTFA facility is now in good working condition and is ready to process and pack the complete range of fruit and vegetables for export. The problem now is not the infrastructure or equipment, but the operational challenges of managing a facility on a fee-for-service basis in the face of low and highly variable throughput and the need to sustain high operating standards in order to maintain access to the New Zealand market.

Decentralised General-Purpose Processing Facilities

Technical Report #45 concluded that if root crop exports are to expand, additional processing facilities would be needed. Increasing food safety concerns among root crop importers and retailers means that such facilities must have high operating standards and be designed so that HACCP accreditation is possible. Technical Report #45 recommended that the decentralised facilities would be available to exporters on a fee-for-service basis. It is likely that the facilities would be mainly used for processing frozen root crops, but could also be used for coconuts, watermelons or other produce.

A number of steps have been taken towards the establishment of the EDPF. An Establishment Board has been created and agreement on the ownership structure and operating model has been reached. A preliminary architectural design and costing has been completed, and the Australian Department of Foreign Affairs and Trade (DFAT) has indicated that it would be prepared to contribute to the financing of the construction costs subject to the completion of a comprehensive feasibility study and business plan and consultations with relevant stakeholders on the arrangements for its construction and operations. A draft feasibility study/business plan is therefore presented in Appendix B of this document.

The preferred option for ownership and operation of the EDPF is for it to be owned by a Public-Private Partnership (PPP) with Government holding less than 50%, and managed by a private sector partner. The role of MAFFF would be confined to technical support and inspection/certification. Some form of grower and/or exporter organisation would be most appropriate to be the majority owner of the facility. Charges for use of the facilities should be sufficient to cover all operating costs as well as contributions to a sinking fund to accumulate money to finance replacement of the buildings and equipment as necessary. Details of the proposed operating model are given in the Business Plan which demonstrates that if the facility is appropriately designed and managed it would make a sustainable contribution to the development of Tonga's export agriculture.

It is therefore recommended that the EDPF be established according to the design features and operating model described in the business plan, recognising however that there are several risks associated with the operating model including: (i) the possibility that it may prove difficult to engage a commercial partner; and (ii) that exporters may be reluctant to pay a full commercial toll fee if the market will continue to accept produce processed in basic non-certified facilities. The first of these risks can be managed by calling for expressions of interest (EOI) from commercial partners at an early stage. It is within the mandate of MAFFF biosecurity to manage the second risk.

1.0 Introduction

1.1 Background

The Pacific Horticultural and Agricultural Market Access Program (PHAMA) is an Australian Department of Foreign Affairs and Trade (DFAT)-funded initiative launched in 2011 and funded through to June 2017. It is designed to provide practical and targeted assistance to help Pacific Island Countries (PICs) manage regulatory aspects associated with exporting primary products including fresh and processed plant and animal products as well as marine and forestry products. This includes gaining access for novel products into new markets, and helping to maintain and improve existing trade. Australia and New Zealand are the markets of major interest, along with export markets outside the Pacific region. The core countries assisted through PHAMA include Fiji, PNG, Samoa, Solomon Islands Tonga, and Vanuatu. PHAMA also provides assistance to other PICs through the Secretariat of the Pacific Community's (SPC) Land Resources Division. The PHAMA regional office is located at SPC in Suva, Fiji. Smaller country offices are operated in all PHAMA countries and staffed by dedicated National Market Access Coordinators.

PHAMA Technical Report #45: *Feasibility Study to Determine Infrastructure Requirements for Processing and Packaging Horticultural Products for Export* (from Tonga) was completed in April 2013 and included a range of recommendations on priority infrastructure issues to be addressed. The three priority infrastructure needs identified in Technical Report # 45 were:

- 1) Improvements to the Ministry of Agriculture, Food, Forestry and Fisheries (MAFFF) Nuku'alofa export processing facility to increase its capacity and enable it to operate more efficiently.
- 2) Overhaul and improvement of the Fua'amotu airport High Temperature Forced Air (HTFA) treatment facility.
- 3) Establishment of two decentralised general-purpose processing facilities on Tongatapu.

The recommendations of Technical Report #45 have been used to guide PHAMA operations in Tonga over the last three years, and recommendations 1 and 2 have been substantially completed. The third recommendation currently being considered is for the proposed decentralised horticultural processing facilities, one in the Eastern District of Tongatapu, and one in the Western District. However the establishment of a modern HACCP-certified export packhouse by Nishi Trading Ltd. provides a facility that is readily accessible to growers and exporters in the Central and Western parts of Tongatapu, and could be upgraded to process root crops. Therefore the focus has now turned to the proposed Eastern District Packing Facility (EDPF).

Exporters have expressed a preference for facilities close to the main root crop production areas where produce could be processed and packed in shipping containers. It was agreed by the Tonga Market Access Working Group (TMAWG) to focus on the proposed facility for the Eastern District. PHAMA supported a series of activities from early 2014 towards considering the ownership and management arrangements, business plan, specific location and design, and funding sources.

By early 2016 progress had been made towards the establishment of the EDPF including the creation of an Establishment Board comprising representatives of Government and the private sector, and agreement on the ownership structure and operating model. It was also recognised that the specific needs and viability of the proposed new processing facilities needed to be reconsidered in light of new information that was available since Technical Report #45 was completed. Key pieces of new information were: (i) the completion of the Nishi Trading export packhouse; (ii) a new Agricultural Census; (iii) completion of Tonga's first Agriculture Sector Plan (TASP¹); and (iv) completion of a draft business plan for the EDPF.

Consequently it was decided that PHAMA would undertake a review of Technical Report #45 to reconsider the needs for new processing facilities and provide updated recommendations in light of developments since early 2013, and to finalise the business plan for the EDPF.

¹ Kingdom of Tonga (October 2015) Tonga Agricultural Sector Plan

1.2 Rationale

Despite having a very small land area, Tonga has very good agricultural production capacity with good soils and favourable climatic conditions for a wide range of tropical and sub-tropical crops as well as temperate horticultural products in the winter months. There are long-standing trade linkages with New Zealand, and Tonga has historically been a source of many fruit and vegetable crops for New Zealand including pineapples, bananas, coconuts, root crops and winter vegetables. Tongan exporters also have long-standing trade linkages with Australia (coconuts and root crops), Japan (squash), North America and other PICs.

However, exports have waned over a number of years due to increasingly stringent phytosanitary regulations, more demanding quality requirements and increasing competition from other suppliers including Australia, South America and North America. In addition some of the export protocols under various bilateral quarantine agreements (BQA) have lapsed (e.g. beans to New Zealand).

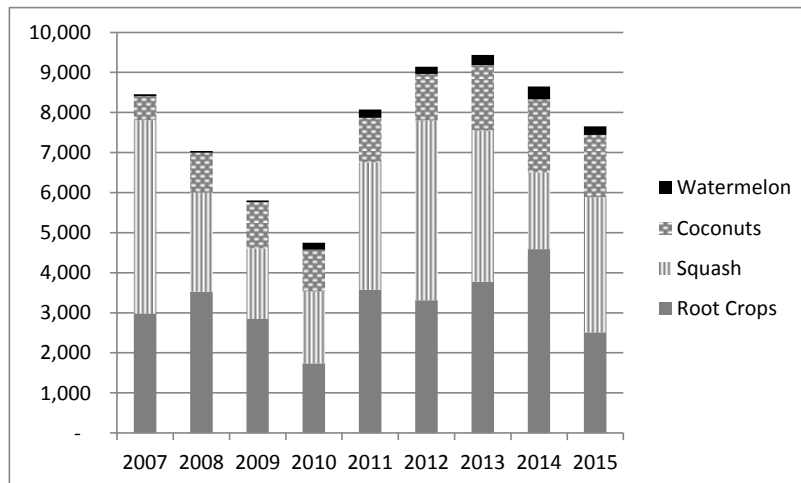
Due to its proximity and transport linkages, New Zealand has always been Tonga's main target market for exports. Although small in absolute terms, the New Zealand market is large relative to Tonga's capacity to produce and export. Effectively, the size of the market does not represent a constraint from Tonga's perspective. New Zealand is heavily dependent on imports of temperate horticultural products during the cooler winter months (May to October), and for tropical products all year round.

The large population of Pacific Islanders, Indo-Fijians and Asians in the Auckland area also provides market opportunities for specialised food products which target the culinary needs of these communities. New Zealand has five or six large fresh produce wholesalers which handle the full range of products and routinely import temperate products for the mainstream market through the winter months, and specialised tropical products for the ethnic communities all year round. This differs markedly from the Australian market which is mostly supplied from domestic production and does not have a strong import culture.

Seasonality strongly favours Tonga in accessing the New Zealand market. Tongan production of horticultural products tends to be higher, and prices lower, between June and October. This coincides with the period when supplies of many items in New Zealand are scarce or non-existent, and when prices in Australia (a competing exporter) are the highest. There are good air and sea freight linkages between Tonga and Auckland, although costs, particularly for air freight, tend to be high due to low volumes. However, current exports are almost entirely confined to low value products transported by sea, such as root crops, pumpkins, squash, watermelons and coconuts. Exports of fresh fruit and vegetables are negligible, and there are no export protocols in place for a number of potentially profitable export commodities.

There are a number of well-established exporters handling squash, coconuts, watermelons and root crops (fresh and frozen) who are interested in expanding their businesses and diversifying fresh produce exports once the export protocols and infrastructure are put in place. Such expansion cannot take place unless there is adequate infrastructure for processing, packaging and transporting these items to market.

As shown in Figure 1 below exports of the major commodities (root crops, squash, coconuts and watermelon) declined between 2007 and 2010 but rebounded in 2011 reaching over 9,000 tonnes by 2013. Severe drought conditions dented production and exports in 2014 and 2015, but shipments are expected to resume their uptrend from 2016 onwards. Most goes to New Zealand except for the squash which goes mainly to Japan, and the coconuts which go to Australia. Root crop and coconut exports are increasing, but squash and melon export volumes are erratic. Most of the root crops (cassava, taro, giant taro, tarua and yams) are bulk shipments in 20kg bags with about 70% in frozen form. Significant increases in both volumes and value are considered possible with improvements to the exporting infrastructure and moving from bulk format to retail packaging. Further development of the export pathways and marketing infrastructure are regarded as a necessary means of increasing exports.

Figure 1: Exports of Principal Commodities 2007 to 2015 (tonnes)

In the past, most export processing was undertaken in small, decentralised and makeshift premises, with consolidation taking place into reefer containers (chilled and frozen) prior to export. However in the last few years establishment of the MAFFF post-harvest facility at Nuku'alofa and the Nishi packhouse have led to greater centralisation and improved quality control. The Nishi facility is a modern HACCP accredited packhouse designed to process cucurbits for export, but could be adapted for other uses such as fresh and frozen root crops. The MAFFF facility was established with EU STABEX funding in 2010 and is equipped for washing, peeling, cutting, bagging, chilling and freezing produce with a capacity of around 4-5 tonnes per day. It also includes a methyl bromide fumigation chamber with a capacity of around 20 tonnes per day. Following improvements to the MAFFF facility as recommended in Technical Report #45, it is now regularly used by about five exporters.

Apart from infrastructure, it is also necessary to be mindful of a number of other constraints. MAFFF has limited capacity to support the expansion of the export sector in terms of export inspection and certification. This is exacerbated by the demands on MAFFF to inspect and certify large numbers of small consignments of handicraft products (mats, wood carvings, tapa, etc.) MAFFF also has limited capacity to provide the necessary research and extension support including grower registration and quality assurance schemes, maintain required biosecurity standards such as pest and disease surveillance, and to progress market access issues and negotiate export/import protocols. Other factors which need to be considered include the high cost of agricultural inputs (seeds, fertilisers, agro-chemicals, etc.), the high cost of fuels and energy, and limited access to finance.

1.3 Strategic Framework

In the long run, Tonga's agricultural and horticultural export performance has been generally disappointing, although the rebound in exports beginning in 2011 gives cause for optimism. In contrast, developing countries globally have benefited from increased trade in high-value agricultural and horticultural products over the past 20–30 years. The relatively poor performance of Tonga and other PICs in this area is particularly disappointing considering: (i) these are agriculture-based economies, often with very limited alternative development opportunities; (ii) the comparative advantage often cited for the region in the production and export of a wide range of agricultural and horticultural products; (iii) the proximity of some large and affluent markets; and (iv) the commonly acknowledged role of economic growth and trade as a mechanism for promoting regional stability.

Difficulties in dealing with the regulatory processes associated with accessing markets are a major reason behind this poor performance. Progress in negotiating new or improved access has been slow, resulting in a high level of frustration and missed export opportunities. New market access agreements have been few and hard won, and trade in some products has stagnated or declined due to the imposition of more onerous protocols for products that were historically traded with relative ease. These conditions apply to some extent to most agricultural and horticultural commodities, with

approved market access pathways for some items (albeit with strict compliance protocols), but total import prohibition for others.

1.4 Study Methodology

The study was undertaken by:

David Young Agribusiness Specialist

Logistical support and guidance was provided by Paula Mosa'ati (PHAMA National Coordinator, Tonga). The study includes an update of Technical Report #45 as part of a process of developing Tonga's capacity to export horticultural products, including the traditional export commodities such as squash, coconuts and root crops as well as higher value perishable fruit and vegetables, by air or sea. It is intended to identify remaining infrastructure bottlenecks and constraints, which PHAMA and other industry stakeholders can then address. The scope of work included:

- Assessing processing infrastructure in relation to installed capacity, throughput, condition, ability to comply with import standards, major product lines, ownership, and ability to meet projected medium-term industry needs.
- Reviewing the latest information on exports of fresh and processed crops to assess likely future exports (product type, volumes and markets).
- Identifying major constraints and issues associated with processing infrastructure, in particular the capacity to meet processing needs and standards.
- Reviewing and refining the draft business plan for the proposed EDPF, identifying capital costs; operating costs; projected throughput; ownership/governance arrangements; management arrangements and a financing plan.

As with the 2013 study which produced Technical Report #45, a three-stage process was employed:

- Analysis of supply issues including the current volume and seasonality of supply, grading, packing and transport requirements, experience in exporting, and other factors influencing Tonga's capacity to supply the principal markets.
- Re-assessment of the design and capacity of the existing processing and packaging infrastructure relative to current and projected future export volumes in order to identify critical bottlenecks which may constrain export growth.
- Preparation of recommendations on the infrastructure required and the operational procedures to be employed, with particular reference to the proposed EDPF, in order to realise Tonga's export potential over the next five years.

2.0 Agricultural Sector Background

2.1 Overview

The major policy development since 2013 has been the completion of the Tonga Agricultural Sector Plan (TASP). This is Tonga's first agricultural sector plan which identifies a vision and priorities for maximising contributions from the agriculture sector both to its economic growth and to sustained food security in the face of a changing world economy, climate change and natural disasters. The Plan also: (i) articulates specific programs and activities to achieve sector priorities; (ii) clarifies the roles and responsibilities of the different stakeholders; (iii) estimates investment needs; and (iv) provides a framework for measuring progress over the short- and medium-terms. There has also been a major improvement in the information-base for strategic planning in the sector through completion of the 2015 National Agricultural Census.

2.2 Tonga Agricultural Sector Plan

2.2.1 Background

The TASP defines the key characteristics of Tonga's agricultural sector and reports on the findings of an extensive community consultation process which identified the following **priority issues**:

- The need for markets and the fact that everyone grows the same products and floods the local market at the same time. There is a lack of understanding that markets cannot simply be created by Government.
- Infrastructure including basic community infrastructure, access roads to farms, access to social services, and evacuation access.
- The unreliability and poor quality of public water supply, and lack of alternative water sources.
- Food security including the lack of appropriate farm implements and tractors, poor access to planting materials, and generally low technological advancement.
- Climate change: traditional farming systems cannot cope with the changes in weather patterns that are being experienced. Drought-tolerant varieties are not available, and current farming practices are not considered to be sustainable.
- Capacity building: there is a widespread lack of knowledge on climate change, agribusiness, farming techniques, food preservation, adding value through processing, and on how to improve crop and livestock productivity.

TASP notes that work to promote exports is currently underpinned by a range of strategies and has been the focus of numerous development initiatives over the past five years. The area is now led by the Agricultural Sector Growth Committee (ASGC), which also coordinated preparation of the TASP, with MAFFF playing an important quarantine and regulatory role. In terms of a **strategy for exports**, TASP recognises the need for a range of strategies to focus on overcoming constraints, identifying and opening export opportunities, and setting priorities. An important aspect will be the development of a program to brand Tongan agriculture as "low carbon and climate resilient". The expected outcomes are a reflection of the core strategies required to drive exports and import replacement over the life of the TASP. They are as follows:

- Identification of constraints to growth in the agricultural supply chain at all levels, including provision of inputs, production, processing, marketing and transport.
- Timely identification of prioritised policies, strategies and initiatives to improve sectoral growth, followed by implementation of these agreed interventions with better monitoring and reporting on progress.
- Consultation, communication and coordination between agricultural sector stakeholders and relevant Government agencies.

2.2.2 Focal Areas

The TASP will focus on four areas which form the basis of the four development Programs:

1. Climate-resilient production systems, which are determined by healthy soils, secure and sustainable water supplies, diverse farming systems, and adaptive communities.
2. The enabling environment in terms of country systems and international relationships, human resource availability and capacity, regulations and compliance, quarantine, etc.
3. Subsistence-level staple food, cash crop and livestock production, associated with rural livelihoods, and including income from local domestic sales.
4. **Export-orientated agriculture**, with a strong focus on vegetables, plus import replacement.

Each focal area has its own strategic objectives, so that that different targeting and engagement mechanisms are required. Engagement with isolated and relatively poor rural households on the outer islands will require an intensive community development process, whereas the approach to successfully support emerging exporters and import replacers needs to be much more commercially oriented. Tonga's geographic characteristics also determine how the implementation of different development initiatives is approached. Farmers on 'Eua, and Tongatapu, have reasonable access to domestic and export markets, whereas farmers on some of the outer islands are very isolated and therefore are more likely to remain as subsistence farmers.

2.2.3 Structure of the Plan

The TASP is organised into four programs, each corresponding to one of the four focal areas. Program 4 is of greatest relevance to export marketing infrastructure.

Program 1: Climate Resilient Environment can be considered as a "protective outer reef, or shell" which acts to ensure that Tonga's key natural resources (healthy soils, secure and sustainable water supply, diverse farming systems, and adaptive communities) are preserved, with a focus on building knowledge of the underlying environmental conditions that are required to support the development of climate-resilient agriculture. The objective is to establish the foundation for climate-resilient agriculture systems. The three specific objectives are to: (i) develop baseline knowledge for sustainable management of soil and water (for agriculture); (ii) develop climate-resilient guidelines and indicators for diverse farming systems; and (iii) build capacity for climate-resilient agriculture (diverse farming systems and adaptive communities) to impact on Program 3.

Program 2: Enabling Environment focuses on improving the environment in which Tonga's agriculture sector operates (governance, regulations and compliance, service delivery, quarantine, finance, etc.) The objective is to improve Tonga's enabling environment for agriculture. This influences and controls sector efficiency and growth. There are ten specific objectives that relate directly to the ten Sub-Programs which include: (i) Sector Institutional Policy; (ii) Bio-physical Policies; (iii) Export and Import Policies; (iv) Land and Rural Finance Policies; (v) International Relationships; (vi) Compliance and Regulations; (vii) Quarantine; (viii) Industry Organisations; (ix) Market Information; and (x) Agro-Meteorology.

Program 3: Sustainable Livelihoods and Healthy Foods focuses on improved farmers' knowledge and technologies for climate-resilient and diversified crop and livestock production, and the marketing of these products. The strategic objective for Program 3 is to develop diverse, climate-resilient farming systems for Tonga's geographical zones (island groups). There are three specific objectives, to: (i) improve farmers' knowledge and practices of natural resource management, and diversified crop, livestock and handicraft production systems; (ii) revitalise Tonga's farming future and encourage young farmers to return to the land; and (iii) support farmers and handicraft producers to produce products that are marketable in local markets, can have value added to them, and which contribute to food and nutritional security.

Program 4: Sustainable Growth and Foreign Exchange Earnings focuses on increased exports, as well as greater import replacement, each of which has a separate sub-program. The export sub-program includes items related to export shipping, farm to pack-house access constraints, value chain and business training, training in post-harvest practices, technical and financing support for value chain development, and investment promotion. Program 4 also addresses export marketing **infrastructure**. In general, infrastructure for value chains and markets should be developed through private sector investment. Clearly, transport infrastructure should be provided as a public good but equipment such as packhouses and cold stores is often better-provided by the private sector. In Tonga, however, the small-scale of many economic activities in the agricultural sector means that it is not always cost-efficient for exporters and other businesses to construct their own facilities. Only a few exporters have their own packhouses and it is not realistic to expect a business which exports, say, one container of frozen cassava a month, to make the necessary investment. If private investment does not offer this service on a commercial basis to numerous small exporters, it has to be provided by Government or the smaller exporters will be unable to operate.

