SUB-REGIONAL OFFICE FOR THE PACIFIC ISLANDS

POTENTIAL FOR EXPORTS OF RETAIL PACKS OF FROZEN ROOT-CROPS FROM TONGA TO NEW ZEALAND

A SUPPLY CHAIN STUDY

Prepared by
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December 2009

For
The Government of Tonga

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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PREFACE

Following a consultative workshop in Tonga on March 9-10 2009, the potential for export of retail size packs of frozen root crops from Tonga to New Zealand was selected as an issue for further study and evaluation.

FAO agreed to fund a study by a National Consultant, Pousima Afeaki, under the technical supervision of Jamie Morrison, Trade and Markets Division, in conjunction with the FAO Sub-Regional Office in Samoa.

The objective of the study was to evaluate whether there is a viable opportunity for Tonga to process fresh root crops into small frozen packs (1-2 kg) for export and sale in retail outlets in New Zealand.

Initial Terms of Reference (TOR) for the study were drawn up on the basis of discussions at the March 2009 Consultative Workshop (refer to Attachment 1), and the selection of the consultant carried out by MAFF-Tonga. The TOR were refined following an interim report to FAO by the consultant in May 2009.

The interim report set out a map of the activities involved in the supply chain for supply of frozen retail packs of root crops from Tonga to New Zealand, and identified issues and constraints associated with those activities. The report also identified key activities and areas where information was lacking, and made recommendations for obtaining this information: (i) current supplies of root crops in Tonga; and (ii) the current and potential demand for frozen retail packs of root crops in New Zealand.

FAO agreed to fund a survey of roadside markets in Tonga to provide fuller information on available supplies of root crops. The Pacific Island Trade and Investment Commission, New Zealand (PITICNZ) agreed to fund a visit by the consultant to New Zealand to carry out research on current and potential demand for frozen retail pack root crops. Separate TOR were drawn up for the research visit to New Zealand (refer to Attachment 2).

CONTENTS

EXECUTIVE SUMMARY

This study uses a value chain approach to assess whether a viable opportunity exists to export retail sized packs of frozen root crops from Tonga to New Zealand.

Drawing on survey based assessments of the current levels of supply of root crops in Tonga for human consumption, and of the demand for frozen root crops in formal markets in New Zealand, the approach allows the identification of key constraints and issues in meeting this potential opportunity. Discussion of the identified constraints and issues results in a set conclusions and recommendations for actions by key chain stakeholders.

The study identifies an opportunity for Tonga to export frozen retail packs of root crops to the formal market in New Zealand. However, the current market for frozen retail packs is found to be small, albeit growing.

In seeking to assess the viability of this opportunity, a number of issues were noted:

(i) Currently, competing frozen root crops from Asian suppliers retail at two to four times the retail prices for equivalent products from the Pacific Islands. The Asian frozen root crops are available in a wider range of sizes and have better packaging and presentation than equivalent products from Pacific Island countries.

(ii) Pacific Island consumers have the option of buying cheaper frozen and fresh root crops in bulk through the informal market in New Zealand. This acts as a restraint on prices of frozen retail packs on sale to Pacific Island consumers in New Zealand.

The study suggests that Tongan processors/exporters will need to develop a wider range of sizes, and improve packaging and presentation. They also need to determine whether exporting to supply Asian customers in New Zealand is profitable. This would require particular attention to food safety and labelling requirements both from the Food Safety Authority of New Zealand and the importer/retailer in New Zealand.

Given the relatively small size of the New Zealand market, supply is not considered be a problem for Tonga. The main island of Tongatapu will produce an estimated 6,330 tonnes of root crops for human consumption in 2009. In 2008, Tonga exported 3,537 tonnes of root crops while New Zealand imported only 143 tonnes of frozen retail pack root crops, which equates to about 14 containers, or just over 1 container per month.

Additionally, processing capacity in Tonga to supply the small market is not likely to be a constraint. The facility in Tonga which is currently processing frozen retail pack root crops for export has the capacity to process 20 tonnes per week or 1,000 tonnes per year.

The New Zealand market for frozen retail pack root crops is therefore not yet large enough to justify large-scale investment by Tongan processors/exporters and farmers, nor by MAFFTonga and Growers Federation of Tonga (GrowFed).

While GrowFed and MAFFTonga should encourage the small-scale development of frozen retail pack root crops by the current processors/exporters, the opportunity to develop exports of frozen retail packs of root crops should be left to the processors/exporters, who are already working on developing this market.

The New Zealand market is a good 'test-market' for exports from Tonga. If Tonga can succeed in exporting and selling frozen retail-packs of root crops to discerning Asian consumers in New Zealand, then Tonga can then look further afield at markets in Australia and other countries.

At that stage, further work to increase the supply of root crops for export would be appropriate. This may include on-farm trials, in conjunction with MAFFTonga and GrowFed, to develop better farming practices for growing root crops, and the development and implement of an effective system for monitoring and controlling diseases and pests.

Roadside Market - Ma'ufanga waterfront, Nuku'alofa

Rootcrops on sale at Talamahu Market

1. Introduction

1.1 Background

Current root crop production and exports

Tonga is able to grow a wide range of root crops because of its fertile soils and favourable climate. The major commercial root crops grown in Tonga are:

- talotonga [swamp taro – *colocasia esculenta*];
- talofutuna [tarua taro- *xanthosoma*];
- kape [giant taro – *alocasia*];
- manioke [cassava – *manihot esculenta*];
- 'ufi [yam – *discorea*];
- kumala [sweet potato – *ipumuea batatas*].

These root crops are grown across all of the islands of Tonga by subsistence and commercial farmers for direct consumption and for local sales, as well as for export. In addition, Irish potatoes are also grown by commercial farmers for local sales.

Tonga currently exports substantial volumes of root crops in both fresh and frozen form. Over the five-year period from 2004 to 2008, Tonga exported an average of 2,729 tonnes of root crops each year. While most root crops are exported fresh, cassava is exported in frozen form because of its very short (5-7 days) shelf-life after harvest. On average, over the 2004 to 2008 period, 845 tonnes of frozen cassava were exported from Tonga per year[1].

Exported root crops of 3,533 tonnes in 2008 overtook squash exports for the first time to become the largest-volume export from Tonga. There are no reliable figures available for the value of exported root crops because exports have been primarily to informal markets (see below). However, an estimated value can be calculated by using prices for local sales of root crops in Tonga. On this basis, the value of the 3,533 tonnes of root crops exported in 2008 is at least TOP 2.27 million. In contrast, the declared export value of 5,005 tonnes of squash exported in 2007 was TOP 2.66 million.

Informal Export Markets

Almost all root crops are exported to informal markets in New Zealand, Australia, USA, Samoa and Hawaii. Typically, a Tongan farmer will grow and ship root crops to family overseas who import and sell the product. Farmers also commonly form groups (through kava-clubs, churches or associations of ex-school students) and grow and ship to affiliated groups of Tongans overseas.

Most of the exported root crops are exported in bulk/large sizes. Root crops are packed in 10-20kg sacks or are packed loose in wooden squash-bins (1.5 cubic metres volume), which are then stacked in shipping containers (dry for most root crops but refrigerated/frozen for cassava). On receipt overseas, bulk packs of root crops are distributed and sold by Tongan importers to Tongans and other Pacific Islanders.

[1] Refer to Attachment 3 – MAFFTonga Quarantine Division Annual Reports

The major drawback of the informal market system is that Tongan farmers do not know what they will get paid for their root crops because there is no contract export price set between farmers and overseas importers. The usual arrangement is for farmers to supply on consignment to the importer who agrees to sell at the best price possible. When there is plentiful supply, competition leads to reduced prices. This compounds a perceived problem of dishonesty where informal importers are sometimes alleged to claim that sales prices were lower than actually achieved.

As a result, many Tongan farmers have lost money over the years where remitted receipts for their root crops were only sufficient to cover expenses (freight, packaging, harvest/processing labour) with no surplus left for the farmer. Tongan farmers, like all farmers, would prefer a system where they could know and be paid a set price for their root crop exports.

Formal Export Markets

Exports to formal markets offer a potential solution to the problem of uncertainty of prices for exported root crops. Formal export-markets are based on orders from overseas importers at set prices agreed between an importer and exporter. Typically, an importer/retailer will order at an agreed export price. The farmer/exporter will fill and ship the order. The importer will distribute and sell the produce to shops and supermarkets, and pay the agreed export price to the exporter. This provides greater certainty of price to the farmers.

However, if there is also a thriving informal market, as there is in New Zealand for imported root crops, then competition from supply to the informal market will reduce demand and prices for root crops in the formal market. For instance, in Auckland, frozen cassava from Tonga is readily available in 10 or 20 kg bulk-packs through the informal market, at a price of NZD2.00-2.50 per kg, delivered free to your home. This reduces the demand and price in the formal market for frozen retail-packs of cassava sold in shops and supermarkets.

1.2 Study approach and structure of the report

This study uses a supply chain (value chain) approach, where as many as possible of the activities involved along the supply chain, between supply of farm inputs in Tonga to purchase and consumption of frozen retail-pack root crops in New Zealand are identified and examined. The supply chain approach allows associated problems and constraints along the chain and between each step to be identified and addressed.

The key question is whether Tonga can profitably export frozen retail-packs of root crops to formal retail markets, beginning with New Zealand. To address this question, the study focuses on the two fundamental components of supply and demand. Regarding supply, the study investigates actual and potential supply of fresh root crops in Tonga, plus actual and potential processing of exports of frozen retail-pack root crops. Regarding demand, the study investigates actual and potential demand for frozen retail-pack root crops in New Zealand.
In the next section, the report sets out a map of the supply chain which shows the activities involved in the chain and how they are linked. This allows the identification

of a number of researchable questions associated with potential constraints to chain development.

These issues are discussed from the two ends of the supply chain. First, the question of, 'what is the actual and potential supply of root crops in Tonga' is addressed in Section 3. Using this analysis as a background, the report evaluates the links in the supply chain from farm input supply to post-harvest handling in Tonga.

In Section 5, the question of, 'what is actual and potential demand for frozen retail-pack root crops in New Zealand' is addressed. On the basis of this analysis, the report discusses key issues regarding the links in the supply chain from export-processing and packing in Tonga to consumption in New Zealand.

In drawing together the two components, issues for further research or consideration are identified, leading to the conclusions and recommendations.

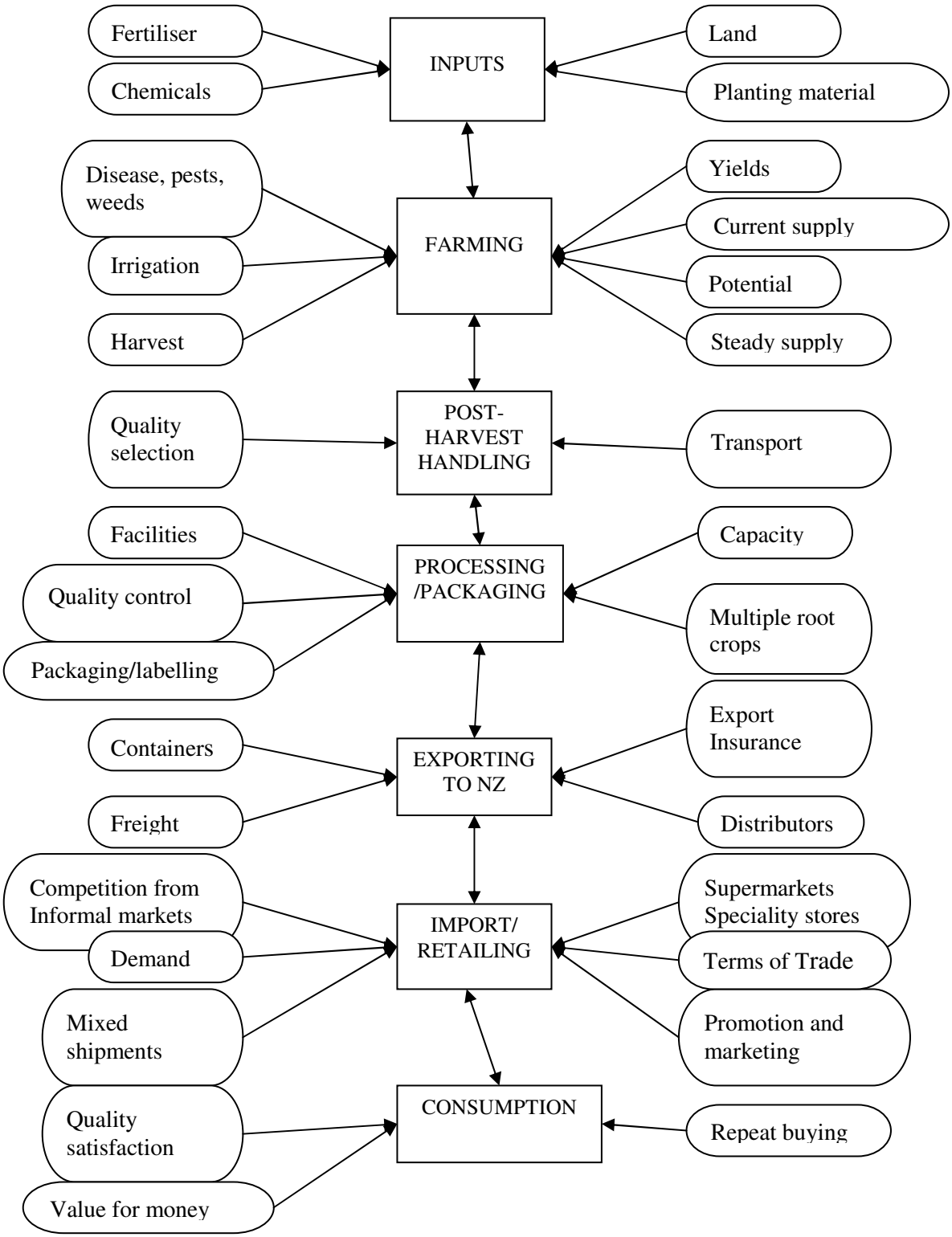
Swamp taro growing

Harvested swamp taro on sale

Talamahu Market, Nuku'alofa

2. Supply Chain for Retail Packs of Frozen Root Crops

The following graphic provides a visual explanation of the key activities involved in production, processing, export and retailing of frozen root crops. At each step, issues for further investigation are highlighted.



The issues highlighted at each step are formulated in terms of a series of questions which are addressed in the remaining sections of the report.

Supply side issues

The following issues will be considered following a discussion of current supply levels:

Activity	Issues/constraints
Inputs	Is sufficient land available for root crop production? Are appropriate varieties of planting material available? Are fertilisers available and effective? Are chemicals (for disease, pest and weed control) available and effective?
Farming	What are current yields per hectare and how can they be increased? How can a steady all year round supply be achieved? What are best practices in disease/pest/weed control? How can irrigation offset potential impacts of drought? What constrains best practices during harvest? What can Tonga supply given available farmland?
Post-harvest Handling	How is initial quality selection undertaken? Are transport and storage facilities adequate?

Demand side issues

The following issues will be considered following discussion of actual and potential demand:

Activity	Issues/constraints
Processing/Packing – New Zealand Food Safety Requirements	What are the required facility standards? Are quality control systems for food safety adequate? What are the packaging and labelling requirements?

Processing/Packing – Capacity and Commercial Requirements

Is capacity sufficient?
Do processors have the ability to process different root crops?

Exporting to New Zealand

What is the availability of refrigerated containers for shipping?
What are current freight rates?
What is the role of export insurance?
What are the processes involved in export to importers/distributors as opposed to direct to retailers?

Retailing

What are the requirements for mixed shipments of different root crops?
What are the issues regarding terms of trade?
What are the relative merits of targeting supermarket chains or specialty retailers provide?
What are the requirements in terms of promotion and marketing?

Consumption

Do Tongan root crops meet quality-satisfaction requirements (taste/texture/colour)?
Do they provide value for money?
What needs to be done to ensure repeat purchasing?

3. Current Levels of Production and Supply of Root Crops

Accurate data collection about the supply of root crops to domestic and export markets is limited to the main island of Tongatapu, and even this is limited to recordings of what is on-sale at Talamahu market in Nuku'alofa (with data collected by MAFFTonga). MAFFTonga also collects accurate data on exports of root crops.

However, data is not recorded on sales outside the Talamahu market or on direct "subsistence" consumption. Compounding the difficulty of estimating the current supply to the market is limited information on current production levels.

In assessing the current supply of root crops on Tongatapu, this report attempts to develop an estimate of total supply/production by incorporating supply from four sources:

1. Talamahu Market;
2. Roadside markets;
3. Direct consumption by farmers and their families;
4. Exports.

3.1 Talamahu Market

The volumes of root crops on-sale in Talamahu market for the 4 calendar years, 2004-2008 (plus the first 9 months of 2009) are summarised in Table 3 below.

Table 1 – Talamahu Market - Volumes of Root crops 2004-2008 (plus the first 9 months of 2009)

Root Crop (Tonnes)	2005	2006	2007	2008	4-Year Total	Jan To Sept 2009
Swamp taro	47.55	40.33	35.50	53.51	176.89	48.07
Tarua taro	62.74	169.79	93.44	95.96	421.93	83.52
Cassava	441.36	287.22	132.39	51.81	912.78	61.77
Sweet potato	180.11	203.93	72.69	28.63	485.36	30.02
Yams	182.83	137.24	44.77	33.51	176.89	37.97
Giant Taro	37.37	35.17	13.95	10.09	96.58	6.59
Totals	***951.96***	***873.68***	***392.74***	***273.51***	***2,491.89***	***267.94***

Source: MAFFTonga Talamahu Market Quarterly Reports (refer Attachment 4)

Salient points regarding root crops supply through Talamahu Market between 2005 and 2008 are set out below.

- There was a dramatic 55% drop in yearly volume from 952 tonnes in 2005 and 874 tonnes in 2006, to 393 tonnes in 2007. This reflects the fact that Talamahu was closed for nearly 3 months following the riot on 16 November 2006. Produce-sellers shifted to roadside markets. The volume of produce being sold through roadside markets has since grown and is now too large for produce-sellers to be able to return to Talamahu, since

Talamahu is not large enough to accommodate the produce offered by roadside produce-sellers.

- The yearly volume dropped again from 393 tonnes in 2007 to 274 tonnes in 2008. The 9-month total to September 2009 is 268 tonnes which is just below the 2008 total.

- Of the root crops, swamp taro is the only root crop where 2008 supply exceeded the supply recorded in 2006, with 54 tonnes in 2008 compared to 40 tonnes in 2006. The other root crops have all recorded reductions in supply through Talamahu market since 2006.

- The major drop in volume after 2006 means that an annual average of volume between 2005 and 2008 is misleading as a statistical guide.

- The annual average volume for 2007 and 2008 is 333 tonnes. The volume for the first 9 months of 2009 was 268 tonnes, so the total volume for 2009 is on track to equalling the annual average of 333 tonnes for 2007 and 2008.

Monthly volumes for root crop supply at Talamahu between May and September 2009 are shown below in Table 4. This is to provide a contrast for roadside market volumes surveyed over the same period.

Table 2: Talamahu Market - monthly volume of root crops supply for the 5 months between May and September 2009

Root Crop (Tonnes)	**May 2009**	**June 2009**	**July 2009**	**Aug 2009**	**Sept 2009**	**5-Month Total**	**Monthly Average**	**% of 5-Month Total**
Swamp taro	8.90	6.23	3.84	4.64	4.21	27.82	5.56	18.8%
Tarua taro	9.53	7.26	6.44	6.85	9.81	39.89	7.98	27.0%
Cassava	10.01	10.17	6.05	6.43	5.53	38.19	7.64	25.8%
Sweet potato	6.59	4.09	1.81	1.52	2.50	16.51	3.30	11.2%
Yams	6.49	4.85	3.57	4.54	2.95	22.40	4.48	15.2%
Giant Taro	0.56	0.51	0.69	0.52	0.71	2.99	0.60	2.0%
Totals	***42.08***	***33.11***	***22.40***	***24.50***	***25.71***	***147.80***	***29.56***	*100.0%*

Source: MAFFTonga - Talamahu Market Quarterly Reports (refer Attachment 4)

Salient points regarding rootcrops supply through Talamahu Market for the 5 months between May and September 2009 are set out below.