The TASP notes that the MAFFF export processing facility plays an important role for small-scale exporters of frozen produce as they have space to peel, wash and pack roots and tubers, and to then either blast-freeze at the facility or to load directly into containers for freezing. A requirement is for the facilities to become HACCP compliant. TASP also makes reference to the need for a new pack-house in the Eastern District of Tongatapu. This is the main horticultural production area of the island but all production is presently consolidated in Nuku'alofa. As with the MAFFF wharf facility, it is proposed that this new facility would be available to all interested exporters, on a rotational basis. In addition to container packing, it would also be suitable for air freight packing as it would be close to the airport.

The TASP also identifies scope for greater collaboration among the private sector. Tonga is too small, with too many diseconomies of scale, for the various actors not to work together to aim for maximisation of both their profits, and benefits to farmers and the broader economy. The Growers Federation (GroFed) aims to engage in policy dialogue to promote the agriculture sector, and stresses that its role is to strengthen private sector representation. GroFed is currently working on its Strategic Plan for the next five years, aiming to be a strong industry organisation representing growers, exporters and any affiliated agricultural organisation in the private sector. The ASGC is expanding representation from both the public and private sectors. ASGC representatives from the Public Sector include MAFFF, Ministry of Commerce, Tourism and Labour, Tonga Meteorological Service, Ministry of Finance and National Planning and National Reserve Bank of Tonga (NRBT), while ASGC representatives from the Private Sector include GroFed (farmers), Growers Export Network (GXN), kava processors and exporters, Tonga Handicraft Association, Tonga Chamber of Commerce and Industry, and domestic market suppliers.

2.3 Agricultural Census

The national agricultural census (the first for 14 years) conducted in 2015, with assistance from FAO, identifies some of the potential and key challenges faced by the sector that can be used to develop an appropriate policy framework. Key challenges include: (i) a lack of up-to-date and accurate agricultural statistics; (ii) a land tenure system which contributes to a high proportion of agricultural land lying idle; (iii) the need for supportive government policy; (iv) a bank lending policy which limits access to finance by many small farmers; (v) a low rate of adoption of improved production and marketing infrastructure and technology; and (vi) the risks introduced by variable weather patterns and increased natural disasters associated with climate change. However the census also demonstrates that there is great potential for further developing the sector. Greater import substitution offers improved domestic market opportunities. With improved capacity to supply the domestic market at the expense of imports, increased domestic demand associated with population growth also offers the potential to create additional employment opportunities in rural areas. Key findings of the census include:

- The total area of agricultural allotments was 66,202 acres, but over 50% of this land is not used for agriculture due to emigration of landholders, or lack of resources such as finance and transportation to engage in agriculture.
- Almost two thirds (64%) of agricultural land is on Tongatapu, 17% on Vava'u, 8% on 'Eua, 7% on Ha'apai and 4% on the Niua.

- Of the 16,122 rural households enumerated by the census about 13,944 or 86% were “agriculturally active” households (defined as being engaged in one or more of the following: cropping, livestock, fishing, forestry or handicraft activities).
- Only 5% of agriculturally active households engaged in commercial agriculture while 95% engaged in subsistence or semi-subsistence farming. The number of “commercial” farmers declined from 242 in 2001 to 89 in 2015.
- Annual and perennial crop cultivation occupied 27,206 acres of agricultural land. The areas of the main annual crops were estimated to be:

Cassava/Manioke	10,207 acres
Yam/'ufi	5,315 acres
Yautia/talo futuna	2,565 acres
Sweet potato/Kumala	1,901 acres
Swamp taro/talo Tonga	1,627 acres

- The main perennial crops are kava (1,257 acres), mulberry (757 acres) and vanilla (632 acres).

The census provides information on the main root crop producing areas of Tonga and Tongatapu by district. Table 1 shows that Vaini, Lapaha and Tatakamotonga produce almost 50% of the root crops in Tongatapu and are in close proximity to the proposed EDPF to be located at Alaki.

Table 1: Area of Principal Root Crops – National, Tongatapu and Tongatapu Districts

		Cassava Manioke	Yam Ufi	Yautia T/Futuna	S/Potato Kumala	S/Taro Taro Tonga	Total Roots
Tonga	Acres	10,207	5,315	2,565	1,901	1,627	21,615
Tongatapu	Acres	8,160	4,248	1,956	1,408	1,216	16,988
Tongatapu	Percent	80	80	76	74	75	79
Vaini	Acres	1,809	726	356	301	301	3,493
Nukunuku	Acres	1,727	673	545	264	280	3,489
Lapaha	Acres	917	1,023	267	235	48	2,490
Tatakamotonga	Acres	945	699	233	222	78	2,177
Kolovai	Acres	1,028	348	153	203	111	1,843
Kolomotu'a	Acres	844	426	222	99	215	1,806
Kolofou	Acres	890	353	181	84	183	1,691

2.4 Agricultural Exports

Tonga's agricultural exports have been very unstable over time. Traditional exports such as copra have declined over time, although coconut exports have increased steadily during the last decade. Exports of tropical fruits (bananas, pineapples, etc.) to New Zealand were important in the 1960s and 1970s but came under increasing competitive pressure from Central America and the Philippines, accentuated by increasingly stringent phytosanitary regimes and the demise of marketing parastatals in both Tonga and New Zealand. Fresh fruit and vegetable exports to New Zealand are currently negligible, although there is a small amount of trade to other Pacific Islands. Cucurbits and root crops are currently the two most important sectors, although performance has been patchy. Exports of cucurbits (mainly squash) collapsed during the last decade but have since staged a modest recovery. Exports of root crops have been fairly consistent over time, subject to seasonal fluctuations, and have been relatively strong over the last five years. There has been some recent success (supported by PHAMA) in developing watermelon exports to New Zealand. Current exports to New Zealand are confined to items that can be treated by fumigation either prior to shipment (e.g. watermelons) or, if required due to pest interceptions, after arrival in New Zealand (e.g. taro, tarua and yams), or can be exported in frozen form.

The biggest success story, and also the biggest disappointment, has been the **squash** export industry. Squash exports commenced in the late 1980s and grew to some 20,000 tonnes per annum, mainly to Japan during a narrow seasonal window (October-November). During the period 1994 -2004, squash exports accounted for about 45% of Tonga's total export earnings and more than 60% of agricultural exports. However squash exports subsequently declined to a low point of 1,800 tonnes in 2010, but have subsequently rebounded into the 2,000-4,000 tonne range. Japan remains the major market for squash although some has also been sent to Korea and New Zealand. The market window is narrow, with almost all exports taking place in October and November. In 2014-15 cucurbit exporters have also begun to diversify into butternut and butterkin exports, mainly to New Zealand.

Appendix A summarises Tonga's agricultural export statistics over the last nine-and-a-half years, January 2007 to May 2016 (second half 2016 figures are not yet available).

- Amongst the root crops, **cassava** is the leading export with New Zealand being the main destination. Cassava exports show a gradual uptrend from around 50 tonnes per month in 2007 to over 100 tonnes per month today, occasionally 150-200 tonnes. All cassava is exported in peeled and frozen form. Whilst cassava can be produced year round, demand in New Zealand is somewhat seasonal and exports average about 70 tonnes per month during the first half of the year, increasing to over 100 tonnes during the second half.
- Exports of **giant taro** (*kape/ta'amu*) fluctuate markedly from month to month. Volumes fell to almost zero in 2010 but rebounded to 30-80 tonnes per month on average but with a large spike in the October to December period.
- Exports of **swamp taro** are also highly unstable but have shown a strong uptrend since 2010 and now average about 40 tonnes per month with seasonal peaks in July-August and November-December. Shipments fell to a very low level during the 2015 drought.
- **Tarua** exports declined between 2007 and 2010 but have recovered to around 40 tonnes per month, somewhat higher in October-December. Again, the drought of 2015 severely curtailed exports. Export of yams is highly seasonal reaching over 200 tonnes per month during the April-June peak season in 2007. Excluding the drought period, the seasonal peak is now around 200-350 tonnes per month.
- Taking **all root crops** together, exports in 2007-2009 were 250-350 tonnes/month, or about 2,800-3,500 tonnes per annum. During 2010 exports slumped to 1,700 tonnes, but subsequently rebounded and are now running at 250-300 tonnes per month. Because different root crops have different seasonal patterns the tonnage exported is fairly consistent over the year with a tendency to be a bit lower in January-February.
- **Watermelons** have become a significant export since the opening of the MAFFF fumigation facility has enabled access to the New Zealand market. The main watermelon export season is October to December during which exports are running at up to 80 tonnes per month, with annual volumes of around 200-300 tonnes. Growers and exporters plan to increase this to at least 500 tonnes per annum.
- Exports of fresh mature (brown) **coconuts** have shown a steady uptrend from around 60 tonnes per month in 2007 to about 150 tonnes per month today. Exports of green nuts are increasing from a low base and now average around 20 tonnes per month.
- The only other significant exports are **kava** to other pacific islands (110-170 tonnes per annum) and **taro leaves** mainly to New Zealand (40-80 tonnes per annum). There are occasional shipments of breadfruit (fresh and frozen). Vanilla exports declined from 13.6 tonnes in 2009 to less than two tonnes in 2011. Fresh fruit and vegetable exports are negligible due to the lack of market access protocols. However, with the re-opening of the heat treatment (HTFA) facility there has been an increase in **breadfruit** exports, reaching 76 tonnes during the first five months of 2016.

2.5 Institutional and Regulatory Framework

MAFFF is the lead institution responsible for agricultural production and marketing. MAFFF is organised into the following divisions: (i) Office of the Director/Corporate Services Division; (ii) Research Division; (iii) Quarantine and Quality Management Division; (iv) Livestock Division; (v) Extension and Women's Development Division; (vi) Forestry Division; (vii) Fisheries Division; and (viii) Outer Islands Operations Division. MAFFF's vision is "an Island Kingdom where agriculture, fisheries and forestry contribute significantly to better living standards of all, in an economically, socially and environmentally sustainable manner". The mission of MAFFF is "to help build a better economy from agriculture, forestry and fisheries for present and future generations". MAFFF's authority to perform its functions is derived from a number of laws and regulations (see Box 1 below). The divisions responsible for research, extension and quarantine and quality management are key to the future success of agricultural production and export marketing.

Box 1: Legislative and Regulatory Framework

- | | |
|--|---|
| • Animal Disease Act and Regulations 2004 | • Plant Quarantine (Squash and Vanilla) (Fees) Regulations 1992 |
| • Agricultural Commodities Export Act 2002 | • Rhinoceros Beetle Act 1988 |
| • Pesticides Act and Regulation 2002 | • Plant Quarantine Act 1988 |
| • Plant Quarantine (Fees) Regulation 1997 | • Noxious Weeds Act 1988 |
| • Plant Quarantine Regulations 1995 | • Copra Act 1988 |
| • Plant Quarantine (Amendment) Act 1995 | • Diseases of Plants Regulations (Cap.127A) |
| • Fruit Export (Buttercup Squash) (Amendment) Regulations 1994 | • Infested Areas Declarations (Cap. 127B) |
| • Fruit Export (Buttercup Squash) Regulations 1993 | • Prescribed Treatment for Bunchy-Top (Cap. 127C) |
| • Fruit Export (Vanilla) Regulations 1993 | • National Forests Policy 2009 |

The Ministry of Commerce, Tourism and Labour (MCTL) includes five divisions: (i) Leadership and Labour Division; (ii) Corporate Services and External Information; (iii) Intellectual Property Office; (iv) Consumer Protection Division; and (v) the Trade, Investment and Business Development Division. MCTL is responsible for licensing agricultural exporters and is actively involved with PHAMA in export promotion and export market development.

The **Ministry of Finance (MOF)** administers the Agricultural Marketing Fund which is a TOP 1.0 million revolving loan facility intended to facilitate export marketing by Tongan business enterprises.

The **Tonga Chamber of Commerce and Industry** promotes economic growth in Tonga, makes representations to Government, creates training opportunities and provides information on the business environment. Other associations operating in Tonga include the Tonga New Zealand Business Association, which has a membership of over 70 businesses throughout Tonga and New Zealand. It focuses on creating a strong business relationship between the countries. There is also a Small Business Association which concentrates mainly on small enterprises.

In 2012-13 the Government established the National Growth Committee and a number of Sector Growth Committees, one of which is the **Agricultural Sector Growth Committee (ASGC)**. The ASGC includes representatives from both Government and the private sector and is intended to inform the National Growth Committee on policies and priorities for the agricultural sector (including food, fisheries and forestry). The ASGC was responsible for overseeing preparation of the TASP in 2015.

The **Growers Federation of Tonga (GroFed)** was established in 2008 as an umbrella organisation for the agricultural sector. It is registered as a not-for-profit incorporated association to engage in policy dialogue to obtain a favourable economic policy environment and political support for the agriculture sector in the long term. Its objectives are to strengthen private sector representation and to work closely with Government ministries and communities and assist to stimulate economic growth. GroFed's constitution requires that registered growers elect their representatives to the 34-member Council, and for the Council to elect the seven members of the Board of Directors. The vision and strategic objectives of GroFed are shown in Box 2.

Box 2: GroFed Vision and Strategic Objectives

Vision: “To be the leading private sector organisation enhancing prosperity and maximising benefits for the growers of Tonga.”

Strategic Objectives:**Marketing:**

- To create and enhance opportunities and market access for our agricultural produce including New Zealand, Fiji, American Samoa, Australia, US and also other countries.
- To double the existing market demands (volumes and gross income earnings).

Production:

- To increase our agricultural production to achieve 1,000 acres or more every year.
- To search and promote additional fresh export market crops such as tomatoes, courgettes, cucurbits, pineapples, maize, sweet potato, sweet yam, organic crops, etc. for export markets.
- To train growers to increase production of marketable yields as well as sustainable and consistent supplies.

Infrastructure:

- To ensure that all quarantine and biosecurity facilities and post-harvest facilities and other new technological export facilities are established and operating to underpin Growers Federation’s export produce.

Export Financing:

- To ensure that growers and exporters are getting easy access to the Export Finance Facility and for Government and Banks to set up the Export Finance Facility to support the export sector.

Maximise Economic Returns to Growers:

- To promote and train growers on production professionalism, agriculture as a business, and to understand the financial benefits of production based on financially viable crops (gross margin analysis of production).

Outer Islands Transport:

- To ensure that more frequent and regular shipping services to the Niuaus and Ha’apai for shipment of their produce.

Research and Development:

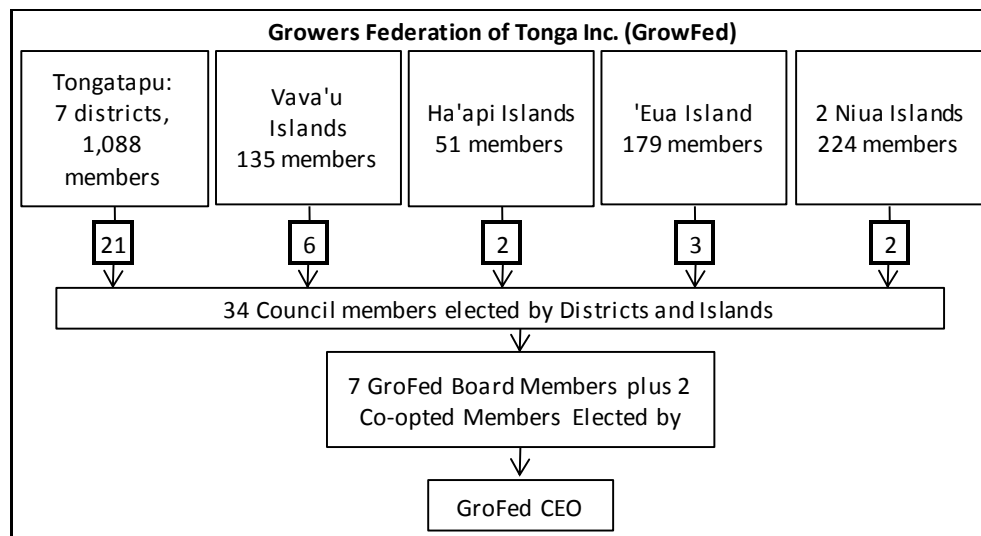
- To work together with Government (MAFFF) on funded research and development works at the Research Division.

Risk Management:

- Operational risks on financial performance and conditions to ensure there is enough resources for GroFed’s operations.
- Effective management and leadership of the Federation’s businesses.
- To minimise technical risks that may cause doubts and uncertainties for growers to participate in production, e.g.:
 - Non-biosecurity and quarantine compliance for agri-exports;
 - Shipping and aircraft schedules for export of both fresh and frozen produce to markets;
 - Inconsistent supplies to market’s demands, etc.

The organisational structure of GroFed is shown in Figure 2. GroFed represents a high level public-private partnership between the growers and the Government to assess sector performance and identify key policy issues. Current policy issues raised by GroFed include the need for increased investment in technology for agricultural production, exporting, marketing, research and development, and human capital in the form of professional, managerial and technical skills. GroFed is calling for: reduced tariffs on agricultural inputs; reduced hire rates for agricultural machinery; increased regional trade with Fiji, Samoa, American Samoa and other Pacific Islands; and better access to finance for growers. In relation to export marketing GroFed is advocating improved packaging and labelling facilities for frozen root crops; opening of market opportunities including Australia and USA; and improved agricultural roads.

Figure 2: GroFed Organisational Structure



GroFed is a not-for-profit organisation and cannot therefore engage in commercial activities. To overcome this constraint GroFed has established its own marketing subsidiary known as **Growers Commodities Marketing Group Ltd (GroCom)**. GroCom is 76% owned by GroFed and 24% owned by four exporters. The GroCom board includes several members from the GroFed Board, exporters, and representatives from the GroFed Council. GroCom's role is to search for more market opportunities for export produce with better prices to growers, with a requirement for the exporter to pay the growers before the shipment leaves Tonga. GroCom acts as an export broker under an exclusive arrangement with Fresh Direct Ltd, one of the major New Zealand-based importers and wholesalers. The system works as follows:

- Fresh Direct provides indicative CIF prices and specifications for produce it wishes to import.
- The four exporter shareholders of GroCom are invited to submit bids to fill the Fresh Direct order.
- The bids are evaluated by a bid panel appointed by the exporters and GroFed on the basis of the prices to be paid to the growers, with the stipulation that the growers are paid when the produce leaves Tonga.
- Fresh Direct pays GroCom on the basis of 30% on the provision of documents for the consignment, 30% seven days after clearance, and 40% 21 days after clearance.
- GroCom pays the growers the agreed contract price and forwards the remaining amount to the exporter after deducting a 2% levy to finance its own operations.

This system is popular with growers, because it provides prompt payment at the time of export, and has been successful in improving prices – in the case of coconuts grower returns have doubled. Two of the exporter GroCom members are active in bidding for contracts, the other two less so.

PHAMA is working together with GroFed and other stakeholders in identifying and facilitating export support services to increase market access opportunities. PHAMA has also provided export market development grants to facilitate the development of two new export products – sweet yam and Guinea yam. The grant funds have been used to help establish a small yam packing facility in the Eastern District which avoids the need for growers in the area to transport their produce all the way to the Nuku'alofa export facility.

The Government initially supported GroFed with a grant of TOP 60,000/year for two years, after which the Federation was expected to be self-sustaining from levy income from produce exports brokered by

GroCom. However the levy income is not yet sufficient to finance the operating costs, despite some donor support, and the organisation is currently struggling to fulfil its mandate.

The **TMAWG** acts as the steering committee for PHAMA activities in Tonga (there are equivalent MAWGs in the other PHAMA countries). For each MAWG, four major meetings are scheduled each year, with interim meetings held as required. The TMAWG fulfils key coordination and communication roles; screening and prioritisation; monitoring; consideration of longer-term sustainability issues; and improving general understanding of international market access systems and processes. The TMAWG is responsible for identifying and endorsing all PHAMA-supported activities in Tonga. Recognising that market access priorities need to be developed by the MAWGs on an ongoing basis in response to evolving needs and information, an approval process has been agreed with DFAT that permits further refinement (and possibly extension) of activities already defined, within the planning year. The TMAWG contains two exporter representatives, three grower (GroFed) representatives, two representatives from MAFFF and two from MCTL Trade and Investment Division.