- The average monthly volume is just under 30 tonnes.

- The highest volume rootcrop is tarua taro (27% of total rootcrops), followed by cassava and swamp taro (with 26% and 19% of total rootcrops respectively).

3.2 Roadside markets

In addition to root crop sales through Talamahu market, large but unrecorded volumes of root crops and other produce are also sold through road-side markets on Tongatapu.

As part of the current study, a roadside-markets survey was carried out each Saturday morning between April 25 and September 26, 2009 (by the operations manager and deputy-foreman of Tinopai Farm). The survey covered the 2 main roadside markets in Nuku'alofa (in Ma'ofanga and Fanga 'o Pilolevu), as well as smaller roadside-markets in the villages between Nuku'alofa and Vaini (on the main road to the airport).

The survey involved a count of baskets or bundles of the same six major root crops which are counted by MAFFTonga at Talamahu market. To determine volumes and prices of root crops on-sale at roadside-markets, the average weights and prices of baskets or bundles from Talamahu market records were used.

While the survey was not exhaustive in recording root crops on-sale every day, at all road-side markets, the results provide important information to enable more accurate estimates about current root crop supplies in Tonga.

The table below summarises monthly volumes of root crops on-sale at road-side markets over the survey period.

Table 3: Tongatapu Roadside Markets - monthly volume and value of root crops supply for the 5 months between May and September 2009 (Saturdays only)

Root Crop (Tonnes)	May 2009	June 2009	July 2009	Aug 2009	Sept 2009	5-Month Total	Monthly Average	% of 5-Month Total
Swamp taro	16.07	14.15	8.96	11.49	9.66	60.33	12.07	12.5%
Tarua taro	16.86	15.52	15.74	31.09	18.24	97.45	19.49	20.2%
Cassava	40.26	39.92	37.60	43.42	28.75	188.87	37.77	39.0%
Sweet potato	30.96	26.39	9.65	14.36	9.93	91.29	18.26	18.9%
Yams	8.95	10.67	6.74	9.73	8.00	44.09	8.82	9.1%
Giant Taro	0.06	0.06	0.05	0.41	0.67	1.25	0.25	0.3%
Totals	**113.18**	**106.71**	**78.74**	**109.40**	**75.25**	**483.28**	**96.66**	100.0%

Source: Roadside survey conducted by Tinopai Farm (refer Attachment 5)

Salient points regarding rootcrops supply through roadside markets for the 5 months between May and September 2009 (for Saturdays only) are set out below.

- The average monthly volume is 97 tonnes which is three times the average monthly volume of 30 tonnes at Talamahu Market.

- Monthly variations are observed, with July and September totals at 79 and 75 tonnes respectively, compared with more than 100 tonnes for May, June and August. However, in interpreting this variation, it should be noted that July and September had only four Saturdays compared with five Saturdays for May, June and August.

- The highest volume root crop is cassava (39% of total root crops), followed by tarua taro and sweet potato (20% and 19% of root crop total respectively). This compares with sales at Talamahu Market, where tarua taro was the highest volume root crop followed by cassava and swamp taro.

What about root crops on-sale at roadside markets between Mondays and Fridays? As noted above, the roadside markets survey was carried out on Saturdays only. However, the roadside markets operate every day of the week except Sunday. While Saturday is the day with biggest volumes offered for sale, there is no survey data available for volumes of root crops on-sale between Mondays and Fridays. A conservative estimate of that volume is 25% of the average monthly volume for Saturdays of 97 tonnes, i.e., average monthly volume for root crops on-sale at roadside markets between Mondays and Fridays is estimated at 24 tonnes.

This brings the estimated total monthly volume of root crops on-sale at roadside markets to 121 tonnes. It is pertinent to note that MAFFTonga began a survey of roadside markets on Tongatapu in November 2009. This will provide valuable information to verify the validity of estimates made in the current study over a longer period of time.

3.3 Direct consumption by farmers and their extended families

The combination of root crops on sale at Talamahu (average 30 tonnes per month) plus the road-side markets (average 121 tonnes per month) indicates a total average monthly volume of root crops sold on Tongatapu, of 151 tonnes per month. This total does not account for the volume of root crops that is not offered for sale but is consumed directly by farmers and their extended families throughout the rest of Tongatapu. There is no data available for root crops consumed directly by farmers and their extended families.

For the purpose of this study, an estimate of direct human consumption of root crops by farmers and their families was made in the following way. It is assumed that most of the root crops on-sale on Tongatapu are bought and consumed by non-farming families in Nuku'alofa. The population of Nuku'alofa is approximately 35,000, so the balance of the Tongatapu population not living in Nuku'alofa is 35,000.

It is further assumed that the outside-Nuku'alofa population will consume root crops at the same proportion as the Nuku'alofa population (NB: this is likely to be an underestimate as farming families will probably eat more root crops because they do not have to buy them).

Proceeding from those assumptions, the Nuku'alofa population of 35,000 currently consumes, on average, 151 tonnes of root crops each month, so the remaining population of 35,000 people outside Nuku'alofa on Tongatapu would consume the same volume of root crops consumed by Nuku'alofa consumers, i.e., on average, each month, 151 tonnes of root crops is consumed directly by farmers and their extended families on Tongatapu. This results in an estimated average monthly volume of root crops currently consumed on Tongatapu, of 300 tonnes per month, or 3,600 tonnes each year.

3. 4 Exports of root crops

The final component of the estimate of total supply is export volumes. Data for exported root crops is collected by MAFFTonga Quarantine Department, as shown in the table below.

Table 4: Exports of Root crops from Tonga, 2004-2008

Root crop (Tonnes)	2004	2005	2006	2007	2008	5-Year Total 2004-8	5-Year Average 2004-8	% of 5-Yr Average	2001 (Peak Year)
Swamp taro	283.78	111.98	181.93	73.13	572.2	1,223.0	244.6	9.0	1,158.7
Tarua taro	288.11	244.37	207.90	626.11	724.8	2,091.3	418.3	15.3	851.4
Cassava	1,567.84	672.10	345.64	680.38	959.3	4,225.2	845.0	31.0	422.9
Yams	1,467.35	1,011.04	572.98	1,272.33	754.3	5,069.4	1,013.9	37.1	992.5
Giant Taro	139.38	89.30	127.37	149.56	532.0	1,037.6	207.5	7.6	576.7
Totals	3,746.5	2,129.2	1,435.7	2,801.5	3,533.6	13,646.5	2,729.3	100.0	4,013.2

Source: MAFFTonga Quarantine Department (refer Attachment 3) Data is not yet available for 2009. Figures from 2001, the peak year for exports by volume, are provided for comparison.

Salient points regarding exports of root crops between the years 2004 and 2008 are set out below.

- The average annual volume of exported root crops was 2,730 tonnes per year.
- The annual exports fell each year between 2004 and 2006, but recovered and increased in 2007 and 2008 (3,747 tonnes in 2004 down to 1,436 tonnes in 2006 but back up to 3,533 tonnes in 2008).
- Sweet potato is not exported from Tonga due to quarantine restrictions on fresh exports (frozen exports are possible and may have potential for development).
- Root crops are exported fresh, except for cassava which is exported in frozen form. The average for cassava exports (frozen) is 845 tonnes each year (31% of all root crops). In 2008, 959 tonnes of frozen cassava was exported.
- The leading exported root crop by volume is yam with an average of 1,014 tonnes each year (37% of all root crops), followed by cassava and tarua taro (31% and 15% of total root crops respectively).
- The volumes of each root crop fluctuate substantially from year to year. For example: swamp taro leapt from 73 tonnes in 2007 to 572 tonnes in 2008; cassava doubled from 346 tonnes in 2006 to 680 tonnes in 2007, and yams crashed from 1,272 tonnes in 2007 to 754 tonnes in 2008. To a large extent this fluctuation is related to climatic fluctuations as discussed further in the section on irrigation and drought below.

Data from MAFFTonga for exported root crops exported over the previous 5-year period 1999-2003 shows that annual exports averaged 2,550 tonnes. Average annual exports increased slightly by 180 tonnes to 2,730 tonnes per year for the 5-year period 2004-2008. This equates to root crop exports of 227.5 tonnes per month.

3. 5 Total root crop supply

Given the estimate of 3,600 tonnes of root crops consumed locally each year on Tongatapu, the average export volume of 2,730 tonnes indicates that Tongatapu is growing a total of about 6,330 tonnes of root crops each year. The table below shows the breakdown of supply-sources which make up the annual total of 6,330 tonnes.

Table 5 – Total Estimated Supply of root crops on Tongatapu

Source Of Supply (Tonnes)	**Monthly Average**	**Annual Average**	**Percentage of Annual Average**
Talamahu Market	30	360	5.7
Roadside markets	120	1,440	22.7
Direct Farmer Consumption	150	1,800	28.4
Exports	228	2,736	43.2
Total	***528***	***6,336****	***100.0***

* Totals are slightly different due to rounding.

Salient points regarding current supplies of root crops are set out below.

- The total current (estimated) annual root crop supply of 6,330 tonnes for Tongatapu.

- Annual local consumption takes up 57% (3,600 tonnes) of total estimated root crops. However, a substantial part of the current estimated root crop supply is exported (43% or 2,730 tonnes). Increased levels of exports could therefore have potential implications for local consumption (in terms of available volumes and prices) of root crops, suggesting that attention should be paid to increasing root crop supply.

As noted above, this value is likely to be an underestimate since on-farm consumption is likely to be higher than that of urban consumers. In addition, no account has been taken of the use of root crops for animal feed or of on-farm wastage. The fact that it relates to Tongatapu only, means that the figure is not directly comparable with national level statistics on root crop production or consumption. However, further research would be required to generate estimates of these components of supply

4. Expanding the Supply of Root Crops

This section discusses potential constraints to increasing supply by examining the supply chain stages of input supply, farming, and post-harvest handling.

4.1 Inputs

a) Is sufficient land available for root crop production?

As discussed above, Tongatapu farmers are currently growing at least 6,330 tonnes of root crops annually for consumption (on farm, domestic and export). More than half of the farmland in Tonga is not being farmed at all, so there is land available for increased farming of root crops and other crops

Because of Tonga's egalitarian land law, land has been widely distributed to Tongans under long-term leases (99 years), in 8-acre blocks for farming. Tongan farmers own their land and are able to grow their own crops for their own private benefit. This is different to many other Pacific Island countries where land is communally-owned which makes it more difficult for farmers to access land for farming for their private benefit.

Tongan farmers are always looking for profitable farming opportunities. They take up these opportunities quickly. This is illustrated by the explosion in the number of farmers growing squash for export to Japan from 40 farmers in the first year 1987, to more than 1,000 farmers in 1991. (FAO 2005, 'Case Studies on Commercialisation of Small Farmers - Squash in Tonga).

For farmers who do not have land, or who have land but want to increase their farming, sub-leasing of land is commonly used in Tonga. Farmers arrange sub-leases of unused farmland with the lease-holders, for periods between 1 and 20 years

b) Are appropriate varieties of planting material available?

In Tonga, many varieties are available for most root crops. For example: at least 30 varieties of yams with different sizes, shapes, length, flesh colour and texture; at least 9 varieties of sweet potato with different sizes, sweetness, flesh colour and texture; plus at least 6 varieties each of cassava and swamp taro. Tarua taro has the least number of varieties, only 3. Planting material is readily available all year round for each root crop.

Table 6 – Planting material for root crops

Root Crop	Planting Material	Source/Availability
Swamp taro	Suckers	Tubers at harvest/every month
Tarua taro	Stalk cut up	Stalks at harvest/every month
Cassava	Stalks	Stalks at harvest/ every month
Sweet potato	Ends of vines	Growing plants/every month
Yams	Tubers cut up	Tubers after harvest/seasonal
Giant Taro	Suckers	Stalk at harvest/every month

It is important to understand what variety or varieties of yam, taro, sweet potato, tarua etc, are currently sold or could be sold as retail-packs in New Zealand shops, and in what frozen form, ie, as chunks, fries, mashed etc. This question was addressed in the market research carried out in Auckland in October 2009. The results of the market research are set out below in the section on actual and potential demand.

c) Are fertilisers available and effective?

Fertilisers are available, in both natural compost and synthetic form (NPK plus variations). Natural compost fertiliser is being made and sold on Tongatapu. NPK plus variations are imported and sold by farming-supplies shops. There are three farming-supplies shops currently operating on Tongatapu. One company also has shops in Vava'u and 'Eua.

In traditional Tongan farming, no fertiliser was used to grow root crops. However, farmers are aware that fertilising increases yields so farmers are beginning to apply natural and synthetic fertilisers to root crops. At present, farmers do not know what type of fertiliser to use nor how much to apply to root crops. There is a need for on-farm trials in conjunction with Tonga MAFF and the Growers Federation of Tonga, to work out the most effective fertilisers and application rates.

d) Are chemicals (for disease, pest and weed control) available and affordable?

Chemicals are imported and are available for purchase from farming-supplies shops. Tonga is fortunate that most root crops do not have pests/diseases which need applications of chemicals. The exceptions are for some varieties of yams which are prone to leaf blight after rain, for taro which can be infested by caterpillars eating the leaves during dry times, and for sweet potato where the tubers can be infested by a type of weevil.

Over time, there has been an increase in farmers planting larger blocks of root crops (1-acre and larger). This has lead to an increase in the use of weed-killer chemicals such as Glyphosate and Paraquat, to avoid the costs of manual weeding and to ensure more effective weed-control. It is cheaper to spray weeds than hire labourers to weed by hand.

Weed-killers are effective in keeping weeds down for up to 2 months whereas manual weeding needs to be carried out at least monthly for most root crops. Fungicide and pesticide chemicals are effective in controlling leaf blight in yams and caterpillars on

taro leaves. Chemicals are often in short-supply or sold-out in the farming-supplies shops so there is an opportunity for the farming-supplies shops to provide better service to their farmer customers.

At present, there are no effective chemicals for controlling weevil infestation of sweet potato tubers which may cause tuber losses of up to 50%. There is a need for on-farm trials in conjunction with Tonga MAFF and the Growers Federation of Tonga, to find an effective pesticide and application rates to control sweet potato weevil.

4.2 Farming

a) What are current yields per hectare and how can they be increased?

Root crops are traditional Tongan crops and are still commonly farmed according to traditional practices. In traditional farming, root crops are grown together in the same plot, for instance, yams were inter-planted with swamp taro, tarua taro and giant taro plus varieties of bananas, or taro and tarua and giant taro were interplanted with sweet potato plus bananas. Mono-cropping was not used for root crop farming in Tonga.

The traditional farming system was used to provide food from different crops over a period of up to 3 years where the yams would be the first crop to be harvested after 6-8 months, then the swamp taro at 10-12 months, then the bananas at 12 months, the tarua taro at 18-24 months, finishing with the giant taro at 24-36 months. After the first harvest of bananas at 12 months, the banana suckers would grow and provide more bananas over the next 2 years.

Interplanted rootcrops, yam, taro and cassava

The traditional ground preparation tool was a large digging fork which was used to dig and break up the soil in circular patches of about one-metre diameter, about one metre apart. So, root crops were planted up to two metres apart. Root crops such as

sweet potato and cassava were planted in groups in the prepared patches of soil, with 3 to 4 sweet potato vine-tips or 3 to 4 cassava stalks being planted together in the same patch, with the result that the plants would have to compete for water and nutrients in the patch.

Tongatapu farmers now use tractors for land preparation and planting space between root crops has decreased from two metres to one metre or less, depending on the root crop. However, root crops such as sweet potato and cassava are still commonly planted in groups, which means that the plants must still compete for water and nutrients.

Root crop yields vary greatly for each of the root crops depending on farming practices. For example, for cassava, increasing planting density by changing from the traditional group-planting to single-planting can increase cassava yield per acre by up to double, from 10 to 20 tonnes per acre. Yields also vary greatly between the different root crops. For example, cassava can yield up to 20 tonnes per acre but takes 12 to14 months to grow; sweet potato can yield up to 18 tonnes per acre after 5 to 6 months; yams can also yield up to 20 tonnes per acre in 6 to 8 months.

Weed control is always an issue for farmers, including root crop farmers. The yields of many farmers' root crops are reduced by poor weed-control due to, inclement weather preventing weeding operations, unavailability of weed-killer chemicals, or inattention by farmers.

Accurate information on average yields of root crops in Tonga is not available. There is a need for on-farm trials in conjunction, to measure and record root crop yields so that accurate information is available. The table below shows estimates of average and high yields based on farming experiences of the author.

Table 7 – Estimated root crop yields and growing periods

Root Crop	Yields Per Acre (Tonnes - Average)	Yields Per Acre (Tonnes - High)	Growing Period To Harvest
Swamp taro	5	10	10-12 months
Tarua taro	10	30	18-24 months
Cassava	8	20	12-14 months
Sweet potato	5	18	5-6 months
Yams	8	20	6-8 months
Giant Taro	7	12	24 months

Source: Author estimates. Yields are calculated over the full growing period

There is potential to substantially increase average root crop yields by Tongan farmers. Yields can be improved by adopting better farming practices including: increased planting density; use of fertiliser; effective weed-control; and in the case of swamp taro, irrigation. In addition, yields may be increased by importing improved varieties of root crops.

Adoption of better farming practices will come about through on-farm trials in conjunction with Tonga MAFF and the Growers Federation of Tonga. Importing and

trialling of improved root crop varieties should also be carried out on-farm in conjunction with Tonga MAFF and the Growers Federation of Tonga.

b) How can a steady all-year-round supply be achieved?

Consistency of supply of appropriate root crops for processing and export is critical. There are various options including the organisation of contract growers, growing by the exporter or a combination of the two.

Steady supply all-year-round would be most likely to be achieved through a combination of in-house growing by exporters plus contract-growers. This is how previous large-scale exports of copra, bananas, vegetables and squash were organised. Because of this, Tongan farmers are familiar and comfortable with contract-growing and coordination of farming for all-year-round supply.

The Growers Federation of Tonga has set up an export-facilitation body (GROCOMM) with members including farmers, exporters and Government representatives. This will assist in the organisation of farmers for all-year-round supply of export root crops. GROCOMM is initially focussing on facilitating increased exports of coconuts and fresh root crops, plus fruit and vegetables through the Hot Air Treatment Facility.

Under a GROCOMM initiative, the Vava'u branch of the Growers Federation has already been successful in organising Vava'u farmers to supply coconuts for export to New Zealand. The first full container of coconuts was shipped in November 2009. The second shipment is scheduled for December 2009. Previous cooperative efforts to ship coconuts from Vava'u have failed to fill the first container.

Diversification of export crops is beneficial for farmers who will be able to grow a variety of crops to alleviate farming and export risk.

c) What are best practices in disease/pest/weed control?

As discussed above, farming practices need to be improved to increase yields and returns to farmers. There is a need for on-farm trials in conjunction with MAFF and the Growers Federation.

An unfortunate side-effect of increased mono-cropping for export markets is the increased incidence of disease and pests in those crops. This happened with bananas (bunchy-top and black-leaf streak) and also with squash (downy/powdery mildews plus mosaic virus). For squash, diseases are controlled by increased applications of chemicals.

With regard to root crops, Tonga is fortunate that there are no serious diseases or pests at present. Two of Tonga's closest neighbours, Samoa and Fiji, have very serious introduced diseases and pests, Samoa with taro leaf blight and giant green snails, and Fiji with taro beetle. MAFFQuarantine in Tonga can claim much credit for ensuring that Tonga remains free from these pests and diseases. MAFFQuarantine and the Tongan public need to remain vigilant.