The **Tonga Development Bank (TDB)** is the leading institutional provider of development finance with the mandate to promote Tonga's economic and social advancement by providing banking and a broad range of other financial services. TDB was established in 1977 and has six branches, in addition to its headquarters in Nuku'alofa. It has a long history of providing financial services to farmers, agricultural marketing ventures and exporters. It provides credit to assist growers and exporters make investments, and also finances working capital needs. TDB is also a business development service provider assisting its clients to prepare business and marketing plans, improve bookkeeping and accounting skills etc. The Bank gives priority to supporting enterprises with positive developmental impacts.

The BQA and related agreements between Tonga and New Zealand govern exports of food and agricultural products from Tonga to New Zealand. The responsible ministries are MAFFF in Tonga and the New Zealand Ministry of Primary Industries (NZ MPI). Under the BQA some 40 plant species shown in Table 2 are approved for export from Tonga to New Zealand, subject to various conditions and forms of treatment, including fumigation and HTFA.

Table 2: Plant Species Approved for Export from Tonga to New Zealand

Botanical Name	Common Name	Botanical Name	Common Name
<i>Abelmoschus manihot</i>	Island cabbage/pele	<i>Alocasia macrorrhiza</i>	Giant Taro/Kape
<i>Artocarpus altilis</i>	Breadfruit	<i>Capsicum frutescens</i>	Chilli
<i>Carica papaya</i>	Papaya	<i>Centella asiatica</i>	Indian pennywort
<i>Citrullus lanatus</i>	Watermelon	<i>Cocos nucifera</i>	Coconut
<i>Colocasia esculenta</i>	Taro, taro leaves	<i>Cucurbita maxima</i>	Squash
<i>Colubrina asiatica</i>	Soap bush	<i>Dioscorea</i> spp	Yam
<i>Cucurbita moschata</i>	Butternut	<i>Gardenia taitensis</i>	
<i>Evodia hortensis</i>		<i>Hoya australis</i>	
<i>Glochidion ramiflorum</i>		<i>Mangifera indica</i>	Mango
<i>Lycopersicon esculentum</i>	Tomato	<i>Microsorium scolopendria</i>	Wart fern
<i>Manihot esculentus</i>	Cassava	<i>Musa</i> spp	Banana
<i>Morinda citrifolia</i>	Indian mulberry	<i>Persea americana</i>	Avocado
<i>Musa paradisiaca</i>	Plantain	<i>Piper methysticum</i>	Kava
<i>Piper graeffei</i>	Pepper	<i>Saccharum officinarum</i>	Sugarcane
<i>Psychotria insularum</i>	Wild coffee	<i>Syzygium cornocarpus</i>	Lillypilly
<i>Solanum melongena</i>	Eggplant	<i>Syzygium malaccense</i>	Malay apple

Botanical Name	Common Name
<i>Syzygium inophylloides</i>	Lillypilly
<i>Ticus obliqua</i>	
<i>Wedelia biflora</i>	

Botanical Name	Common Name
<i>Vigna marina</i>	Beach bean
<i>Xanthosoma sagittifolium</i>	Tarua
<i>Zingiber zerumbet</i>	Ginger

3.0 Marketing Infrastructure and Transport Services

The four main export facilities are at Nuku'alofa port, the Nishi Packhouse at 'Utulau on Tongatapu, Vava'u port and Fua'amotu international airport.

3.1 MAFFF Export Marketing Facility, Nuku'alofa

- Location: Nuku'alofa port area, adjacent to main roads on two sides, 500m from the main wharf and 2.5 km from the town centre.
 - Land area: 100m x 65m (6,500 m²)
 - Offices: 400m² x 2 levels = 800m² of office space, used by MAFFF
 - Food processing area: 130m²
 - Export processing and inspection area: 270m²
 - Fumigation facility: 300m²
 - Forecourt, container stands, and un-used areas: 5,400m²
- Food processing/preservation area (130m²): includes equipment for pilot scale food processing, cooking, preserving, refrigeration etc. Operated by the Food Department of MAFFF.
- Export processing and inspection area (270m²): includes tables and benches for inspection, scales, forklift, cool room (50m³) and blast freezer (50m³). Operated by MAFFF Quarantine.
- Fumigation facility (300m²): includes 40-foot container used for methyl bromide fumigation, and separate doors for incoming and unloading into sea containers. Operated by MAFFF Quarantine.
- Paved area between the export processing and inspection area and the fumigation facility (approx. 120m²): includes water supply and washing vats – used for washing and packing root crops for export. Roof covering recently installed as recommended in Technical Report #45.
- Electricity: three-phase power with a back-up generator installed by PHAMA.
- Water supply: not connected to municipal water supply – rainwater from roof catchment stored in six 20,000 litre tanks.
- Waste disposal/treatment facilities: effluent is discharged via a concrete drain to the sea.

The Nuku'alofa export marketing facility was constructed in 2010 using EU STABEX funding. The facility is well located with paved roads on two sides and is only about 500m from the international shipping wharf. There is abundant land available to expand the facilities if needed. About a third of the complex is used for MAFFF offices, for work not necessarily related to export marketing. All other parts of the facility are available for use by exporters without charge other than payment for electricity used. Five exporters are using the facility on a regular basis to process root crops for export in sea containers, both frozen and chilled.

The food processing facility is available to anyone wishing to undertake pilot food processing activities, but is rarely used. The export processing and inspection area was mostly used for inspecting handicrafts for export and was not generally available for processing, packing and inspecting fresh produce for export. This area includes a cool room and blast freezer, the latter of which is used for freezing root crops for export. Following the recommendations of Technical Report #45 a new building for inspecting handicrafts prior to export has been constructed at the site (with PHAMA funding) freeing up space for processing fresh produce.

The paved outside area between the two buildings is used for washing and packing root crops for export. A roof was recently installed as recommended by Technical Report #45 but it still does not have packing tables, or adequate lighting and power supply, and the floor sloping makes it difficult to clean adequately. Wastewater is discharged directly to the sea without treatment. Water supplies come from rainwater tanks with a total capacity of 120,000 litres. The fumigation facility is currently

able to treat all the watermelons exported and there is space to add an additional 40-foot fumigation chamber if needed.

Despite its shortcomings the MAFFF facility is functioning reasonably well and is regularly used by about five exporters processing a total of 2-3 container loads of mainly root crops per week. However, on-going maintenance and future improvement of the facility (including the fumigation chamber) is a recognised issue with the absence of real charges for using the facility meaning there is no established source of funding for these costs (refer section 5.6).

3.2 MAFFF Export Marketing Facility, Vava'u

- Location: Vavau'u port area in town centre approximately 100m from main wharf with main roads on two sides.
 - Land area: 65m x 35m (2,275 m²)
 - Offices: 250m² on upper/mezzanine level
 - Produce receival area: 25m²
 - Washing and packing area: 100m²
 - Food processing and quarantine/inspection area: 150m²
 - Packing and storage area: 175m²
 - Fumigation facility: 50m²
 - Open general purpose storage, packing and loading area: 1,000m²
- Forecourt, car park, and un-used areas: 775m²
- Produce receival area (25m²): adjoins road but below road level. Vehicles must park on road for un-loading.
- Washing and packing area (100m²): long narrow room with no windows or ventilation. Tiled floor, equipped with washing vats and crates but no tables.
- Food processing/preservation and quarantine/inspection area (150m²): includes equipment for pilot scale food processing, cooking, preserving, refrigeration etc., as well as quarantine inspection equipment, microscope etc.
- Packing and storage area (175m²): adjoins fumigation facility. Used for storing packaging materials.
- Fumigation facility (50m²): includes 20-foot container for methyl bromide fumigation, and separate doors for incoming and outloading into sea containers.
- Open general purpose storage, packing and loading area (1,000m²): large area open on two sides suitable for packing, storage and loading. Includes a small blast freezer of 15m³.
- Electricity: three phase power.
- Water supply: connected to municipal water supply supplemented by rainwater from roof catchment stored in one 20,000 litre tank.
- Waste disposal/treatment facilities: effluent is discharged to the town sewerage system.

The Vava'u export processing facility was upgraded in 2010-11 using EU STABEX funding. It contains most of the equipment needed to process, pack and store fresh produce for export. It is well located in the port area with good access to road and sea transport. The facility is available to anyone wishing to process fresh produce for export but has **never been used** for this purpose. This may be partly attributable to the very low level of export activity in Vava'u with only one cassava exporter active on a semi-regular basis. However there are also a number of design features which detract from the usefulness of the facility. The produce receival area would be very inconvenient to use, being below road level and with no vehicle parking space. The washing and packing area is a very narrow un-ventilated room with no windows which would be extremely hot and humid to work in. The large open general work and storage area is potentially useful as a packing area, but contains no packing

equipment (tables, scales etc.). The blast freezer is only about half the size needed to prepare a full container load of produce for export. There are no certified fumigation operators (the Vava'u delegate was unable to obtain his Australian Fumigation Accreditation Scheme certificate at the training held in Fiji).

3.3 Fua'amotu Airport HTFA Facility

- Location: Fua'amotu airport, Tongatapu, adjoining the domestic passenger terminal, 700m from the international cargo area and about 25km from Nuku'alofa town centre.
- Building size: 32m x 36m = 1,150m²
 - Open area for produce receipt, washing, grading and preparation (460m²).
 - Insect-proof (screened) area for packing and chilling produce (690m²).
 - Office and toilet facilities.
- Separate MAFFF office area of 200m² near the main building (used intermittently as a packhouse).
- Equipment:
 - Boiler, hydrocooler, forklift, washing tank, standby generators, bins and crates.
 - Stainless steel HTFA unit, twin chamber, connecting the receipt area and insect proof areas. Includes computers for monitoring temperatures of both chambers and hydro cooler for lowering fruit temperatures after treatment.
 - Screened area contains a forced air cooler of 60m³ capacity and a quarantine cool room of similar size for storing packed air containers and opening onto the tarmac.
 - Rainwater tank.

The airport HTFA facility was constructed in 1996 with funding from New Zealand and USAID. Its main purpose is to perform HTFA treatment of fresh produce in line with the Tonga-New Zealand BQA requirements for fruit fly host species (papaya, chilli, eggplant, breadfruit, mangoes, avocados, tomatoes, etc.) The facility is well located with direct access to the airport cargo area and has all of the necessary equipment for HTFA treatment and cold storage chambers in an insect-proof area. It is also suitable for packing and cold storage of non-fruit fly host products such as beans and okra prior to export. The facility was initially operated by a state-owned company, Export Produce Treatment Services Ltd, but throughput was insufficient to cover operating costs and the company was wound up in 2000. The facility was then handed over to MAFFF. However, there was very little use of the facility under MAFFF management and maintenance was limited. Some repairs were undertaken during 2012-13 with the help of a New Zealand volunteer and PHAMA funding, but these were only partial due to lack of funding.

In June 2010 the New Zealand Aid Program and the Government agreed to provide TOP 184,000² in funding to support the overhaul of the airport facility and its operations for several years until throughput was sufficient to be self-financing. It was a condition of the agreement the facility would be transferred to a public enterprise (parastatal company), Tonga Exports Quality Management (TEQM) and re-commissioned. The asset transfer agreement between MAFFF and TEQM was executed in March 2013. Subsequently the facility has been extensively overhauled and is now in good working condition, under the management of an experienced HTFA technician, formerly lead technician of Nature's Way Cooperative in Fiji.

However the facility has struggled to operate viably under TEQM management due to the low and variable level of throughput. TEQM estimates that the facility needs around TOP 180,000 per annum of revenue to cover its costs, equivalent to around 300 treatments at the standard flat rate charge of TOP 600 per treatment. Throughput is currently well below this level. In addition in 2015 New Zealand MPI suspended the pathway and imposed stricter standards of operation following detection of a

² TOP 141,000 was to be provided by NZAP and TOP 43,000 by Government

quarantine pest in a consignment of breadfruit processed by the facility. Development and implementation of the new standards and associated procedures for use by MAFFF and the private sector is on-going including with oversight from NZ MPI while confidence in Tonga's capacity to comply is established. Support is also being provided through the PHAMA program towards the private sectors' capacity to comply with their increased roles and responsibilities.

Management of an HTFA facility as a stand-alone business will always be a challenge because of the high level of overhead costs and the likelihood that there will be long periods of time when there is little or no produce to process. This has been the experience with other HTFA facilities in the Pacific Islands, most notably Nature's Way Cooperative in Fiji which is still struggling to achieve financial sustainability after more than 20 years³.

MFAT has agreed to finance a study on the viability of TEQM which is expected to be undertaken before the end of 2016. The goal of this assignment is to provide recommendations on the necessary changes and strategies required by TEQM to become a sustainable, self-sufficient, commercially viable business. The objective is to assess TEQM's financial management, governance structures and operational performance and recommend a preferred option to the Ministry of Public Enterprises on how TEQM can become a viable and sustainable business.

3.4 Private Packhouses

The established exporters handling squash, pumpkins, coconuts and watermelons have packhouse and storage facilities which are adequate to handle the current volumes exported. During the narrow squash exporting season, these facilities need to pack up to 1,000 tonnes per week. However they have handled much more than this in the past when Tonga was exporting up to 20,000 tonnes in a two-month season.

The most notable development has been the establishment of a large modern packhouse facility by **Nishi Trading Ltd.** During 2013-14 the company built Tonga's first international standard export packhouse and food processing plant. The facility was partly financed by a grant from the EU-funded Increasing Agricultural Commodity Trade (IACT). The facility is being used to process and pack a number of fresh produce commodities for export to New Zealand, Japan and Korea including squash, watermelons, butternut pumpkins and butterkins. The design of the packhouse is adaptable and enables it to process a wide range of root crops and other fresh produce for export in a variety of forms including both chilled and frozen. Nishi Trading uses the packhouse to process its own produce for export, but also makes the facility available to process cucurbits on a fee-for-service (toll) basis for other growers and exporters. It is not currently equipped to process root crops but could be adapted for this purpose.

The packhouse covers 1,200m², is well-designed and built, HACCP⁴ accredited and has the capacity to be adapted for a range of food processing and packaging applications. HACCP accreditation enables the company to export to a wide range of markets, doing business with wholesalers and supermarkets that require their suppliers to be HACCP compliant. The facility is also registered under the Sea Container Hygiene System (SCHS) administered by NZ MPI to ensure that containers arriving in New Zealand are free of pests and biosecurity contamination. This facilitates exports to New Zealand and reduces the risk that shipping containers will be delayed on arrival and avoids extra costs due to fumigation or cleaning.

The packhouse has the capacity to receive and process produce from large numbers of growers, and is introducing an identity preservation (traceability) system so that quality issues at any point in the marketing pathway can be traced back the original supplier and remedial action taken. This is increasingly a requirement of wholesalers and retailers in New Zealand, Japan and other export markets. The facility has stands for six 40-foot refrigerated containers enabling up to 20 containers to be included in a single shipment.

Nishi adopts a whole value chain approach to its operations, seeking to maintain tight controls at every step from farm to delivery to the importer. Consequently the farmers who supply fresh produce under

³ PHAMA (2016) Feasibility Study for the Establishment of a HTFA (Heat Treatment) Facility in the Central Division of Fiji

⁴ Hazard Analysis and Critical Control Point

contract growing arrangements are trained in the use of good agricultural practices (GAPs) to produce safe and high quality produce of the required specifications. Farmer training is undertaken through the company's farmer training centre, which has been accredited by the Tonga National Qualifications Accreditation Board. The company is also seeking to extend farmer training on a larger scale through the Nishi Foundation, to improve the level of skills among Tongan farmers generally.

The packhouse is located on an 8 acre site at 'Utulau which is a 20-minute drive on sealed roads from Nuku'alofa. The location of the facility makes it suitable to source produce in the central and Western parts of Tongatapu. The company also has 300 acres of high quality agricultural land comprising 50 acres about 4km from the headquarters and 250 acres near the village of Vaini, about 15km away. Most of the land is used for growing cucurbits (squash, pumpkins, melons, etc.) with smaller areas used for onions, potatoes, sweet corn and vegetables.

In addition to its own farming operations Nishi also operates an outgrower scheme to supplement its own production. About 70 outgrowers supply some 25 percent of the volume of squash and pumpkins and all of the watermelons processed through the packhouse. The more technically demanding crops such as onions and potatoes are grown by Nishi itself. Outgrowers are offered fixed price contracts at the beginning of each season and are provided with crop inputs and technical support.

3.5 Air and Sea Freight

Air New Zealand operates the following flight schedule from Nuku'alofa to Auckland:

Table 3: Airline Schedule and Cargo Capacity, Nuku'alofa to Auckland

Day	Depart	Arrive	Aircraft	Cargo Capacity
Monday	13.00	15.00	A320	Up to 3,000 kg depending on passenger loading
Tuesday	21.55	23.59		
Wednesday	14.40	16.40		
Thursday	21.55	23.59		
Friday	12.00	14.00	B777 a/	15-20,000 kg regardless of passenger loading
Saturday	21.55	23.59	A320	Up to 3,000 kg
Sunday	----- No service -----			

a/ During the winter tourism season B777s often replace some of the A320 services

For fresh produce exports the most convenient consignment days are Wednesday and Friday/Saturday. Produce shipped on Wednesday will be cleared and ready for sale on Friday. Produce shipped on Friday or Saturday will be cleared over the weekend and ready for sale on Monday. Most of the produce is expected to be exported during the winter months when ambient temperatures in Auckland are quite cool (minimum 8-12⁰C, maximum 15-18⁰C) so that if there are delays in inspection and clearance, product deterioration will be limited. Flights with evening or early morning arrivals are preferred (Tuesday, Thursday and Saturday).

There are about three ship departures per month from Nuku'alofa to Auckland and one departure every three weeks from Vava'u. These are used for exporting root crops (chilled and frozen), watermelons and coconuts.

3.6 Internal Transport

Tonga has two international sea ports (Nuku'alofa and Vava'u) and one international airport (Fua'amotu). Due to the limited and expensive inter-island transport services, the bulk of agricultural exports originate in Tongatapu where they are transported by road to packing facilities and the seaport. There are also some root crop exports direct from Vava'u. Internal air freight services are too unreliable and too expensive to consider air transport of produce from the outer islands to Tongatapu for export via Nuku'alofa international airport.

3.7 Export Opportunities and Constraints

Whilst Tonga's track record as an agricultural exporter is patchy, there have been some notable success stories in the past, and there is considerable potential to develop the sector in the coming years. The strengths of Tonga's agricultural export sector lie in:

- A core group of established and experienced fresh produce exporters, currently exporting root crops, coconuts and cucurbits, who are eager to expand and diversify their export activities.
- A well-defined strategy (TASP) that specifies the role of export market development in the development of the agricultural sector.
- Well-established commercial linkages between these exporters and several of the major New Zealand importer/wholesalers.
- The existence of GroFed and its commercial affiliate GroCom; and the marketing arrangements between GroFed/GroCom and Fresh Direct in New Zealand.
- Satisfactory (but expensive) transport linkages (sea and air) with Auckland.
- Climate and soils favourable to production of a wide range of tropical crops year round and winter season temperate crops during the months when supplies are lowest and prices are highest in New Zealand.
- A clean/green image with capacity to be turned into a powerful marketing/promotion tool.

It is also necessary to be mindful of a number of constraints which have prevented the full realisation of these opportunities until now. Foremost amongst these are:

- The lack of workable market access protocols for most agricultural commodities other than those which can be treated by fumigation.
- Institutional weaknesses particularly in research and extension support and quarantine and quality control functions.
- Infrastructure constraints especially for export inspection and certification, pre-export treatment (fumigation and HTFA), and decentralised packing and chilling/freezing facilities.

4.0 Export Pathways and Infrastructure Needs

In order to assess the resources needed for exporting various items, the following section details the steps in the export pathways for the major product categories, the actual and projected volumes exported, and the estimated equipment and infrastructure needs. This serves to highlight the critical infrastructure bottlenecks in Tonga's export marketing pathways for agricultural and horticultural produce.

4.1 Coconuts

Export of fresh mature coconuts by refrigerated sea container to New Zealand and Australia:

Steps in Export Pathway	Equipment and Infrastructure Requirements
<ul style="list-style-type: none"> Collect nuts from plantation 	<ul style="list-style-type: none"> Tractor and trailer Potential to use mechanised husking equipment
<ul style="list-style-type: none"> Transport to husking station 	
<ul style="list-style-type: none"> Remove husks and discard defective nuts 	
<ul style="list-style-type: none"> Transport to packhouse 	<ul style="list-style-type: none"> Tractor and trailer or truck
<ul style="list-style-type: none"> Final inspection – discard defective nuts 	<ul style="list-style-type: none"> MAFFF registered packhouse, preferably HACCP certified
<ul style="list-style-type: none"> Size grading and bagging 	
<ul style="list-style-type: none"> Pack bags in container 	
<ul style="list-style-type: none"> Chill container 	<ul style="list-style-type: none"> Container stand with reliable power supply
<ul style="list-style-type: none"> Move container to port 	<ul style="list-style-type: none"> Truck to lift 20 foot container
<ul style="list-style-type: none"> Wash container 	<ul style="list-style-type: none"> Container washing facility
<ul style="list-style-type: none"> Load container onto ship 	<ul style="list-style-type: none"> Container loading hoist at wharf

Current exports of coconuts are around 1,700 tonnes/year, equal to about 95 twenty-foot containers (20,000 nuts/18 tonnes per container). Exports of coconuts have increased from about 50 tonnes/month to almost 150 tonnes/month during the last nine years, occasionally reaching 200 tonnes per month. Coconut exporters do not face any equipment or infrastructure constraints in handling these volumes. However mechanised de-husking equipment has the potential to improve profitability of the value chain by reducing the amount of labour used in husking nuts.