Farmers, MAFF and the Growers Federation will need to work together to develop preventative systems such as rotational and/or inter-cropping practices to reduce the development and incidence of diseases and pests. Farmers, MAFF and the Growers Federation will also need to monitor crops closely for pests and diseases, and develop effective ways to disseminate information quickly about control-measures.

d) How can irrigation offset potential impacts of drought?

Irrigation is not needed for some root crops which are drought-resistant, e.g., cassava, yam and sweet potato, but is essential for other root crops like swamp taro, giant taro and tarua taro to ensure export-yields. Irrigation is not common in Tonga apart from hand-watering of vegetable crops.

Tonga enjoyed nearly three years of plentiful and regular rainfall in 2007, 2008 and up until November 2009 when no significant rainfall was recorded for November. This is reflected in the huge leap in exports of swamp taro and giant taro from 73 tonnes in 2007 to 572 tonnes in 2008, and 50 tonnes in 2007 to 532 tonnes in 2008, respectively. Tarua leaf exports trebled from 20 tonnes in 2007 to 66 tonnes in 2008. (MAFFQuarantine)

Drought-stricken tarua taro at the end of November 2009

Drought-stricken swamp taro at the end of November 2009

The photographs above show the effect of six weeks without significant rainfall on swamp taro and tarua taro. The swamp taro tubers will be smaller and misshapen as a result. The tarua taro has stopped growing new leaves which can be picked for local sale/export.

Farmers will need to install and use irrigation if they intend to grow swamp taro, giant taro and tarua taro on a commercial basis for export. An irrigation system with bores, pumps, pipes and soakhoses to cover 4 acres of a standard 8-acre Tongan ‘api/farm, would cost about $20,000. (Author’s estimate based on own use of soakhose irrigation system).

The estimated cost of $20,000 for an irrigation system is about the same cost for a flat-deck 2-tonne truck which is the standard vehicle used by Tongan farmers. Irrigation will help ensure yields and returns for export crops such as swamp taro. Irrigation can also be used for other crops such as vegetables and watermelons. Farmers can apply for loans to install irrigation through the Tonga Development Bank (TDB).

Tongan farmers are familiar with the procedures and conditions for taking loans from the TDB. The TDB funded most of the farming loans for squash-growing by small and large farmers in Tongatapu, ‘Eua and Vava’u, and continues to fund farmers growing different crops including root crops.

e) What constrains best practices during harvest?

Currently, most root crops are harvested by hand. A few commercial farmers use potato harvesters for harvesting potatoes. There is potential to use machines to harvest root crops such as sweet potato, tarua and swamp taro. The advantages of machine harvesting include speed and savings on labour costs for large-scale farming.

There is potential for contractors of farming-services (ploughing, discing, harrowing, hillocking etc) to buy harvesting implements and offer root crop harvesting services to farmers.

f) What can Tonga supply given available farmland?

More than half of Tonga's farmland is currently fallow. This is due to the lack of demand for crops which farmers can grow and make a profit from.

The current estimated annual supply of root crops of 6,330 tonnes (for Tongatapu) is relatively small compared to what Tonga can actually produce. The record of squash-exports averaging 15,000 tonnes per year between 1990 and 2005 shows what volumes of produce Tonga can grow and export. The acreage under squash cultivation reached 5,000 acres in the peak years between 1991 and 1994.

The table below shows what Tonga could produce if there were 500 acres under cultivation for each of the six root crops under consideration in this report, i.e., only 3,000 acres in total.

Table 8: Projected volume of supply for 500 acres per root crop

Root Crop (Tonnes)	**Normal One Year Yield/Acre)**	**Harvest Of 500 Acres**	**2008 Exports**
Swamp taro	5	2,500	572
Tarua taro	5	2,500	725
Cassava	8	4,000	959
Sweet potato	5	2,500	-
Yam	8	4,000	745
Giant taro	3	1,500	532
Total		*17,000*	*3,353*

The total projected root crop harvest from 3,000 acres at normal yields would be 17,000 tonnes compared with 3,533 tonnes exported in 2008 and with the current estimated annual supply of 6,330 tonnes for Tongatapu.

If 3,000 acres of farmland was planted in root crops, there is potential to increase the total supply of root crops by nearly three times the current estimated total supply of Tongatapu.

4.3 Post-Harvest Handling

a) How is initial quality selection undertaken?

After harvest, initial selection is carried out on-site. The usual practice is to leave undersized, insect-infested and decaying tubers on the field. In extreme cases of weevil infestation, up to half the sweet potato tubers may be left on-field. The practice of leaving decaying and disease-infested tubers in the field may lead to disease and pests for future crops. Best practices need to be researched by MAFFTonga and implemented in conjunction with farmers and the Growers Federation.

b) Are transport and storage facilities adequate?

The squash industry led to a massive increase in transport and storage facilities for farming in Tongatapu, 'Eua and Vava'u. Squash exports have declined from the annual average of 15,000 tonnes to less than 2,000 tonnes. Most of the storage facilities for squash are now unused and are available for storage of other crops including root crops.

Tongan farmers own their own vehicles or can access vehicles by borrowing or hiring. Flat-deck trucks (2 and 3-tonnes) are the most common vehicles owned/used by farmers to transport produce. Small farmers usually harvest and sell to market or to exporters on the same day or the following day, so storage is not an issue. Large commercial farmer/exporters usually have their own work-sheds to store and process root crops for export. Work-sheds are also available for hire.

5. Current and Potential Demand for Frozen Retail-Pack Root Crops

5.1 Competing products and prices?

Tonga is not the only country that exports frozen root crops to New Zealand. Data from Statistics New Zealand shows that China, USA, Fiji, Vietnam, Japan, Thailand, India and Korea are also exporting frozen root crops to New Zealand. The table below shows imports of frozen cassava, sweet potato and other root crops (yams and taro) to New Zealand between 2006 and 2008.

Salient points about frozen root crop imports into New Zealand for the years 2006-2008 include the following.

- The statistics do not differentiate between imports for formal and informal markets.

- Frozen cassava is the largest imported frozen root crop - imports have increased five-fold from 60 tonnes in 2006 to 328 tonnes in 2008.

Table 9: Imports of Frozen Root crops into New Zealand, 2006-2008

Country (Tonnes)	2006 Cassava	2006 Sweet potato	2006 Taro/ yams	2007 Cassava	2007 Sweet potato	2007 Taro/ yams	2008 Cassava	2008 Sweet potato	2008 Taro/ yams
Tonga	57.2	-	-	161.1	-	-	277.7	-	-
Fiji	-	-	2.0	-	-	1.0	39.8	-	0.60
Thailand	-	-	-	0.3	-	-	1.3	-	-
USA	1.2	-	-	-	-	-	-	13.1	-
Vietnam	1.7	-	-	-	0.48	16.0	8.8	-	-
China	-	73.0	0.1	-	58.41	-	-	78.8	0.01
Korea	-	-	-	-	0.01	-	-	-	-
India	-	-	0.2	-	-	-	-	-	0.27
Japan	-	-	-	-	-	1.3	-	-	0.43
Total	*60.1*	*73.0*	*2.3*	*161.4*	*58.9*	*18.3*	*327.6*	*91.9*	*1.31*

Source: Statistics New Zealand (refer Attachment 6)

- Tonga is the largest exporter of frozen cassava with 278 tonnes (85% of total) in 2008, 161 tonnes out of 161.4 tonnes in 2007, and 57 out of 60 tonnes in 2008.
- Fiji and Vietnam are the only other countries with significant exports of frozen cassava, Fiji with 40 tonnes in 2008 and Vietnam with 9 tonnes.
- Tonga's exports of frozen cassava are almost all directed to informal markets, so the 278 tonnes exported by Tonga in 2008 indicates that the informal market made up 85% of the total market for cassava in 2008 including the formal market.
- Imports of frozen sweet potato have increased from increased from 60 tonnes in 2006 to 92 tonnes in 2008.
- Imports of frozen taro and yam were 2.3 tonnes in 2006, increasing to 18.3 tonnes in 2007 and dropping to 1.3 tonnes in 2008.
- Tonga is not recorded as having exported any frozen sweet potato, taro or yam to New Zealand.
- Asian countries, in particular, China and Vietnam, export the majority of frozen sweet potato, taro and yam to New Zealand.
- Total imports of frozen root crops have increased from 135 tonnes in 2006 to 421 tonnes in 2008.
- After removing imports of Tonga cassava which are almost all for the informal market, total imports of formal frozen root crops appear to have increased from 78 tonnes in 2006 to 143 tonnes in 2008.

5.2 What is the demand for frozen root crops for formal markets?

Pacific Island plus Asian consumers

In addition to the Pacific Island immigrant population of approximately 300,000 in New Zealand, there is also a larger population of approximately 400,000 Asian immigrants (including Chinese, Thais, Malaysians, Indonesians, Philipinos, Vietnamese, Cambodians and Burmese) who also eat tropical root crops. There is a potential market of 700,000 Pacific Island and Asian consumers for frozen root crops.

Tonga's exports of root crops to New Zealand, including frozen cassava, are primarily directed at Pacific Island consumers. Through links to expatriate Tongans in New Zealand, there was some knowledge available about the preferences of Pacific Island consumers for retail-packs of frozen root crops. There was no knowledge available in Tonga about preferences of Asian consumers in New Zealand for retail-packs of frozen root crops.

Research visit

As part of this study, a visit was made to Auckland in October 2009 to research actual and potential demand for retail packs of frozen root crops. The research visit focussed on visits and discussions with importers/retailers who are supplying frozen retail-packs of root crops to Pacific Island and Asian consumers. A number of useful and illuminating discoveries were made during the visit:

- There has been an increase in the number of importers/retailers which specialise in supplying products for Pacific Island and Asian consumers, including frozen root crops.

- In response to this competition, the two major New Zealand supermarket chains have recently changed their policy to allow supermarkets in areas with concentrations of Pacific Island and Asian consumers, to order and sell retail-packs of frozen root crops.

- The predominant frozen retail pack root crop for sale to Pacific Island consumers[2] are 2kg packs of cassava.

- Sales of retail packs of frozen root crops to Pacific Islanders depend on the availability and price of fresh root crops plus the availability and price of frozen root crops in the informal market. For instance, sales of retail packs of frozen cassava are lower when fresh taro is plentiful and cheaper, and also lower when supplies of frozen cassava are plentiful in the informal market.

- Due to plentiful and cheaper taro, plus plentiful supplies of frozen cassava in the informal market, the sale price in South Auckland supermarkets in October 2009, for a 2kg retail-pack of cassava from Fiji was NZ$2.99 (NZ$1.50 per kg).

[2] Observed in October 2009 by the author

- Specialty shops in Auckland supplying Asian consumers had a greater range of retail packs of frozen root crops, including cassava, taro, sweet potato and yams, imported from Thailand, Vietnam and China. There were also frozen packs of ground/mashed cassava.

- There were no frozen retail packs of root crops from Pacific Island countries in Asian specialty shops.

- Frozen retail packs of root crops from Asia were available in a range of sizes, 1 pound (454g), 1 kg and 2kg.

- Frozen retail packs of root crops from Asia were vacuum packed without any ice-crystals, as opposed to root crops from Pacific Islands which were packed loose with ice-crystals.

- Frozen retail packs of root crops from Asia were retailing, in October 2009, at prices which were twice to four times higher than retail prices for equivalent fresh or frozen root crops from the Pacific Islands.

- A 1-pound (454g) pack of frozen cassava from Vietnam was retailing, in October 2009, at NZ$2.80 compared with NZ$2.99 for 2 kg of frozen cassava from Fiji.

- A 2 kg pack of frozen white taro from Vietnam was retailing at NZ$12.00 (NZ$6.00 per kg) compared with NZ$3.50 per kg for fresh white taro from Tonga.

- A 1-pound (454g) pack of frozen yam from Vietnam was retailing at NZ$2.90.

- According to the Asian speciality store managers visited during the study, Asian consumers prefer the white, soft-flesh taro grown in Tonga (lau'ila variety) to the pink hard-flesh variety grown in Fiji and Niue.

- Frozen sweet potato from Asia is pre-cooked then frozen so it can be re-heated and served quickly. It is in demand from the food-service industry (restaurants, commercial kitchens and takeaways). All of the Asian specialty stores visited had run out of frozen sweet potato.

On the basis of the research visit the following conclusions can be drawn:

(i) There is an opportunity for Tonga to export retail packs of frozen root crops to New Zealand for sale to Pacific Island and Asian consumers through the mainstream chains of supermarkets plus the specialty stores which supply Pacific Island and Asian consumers. The formal market for frozen root crops is small in volume but appears to be growing (78 tonnes in 2006 to 143 tonnes in 2008 as discussed above in the section on New Zealand import statistics).

(ii) Frozen root crops from Asia are packed in a wider range of sizes, are better presented (vacuum packed without ice-crystals), and retail at 2 to 4 times the prices for equivalent fresh or frozen root crops from the Pacific Islands.

(iii) For Tonga to supply Asian consumers in New Zealand, Tongan processors/exporters would need to improve packaging and expand the range of sizes, plus send samples for trialling. To do this, Tongan processors/exporters would need to get samples of Asian retail packs from New Zealand, develop their own packaging and send samples to New Zealand for trials.

(iv) There is an opportunity for Tonga to grow and export white soft-flesh lau'ila (Tongan) taro (both fresh and frozen) to Asian consumers in New Zealand.

(v) There is an opportunity for Tonga to grow and export pre-cooked frozen sweet potato for the food-service industry in New Zealand. The pre-cooked frozen sweet potato market is small but has grown from 73 tonnes in 2006 to 92 tonnes in 2008.

(vi) There is also an opportunity for Tongan processors/exporters to export frozen retail-packs of root crops to Asians consumers in Australia. The author has seen similar retail packs of frozen root crops on sale in Australia. There are approximately one million Asians living in Australia.

Figure 9 - Frozen root crops from Asian countries

6. Meeting the Demand for Frozen Retail Pack Root Crops

This section discusses potential constraints to meeting demand by examining the supply-chain stages of, Processing/packing, Exporting, Import/Retailing, and Consumption.

6.1 Processing/Packing – New Zealand Food-Safety Requirements

a) What are the required facility standards?

Frozen root crop exports from Tonga are targeted at two markets, formal and informal. Food-safety requirements for processing and packaging differ between the two markets.

Imports of food into New Zealand are monitored by the Food Safety Authority of New Zealand (FSANZ) which is the New Zealand Government agency responsible for ensuring food is safe to eat. FSANZ has proposed a new law which will change the requirements for foods imported into New Zealand. There is more discussion on the new requirements in the section below on quality-control[3].

(i) Informal markets

Currently, almost all frozen root crop exports from Tonga are targeted at informal markets of expatriate Tongans and Pacific Islanders living in NZ, Australia and the US. Root crops are processed at farmers' homes (commonly in garages or verandas) and packed in nylon-netting sacks or plastic bags with weights of between 10-20 kg. Frozen cassava makes up more than 90 percent of frozen root crop exports. Cassava can only be exported in frozen form because it has a very short shelf-life when fresh, up to one week.

(ii) Formal markets

In contrast to informal markets, processing for export to formal markets in New Zealand has stricter requirements. Processing for formal markets needs to be carried out in a facility that is clean and sanitary. The requirements are not onerous – they are the same requirements that cafes, restaurants or commercial kitchens need to comply with, including, insect controls, sanitary processing surfaces, toilets plus hand washing facilities.

There are three privately owned frozen processing facilities on Tongatapu which comply with cleanliness and sanitation requirements. Two of these facilities were built for exports of processed fish and are currently unused. The third facility was built for frozen-processing of root crops to formal markets and is currently in operation.

[3] Details of FSANZ requirements for imported foods can be found on the website: www.fsanz.govt.nz

In addition, MAFFTonga is arranging construction of two new processing facilities, one in Tongatapu and one in Vava'u. The facilities will include freezers for frozen processing and will comply with cleanliness and sanitation requirements.

b) Are quality control systems for food safety adequate?

New Zealand, under the proposed new food safety law proposed by FSANZ, will move to mandatory use of quality control systems by food handling companies. This means processors of frozen root crops in Tonga will need to set up and use approved quality control systems to be able to export to formal markets in New Zealand. In time, processors of frozen root crops for informal markets in New Zealand will also need to use approved quality control systems.

The standard quality control system is Hazard Analysis Critical Control Point (HACCP). HACCP involves writing down all the steps of processing and identifying hazards or problems which can occur, plus identifying controls and corrections for hazards and problems that may occur, and then recording corrections to hazards and problems that happened.

The international trend is for imported foods to be tested for chemical residues or toxins. FSANZ has minimum levels for residues or toxins in imported foods.

Cassava is one such food because it contains the natural toxin, hydrocyanide. Frozen cassava cannot be imported into New Zealand unless it has less than 50mg per kg of hydrocyanide. FSANZ has clarified that the proposed reduction in minimum hydrocyanide levels does not apply to frozen cassava, but only to products such as cassava flour and cassava crisps/chips.

In future, exporters of frozen root crops to New Zealand will be required to supply test-results for chemical residues and toxins. Tonga does not have testing facilities at present so these tests will need to be carried out overseas.

Chemical residue tests are currently carried out by Tongan exporters of squash and taro to Japan. Samples are sent to laboratories in New Zealand or Fiji for testing.

c) What are the packaging and labelling requirements?

Labels on exports of frozen root crops to formal markets in New Zealand need to comply with labelling requirements. FSANZ has specific requirements for food labels, in English, including:

- name of the food;
- name and address of supplier in New Zealand;
- best-before or use-by date;
- as required, warning or advisory statements and declarations about allergens;
- list of ingredients;
- directions for use and storage;
- nutrition information;
- net weight or volume.

Importers/retailers will also have their own separate requirements, including bar codes and specifications on packaging. Processors/exporters will need to communicate frequently with importers/retailers to ensure packaging requirements are met and to develop packaging that is effective in marketing the product.

6.2 Processing and Packing – Capacity and Commercial Requirements

a) Is capacity sufficient?

There are already three processing facilities on Tongatapu which comply with cleanliness and sanitation requirements, plus MAFFTonga is arranging for construction of another two facilities.

Each of the three facilities on Tongatapu can process a minimum of 20 tonnes per week of frozen root crops or 1,000 tonnes per year. If all three facilities were operating, the capacity for frozen processing would be at least 3,000 tonnes per year. There is more than enough processing capacity for Tongan companies to enter into commercial agreements to supply New Zealand companies.

Because two of the three processing facilities are currently unused, prospective processors/exporters have the benefit of being able to rent processing facilities instead of having to invest funds in building new facilities.

b) Do processors have the ability to process different root crops?

Given the cost of setting up or operating a frozen processing facility, viability will depend in large part on the ability of the facility to process a range of root crops.

The technical and mechanical requirements for processing differ between root crops. Swamp taro, tarua, sweet potato and small yams can be peeled efficiently using abrasive peelers. Cassava is easily and quickly peeled by hand. Chopped-up root crops may need to be blanched before blast-freezing.

Processors will need to be able to process different root crops and will need to carry out research to determine the most cost-effective methods of processing.

6.3 Exporting to New Zealand

a) What is the availability of refrigerated containers for shipping?

This is a problem, but can be overcome by scheduling supply of containers with shipping companies. For example, In October, November and December 2008, for the first time, refrigerated containers were used to export all of Tonga's squash. In total, 3,100 tonnes of squash was exported over a three month period to Japan, Korea and the UK, packed in 20-foot and 40-foot refrigerated containers which were shipped empty to Tonga for this purpose. In October and November 2009, squash was again exported in refrigerated containers under the same arrangement.

b) What are current freight rates?

There are three shipping companies which sail between Tonga and New Zealand. Freight for a one-off shipment using a 20-foot refrigerated container from Tonga to New Zealand costs about NZ$ 2,400 plus CABAF (Currency adjustment and Bunker adjustment factors).CABAF for NZ-bound freight was about 45 percent in October 2009 so freight for a 20-foot refrigerated container would be about NZ$ 3,480.