4.2 Watermelons

Export of watermelons in refrigerated sea containers to New Zealand:

Steps in Export Pathway	Equipment and Infrastructure Requirements
<ul style="list-style-type: none"> Harvest into field bins 	<ul style="list-style-type: none"> Tractor, trailer and harvesting boom
<ul style="list-style-type: none"> Transport field bins to packhouse 	<ul style="list-style-type: none"> Tractor and trailer or truck
<ul style="list-style-type: none"> Wash, sort and grade 	<ul style="list-style-type: none"> MAFFF registered packhouse, preferably HACCP certified, with mechanised washing facility, and grading/packing conveyer belt
<ul style="list-style-type: none"> Discard defective fruit and pack in export bins 	
<ul style="list-style-type: none"> Transport export bins to MAFFF fumigation facility 	<ul style="list-style-type: none"> Forklift and truck
<ul style="list-style-type: none"> Unload truck and place bins in fumigation chamber 	<ul style="list-style-type: none"> Forklift Insect proof fumigation area Fumigation chamber with minimum 12 tonne capacity
<ul style="list-style-type: none"> Fumigate with methyl bromide for 4 hours 	
<ul style="list-style-type: none"> Stow export bins in 20 foot reefer container 	<ul style="list-style-type: none"> Forklift and insect proof outloading area
<ul style="list-style-type: none"> Chill container 	<ul style="list-style-type: none"> Container stand with reliable power supply
<ul style="list-style-type: none"> Move container to port 	<ul style="list-style-type: none"> Truck to lift 20 foot container
<ul style="list-style-type: none"> Wash container 	<ul style="list-style-type: none"> Container washing facility

• Load container onto ship	• Container loading hoist at wharf
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Current watermelon exports are around 200-300 tonnes per annum, mostly during October, November and December when monthly volumes can reach 80-100 tonnes or 8-10 twenty-foot containers (assuming 10 tonnes of melons per container). The watermelon exporters have the capacity to harvest, grade and pack this volume, using the same facilities as those used for squash. The MAFFF fumigation facility can handle two 10 tonne container loads per day, so with about three ships per month it is generally possible to fumigate the current level of exports during one or two days before sailing. However, the capacity of the fumigation facility could become limiting if the watermelon industry expands significantly. The capacity of the facility is estimated as follows:

- Two 10 tonne container loads per day for three days prior to shipment = 60 tonnes/shipment
- Three shipments per month = 180 tonnes per month
- Three months x 180 tonnes = 540 tonnes per annum

The New Zealand market for watermelons in October-December is around 135 tonnes/week (580 tonnes/month), supplied mainly by imports from Australia. If the fumigation facility works at full capacity it could process 180 tonnes per month, which is only about 30% of the market requirements during Tonga's export season. The watermelon exporters have plans to expand volumes towards 1,000 tonnes over the next few years, which would be a market share of around 60% during the season. On this basis the capacity of the fumigation facility would become limiting in the near future. One way to overcome this capacity constraint would be to extend the watermelon export season, but to take advantage of the strong demand in the spring and early summer, there would still be a need to install a second fumigation chamber. The fumigation facility is only used for watermelons at present. If exporters wish to use it for other commodities, or expand beyond 180 tonnes per month of watermelons, it would be necessary to install a second fumigation chamber. A second chamber would certainly be needed if the industry target of 1,000 tonnes is to be realised over say five months. There is sufficient space in the building to install a second chamber beside or above the existing chamber. It is also important to be mindful of the risks to the exporter of any malfunctioning of the fumigation facility, for example through equipment breakdowns, shortages of fumigant, or non-availability of trained operators. This would have disastrous consequences for the exporters, since an entire shipment could be lost.

4.3 Squash, Pumpkins, etc.

Export of squash or pumpkins to Japan, Korea or New Zealand:

Steps in Export Pathway	Equipment and Infrastructure Requirements
• Harvest into field bins	• Tractor, trailer and harvesting boom
• Transport field bins to packhouse	• Tractor and trailer or truck
• Brush, sort and grade	• MAFFF registered packhouse, preferably HACCP certified, with mechanised brushing facility, and grading/packing conveyer belt
• Discard defective fruit and pack in export bins	
• Stow export bins in 40 foot reefer container	• Forklift
• Chill container	• Container stand with reliable power supply
• Move container to port	• Truck to lift 40 foot container
• Wash container	• Container washing facility
• Load container onto ship	• Container loading hoist at wharf

Current exports of squash are around 2,000 – 4,000 tonnes per annum over a period of about six weeks. This requires an average harvesting and packing capacity of 50-100 tonnes per day (6 weeks x 6 days per week). The largest exporter, Nishi Trading, has the capacity to harvest and pack this amount, more if necessary by working extended or double shifts. There are also several smaller squash packing facilities. Together these have handled much larger volumes of squash in the past.

Since squash exports to Japan and Korea are unlikely to expand very much, and any exports to New Zealand will be over a longer seasonal window, the squash/pumpkin marketing pathway does not have any significant capacity constraints.

4.4 Root Crops

Cassava and other root crops exported **frozen**:

Steps in Export Pathway	Equipment and Infrastructure Requirements
<ul style="list-style-type: none"> Harvest into field bins, baskets or sacks Transport to packhouse 	<ul style="list-style-type: none"> Tractor and trailer or truck
<ul style="list-style-type: none"> Peel, sort and discard defective material Wash in water Rinse in sodium metabisulphite solution Drain and pack in wholesale (20-25 kg) or retail (3-5kg) plastic bags 	<ul style="list-style-type: none"> MAFFF registered packhouse with facilities to peel, sort, wash and pack root crops, preferably HACCP certified Access to clean water and electricity Facilities for solid and liquid waste disposal
<ul style="list-style-type: none"> Freeze 	<ul style="list-style-type: none"> Blast freezer with capacity to reduce the temperature of produce to -15°C in 4 hours
<ul style="list-style-type: none"> Stow in freezer container 	<ul style="list-style-type: none"> Container stand with reliable power supply
<ul style="list-style-type: none"> Move container to port 	<ul style="list-style-type: none"> Truck to lift 20 foot container
<ul style="list-style-type: none"> Wash container 	<ul style="list-style-type: none"> Container washing facility
<ul style="list-style-type: none"> Load container onto ship 	<ul style="list-style-type: none"> Container loading hoist at wharf

Taro, giant taro, tarua, yams and other root crops exported **chilled**:

Steps in Export Pathway	Equipment and Infrastructure Requirements
<ul style="list-style-type: none"> Harvest into field bins, baskets or sacks Transport to packhouse 	<ul style="list-style-type: none"> Tractor and trailer or truck
<ul style="list-style-type: none"> Wash, peel, trim and discard defective material Drain and pack in red-net bags and export bins 	<ul style="list-style-type: none"> MAFFF registered packhouse with facilities to peel, trim, sort, wash and pack root crops, preferably HACCP certified Access to clean water and electricity Facilities for solid and liquid waste disposal
<ul style="list-style-type: none"> Chill 	<ul style="list-style-type: none"> Chiller and/or reefer container
<ul style="list-style-type: none"> Stow in reefer container 	<ul style="list-style-type: none"> Container stand with reliable power supply
<ul style="list-style-type: none"> Move container to port 	<ul style="list-style-type: none"> Truck to lift 20 foot container
<ul style="list-style-type: none"> Wash container 	<ul style="list-style-type: none"> Container washing facility
<ul style="list-style-type: none"> Load container onto ship 	<ul style="list-style-type: none"> Container loading hoist at wharf

Tonga does not have the required infrastructure for hygienic and efficient processing of root crops in the required quantities. Discounting the 2015 drought year, exports are about 1,650 tonnes of frozen cassava, 1,000 tonnes of other frozen root crops, and about 2,200 tonnes of chilled fresh root crops. This represents about 240 twenty-foot containers per year or 5-6 containers per week (14-15 tonnes per container). The New Zealand market has the capacity to absorb increased exports of root crops, and there are also markets further afield with considerable potential, especially for frozen product, including Australia and North America. Processing infrastructure limitations could constrain access to these markets if production is expanded to meet the demand.

Since it was upgraded according to the recommendations of Technical Report #45, the MAFFF export processing facility at Nuku'alofa has the capacity to process 2-3 containers of root crops per week, which is less than half the current level of exports. Because the MAFFF facility lacks the capacity, most of the root crops are processed in very basic facilities which do not meet acceptable hygiene standards or levels of operational efficiency. Also the MAFFF facility itself is not HACCP compliant.

The root crop exporters have expressed a preference for access to decentralised processing facilities with the equipment needed to process root crops hygienically and efficiently in the rural areas. It was initially suggested that two decentralised units would be appropriate, one each in the Eastern and Western Districts of Tongatapu. However the subsequent establishment of the Nishi packhouse and the company’s plans to upgrade this to process root crops with a capacity of about one container per week, means that only the Eastern District packhouse is needed. Some further investments and operational modifications would also improve the capacity of the MAFFF facility and prepare it for HACCP accreditation.

4.5 Fresh Fruit and Vegetables

Steps in Export Pathway	Equipment and Infrastructure Requirements
<ul style="list-style-type: none"> Harvest into field bins, baskets or sacks Transport to packhouse a/ 	<ul style="list-style-type: none"> Tractor and trailer or truck
<ul style="list-style-type: none"> Wash (if necessary) and sort – discard defective material Pack into re-usable plastic crates/lugs 	<ul style="list-style-type: none"> MAFFF registered packhouse with facilities to sort, wash and pack fruit and vegetables, preferably HACCP certified Access to clean water and electricity Facilities for solid and liquid waste disposal
<ul style="list-style-type: none"> Transport to MAFFF airport facility 	<ul style="list-style-type: none"> Covered truck
<ul style="list-style-type: none"> Transfer to HTFA bins b/ HTFA treatment b/ 	<ul style="list-style-type: none"> Functional HTFA facility
<ul style="list-style-type: none"> Final sort/grade and pack into cardboard cartons in insect proof area 	<ul style="list-style-type: none"> Work benches, scales, supply of cartons in insect-proof area etc
<ul style="list-style-type: none"> Cool produce in cartons in forced air cooling chamber 	<ul style="list-style-type: none"> Forced air cooling chamber in insect-proof area
<ul style="list-style-type: none"> Transfer cartons to air container Store air container in quarantine cool room 	<ul style="list-style-type: none"> Air containers and cool room with outloading onto airport tarmac
<ul style="list-style-type: none"> Transfer container to international airport Load onto aeroplane 	<ul style="list-style-type: none"> Covered holding area for cargo prior to loading Airport cargo handling equipment

a/ May be exporter’s packhouse or Fua’amotu airport facility

b/ These steps not required for non-fruit fly hosts (e.g. beans and okra)

Exports of fresh fruit and vegetables have been running at a very low level, mainly confined to taro leaves (non-fruit fly host) and breadfruit (cooked and frozen). There are several MAFFF registered packhouses currently used for watermelons which could be used to process fruit and vegetables, although none of these are HACCP certified⁵. However there has been a small revival of fresh fruit exports (mainly papaya and breadfruit) following the overhaul and re-commissioning of the HTFA facility under TEQM management. The capacity of this facility (about three tonnes per shift) is far greater than the actual volumes processed, so that HTFA capacity does not present a constraint in the foreseeable future. Of greater concern however, is the financial viability of the facility which is struggling due to low throughput volumes.

⁵ PHAMA is currently considering providing assistance to obtain HACCP certification for some of these facilities.

5.0 Conclusions and Recommendations

5.1 Priority Infrastructure and Equipment Needs

Technical Report #45 identified the infrastructure needs for processing and packing horticultural commodities, in order of priority as:

Priority	Current Status
1. Improvements to the Nuku'alofa export processing facility to increase its capacity and enable it to operate more efficiently.	<ul style="list-style-type: none"> Many of these improvements have been implemented, but further work is needed to enhance efficiency and facilitate HACCP accreditation. Working at near full capacity.
2. Overhaul and improvement of the Fua'amotu airport facility.	<ul style="list-style-type: none"> Overhaul and improvements completed and operation transferred to TEQM. Financial sustainability is doubtful unless throughput is substantially increased.
3. Establishment of two decentralised general-purpose processing facilities on Tongatapu.	<ul style="list-style-type: none"> One new multi-purpose packhouse established by Nishi Trading Ltd. to service growers and exporters in central and Western Tongatapu. Steps have been taken to initiate a new Eastern district packhouse facility including preliminary design and feasibility assessment.

5.2 Nuku'alofa Export Processing Facility

Technical Report #45 identified the main requirements to improve the Nuku'alofa facility in order to free-up the existing floor space so that it can be used as initially intended, and to install additional equipment in the outdoor washing and packing area to improve operational efficiency. The Technical Report #45 recommendations and their current status are as follows:

Technical Report #45 Recommendation	Current Status
1. Construct and equip a new building of around 40m ² for inspection and certification of handicrafts for export. This will free-up much of the export processing and inspection area in the existing building for processing of horticultural exports.	<ul style="list-style-type: none"> New building for handicrafts constructed but may be too small to handle the volume of exports.
2. Equip the existing export processing and inspection area with stainless steel benches to facilitate sorting, grading, packing and inspection of produce for export.	<ul style="list-style-type: none"> Some washing vats installed but no stainless steel benches. Produce is still being washed peeled and sliced on the concrete floor.
3. Install shelving in the blast freezer to allow for faster freezing of produce in individual pieces, with bagging after freezing prior to transfer to the shipping container. This is more energy efficient than bagging the produce before freezing, provides for quicker and more uniform freezing, and improves product quality by allowing individual pieces to be easily separated for placement in retail packs either at the packing facility or by the importer/distributor. Packing ready frozen produce is standard procedure for most frozen food products.	<ul style="list-style-type: none"> Shelving has not yet been installed and produce is still being frozen in bags.
4. Engage a qualified refrigeration engineer to check the operation of the blast freezer to ensure that it is working satisfactorily. The long periods required to freeze cassava suggest that the freezer may not be functioning properly, although freezing bagged product also contributes to the	<ul style="list-style-type: none"> Blast freezer is now performing satisfactorily, although freezing bagged product impedes efficiency.

Technical Report #45 Recommendation	Current Status
problem.	
5. Construct a roof over the 120m ² paved area between the export processing and inspection area and the fumigation facility. This area is used for washing and packing root crops for export. The area also needs to be equipped with stainless steel benches, lighting, three-phase electricity, weigh-scales and a washing machine for root crops. These machines greatly accelerate the washing and packing of cassava and other root crops, use much less water, and enable a full twenty-foot container load to be processed in 4-6 hours.	<ul style="list-style-type: none"> • Roof constructed but none of the other facilities or equipment have been sourced or installed.
6. Install additional rainwater tanks or connect to the town water supply to allow for increased volumes of root crops to be processed.	<ul style="list-style-type: none"> • Tanks not yet installed.
7. Assess compliance of wastewater disposal with environmental regulations, and if necessary install a wastewater treatment facility. Install removable bins for solid waste disposal.	<ul style="list-style-type: none"> • Untreated wastewater still being discharged to the sea. • Operators are responsible for removing their own solid waste.
8. Monitor utilisation of the fumigation facility. If exporters plan to export more than about 60 tonnes of fumigated produce per shipment, the capacity of this facility would become limiting and an additional fumigation chamber will need to be installed. Accreditation of additional MAFFF staff also appears to be a wise precaution to guard against possible disruptions to exports.	<ul style="list-style-type: none"> • Drought conditions in 2014-15 means that the volume of fumigated produce has not increased as expected. • Continued monitoring of the utilisation rate is needed. • Maintenance of fumigation chamber and associated equipment and training in its operations to be funded by PHAMA during October 2016.

Complete implementation of the Technical Report #45 recommendations for the Nuku'alofa facility would enable capacity to increase from 2-3 20-foot containers per week to 3-4 per week; and if volumes are sufficient, to increase the capacity of the fumigation facility from 60 tonnes per shipment to 120 tonnes.

5.3 Fua'amotu Airport HTFA Facility

Technical Report #45 reported that the facility had recently been signed over from MAFFF to TEQM, which proposes to operate it on a commercial basis but that it needed a fairly extensive overhaul before it can become reliably operational. The Technical Report #45 recommendations and their current status are as follows:

Technical Report #45 Recommendation	Current Status
1. Structural repairs to the building including replacement of guttering, repairs to the insect screens, and repair of the main entrance gates.	Most of these recommendations have been implemented (with PHAMA support) and the facility can easily handle the volume of produce available for processing
2. Installation of shutters on the Western side of the building to keep the working areas dry during heavy rain storms.	
3. Installation of a lockable storage area.	
4. Overhaul of the electrical system including standby generator.	
5. Installation of a larger boiler and a new boiler room.	
6. Installation of work benches for grading and packing produce.	
7. Overhaul of the toilet and washroom facilities.	
8. Ancillary equipment including a new forklift, platform scales, office equipment and computer.	

The airport HTFA facility is now in good working condition and is ready to process and pack the complete range of fruit and vegetables for export by air including products for which market access is being pursued (courgettes/zucchini and possibly green beans), and including those commodities requiring HTFA treatment. In addition the old office building adjacent to the HTFA building is being used occasionally to grade and pack produce prior to HTFA treatment.

The problem now is not the infrastructure or equipment, but the operational challenges of managing a facility on a fee-for-service basis in the face of low and highly variable throughput and the need to sustain high operating standards in order to maintain access to the New Zealand market. Operation of the facility is dependent on the continuing presence of the HTFA Technician recruited from Fiji.

5.4 Decentralised General-Purpose Processing Facilities

Technical Report #45 reported that the current level of root crop exports would fully utilise the Nuku'alofa facility, even after the recommended enhancements some of which have already been implemented. During 2015, root crop exports reached a record 4,600 tonnes (about 310 containers) and in busy months reached 400-500 tonnes, equivalent to 27-33 containers or 6-8 containers per week. Recovery from the drought, and strong demand for root crops in the main export markets, makes it likely that the 2015 levels will be equalled or exceeded in due course.

Technical Report #45 concluded that if root crop exports are to expand, additional processing facilities would be needed. Increasing food safety concerns among root crop importers and retailers means that such facilities must have high operating standards and be designed so that HACCP accreditation is possible, as is the case with the new Nishi packhouse.

During the preparation of Technical Report #45 exporters expressed a preference for decentralised facilities close to the main root crop production areas where produce can be processed and packed in shipping containers. It was suggested that growers and exporters in the central part of Tongatapu would use the Nuku'alofa facility, and that two new facilities would be constructed in the rural areas, one in the Eastern District and one in the Western District. However establishment of the Nishi packhouse which can easily access produce from central and Western Tongatapu, and could be upgraded to handle a modest volume of root crops, means that only the Eastern facility is now needed. The need for the Eastern district facility is based on the following capacity assessment:

- Current volume of root crop exports: 5-6 containers/week, increasing to 6-8 during busy periods.
- Capacity of MAFFF facility: 2-3 containers/week, able to be increased to 3-4 with further improvements as recommended in Technical Report #45.
- Nishi Packhouse capacity: Currently used only for cucurbits but could be upgraded to process one container of root crops per week.
- Volume of root crops currently processed in informal/makeshift facilities: 2-6 containers per week.

Technical Report #45 recommended that the decentralised packhouse facilities would be general purpose processing and packing facilities able to handle the full range of root crops (chilled and frozen) and cucurbits. The facilities would have the capacity to process one twenty-foot container load of produce per day. They would include:

- An open-sided shed of around 200m² to allow for ventilation and easy cleaning with a concrete slab floor, together with small office and lunch area, toilets and wash room.
- Equipped with stainless steel benches, washing vats, washing machines and weigh-scales to facilitate sorting, grading, packing and inspection of produce for export.
- Connection to three-phase power with a backup generator and lighting to enable night operation.
- Borehole and tank for clean water supply, with high pressure pump to allow the work area to be cleaned.

- Blast freezer of about 50m³, sufficient to freeze one twenty-foot container load of root crops per shift.
- Parking space (concrete slab) and power for two twenty-foot reefer containers.
- Lockable areas to enable users to store packing materials and equipment.
- Composting bins for solid waste disposal (leaves, peel, reject produce etc.)
- A wastewater treatment facility to allow clean wastewater to be discharged or re-used.
- Access to an all-weather road suitable for heavy vehicles.
- Forklift for loading/unloading produce, bins etc.
- Perimeter fence, approximately 3m high.

Technical Report #45 recommended that the decentralised facilities would be available to exporters on a fee-for-service basis. The operators would hire the facilities by the day and be responsible for engaging their own labourers and provision of all movable tools, consumables, packaging material and other equipment. It is likely that the facilities would be mainly used for processing frozen root crops, but could also be used for coconuts, cucurbits or other produce. The facilities would enable much more efficient and hygienic operations than the current makeshift facilities used by many of the exporters, as well as ensuring better quality product by blast freezing rather than the current practice of freezing bagged product in containers. Chilled product would be chilled in the container, avoiding the need for a separate cool room. The facilities would also be potentially HACCP certifiable.

A number of steps have been taken towards the establishment of the Eastern District Packing Facility (EDPF). An Establishment Board has been created comprising representatives of Government and the private sector, and agreement on the ownership structure and operating model has been reached. A preliminary architectural design and costing has been completed, and the basic outline of a business plan has been prepared. Importantly, the Australian Department of Foreign Affairs and Trade (DFAT) has indicated that it would be prepared to contribute to the financing of the construction costs of the project subject to the completion of a comprehensive feasibility study and business plan and consultations with relevant stakeholders on the arrangements for its construction and operations. A draft feasibility study/business plan (prepared independently from this report) is therefore presented in Appendix B of this document.

The justification for locating the facility in the Eastern District is supported by the 2015 agricultural census which provides information on the main root crop producing areas of Tonga and Tongatapu by district. Vaini, Lapaha and Tatakamotonga produce almost 50% of the root crops in Tongatapu and are in close proximity to the proposed EDPF to be located at Alaki. A number of other sites were considered but found to be less suitable. The MAFFF office site in Alaki was discarded on the grounds that it would be expensive to develop due to the uneven terrain. Land adjacent to Fua'amotu airport was also set aside by the Establishment Board as the 4,000 m² site (approximately one acre) would have cost TOP 24,000 per annum to lease. The preferred site (see Appendix B, Attachment 1) is land adjacent to the MAFFF site in Alik. This one acre block, a former rugby field, was considered the preferred site for the facility and is available for 50 years for a once-only payment of TOP 50,000. The location is also very suitable with good road connections to growers in North-Eastern, South-Eastern and Central Tongatapu.

It is therefore recommended that the EDPF be established according to the design features given above and the operating model described in the business plan in Appendix B.

5.5 Vava'u Export Processing Facility

Technical Report #45 noted that whilst the Vava'u facility has some design problems that partly explain why it is not being used, there is only one root crop exporter in Vava'u who operates on an intermittent basis and prefers to use his own facilities. This assessment has not changed. Consequently improvements to the Vava'u facility are considered low priority at this stage.

5.6 Ownership and Operational Issues

The ownership and operation of the export processing facilities detailed above is just as important as the structures and equipment therein. One option is for the exporters to own and operate all processing and packaging facilities, similar to the Fiji model with Nature's Way Cooperative (NWC). NWC is a cooperative of growers and exporters, which owns and operates the HTFA facility and export packhouse at Nadi Airport. It has been in operation for 21 years, during which the number of shareholders has grown and throughput has steadily increased. NWC has a full-time professional management team, and operates on a user-pays basis, but has always struggled to be profitable due to fluctuations in the supply of raw material for processing. It is important to note that NWC received substantial amounts of donor support to finance investments during its early years, and continues to be dependent on donor funding for its ongoing operations.

The two MAFFF export facilities at Nuku'alofa and Vava'u are available for use by exporters for the cost of electricity only. This arrangement is not sustainable as it makes no provision for other operating costs, repairs, maintenance or replacement of the facilities at the end of their working life. Given the constrained budgetary position of MAFFF it is inevitable that the condition of the facilities will deteriorate over time unless a system of full cost recovery is established. Ideally, the facilities should be leased to a private sector operator, possibly a NWC-type entity, which would charge commercial rates for use of the facility.

The airport HTFA facility has been transferred from MAFFF to TEQM, which is a state-owned company. TEQM has no other assets and no sources of revenue other than fees paid by users of the facility. It is essential therefore that these fees are adequate to cover the full operating costs. As a parastatal TEQM is able to retain the fee income it generates, unlike a ministry where fee income goes back to the treasury. Technical Report #45 recognised that over the next few years revenue collected by TEQM from users of the airport facility would almost certainly be insufficient to cover the full operating costs or to finance the necessary repairs, maintenance and improvements. This has proven to be correct. TEQM will therefore need continuing external funding. As with the MAFFF facilities, once throughput is sufficient, the facility should be leased to a private sector operator. This was in fact the intention under the NZAP-Government agreement, which envisaged that TEQM would hand over to the private sector once the facility had sufficient throughput to cover its costs. Now that the facility has been transferred to TEQM the transition to private sector operation can again be considered. However throughput in 2015 and 2016 is far below break-even levels and it is unlikely that there would be any interest from the private sector.

The preferred option for ownership and operation of the proposed decentralised processing facility (i.e. the EDPF) is for it to be owned by a Public-Private Partnership (PPP) with Government holding less than 50%, and managed by a private sector partner. Under such an arrangement the role of MAFFF would be confined to technical support and inspection/certification. In the absence of a NWC-type entity, some form of grower and/or exporter organisation would be most appropriate to be the majority owner of the facility. Charges for use of the facilities should be sufficient to cover all operating costs as well as contributions to a sinking fund to accumulate money to finance replacement of the buildings and equipment as necessary. Details of the proposed operating model are given in the Business Plan in Appendix B. The business plan also identifies several risks associated with this operating model including (i) the possibility that it may prove difficult to engage a commercial partner; and (ii) that exporters may be reluctant to pay a full commercial toll fee if the market will continue to accept produce processed in basic non-certified facilities. The first of these risks can be managed by calling for EOIs from commercial partners at an early stage. It is within the mandate of MAFFF biosecurity to manage the second risk.

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Appendix A

Tonga's Agricultural
Exports 2007-2016

Appendix A Tonga’s Agricultural Exports 2007-2016

<p>Figure 1: Monthly Exports of Cassava 2007-May 2016 (tonnes)</p> <p>Cassava exports show a gradual uptrend from around 50 tonnes per month in 2007 to more than 100 tonnes per month today.</p> <p>All cassava is exported in frozen form</p>	
<p>Figure 2: Average Monthly Exports of Cassava 2007-2015 (tonnes)</p> <p>Cassava exports average about 70 tonnes per month during the first half of the year, increasing to over 100 tonnes per month during the second half.</p> <p>This is mainly related to the seasonality of demand in New Zealand</p>	
<p>Figure 3: Monthly Exports of Giant Taro (Kape) 2007-May 2016 (tonnes)</p> <p>Exports of giant taro fluctuate markedly within and between years. Volumes fell to almost zero in 2010 and again in 2015 due to the drought</p>	

Figure 4: Average Monthly Exports of Giant Taro (Kape) 2007-2015 (tonnes)

There is usually a significant spike in giant taro exports during the October to December period

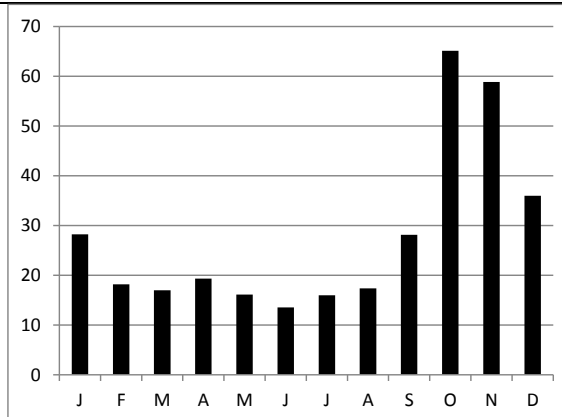


Figure 5: Monthly Exports of Swamp Taro (Taro Tonga) 2007-May 2016 (tonnes)

The long term uptrend in Swamp Taro exports has been severely dented by the 2015 drought

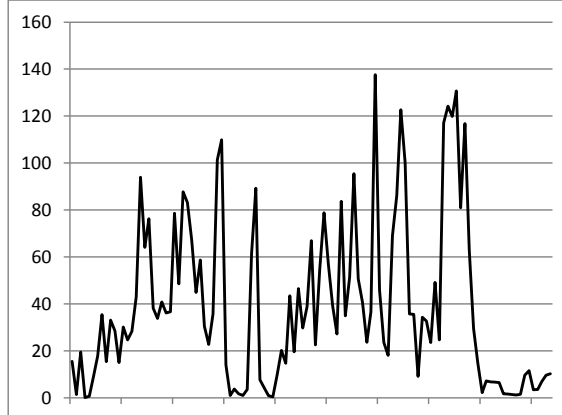


Figure 6: Average Monthly Exports of Swamp Taro (Taro Tonga) 2007-2015 (tonnes)

Exports of Swamp Taro are highest in June-July and December

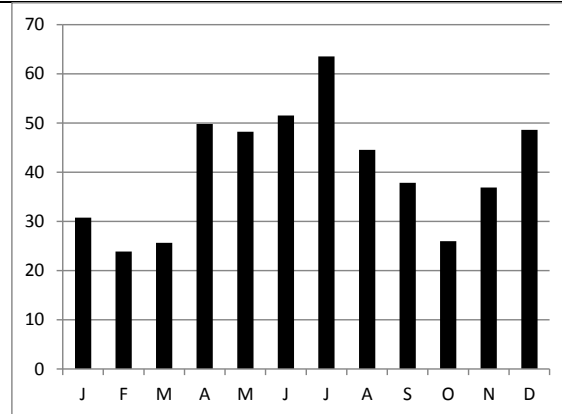


Figure 7: Monthly Exports of Taro Tarua (Taro Futuna-tea) 2007-May 2016 (tonnes)

Taro Tarua exports show an overall decline, exacerbated by the 2015 drought

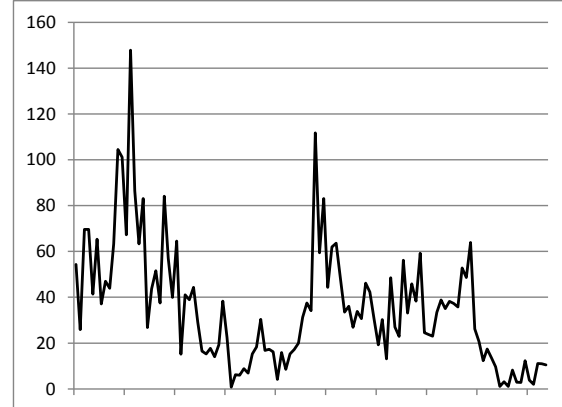


Figure 8: Average Monthly Exports of Taro Tarua (Taro Futuna-tea) 2007-2015 (tonnes)

Taro Tarua exports tend to be stronger in October-December and weakest in June-July-August

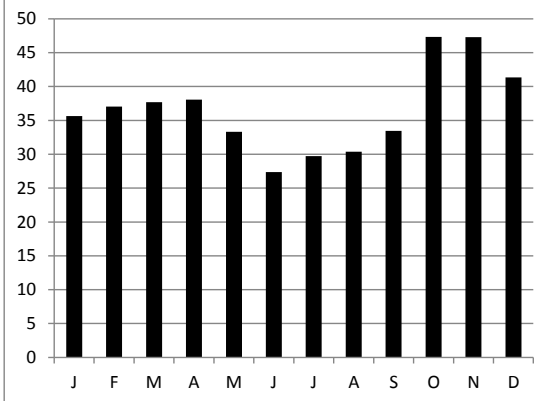


Figure 9: Monthly Exports of Yams 2007-May 2016 (tonnes)

Peak season exports of yams are generally between 100 and 200 tonnes per month, but exceeded 350 tonnes recently

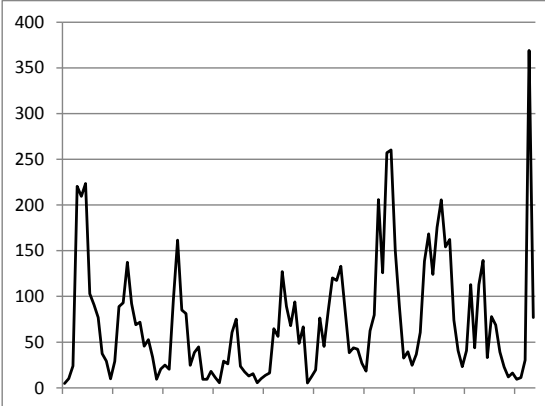


Figure 10: Average Monthly Exports of Yams 2007-2015 (tonnes)

Yam exports are strongly seasonal with the peak period being April-May-June

Exports fall to a trickle in November-December-January

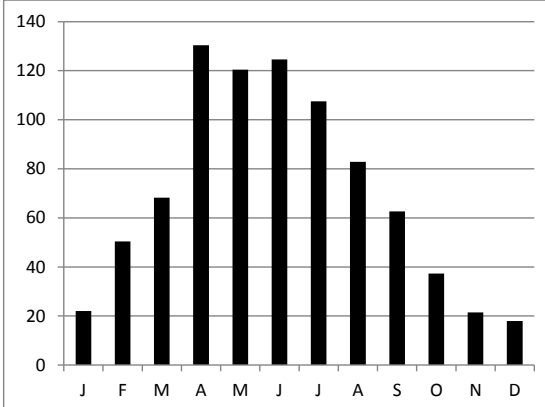
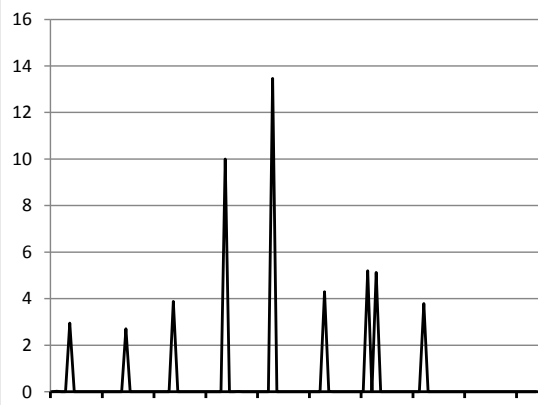
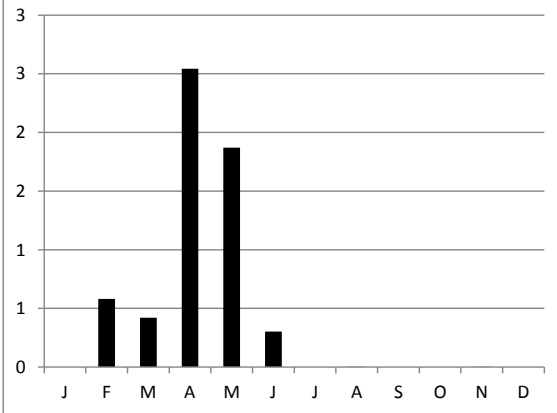
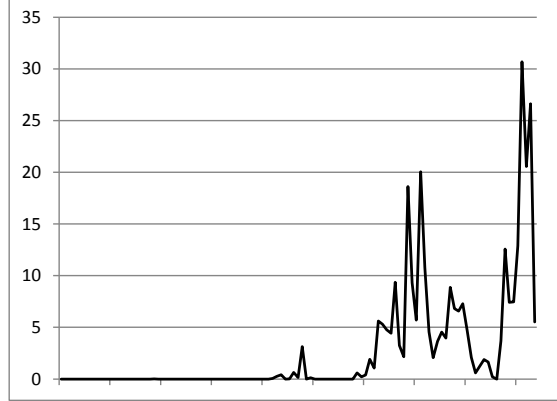
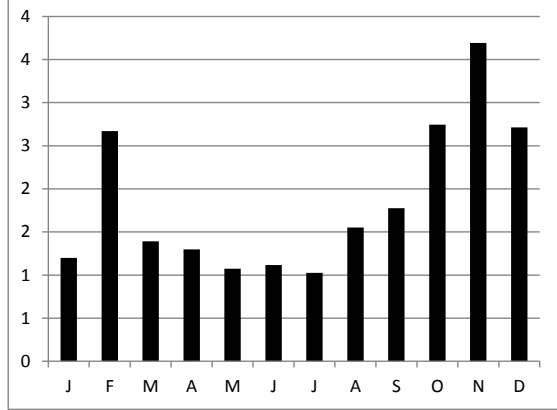
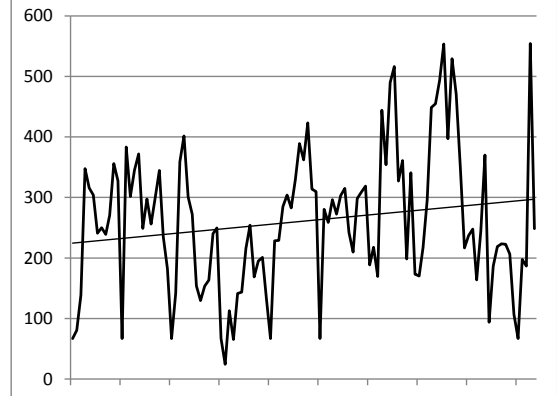


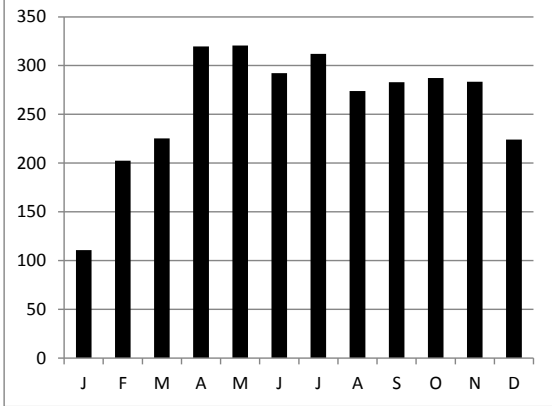
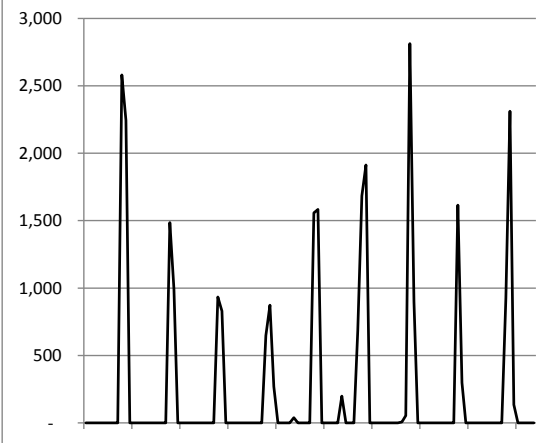
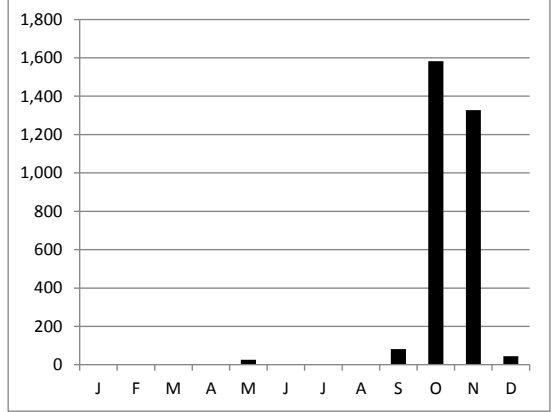
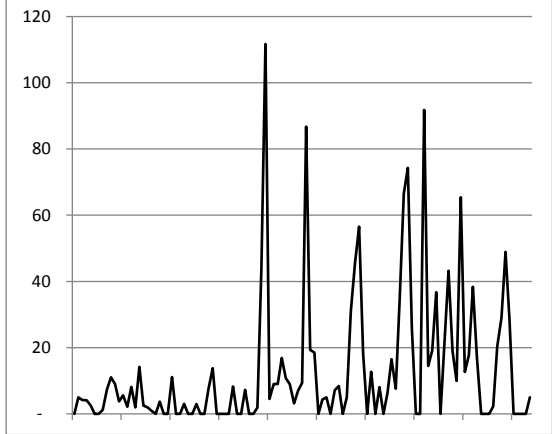
Figure 11: Monthly Exports of Japanese Taro 2007-May 2016 (tonnes)