Shipping companies will negotiate freight rates based on volume. For exporters who are starting with small volume, freight will be more expensive. To reduce freight rates, a small exporter can try to get forward orders if possible, so the exporter can negotiate rates based on projected volume with the shipping companies.

c) What is the role of export insurance?

Exporting is a risky business. It is prudent, especially for small or new exporters to insure high-value shipments of processed retail root crops against damage or loss.

Export insurance is expensive in Tonga because of the small number of insurance companies. An alternative is for exporters to arrange with importers in New Zealand for insurance at less expensive rates.

6.4 What are the processes involved in export to importers/distributors as opposed to direct to retailers?

Exporters will need to choose between exporting to an importer/distributor who will supply to retailers or exporting directly to a retailer.

The Agricultural Trade Mission from Tonga to New Zealand in May 2009 (in conjunction with PITICNZ) provided very useful information on the structure of the New Zealand retail market for imports of produce to this market.

There are two very large nationwide supermarket companies which import directly and also buy from importers. There are also smaller supermarkets and produce shops which import directly and/or buy from importers. Independent importers also import and supply to supermarkets and retailers. Detailed information about importers and retailers is available from PITICNZ.

An important consideration is whether the importer/distributor or retailer is able and willing to store a container load of frozen product, and at what cost.

Before choosing between exporting to an importer/distributor or to a retailer, Tongan exporters need to visit New Zealand to meet and talk with a range of companies. There is further discussion on this point below in the Import and Retailing section below.

6.5 Import and Retailing in New Zealand

a) What are the requirements for mixed shipments of different root crops?

In order to sell stock faster in the current small formal market, New Zealand importers/retailers will order mixed shipments of frozen root crops. As discussed above, Tongan processor/exporters will need to be able to process different root crops to be able to supply mixed orders. The mix of root crops will depend on what the importer/retailer thinks will sell at the import-prices agreed.

b) What are the issues regarding terms of trade?

Before exporting, a Tongan exporter will need to agree terms of trade with a New Zealand importer. Terms of trade include:

- specifications about the product/s (size, weight, packaging);
- price and currency;
- payment.

Typical payment terms for exports to New Zealand are FOB or CIF in NZ$ or TOP, with payment 30 days from date of export from Tonga or clearance in New Zealand.

Terms of trade will be negotiated between the exporter and importer and will depend on what is acceptable to both.

c) What are the relative merits of targeting supermarket chains or specialty retailers provide?

There are both advantages and disadvantages for exporters in dealing with supermarket chains or specialty retailers.

One advantage of dealing with a supermarket chain is larger volume/orders, but this may not be possible for a new processor/exporter. In this case, it may be better for the exporter to deal with a specialty retailer with smaller volume/orders.

One disadvantage of dealing with a supermarket chain is the push for lower supply prices. Specialty stores usually charge higher prices than supermarkets because the specialty stores stock items that are not available in supermarkets. This allows the specialty stores to pay higher prices to suppliers.

As discussed above in the Exporting section, Tongan exporters will first need to decide whether they export to an importer/distributor or to a retailer (supermarket chain or specialty store). If they decide to export to a retailer, then the next decision will be whether to supply to a supermarket chain or specialty store.

In either case, to make the best decision, Tongan exporters need to visit and meet with a range of companies in New Zealand.

d) What are the requirements in terms of promotion and marketing?

The cost of promotion and marketing is always a problem for small export businesses. Promotion and marketing assistance to Tongan exporters is available from PITICNZ. This can include brochures and other promotional literature plus point-of-sale taste-trials.

6.6 Customer/Consumer Satisfaction

After all the work has been done to start exports and retail sales, the following and crucial question will be customer satisfaction.

> Are the customers satisfied with the taste/texture/colour etc of the frozen root crops they are buying?
> Do customers think they are getting value for the money they pay?
> Are customers buying the products again?

It is vital for the exporter to talk regularly with the importer/retailer about these questions and to take action to fix problems that customers have. Exporters that do not listen to their customers and take action will not stay in business very long.

7. Conclusion and Recommendations

7.1 Demand from New Zealand

There is an opportunity for Tonga to export frozen retail packs of root crops to the formal market in New Zealand. The current market for frozen retail packs is small but it is growing (78 tonnes in 2006 and 143 tonnes in 2008).

To date, the focus in Tonga had been on exports of frozen retail packs for sale to Pacific Island consumers in New Zealand. The research visit in October 2009 found that Asian countries are also exporting frozen retail packs of root crops for sale to Asian consumers in New Zealand.

Asian frozen root crops retail at 2 to 4 times the retail prices for equivalent products from the Pacific Islands. The Asian frozen root crops are available in a wider range of sizes and have better packaging and presentation than equivalent products from Pacific Island countries.

Pacific Island consumers have the option of buying cheaper frozen and fresh root crops in bulk through the informal market in New Zealand. This acts as a restraint on prices of frozen retail packs on sale to Pacific Island consumers in New Zealand.

To export retail packs of frozen root crops to higher paying Asian consumers in New Zealand, Tongan processors/exporters will need to develop a wider range of sizes, and improve packaging and presentation. Tongan processors/exporters will need to send samples for trialling by Asian consumers. Exporters will also need to determine whether exporting to supply Asian customers in New Zealand is profitable.

In addition, Tongan processors/exporters will need to comply with food-safety and labelling requirements from FSANZ and the importer/retailer in New Zealand.

(i) Food-safety requirements:
Processors will need to comply with the current and future requirements of the Food Safety Authority of New Zealand (FSANZ). Current requirements include specifications for labelling and sanitation of processing facilities. Future requirements will include implementation of an approved quality-control system for processing facilities, plus testing for chemical-residues. Processors will need to keep in close and regular contact with FSANZ to ensure they know about and comply with food-safety requirements.

(ii) Retailer requirements:
Processors will also need to comply with packaging/labelling requirements from the New Zealand retailers they supply to. Requirements will include, barcodes, sizes (weights) of retail-packs, packaging (loose or vacuum-packed), plus supply of mixed root crops.

7.2 Supply from Tonga

Given the small size of the New Zealand market for frozen retail pack root crops, supply will not be a problem for Tonga. The main island of Tongatapu will produce an estimated 6,330 tonnes of root crops in 2009. In 2008, Tonga exported 3,537 tonnes of root crops while New Zealand imported 143 tonnes of frozen retail-pack root crops. The New Zealand market is growing but is still small – 143 tonnes of imported frozen retail pack root crops equates to about 14 containers or just over 1 container per month.

The New Zealand market for frozen retail pack root crops is therefore not yet large enough to justify large-scale investment by Tongan processors/exporters and farmers, nor by MAFFTonga and GrowFed.

Processing capacity in Tonga to supply the small New Zealand market is not a problem. The facility in Tonga which is currently processing frozen retail pack root crops for export has capacity to process 20 tonnes per week or 1,000 tonnes per year.

The opportunity to develop exports of frozen retail packs of root crops should be left to the current processors/exporters, who are already working on developing this market for Tonga.

Further work to increase the supply of root crops should not be undertaken until exporters have established whether there is a large enough market for exports of frozen retail pack root crops.

Further work to improve farming practices and yields of root crops should be considered by MAFFTonga in view of the importance of root crops for both local consumption as well as exports. On-farm trials, in conjunction with MAFFTonga and GrowFed, are needed to develop better farming practices for growing root crops, including:

(i) determining effective fertilisers and application rates;
(ii) determining optimum planting densities;
(iii) researching the effects of leaving diseased/decaying root crops on-field after harvest;
(iv) determining effective pesticides for controlling weevils in sweet potato;
(v) importing and testing new imported varieties of root crops.

MAFFTonga, GrowFed and farmers need to develop and implement an effective system for monitoring and controlling/stopping diseases/pests of root crops, in particular, new diseases/pests.

Farmers who are growing taro, tarua taro or giant taro for export markets will need to install irrigation to ensure sufficient export yields.

7.3 Future opportunities

The New Zealand market is a good 'test-market' for exports from Tonga. If Tonga can succeed in exporting and selling frozen retail-packs of root crops to discerning Asian consumers in New Zealand, Tonga can then look further afield at markets in Australia and other countries.

7.4 Recommendations

It is recommended that the following immediate steps are taken:

a) The Growers Federation of Tonga (GrowFed) and MAFFTonga encourage small-scale development of frozen retail pack root crops by the current processors/exporters, for supply to the small but growing formal market in New Zealand.

b) Tongan processors/exporters of frozen retail pack root crops re-focus on supply to Asian consumers in New Zealand.

c) Tongan processors/exporters develop a wider range of sizes (weights) and improve packaging and presentation by using frozen retail-packs currently imported into New Zealand from Asian countries as a model.

d) Tongan processors/exporters maintain close contact with FSANZ to be aware of and comply with food-safety requirements for exports to New Zealand.

e) MAFFTonga implements a programme of on-farm trials, in conjunction with GrowFed farmers, to improve farming practices for root crops.

f) Farmers who grow taro, tarua taro or giant taro for export, install irrigation to ensure export level yields.

8. List of Attachments

1. Terms of Reference for the Frozen Root crops Study from FAO

2. Terms of Reference from PITICNZ for the Research Visit to New Zealand

3. MAFFTonga – Annual Quarantine Reports

4. MAFFTonga – Talamahu Market Reports

5. Tinopai Farm – Tongatapu Roadside-Markets Survey

6. Statistics New Zealand – Frozen Root crop Imports

ATTACHMENT 1 – FAO TOR – April 2009

Terms of Reference for a chain analysis of the potential for the export of retail sized packs of frozen root crop products from Tonga

I. Background

On the basis of a consultative workshop held in the Kingdom of Tonga on 9th and 10th March 2009, the potential for export of retail size packs of frozen root crop products was selected as an issue for further evaluation.