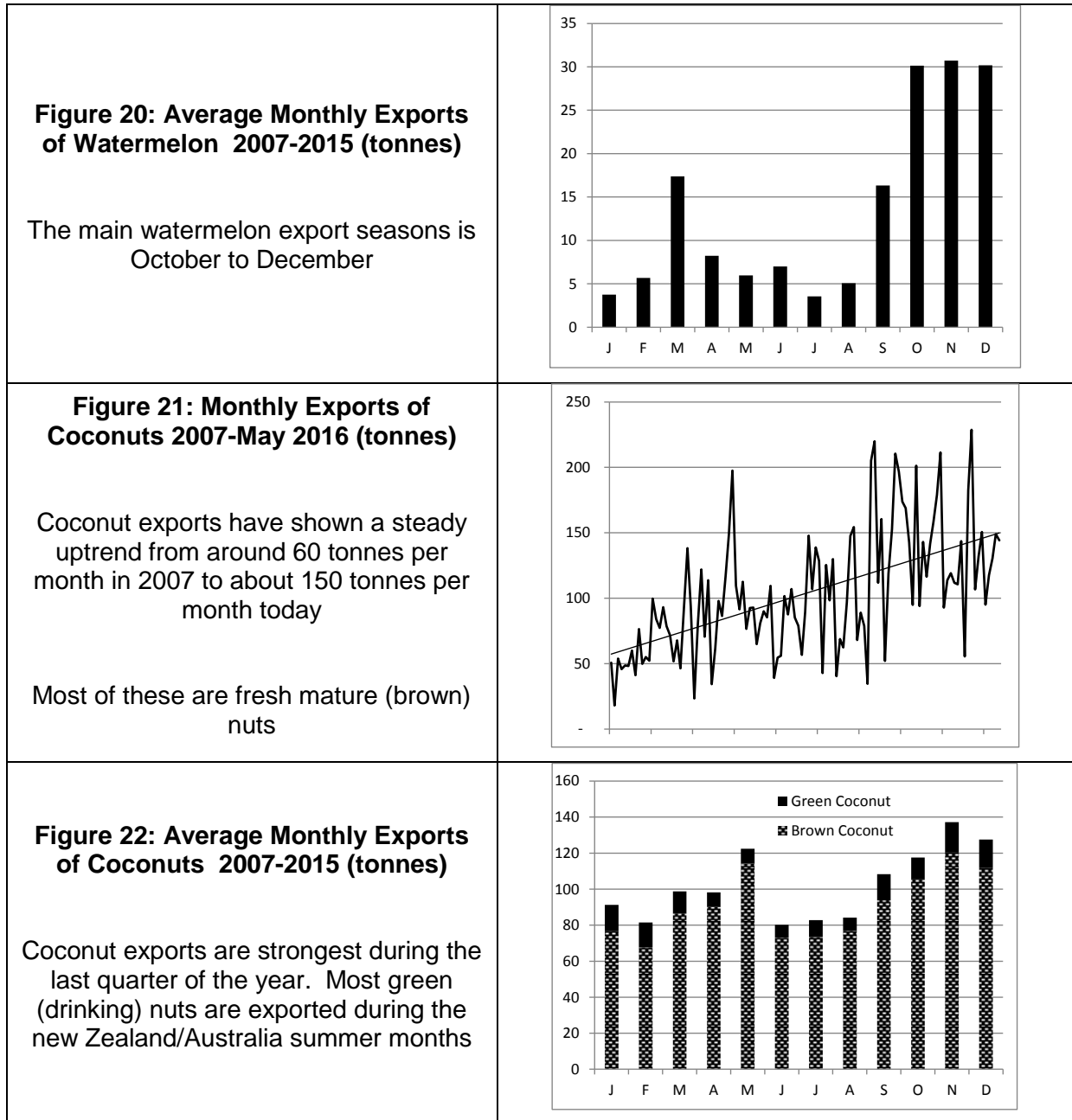
There are occasional small shipments of Japanese Taro, but volumes are low compared to the other root crops

There have been no exports during the last two years



<p>Figure 12: Average Monthly Exports of Japanese Taro 2007-2015 (tonnes)</p> <p>Exports of Japanese Taro peak in April and May</p>	
<p>Figure 13: Monthly Exports of Sweet Potato (Kumala) 2007-May 2016 (tonnes)</p> <p>Sweet potato exports commenced in 2011-12 but were badly affected by the drought in 2015</p>	
<p>Figure 14: Average Monthly Exports of Sweet Potato (Kumala) 2007-2015 (tonnes)</p> <p>Sweet potato exports are moderately seasonal with a peak in October-November-December and another one in February</p>	
<p>Figure 15: Monthly Exports of all Root Crops 2007-May 2016 (tonnes)</p> <p>Total root crop exports are mostly in the 100-300 tonnes per month range, occasionally reaching around 500 tonnes</p> <p>There is a gradual uptrend of 3.2% per annum with wide fluctuations within and between years</p>	

<p>Figure 16: Average Monthly Exports of all Root Crops 2007-2015 (tonnes)</p> <p>January-February-March is generally the low point for root crop exports but volumes are fairly stable over the remainder of the year</p>	 <table border="1"> <caption>Estimated data for Figure 16</caption> <thead> <tr> <th>Month</th> <th>Exports (tonnes)</th> </tr> </thead> <tbody> <tr><td>J</td><td>110</td></tr> <tr><td>F</td><td>200</td></tr> <tr><td>M</td><td>225</td></tr> <tr><td>A</td><td>315</td></tr> <tr><td>M</td><td>320</td></tr> <tr><td>J</td><td>290</td></tr> <tr><td>J</td><td>310</td></tr> <tr><td>A</td><td>275</td></tr> <tr><td>S</td><td>285</td></tr> <tr><td>O</td><td>285</td></tr> <tr><td>N</td><td>280</td></tr> <tr><td>D</td><td>225</td></tr> </tbody> </table>	Month	Exports (tonnes)	J	110	F	200	M	225	A	315	M	320	J	290	J	310	A	275	S	285	O	285	N	280	D	225
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<p>Figure 17: Monthly Exports of Squash 2007-May 2016 (tonnes)</p> <p>Monthly exports of squash reached 2,500 tonnes in 2007, fell to less than 1,000 tonnes per month in 2009 and 2010 but have since recovered</p>																											
<p>Figure 18: Average Monthly Exports of Squash 2007-2015 (tonnes)</p> <p>The squash export season is concentrated in October and November</p>	 <table border="1"> <caption>Estimated data for Figure 18</caption> <thead> <tr> <th>Month</th> <th>Exports (tonnes)</th> </tr> </thead> <tbody> <tr><td>J</td><td>0</td></tr> <tr><td>F</td><td>0</td></tr> <tr><td>M</td><td>0</td></tr> <tr><td>A</td><td>0</td></tr> <tr><td>M</td><td>0</td></tr> <tr><td>J</td><td>0</td></tr> <tr><td>J</td><td>0</td></tr> <tr><td>A</td><td>0</td></tr> <tr><td>S</td><td>50</td></tr> <tr><td>O</td><td>1550</td></tr> <tr><td>N</td><td>1300</td></tr> <tr><td>D</td><td>50</td></tr> </tbody> </table>	Month	Exports (tonnes)	J	0	F	0	M	0	A	0	M	0	J	0	J	0	A	0	S	50	O	1550	N	1300	D	50
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<p>Figure 19: Monthly Exports of Watermelon 2007-May 2016 (tonnes)</p> <p>Watermelons have become a significant export since the opening of the MAFFF fumigation facility has enabled access to the New Zealand market</p> <p>Production was badly affected by drought in 2015</p>																											





Appendix B

Business Plan for
Eastern District
Packhouse Facility

Appendix B Business Plan for Eastern District Packhouse Facility

KINGDOM OF TONGA EASTERN DISTRICT PACKHOUSE FACILITY (EDPF) DRAFT FEASIBILITY STUDY AND BUSINESS PLAN

**Prepared by
Pacific Horticultural and Agricultural Market Access
Program (PHAMA)**

**In Consultation with:
The EPDF Establishment Board**

SEPTEMBER 2016

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Attachment 1: Packhouse Location and Site

Attachment 2: Preliminary Design

Attachment 3: Financial Analysis

1. BACKGROUND

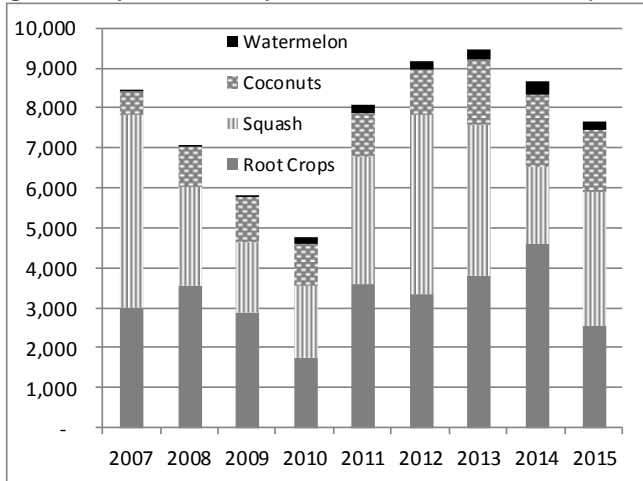
The Pacific Horticultural and Agricultural Market Access Program (PHAMA) Technical Report 45 (TR 45): *Feasibility Study to Determine Infrastructure Requirements for Processing & Packaging Horticultural Products for Export* (from Tonga) was completed in April 2013 and included a range of recommendations on priority infrastructure issues to address. One of the three priority infrastructure needs was the establishment of two decentralised general-purpose processing facilities on Tongatapu. Exporters have expressed a preference for facilities close to the main root crop production areas where produce could be processed and packed in shipping containers. The establishment of a modern HACCP-certified export packhouse by Nishi Trading Ltd. provides a facility that is readily accessible to growers and exporters in the Central and Western parts of Tongatapu. The company plans to upgrade the packhouse to process root crops with a capacity of about one container per week. Therefore the focus has now turned to the proposed Eastern District Packing Facility (EDPF).

By early 2016 progress had been made towards the establishment of the EDPF including the creation of an Establishment Board comprising representatives of Government and the private sector, and agreement on the ownership structure and operating model. It was also recognised that the specific needs and viability of the proposed new processing facilities needed to be reconsidered in light of new information that was available since TR 45 was completed. Key pieces of new information were: (i) the completion of the Nishi Trading export packhouse; (ii) a new Agricultural Census; (iii) completion of Tonga’s first Agriculture Sector Plan (TASP); and (iv) completion of a draft business plan for the EDPF.

2. PROJECT RATIONALE

Despite having a very small land area, Tonga has very good agricultural production capacity with good soils and favourable climatic conditions for a wide range of tropical and sub-tropical crops as well as temperate horticultural products in the winter months. There are long-standing trade linkages with New Zealand, and Tonga has historically been a source of many fruit and vegetable crops for New Zealand including pineapples, bananas, coconuts, root crops and winter vegetables. Tongan exporters also have long-standing trade linkages with Australia (coconuts and root crops), Japan (squash), North America and other PICs.

Figure 1: Exports of Principal Commodities 2007 to 2015 (tonnes)



There are a number of well-established exporters handling squash, coconuts, watermelons and root crops (fresh and frozen) who are interested in expanding and diversifying their businesses. However, such expansion cannot take place unless there is adequate infrastructure for processing, packaging and transporting these items to market.

As shown in Figure 1 exports of the major commodities (root crops, squash, coconuts and watermelon) declined after 2007 but rebounded in 2011 reaching over 9,000 tonnes by 2013. Severe drought conditions dented production and exports in 2014 and 2015, but shipments

are expected to resume their uptrend from 2016 onwards.

In the past, most export processing was undertaken in small, decentralised and basic premises, with consolidation taking place into reefer containers (chilled and frozen) prior to export. However in the last few years establishment of the Nishi packhouse and the MAFFF post-harvest facility in the Nuku’alofa port area have led to greater centralisation and improved quality control of export processing. The Nishi facility is a modern HACCP accredited packhouse designed to process cucurbits for export, but could be adapted for other uses such as fresh and frozen root crops. The

MAFFF facility is equipped for washing, peeling, cutting, bagging, chilling and freezing produce, mainly root crops, with a capacity of around 4-5 tonnes per day. It also includes a methyl bromide fumigation chamber with a capacity of around 20 tonnes per day. Following improvements to the MAFFF facility recommended in TR 45 it is now regularly used by about five exporters processing 2-3 container loads per week.

It is expected that the EDPF will mainly service root crop exporters, but could also be used for packing cucurbits or coconuts for export. Taking all root crops together, exports in 2007-2009 were 250-350 tonnes/month, or about 2,800-3,500 tonnes per annum. During 2010 exports slumped to 1,700 tonnes, but have subsequently rebounded and are now running at 250-300 tonnes per month. Because different root crops have different seasonal patterns the tonnage exported is fairly consistent over the year with a tendency to be a bit lower in January-February. The 2015 agricultural census provides information on the main root crop producing areas of Tonga and Tongatapu by district. Vaini, Lapaha and Tatakamotonga produce almost 50% of the root crops in Tongatapu and are in close proximity to the proposed EDPF to be located at Alaki.

Tonga does not have the required infrastructure for hygienic and efficient processing of root crops in the required quantities to access existing and potential new markets. The four main export facilities are at Nuku'alofa port, the Nishi Trading packhouse at 'Utulau (Tongatapu), Vava'u port and Fua'amotu international airport. Only the MAFFF facility at Nuku'alofa is currently used to process root crops for export although the Nishi facility could be adapted for that purpose.

Discounting the 2015 drought year, exports are about 1,650 tonnes of frozen cassava, 1,000 tonnes of other frozen root crops, and about 2,200 tonnes of chilled fresh root crops. This represents about 240 twenty-foot containers per year or 5-6 containers per week (15 tonnes per container). The New Zealand market has the capacity to absorb increased exports of root crops, and there are also markets further afield with considerable potential, especially for frozen product, including Australia and North America. Processing infrastructure limitations could constrain access to these markets if production is expanded to meet the demand.

Since it was upgraded according to the recommendations of TR 45, the MAFFF export processing facility at Nuku'alofa has the capacity to process 2-3 containers of root crops per week, which is less than half the current level of exports. Because the MAFFF facility lacks the capacity, most of the root crops are processed in very basic facilities which do not meet acceptable hygiene standards or levels of operational efficiency. Moreover the MAFFF facility itself is not HACCP compliant. The root crop exporters have expressed a preference for access to decentralised processing facilities with the equipment needed to process root crops hygienically and efficiently in the rural areas. It was initially suggested that two decentralised units would be appropriate, one each in the Eastern and Western Districts of Tongatapu. However the subsequent establishment of the Nishi packhouse which will probably be upgraded to process root crops, means that only the Eastern District packhouse is needed. Some further investments and operational modifications would also improve the capacity of the MAFFF facility and prepare it for HACCP accreditation.

TR 45 reported that the current level of root crop exports would fully utilise the Nuku'alofa facility, even after the recommended enhancements, some of which have already been implemented. During 2015 root crop exports reached a record 4,600 tonnes (about 310 containers) and in busy months reached 400-500 tonnes, equivalent to 27-33 containers or 6-8 containers per week. Recovery from the drought, and strong demand for root crops in the main export markets, makes it likely that the 2014 levels will be equalled or exceeded in due course.

TR 45 concluded that if root crop exports are to expand, additional processing facilities would be needed. Increasing food safety concerns among root crop importers and retailers means that such facilities must have high operating standards and be designed so that HACCP accreditation is possible, as is the case with the new Nishi Trading packhouse. The exporters expressed a preference for decentralised facilities close to the main root crop production areas where produce can be processed and packed in shipping containers.

The need for the Eastern district facility is based on the following capacity assessment:

- Current volume of root crop exports: 5-6 containers/week, increasing to 6-8 during busy periods.

- Capacity of MAFFF facility: 2-3 containers/week, able to be increased to 3-4 with further improvements as recommended in TR 45.
- Nishi Packhouse capacity: Currently used only for cucurbits but could be upgraded to process one container of root crops per week.
- Volume of root crops currently processed in informal/makeshift facilities: 2-6 containers per week

TR 45 recommended that the decentralised packhouse facilities would be general purpose processing and packing facilities able to handle the full range of root crops (chilled and frozen) and cucurbits. The facilities would have the capacity to process one twenty-foot container load of produce per day. The availability of the Nishi facility for processing cucurbits means that the EDPF will be mainly used for processing root crops.

TR 45 recommended that the decentralised facilities would be available to exporters on a fee-for-service basis. It is likely that the facilities would be mainly used for processing frozen root crops, but could also be used for coconuts, watermelons or other produce. The facilities would enable much more efficient and hygienic operations than the current makeshift facilities used by most exporters, as well as ensuring better quality product by blast freezing rather than the current practice of freezing bagged product in containers. The facilities would also be potentially HACCP certifiable.

A number of steps have been taken towards the establishment of the EDPF. An Establishment Board has been created comprising representatives of Government and the private sector, and agreement on the ownership structure and operating model has been reached. A preliminary architectural design and costing has been completed, and the basic outline of a business plan has been prepared. Importantly, the Australian Department of Foreign Affairs and Trade (DFAT) has indicated that it would be prepared to contribute to the financing of the project subject to the completion of a comprehensive feasibility study and business plan.

The preferred option for ownership and operation of the EDPF is a Public-Private Partnership (PPP), with Government holding less than 50% of the equity. Under such an arrangement the role of MAFFF would be confined to technical support and inspection/certification. Some form of grower and/or exporter organisation would most appropriate to be the majority owner of the facility. Charges for use of the facilities should be sufficient to cover all operating costs as well as contributions to a sinking fund to accumulate money to finance replacement of the buildings and equipment as necessary.

The Establishment Board was selected by the potential government and private sector shareholders given the responsibility of turning the EDPF concept into a reality within the following framework:

- That the facility is built and operated on a full cost recovery basis with a margin for infrastructure replacement as it falls due; and
- a private sector-led ownership model be in place at the outset to drive commercial principles and for the Government to provide technical support.

3. BUSINESS OBJECTIVES

The objective of the EPDF is to address a number of constraints to the expansion of fresh produce exports by providing the following services for growers and exporters:

- Provide a hygienic, properly equipped facility for washing, peeling, cutting, bagging, chilling and freezing of produce for export.
- Address market access issues by adopting high standards of hygiene, biosecurity and quality control, in a way that is not possible with most of the informal privately owned packing facilities.
- Facilitate the growth of exports for growers by improving product handling efficiency and reducing wastage in the system.
- Improve value addition to exports by moving from bulk commodity to retail packaging formats.

- Capacity development for growers via discipline in planning and planting of crops to synchronise with market requirements.

4. THE BUSINESS PLAN

4.1 Ownership Model

A series of meetings were convened by PHAMA during 2014 and 2015 in order to develop a consensus position on the ownership and governance of the facility. These involved MAFFF, the Ministry of Commerce, Tourism and Labour (MCTL), Growers Federation of Tonga (GroFed), Hahake (Eastern District) Grower's Council (HGC), and the Grower's Export Network (GXN). Three ownership models were considered: 100% Government ownership; 100% private sector ownership; and a public-private partnership (PPP) model comprising 49% Government and 51% private sector shareholding. The outcome of the consultations was in favour of the PPP model employing a limited liability company with the following shareholding structure:

Sector	Shareholder	Percent
Private Sector	HGC	17%
	GroFed	17%
	GXN	17%
Government	MAFFF	49%
Total		100%

The company will operate under the Companies Act of Tonga (2007) and comply with the reporting requirements contained therein. It was also agreed to create a five person Establishment Board comprising one person from each of the private sector shareholders and two from Government (MAFFF and MCTL). The MAFFF representative currently holds the chair. The Establishment Board is expected to become the Company Board once the company is incorporated.

4.2 Location

The consultation meetings considered three possible locations for the facility:

- The MAFFF office site in Alaki: this was discarded on the grounds that it would be expensive to develop due to the uneven terrain.
- Land adjacent to Fua'amotu airport: this was also set aside by the Establishment Board as the 4,000 m² site (approximately one acre) would have cost TOP 24,000 per annum to lease.
- Land adjacent to the MAFFF site in Alik: this one acre block, a former rugby field (see Attachment 1) was considered the preferred site for the facility and is available for 50 years for a once-only payment of TOP 50,000. The location is also very suitable with good road connections to growers in North-Eastern, South-Eastern and Central Tongatapu.

4.3 Operating Model

The Establishment Board has proposed a lease agreement between the owner of the facility (provisionally known as the "EPDF Company") and the Operator (lessee). Details of the agreement will be negotiated following a call for expressions of interest (EOIs) from legally constituted businesses who are interested in operating the facility. The lease agreement will specify that the Company, represented by its Board, will build and own the packing facility including the land and permanent structures and lease these for an agreed schedule of fees to the Operator. The Operator will be responsible for installing and maintaining all moveable items and equipment, and will retain ownership of these for the full term of the lease, expected to be a minimum of five years, preferably ten.

The responsibilities of the Owner will be limited to maintenance of the building and its ancillary facilities (roads, parking areas, fencing, water and electricity supply etc.), and for the receipt of lease payments or user fees from the lessee. The Operator will be responsible for all operational aspects

including staffing, repairs and maintenance of moveable items and equipment, payment for water and electricity and collection of revenue from the growers or exporters who wish to use the facility.

The lease could specify a fixed monthly rental amount to be paid by the operator/lessee, or could specify an agreed toll per tonne processed. The tolling arrangement is preferred because it would be less risky for prospective operator/lessees than a fixed rental payment.

The EDPF Company (the Owner) will be responsible for maintenance of the facilities (other than for the moveable items and equipment) and for their eventual replacement when this becomes necessary. The Company will therefore be required to establish a sinking fund in the form of an interest-bearing account for accumulating free cash flow to finance the required operation, maintenance and replacement of the facilities.

The Operator will be required to provide services to growers and/or exporters on a toll-paying basis which covers the direct costs of processing (labour, electricity and water) as well as an allowance for overheads, depreciation of equipment and profit margin to provide a reasonable return on investment. The Operator may also process produce on its own account, subject to payment of the standard toll to the Company. The growers and/or exporters who use the facility will be responsible for harvesting or procuring the raw materials, transporting them to the facility, providing packing materials (plastic bags, crates, cartons, etc.) and for shipping loaded containers to their export markets.

Selection of the Operator will be undertaken through a two-stage process comprising: (i) EOI, and (ii) full proposal. Any legal entity registered in Tonga, whether locally owned or not, will be eligible to submit an EOI. EOIs will be evaluated by the Board and one or more bidders may be asked to submit full proposals describing how they propose to operate the facility and their qualifications for doing so.

4.4 Financial Analysis

A detailed financial analysis for the proposed EDPF is shown in Attachment 3 and is separated into two parts. One part is for the Owner (the EDPF Company) and the other is for the Operator. The analysis presents quarterly and annual projections for each of the partners including the investment costs, gross income, cost of sales, overhead costs, net cash flow, EBITDA⁶, depreciation and profit/loss. All values are expressed in constant mid-2016 TOP. The analysis is based on processing of root crops for export in fresh and/or frozen form, which is expected to account for most of the turnover. However other commodities such as cucurbits may also be processed by the facility. The items included in the financial analysis are as follows:

	Item	Owner/EPDF Company	Operator/Lessee
A	Investment Costs	<ul style="list-style-type: none"> Land Site works Construction of packhouse and ancillary facilities 	<ul style="list-style-type: none"> Moveable items Machinery and equipment Working capital
B	Gross Income	<ul style="list-style-type: none"> Processing tolls paid by Operator/Lessee to Owner 	<ul style="list-style-type: none"> Processing tolls paid by packhouse users (growers and exporters) to Operator
C	Cost of Sales	<ul style="list-style-type: none"> No costs incurred 	<ul style="list-style-type: none"> Direct costs of processing/packing including labour, utilities and processing tolls paid to Owner
D	Gross Profit	(B-C)	
E	Overhead Costs	<ul style="list-style-type: none"> Fixed costs including Board honoraria, accounting, audit, insurance, R&M of structures, transport, communications etc. 	<ul style="list-style-type: none"> Fixed costs including salaries of manager and accounts clerk, accountancy and audit, R&M of equipment, transport, communications etc.

⁶ Earnings before interest, tax, depreciation and amortisation

Kingdom of Tonga: Infrastructure Requirements for Processing and Packaging Horticultural Products for Export

	Item	Owner/EPDF Company	Operator/Lessee
F	Net Cash Flow	(B-C-A)	
G	EBITDA	(F-A)	
H	Depreciation	<ul style="list-style-type: none"> Depreciation of buildings and structures owned by the Owner 	<ul style="list-style-type: none"> Depreciation of moveable items, machinery and equipment owned by the Operator
I	Profit/ Loss	(G-H)	

The financial analysis is based on the expected level of utilisation of the packhouse facility, beginning at ten container loads per quarter each containing 14 tonnes of produce during the first quarter of operation, up to 50 containers per quarter from year 5 onwards. These throughput levels compare with maximum capacity of around 60 containers per quarter for a five-day week with single shift, or around 70 with a six-day week, both with a 4-week shut-down period. Based on these levels of utilisation the financial results for the Owner and Operator would be as shown in Table 1

Table 1: Summary of Financial Projections (TOP'000)

	EPDF Owner					EPDF Operator/Lessee				
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5+	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5+
Investment Costs	1,220	0	0	0	0	338	32	22	22	0
Gross Income	0	87	168	249	280	0	368	714	1,060	1,190
Cost of Sales	0	0	0	0	0	0	286	555	824	925
Gross Profit	0	87	168	249	280	0	82	159	236	265
Overhead Costs	60	160	176	188	188	34	127	127	127	127
Net Cash Flow	-1,279	-74	-8	61	92	-372	-78	9	87	138
EBITDA	-60	-74	-8	61	92	-34	-45	32	109	138
Depreciation	22	56	54	51	48	4	32	29	26	24
Profit/loss	-81	-130	-62	10	43	-38	-77	3	83	114
Internal Rate of Return	1 %					20 %				

Table 1 shows that the total investment required would be some TOP 1.56 million of which TOP 1.22 million would be financed by the Owner and TOP 0.34 million by the Operator. Revenue earned by the Owner consisting of tolls paid by the Operator would reach TOP 0.28 million from Year 5 onwards, whereas the Operator would generate revenues of TOP 1.19 million by Year 5 consisting of tolls paid by the growers and exporters using the facility. These revenue estimates are based on the following toll rates:

- Operator pays Owner: TOP 100/tonne of produce packed for export.
- User (grower or exporter) pays Operator TOP 425/tonne of produce packed for export.

Based on these throughputs, revenues and cost estimates, the Owner would incur losses for the first three years, and over a 20 year period would roughly break even with a 1% return on investment. Revenues received by the Owner would be used to finance maintenance of the facility to keep it in good working order and cover other overhead and administration costs. Positive cash balances from Year 4 onwards would be transferred to an interest-bearing sinking fund which would accumulate sufficient money to replace the assets at the end of their working life.

The Operator would be expected to generate a commercial rate of return on its investment commensurate with the risks involved and sufficient to attract interest from prospective private sector partners. Table 1 shows that the Operator would be expected to incur losses during the first two years of operation, roughly break even in Year 3 and generate profits thereafter. The overall rate of return on investment for the Operator is estimated to be around 20%.

For both the Owner and the Operator financial outcomes shown in Table 1 represent averages and could be better or worse than the above estimates depending mainly on the level of throughput. There will inevitably be periods following natural disasters such as droughts or cyclones when throughput is low but also periods when seasonal and market conditions are favourable and there will be heavy demand for the services provided.

The toll of TOP 425/tonne payable to the Operator is higher than earlier estimates. However these did not give due consideration to the need for accumulating reserves for asset maintenance and replacement, overhead and depreciation costs incurred by both the Owner and the Operator, or a commercial level of profit for the Operator. The financial analysis shows that the TOP 425/tonne toll includes a profit margin of just TOP 40 (9.4%) when the facility is working at the rate of 50 containers per quarter, less with lower levels of throughput.

	TOP/tonne	Percent
Toll paid to owner	100	23.6
Labour and electricity	230	54.1
Overheads	46	10.8
Depreciation	9	2.1
Profit	40	9.4
Total	425	100.0

Table 7 in Attachment 3 demonstrates that if exporters pay a toll of TOP 425 per tonne, export of frozen root crops is a financially attractive proposition given current FOB prices in Australia and New Zealand of around TOP 2,900 per tonne. Even higher prices are available for frozen root crops in the USA, although shipping costs are also higher.

4.5 Governance Arrangements

Governance arrangements will be defined in a PPP agreement between the Owner and the Operator. The Owner will be a limited liability company with an independent Board of five persons, two from the Government and three from the private sector, each with one vote. At least two of the five Directors will be women. The EDPF Company will operate under the Tonga Companies Act and will be subject to an annual audit undertaken or supervised by the Auditor General. In accordance with the Act, Directors will be required to act in the best interests of the Company and its shareholders, not the “constituency” they represent. Directors will receive an honorarium and will be expected to attend four or more meetings per annum, as well as the annual general meeting. The chair of the Board will be appointed by shareholders.

The Operator will be a Tongan registered business entity selected by a two-stage competitive process comprising of EOI and full proposal. The PPP agreement will define the rights and responsibilities of the Operator including freedom to manage the facility on a purely commercial basis. The toll rates payable by the Operator to the Owner will be defined in the agreement. However the Operator will be able to set toll rates charged to users according to commercial considerations, bearing in mind the services and rates offered by competitors such as the MAFFF facility and other private sector packhouses. Different toll rates may be charged for different commodities and processing/packaging

formats⁷. One condition of the PPP agreement will be that the facility must be available to all potential users, not just those based in the Eastern District, or who are members of one of the shareholder groups.

5. DEVELOPMENT IMPACTS

Establishment of the EDPF would form part of Program 4 of the TASP (Sustainable Growth and Foreign Exchange Earnings) which focuses on increased exports as well as import replacement, and recognises the fundamental importance of export marketing infrastructure in increasing income-generating and employment opportunities in rural areas. Agricultural exports generally, and root crops and cucurbits in particular, have performed reasonably well over recent years, especially considering the adverse seasonal conditions in 2014-15. Export demand is solid, but importers in New Zealand, Australia and elsewhere are becoming increasingly discriminating with regard to product quality and food-safety. Access to modern, efficient and hygienic processing and packaging facilities will therefore be essential for continuing access to these markets.

Most of Tonga's export crops are grown by small-scale and semi-commercial farmers who are heavily reliant on income from these crops for their food security and livelihood. These also provide scope for increased engagement of women and youth in rural areas who otherwise have limited employment and self-employment opportunities. The facility will also provide employment opportunities for up to 50 process workers, possibly more during busy periods when multiple shifts may be employed. The great majority of these workers are expected to be women.

The project will also contribute to the climate resilience of Tonga's rural livelihoods. The TASP incorporates a strong focus on sustainability and building resilience against climate change and natural disasters through two of its four strategic objectives (SO): SO1 to develop a climate-resilient environment; and SO3 to develop diverse, climate-resilient farming systems. The TASP promotes the concept of branding Tongan produce as "low carbon and climate resilient" It also emphasises the importance of including climate change adaptation and disaster risk reduction into programs and projects in the agricultural sector. The project is consistent with the climate resilience thrust of the TASP by promoting diversification of agricultural production and incomes by expanding the range of commodities and products for export. Several of the major crops to be processed (cassava and yams) are inherently resilient to both drought and severe storm events. There is potential to further improve the resilience of these crops by wider adoption of improved varieties, irrigation and conservation farming systems.

6. SUSTAINABILITY

The key to sustainability of the EDPF is profitability. The PPP model for ownership and operation of the facility recommended in TR 45 has been elaborated through an extensive consultation process over several years involving all stakeholder groups including growers, exporters and the Government. The model is based on toll rates that enable the Owner to recoup the cost of the investment over the life of the facility and accumulate funds to finance its maintenance and eventual replacement; and for the Operator to earn a commercial rate of return on its investment and business risk. Such arrangements minimise the chances that either of the partners will encounter financial difficulties that may destabilise the PPP.

A further risk to profitability, and therefore sustainability, is throughput levels. The facility needs to process around 28 containers per quarter (2.1 per week) to break even on a cash basis and 32 containers (2.5 per week) to make a profit. These throughput levels are quite modest compared to current exports of 4-6 containers per week or root crops alone and 10-15 containers per week for all agricultural commodities. Although these break-even throughput levels would not be sufficient to accumulate funds for asset maintenance and replacement, or to generate a satisfactory level of profit for the Operator, it does demonstrate that the facility could survive periodic downturns in throughput due to adverse seasonal or market conditions. Complete shutdowns are likely after extreme events

⁷ For example, cucurbits can be processed at a much lower cost per tonne than root crops and would therefore have lower toll rates. Root crops in frozen form incur higher costs for washing, peeling, cutting, packaging and freezing than the same items exported in fresh/chilled form.

such as major cyclones and droughts but experience has shown that production generally recovers fairly quickly.

It is possible that potential users of the facility (growers and exporters) may be reluctant to pay a toll rate of TOP 425 per tonne to process their produce for export and would prefer to continue using their own informal/makeshift facilities or use alternatives such as the MAFFF packhouse at Nuku'alofa Port, the latter of which charges only for electricity, equal to about TOP 110 per tonne. However the MAFFF packhouse has limited or no spare capacity, and importers are increasingly demanding that produce is processed through HACCP accredited facilities with full traceability systems in place. Consequently the use of informal facilities will become a less feasible option in the near future.

Governance arrangements are always a risk associated with public investment in commercial ventures. This risk will be addressed by clear demarcation of financing and management responsibilities between the Owner and the Operator in which the Operator can make decisions on a purely commercial basis within the confines of the PPP agreement, without undue interference from the Owner or other parties. Any disputes will be settled by arbitration procedures as defined in the agreement.

There are no significant environmental risks that threaten the sustainability of the operation. All of the required environmental permits will be obtained before construction begins and the design will incorporate a septic tank for liquid waste disposal to ensure that the nearby lagoon (see site map in Attachment 1 Figure 2) and historical site (Captain Cook's landing) are not contaminated. No toxic materials will be used and all solid waste will be composted and used for organic fertiliser. Access will be via main roads which normally carry trucks transporting agricultural produce.

7. RISKS

Whilst the arguments in favour of the EDPF are compelling, the project does not come without risks. It may prove difficult to engage a commercial partner to operate the facility in view of the expected 2-3 year delay before throughput volumes are projected to reach profitable levels. This risk can be managed by calling for EOIs at an early stage (see next steps below) to get a better ideal of the level of interest from potential operating partners, and to address any concerns that they may have. Another area of risk is that overseas markets, especially the informal sector, will continue to accept produce processed in basic non-certified facilities, and that some or all of the exporters will be reluctant to pay a full commercial toll fee for processing in HACCP certified facilities. It is within the mandate of MAFFF to manage this risk through its export phytosanitary certification function.

8. CONCLUSIONS AND NEXT STEPS

The business plan demonstrates that the establishment of the proposed EDPF would be a viable proposition under a PPP model, subject to the availability of funds to finance the investment and engagement of a suitable private sector operating partner, within a well-defined PPP agreement incorporating strict governance measures. The project has the potential to make an important contribution to Tonga's overall development strategy and sectoral objectives incorporated in the TASP. The next steps required to turn the plan into reality are:

1. Review and endorsement of the business plan by the EDPF Establishment Board.
2. A call for EOIs from potential private sector partners.
3. Agreement on a financing framework between the Government and potential development partners, based on DFAT's expressed interest in supporting the initiative.
4. Completion of detailed engineering and architectural design of the facility and issuance of the necessary licenses and permits.
5. Negotiation of a PPP agreement between the EDPF Board and the Operating Partner.
6. Construction of the facility.

Attachment 1: Packhouse Location and Site

Figure 1: Packhouse Location



Figure 2: Packhouse Site



Attachment 2: Preliminary Conceptual Design

PRELIMINARY CONCEPTUAL DESIGN : PROPOSED EASTERN DISTRICT PACKING FACILITY, LOCATED AT 'ALAKI, HAHAKE DISTRICT, TONGATAPU

DRAWING INDEX

Date Issue : 25th February, 2015

PRELIMINARY WORKS SERIES

PR.00 COVER SHEET

PR.01 PRELIMINARY SITE PLAN

PR.02 PRELIMINARY GROUND FLOOR PLAN

PR.03 PRELIMINARY MEZZANINE PLAN

ATTACHMENTS

PRELIMINARY COSTING REPORT

3D PERSPECTIVE VIEWS

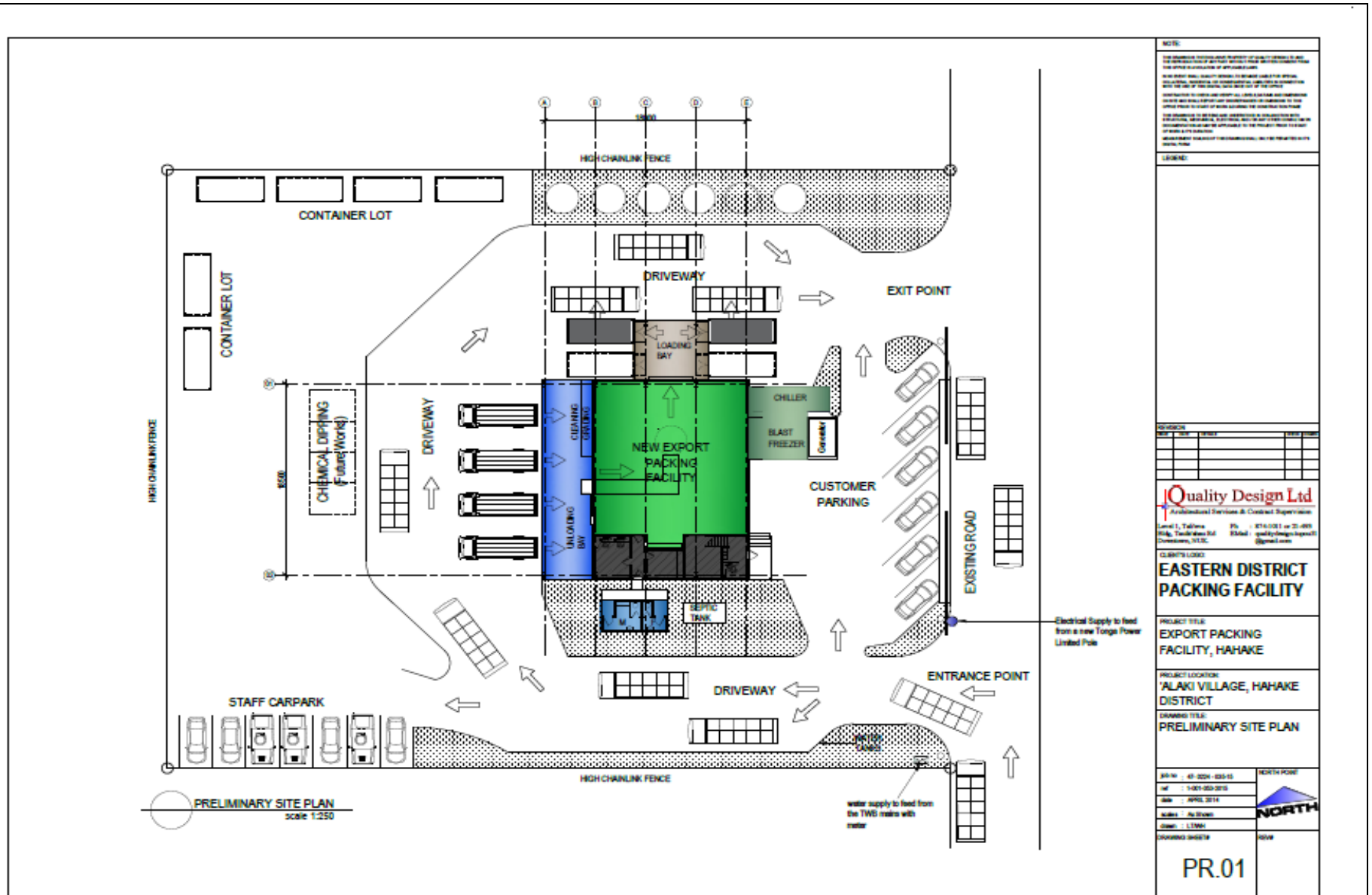
PRELIMINARY FOR APPROVAL ONLY

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Architectural Services & Contract Supervision

PR.00



NOTE:
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REVISION:

NO.	DATE	DESCRIPTION

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CLIENT'S LOGO:
**EASTERN DISTRICT
 PACKING FACILITY**

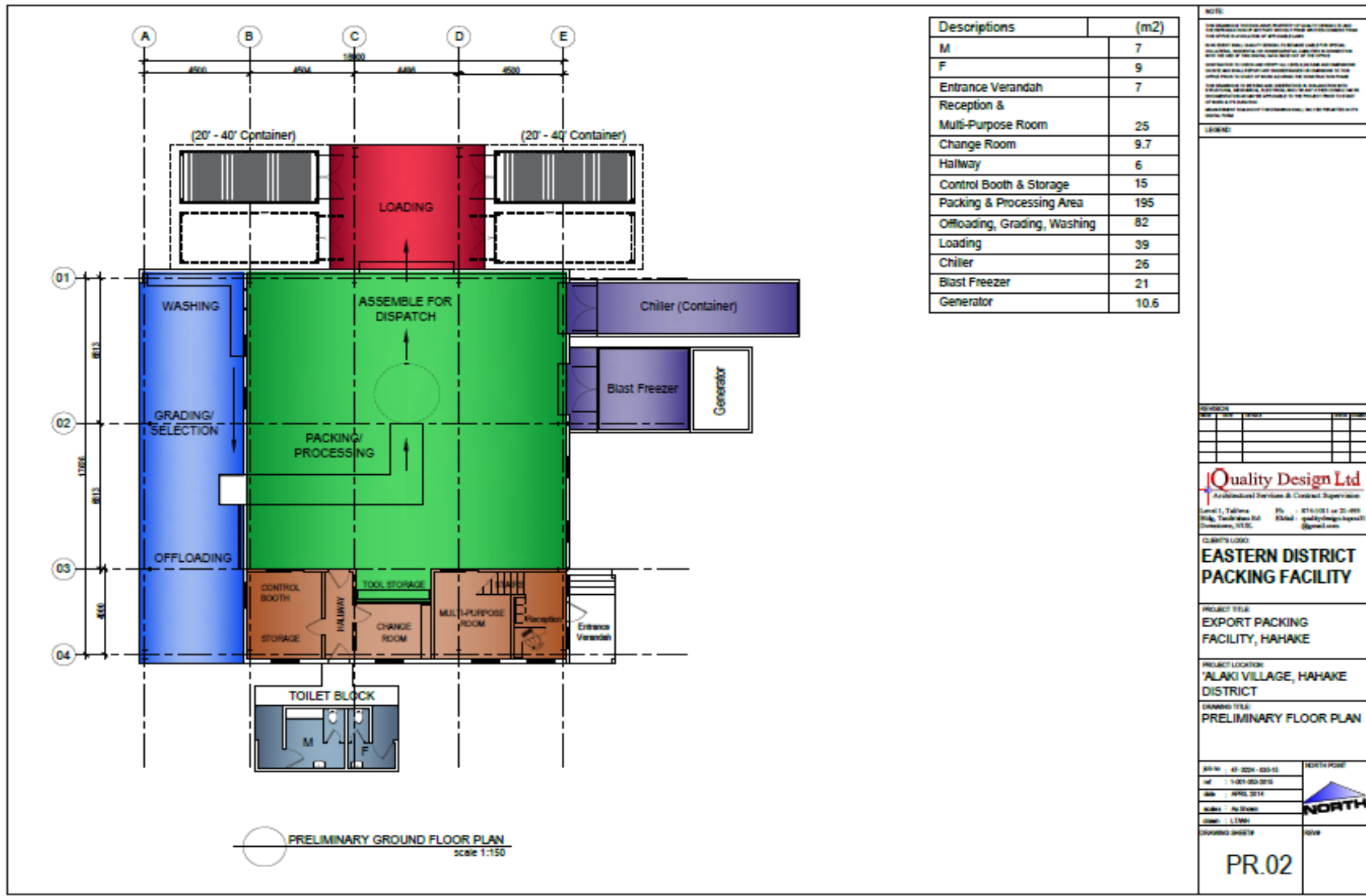
PROJECT TITLE:
**EXPORT PACKING
 FACILITY, HAHAKE**

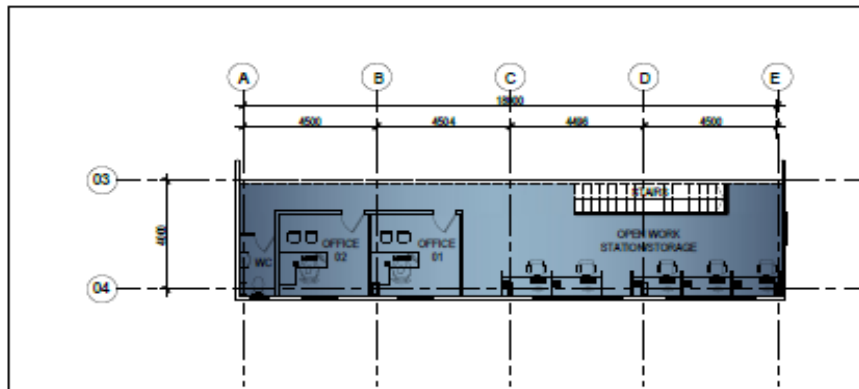
PROJECT LOCATION:
**'ALAKI VILLAGE, HAHAKE
 DISTRICT**

DRAWING TITLE:
PRELIMINARY SITE PLAN

REV: 01	2016-03-15	
REV: 02	2016-03-20	
REV: 03	2016-04-01	
REV: 04	2016-04-01	
DESIGNER:	L. LING	DATE:

PR.01





Descriptions	(m2)
Open Workstation/Storage	50
Office 01	9
Office 02	9
Unisex Toilet	3

NOTES:

1. The proposed construction shall be in accordance with the relevant provisions of the Building Code of Tonga and the relevant provisions of the Building Code of Australia.

2. The proposed construction shall be in accordance with the relevant provisions of the Building Code of Tonga and the relevant provisions of the Building Code of Australia.

3. The proposed construction shall be in accordance with the relevant provisions of the Building Code of Tonga and the relevant provisions of the Building Code of Australia.

4. The proposed construction shall be in accordance with the relevant provisions of the Building Code of Tonga and the relevant provisions of the Building Code of Australia.

5. The proposed construction shall be in accordance with the relevant provisions of the Building Code of Tonga and the relevant provisions of the Building Code of Australia.

- LEGEND:**
- 150mm conc block wall, joint & paint
 - 100x50 timber framed wall with 10mm g.b. board @ dry areas, 5mm v.l.s. @ wet areas
 - hot dipped steel columns

NO.	DATE	REVISION

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EASTERN DISTRICT PACKING FACILITY

PROJECT TITLE:
 EXPORT PACKING FACILITY, HAHAKE

PROJECT LOCATION:
 'ALAKI VILLAGE, HAHAKE DISTRICT

DRAWING TITLE:
 MEZZANINE FLOOR PLAN

DATE: 16-DEC-2016
 DRAWN BY: J. L. WONG
 CHECKED BY: J. L. WONG



PR.03

Attachment 3: Financial Analysis**Table 1: Investment Costs for Site Works and Construction**

Site Works	Note	No	Unit	Unit Cost	
				TOP	TOP'000
Preliminary and general works	a	1	LS	30,000	30
Site Works					
Chip seal/asphalt driveway and parking	b	70	m ²	1,400	98
Surface water tanks	c	1	LS	38,000	38
Access gates and perimeter fence	d	256	m	280	72
Compacted gravel parking	e	184	m ²	150	28
Septic tank and field drainage	f	1	LS	9,500	10
				Subtotal	275
				Consumption tax (15%)	41
				Contingencies (10%)	32
				Total Site Works	348
Building Construction					
Preliminary and general	g	1	LS	18,000	18
Ground floor packing and processing area	h	190	m ²	1,400	266
Ground floor reception and multi-purpose room	i	25	m ²	1,100	28
Ground floor change room, control booth, storage	j	25	m ²	1,100	28
Ground floor male and female toilet	k	16	m ²	1,100	18
Ground floor offloading, wash/grading bay	l	82	m ²	700	57
Ground floor loading bay	m	39	m ²	700	27
Ground floor chiller	n	26	m ²	600	16
Ground floor blast freezer and generator shed	o	30	m ²	1,200	36
Mezzanine floor open work station/storage area	p	53	m ²	900	48
Mezzanine floor office 1 and 2	q	18	m ²	1,200	22
Mezzanine floor unisex toilet	r	3	m ²	1,200	4
				Subtotal	566
				Consumption tax (15%)	85
				Contingencies (10%)	65
				Total Construction	716
				Total Site Works and Construction	1,063
Budget includes preliminary and general materials, labour, machinery, transport, overhead, margin and 15% consumption tax Prepared by Independent Quantity Surveyor for Quality Design Ltd.					

Notes to Table 1

a	Includes heavy machinery, site clearance, excavation, trenching and borehole for underground water
b	Includes all base course works, grading, compaction, asphalt and double layer chip seal
c	Includes all reinforcing steel, concrete works, piping connections, electrical water pressure pump and 10,000 litre Roto tanks
d	Includes galvanised steel sliding vehicular gates and fixing detail, 2.4m height boundary fence of 3 max layers of 400 x 200 x 150 mm blockworks. Galvanised steel posts, barbed wire and chain link fence
e	Includes half inch or quarter inch gravel fill onto well compacted parking zone south west of property for staff parking

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f	Includes size 7 septic tank and underground field drainage and all miscellaneous piping works
g	Includes mobilisation, demobilisation, temporary power and water connections, insurance, permits and site office
h	Includes all sub-structures and super-structures, architectural finishes, electrical services, communication services, fire protection, packing joineries, roller doors, PVC curtains and miscellaneous
i	Includes all sub-structures, super-structures architectural finishes, electrical services, communication services, access stair to mezzanine and joinery
j	Includes all sub-structures, super-structures, architectural finishes and electrical services
k	Includes all sub-structures, super structures, architectural finishes, electrical services and plumbing services
l	Includes all sub-structures, super structures, architectural finishes and electrical services
m	Includes all sub-structures, super structures, architectural finishes and electrical services
n	Includes container stands, architectural finishes, access hatch, roller doors and PVC curtain access
o	Includes all sub-structures, and super-structures, architectural finishes, electrical services and PVC curtain access
p	Includes all super-structures, architectural finishes, electrical services, communication services and mechanical (A/C)
q	Includes all super-structures, architectural finishes, electrical services, communication services and mechanical (A/C)
r	Includes all super-structures, architectural finishes, electrical services, and communication services

Table 2: Investment Costs for Moveable Items, Machinery and Equipment

Machinery and Equipment	Note	No	Unit	Unit Cost	
				TOP	TOP'000
Vehicle (second hand 4WD pickup)		1	Veh.	50,000	50
Blast freezer (30m ³)		1	Unit	30,000	30
Stainless steel tables		5	Table	5,000	25
Forklift		1	Unit	25,000	25
Standby generator		1	Unit	25,000	25
Chiller (30m ³)		1	Unit	22,000	22
Field bins		100	Bins	150	15
Air conditioners		5	Each	3,000	15
Stackable crates		500	Crate	25	13
Platform scale		1	Unit	12,000	12
Office furniture and equipment		1	Set	10,000	10
Miscellaneous equipment		1	Set	10,000	10
Washing vats		5	Vat	1,200	6
Workshop equipment, tools and spares		1	Set	5,000	5
High pressure water pump and hoses		1	Pump	4,500	5
				Subtotal	267
				Consumption tax (15%)	40
				Contingencies (10%)	31
Total Moveable Items, Machinery and Equipment					338

Table 3: Summary of Quarterly Financial Projections (TOP'000) for EDPF Owner

	Year 1				Year 2				Year 3				Year 4				Year 5				Total	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
Investment Costs																						
Purchase of Alaki site	50																				50	
Site works and construction	266	266	266	266																	1,063	
Architect design and supervision (10%)	27	27	27	27																	106	
Machinery and equipment																					0	
Total Investment Costs	342	292	292	292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,220	
Gross Income																						
Containers processed					10	14	17	21	25	28	32	35	39	43	46	50	50	50	50	50	50	560
Tonnes (14 tonnes/container)					140	191	242	293	344	395	445	496	547	598	649	700	700	700	700	700	700	7,840
Processing tolls 100 TOP/tonne	0	0	0	0	14	19	24	29	34	39	45	50	55	60	65	70	70	70	70	70	784	
Total Gross Income	0	0	0	0	14	19	24	29	34	39	45	50	55	60	65	70	70	70	70	70	784	
Cost of Sales																						
Total Cost of Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Gross Profit	0	0	0	0	14	19	24	29	34	39	45	50	55	60	65	70	70	70	70	70	784	
Overhead Costs																						
Board honoraria	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	50	
Accounting and audit			2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	36	
Insurance of structures			13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	239	
R&M of structures				13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	213	
Transport and communications	2	2	2	2	4	4	4	4	6	6	6	6	6	6	6	6	6	6	6	6	96	
Other overheads	2	3	3	3	5	5	5	5	7	7	7	7	10	10	10	10	10	10	10	10	139	
Total Overhead Costs	7	8	23	23	40	40	40	40	44	44	44	44	47	47	47	47	47	47	47	47	773	
Net Cash Flow	-349	-300	-315	-315	-26	-21	-16	-11	-10	-5	0	6	8	13	18	23	23	23	23	23	-1,209	
Cumulative Net Cash Flow	-349	-649	-964	-1,279	-1,305	-1,326	-1,342	-1,353	-1,363	-1,367	-1,367	-1,361	-1,354	-1,341	-1,323	-1,300	-1,277	-1,254	-1,232	-1,209		
EBITDA	-7	-8	-23	-23	-26	-21	-16	-11	-10	-5	0	6	8	13	18	23	23	23	23	23	11	
Depreciation of structures	0	4	7	11	14	14	14	14	14	13	13	13	13	13	13	12	12	12	12	12	231	
Profit/loss	-7	-11	-30	-34	-40	-35	-30	-25	-23	-18	-13	-8	-5	0	5	10	11	11	11	11	-220	
Depreciation of structures																						
Opening Value	0	292	581	866	1,148	1,134	1,119	1,105	1,092	1,078	1,064	1,051	1,038	1,025	1,012	1,000	987	975	963	951		
Investments	292	292	292	292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,170	
Depreciation 5 %	0	4	7	11	14	14	14	14	14	13	13	13	13	13	13	12	12	12	12	12		
Closing Value	292	581	866	1,148	1,134	1,119	1,105	1,092	1,078	1,064	1,051	1,038	1,025	1,012	1,000	987	975	963	951	939		

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Table 4: Annual Financial Summary (TOP'000) for EDPF Operator/Lessee

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Yr 20	
Investment Costs	1,220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross Income	0	87	168	249	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Cost of Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross Profit	0	87	168	249	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Overhead Costs	60	160	176	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188
Net Cash Flow	-1,279	-74	-8	61	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92
EBITDA	-60	-74	-8	61	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Depreciation	22	56	54	51	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Profit/loss	-81	-130	-62	10	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Internal Rate of Return	1%																				
Sinking Fund	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Yr 20	
Opening balance	0	0	0	0	61	155	251	350	452	558	666	778	893	1,011	1,133	1,259	1,388	1,521	1,659	1,800	
Transfers in		0	0	61	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	
Interest earned	0	0	0	0	2	5	8	11	14	17	20	23	27	30	34	38	42	46	50	54	
Closing balance	0	0	0	61	155	251	350	452	558	666	778	893	1,011	1,133	1,259	1,388	1,521	1,659	1,800	1,946	

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Table 5: Summary of Quarterly Financial Projections (TOP'000) for EDPF Operator/Lessee

	Year 1				Year 2				Year 3				Year 4				Year 5				Total	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
Investment Costs																						
Working capital a/ Machinery and equipment			169	169	15	6	6	6	6	6	6	6	6	6	6	6	0	0	0	0	0	77
Total Investment Costs	0	0	169	169	15	6	6	6	6	6	6	6	6	6	6	6	0	0	0	0	0	338
Gross Income																						
Containers processed					10	14	17	21	25	28	32	35	39	43	46	50	50	50	50	50	50	560
Tonnes (14 tonnes/container)					140	191	242	293	344	395	445	496	547	598	649	700	700	700	700	700	700	7,840
Processing tolls 425 TOP/t	0	0	0	0	60	81	103	124	146	168	189	211	233	254	276	298	298	298	298	298	298	3,332
Total Gross Income	0	0	0	0	60	81	103	124	146	168	189	211	233	254	276	298	298	298	298	298	298	3,332
Cost of Sales																						
Labour 118 TOP/t	0	0	0	0	17	23	29	35	41	47	53	59	65	71	77	83	83	83	83	83	83	924
Electricity 112 TOP/t	0	0	0	0	16	21	27	33	39	44	50	56	62	67	73	79	79	79	79	79	79	881
Tolls to owner 100 TOP/t	0	0	0	0	14	19	24	29	34	39	45	50	55	60	65	70	70	70	70	70	70	784
Total Cost of Sales	0	0	0	0	46	63	80	97	113	130	147	164	181	198	214	231	231	231	231	231	231	2,589
Gross Profit	0	0	0	0	13	18	23	28	33	37	42	47	52	57	61	66	66	66	66	66	66	743
Overhead Costs																						
General manager			15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	270
Accounts/admin clerk					4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	72
Accounting and audit					2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	32
R&M of equipment					6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	101
Transport and communications				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	51
Other overheads				1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	17
Total Overhead Costs	0	0	15	19	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	543
Net Cash Flow	0	0	-184	-188	-34	-19	-15	-10	-5	0	5	10	14	19	24	29	34	34	34	34	34	-216
Cumulative Net Cash Flow	0	0	-184	-372	-406	-425	-440	-449	-454	-454	-450	-440	-426	-406	-382	-353	-319	-285	-250	-216		
EBITDA	0	0	-15	-19	-19	-14	-9	-4	1	6	10	15	20	25	30	34	34	34	34	34	34	199
Depreciation of equipment	0	0	0	4	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	115
Profit/loss	0	0	-15	-23	-27	-22	-17	-12	-7	-2	3	8	13	18	23	28	28	28	29	29	29	84
Depreciation of equipment																						
Opening Value	0	0	0	169	334	325	317	309	301	294	287	279	272	266	259	252	246	240	234	228		
Investments	0	0	169	169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	338
Depreciation 10 %	0	0	0	4	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	115
Closing Value	0	0	169	334	325	317	309	301	294	287	279	272	266	259	252	246	240	234	228	222		

a/ One month of cost of sales

Table 6: Annual Financial Summary (TOP'000) for EDPF Operator/Lessee

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Yr 20	
Investment Costs	338	32	22	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross Income	0	368	714	1,060	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190
Cost of Sales	0	286	555	824	925	925	925	925	925	925	925	925	925	925	925	925	925	925	925	925	925
Gross Profit	0	82	159	236	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265
Overhead Costs	34	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127
Net Cash Flow	-372	-78	9	87	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
EBITDA	-34	-45	32	109	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
Depreciation	4	32	29	26	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Profit/loss	-38	-77	3	83	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
Internal Rate of Return	20%																				

Table 7: Gross Margins for Frozen Root Crops for Export (TOP)

Unit: 1 freezer container containing 14 tonnes of product

Gross Income	Unit	No	TOP/unit	TOP	Comments
Frozen product CIF Auckland	tonne	14.0	2,870	40,180	NZD 1.75/kg CIF
Local market	tonne	1.9	1,000	1,867	
Trimming and waste	tonne	2.8			
Total Gross Income		18.7		42,047	
Variable Costs					
Purchase from growers	tonne	18.7	1,000	18,667	Purchase at farmgate
Transport to packhouse	tonne	18.7	9	160	30 km round trip in 4 tonne truck
Packhouse fees a/	tonne	14.0	425	5,950	Fee paid to packhouse operator
Packing materials	tonne	14.0	286	4,004	1kg and 5kg plastic bags and 25 kg cartons
Container handling, port charges etc.	container	1.0	860	860	TOP 860 per container including customs etc.
Shipping to Auckland	container	1.0	234	234	NZ\$2,000 per container
Total Variable Costs				29,874	
Total Gross Margin per container				12,172	
Gross Margin percent of costs				41	

Packhouse Costs for Frozen Product: 1 freezer container per day					
	No	TOP	TOP/day	t/day	TOP/t
Process workers	55	30.00	1,650	14	117.9
Electricity (kwh)	1,010	0.78	788	14	56.3
Packaging:					
1kg laminated bags	7,000	0.28	1,960	14	140.0
5kg laminated bags	1,400	0.70	980	14	70.0
25kg cartons	560	1.90	1,064	14	76.0
Total Packhouse Costs			6,442	14	460.1

Exchange Rates	TOP
AUD	1.72
USD	2.27
NZD	1.64
FJD	1.09

Wages (per day)	TOP
Labour	30
Technician/driver	40
Supervisor/foreman	50

Refrigeration	kw	TOP/kwh	Hrs/day	TOP/day
20 foot reefer container	4.0	0.78	12.0	37.4
20 foot freezer container	6.0	0.78	12.0	56.2

Salaries (per month)	TOP
Junior Professional	1,500
Mid-level	3,000
Senior Professional	5,000

Root Crop Packout Ratios	Percent
Export grade	75
Domestic grade	10
Trimming and waste	15

Operating Costs: 4 tonne truck	TOP/year
10,000 km/year	
Fuel: 20 L/100 km @ TOP 2.00/L	4,000
Registration and insurance	2,700
Servicing (2 per year)	1,500
Tyres (six tyres every 2 yrs)	1,200
Repairs and maintenance	2,000
Total Operating Costs/year	11,400
Total Operating Costs/km	1.14



Appendix C

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Appendix C Bibliography

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