It was proposed that value could be added to current exports of fresh and frozen root crops by packing primary processed (frozen) products (cassava, tarua, taro, yams) into retail size bags for distribution on the New Zealand market. For this opportunity to be realised, a number of aspects were tentatively identified for further investigation:

- At the New Zealand market level, a shift from informal to formal distribution channels would be required. There is currently limited information about the formal market structure, distribution channels and of the requirements and constraints associated with using these channels.

- At the domestic purchaser level, approximately 80 percent of root crop destined for export markets is currently purchased from farmers in spot market transactions. Greater use of production contracts may be required as volumes purchased increase, to ensure that importer needs can be met.

- There is limited information about local market characteristics (volumes/prices). This information would be required to assess the level of domestic demand and the relative merits of alternative contractual arrangements deemed necessary to ensure consistent supply to purchasers.

It was suggested that a value chain approach be used to determine: (i) the relative merits of alternative distribution channels, building on a current initiative by MAFF to study the NZ market, (ii) domestic market characteristics, (iii) the need for, and potential form of, production contracts and (iv) mechanisms for improving information flows along the chain.

II. Terms of Reference for the National Consultant of the Study

Under the technical supervision of the FAO Trade and Markets Division, in close cooperation with FAO Sub-Regional Office, the National Consultant (NC) will, using the attached brief guide on "Using Value Chain Approaches in the Pacific Island Countries":

(i) Refine the objectives of the study and formulate key questions to be addressed by the study.

(ii) Collate existing secondary information (i.e. data on key production, trade and market parameters and information and analysis on the performance of chain activities, market opportunities etc) related to the product in question.

(iii) Map, using the available secondary information, and in close consultation with key national stakeholders, the chain of the selected product by:

a. Delimiting the targeted value chains
b. Identifying the main activities between the start of the production process and sale to the final customer
c. Identifying the distinct marketing channels or final outlets (for example, local market, supermarkets, food processors, importers in destination countries, retailers etc.)
d. Identifying the different types of enterprises that carry out each successive function
e. Explaining the relationships (spot market transactions, form of contracts etc) between adjacent enterprises in the chain

(iv) Use the map to:

a. further refine key questions for further analysis and to determine the analytical approach required.
b. identify where available information is not adequate to undertake this analysis

(v) Where secondary information does not exist, suggest appropriate investigation approaches and tools (for example direct observation, focus group interviews, informal discussions, survey questionnaires, etc.) through which to collect the required data.

(vi) Submit a brief interim report to FAO summarising the above activities, including proposed data collection and analytical approaches, together with estimates of associated costs. These will be further agreed and refined in consultation with FAO prior to their implementation.

(vii) Undertake field investigations to collect the required data and information on chain operators and the relationships between them (for example producers, importers, distributors, hotels/restaurants, consumers, exporters).

(viii) Undertake analysis in support of the questions detailed under (iii) with a view to formulating key recommendations on policy and support interventions in line with the objectives of the study.

(ix) Submit a full report (max 7500 words plus annexes) summarising the findings of the mapping and analytical activities, and key recommendations.

ATTACHMENT 2 – PITICNZ TOR – October 2009

MARKET INSIGHTS ON FROZEN ROOT CROPS IN NEW ZEALAND

Introduction:
The Pacific Islands Trade & Investment Commission (PITIC) NZ commissions ***Pousima Afeaki*** to undertake research and survey work for PITICs Market Insights on Frozen Root Crops. These reports are an integral part of the PITIC NZ Information Support Network for the Trade division as they are circulated to Pacific Island Trade and Industry Departments and the private sector (exporters) wishing to either expand their existing markets or seek new export marketing opportunities.

Outcomes:
The primary outcome of the research work is to produce a market brief for selected products of interest to the Pacific Islands with a focus on identifying potential opportunities for them in the New Zealand market.

You will be required to undertake the necessary literature surveys, analysis and on-site research for the PICs covering the following aspects:

- Overview of the Market;
- Statistical Analysis of Market Trends – trade data; market share etc;
- Entry requirements such as quarantine, customs, barcoding, food standards (includes labelling) and any other restrictions;
- Market analysis such as demand, pricing structure, competitors, distribution arrangements for the products as well as consumer / retailer preferences for packaging, presentation etc;
- Future trends and Specific marketing opportunities for PICs;
- Industry contacts and contact details of potential NZ importers (large and small);
- Any other relevant marketing information.

The key outcomes of the Market Insights Research work will be to:

1. Complete market overview;
2. Complete entry requirements;
3. Complete statistical analysis of market trends;
4. Compile a list of Industry contacts and contact details of potential NZ importers;
5. Complete market analysis;
6. Gather all the data collected in the above sections to structure and compile the market insights report complete with referencing and footnotes.

ATTACHMENT 3 – MAFFTONGA – QUARANTINE ANNUAL EXPORT REPORTS (2004-2008)

Quantity and Values (FOB) of Major Agricultural Export, 1996 - 2005

Commodity		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Squash	Quantity (MT)	12,955.70	11,874.80	7,258.50	17,617.00	14,700.00	16,701.00	18,144.00	20,100.00	13,030.00	13,021.00	10,614.00	5,055.00
	Price $/kg	0.42	0.50	0.50	0.50	0.60	1.29	0.57	0.65	0.71	0.64	0.52	0.53
	Value ($M)	**5.44**	**5.94**	**3.63**	**8.81**	**8.82**	**21.54**	**10.34**	**13.79**	**9.24**	**8.32**	**5.57**	**2.66**
Vanilla	Quantity (MT)	14.78	11.71	20.37	56.30	65.80	16.90	13.90	16.00	8.67	6.13	0.05	10.15
	Price $/kg	59.00	50.00	50.00	50.00	39.97	36.69	38.13	383.13	104.96	55.46	12.98	25.78
	Value ($M)	**0.87**	**0.59**	**1.02**	**2.82**	**2.63**	**0.62**	**0.53**	**6.13**	**0.91**	**0.34**	**0.00**	**0.26**
Kava	Quantity (MT)	126.65	131.51	223.30	74.10	56.50	97.60	121.00	109.00	119.67	89.99	65.68	47.24
	Price $/kg	17.00	18.00	18.00	18.00	17.70	18.03	18	5.41	7.94	4.67	14.76	17.04
	Value ($M)	**2.15**	**2.37**	**4.02**	**1.33**	**1.00**	**1.76**	**2.18**	**0.59**	**0.95**	**0.42**	**0.97**	**0.81**
Cassava	Quantity (MT)	814.44	597.99	572.10	1,174.00	566.10	433.90	568.00	875.40	1,567.84	672.10	345.64	680.38
	Price $/kg	0.45	0.50	0.50	0.50	0.49	0.51	0.50	0.43	0.61	0.70	0.63	0.56
	Value ($M)	**0.37**	**0.30**	**0.29**	**0.59**	**0.28**	**0.22**	**0.28**	**0.38**	**0.96**	**0.47**	**0.22**	**0.38**
Taro-tarua	Quantity (MT)	218.95	186.14	44.79	62.20	771.10	851.40	415.00	234.60	288.11	244.37	207.90	626.11
	Price $/kg	0.70	0.75	0.75	0.75	0.70	0.70	0.70	0.55	0.87	0.49	0.90	0.91
	Value ($M)	**0.15**	**0.14**	**0.03**	**0.05**	**0.54**	**0.60**	**0.29**	**0.13**	**0.25**	**0.12**	**0.19**	**0.57**
Swamp-taro	Quantity (MT)	52.25	131.28	26.72	24.00	373.40	1,158.70	463.00	202.40	283.78	111.98	181.93	73.13
	Price $/kg	1.00	1.00	1.00	1.00	1.39	1.38	1.38	0.69	0.70	1.70	0.94	1.12
	Value ($M)	**0.05**	**0.13**	**0.03**	**0.02**	**0.52**	**1.60**	**0.64**	**0.14**	**0.20**	**0.19**	**0.17**	**0.08**
Yams	Quantity (MT)	551.42	619.80	330.73	341.64	523.50	992.50	525.00	918.50	1,467.35	1,011.40	572.98	1,272.33
	Price $/kg	0.90	1.00	1.00	1.00	1.20	1.21	1.20	0.94	0.72	0.60	1.05	1.79
	Value ($M)	**0.50**	**0.62**	**0.33**	**0.34**	**0.63**	**1.20**	**0.63**	**0.86**	**1.06**	**0.61**	**0.60**	**2.28**
Giant taro	Quantity (MT)	147.18	64.95	13.45	26.60	451.90	576.70	126.00	92.00	139.38	89.30	127.37	149.56

	Price $/kg	0.50	0.50	0.50	0.50	0.44	0.45	0.45	0.43	0.79	0.67	1.29	0.97
	Value ($M)	**0.07**	**0.03**	**0.01**	**0.01**	**0.20**	**0.26**	**0.06**	**0.04**	**0.11**	**0.06**	**0.16**	**0.14**
Green Coconuts	Quantity (MT)	39.63	33.58	39.53	34.38	26.10	88.50	89.00	214.80	82.63	50.33	27.51	2.43
	Price $/kg	0.50	0.50	0.50	0.50	1.15	1.02	1.10	1.16	0.85	0.20	0.60	1.70
	Value ($M)	**0.02**	**0.02**	**0.02**	**0.02**	**0.03**	**0.09**	**0.10**	**0.25**	**0.07**	**0.01**	**0.02**	**0.00**
Mature Coconuts	Quantity (MT)	854.75	847.51	924.14	465.24	633.40	636.90	1,626.00	570.90	630.50	531.25	86.53	282.17
	Price $/kg	0.22	0.22	0.22	0.22	0.51	0.50	0.50	0.35	0.49	0.21	1.40	1.47
	Value ($M)	**0.19**	**0.19**	**0.20**	**0.10**	**0.32**	**0.32**	**0.81**	**0.20**	**0.31**	**0.11**	**0.12**	**0.41**
Watermelon	Quantity (MT)	211.74	66.68	105.89	80.14	65.80	136.50	52.00	82.60	113.39	15.82	27.72	55.95
	Price $/kg	0.60	0.50	0.50	0.50	0.91	0.88	0.90	0.48	1.06	1.26	1.34	0.81
	Value ($M)	**0.13**	**0.03**	**0.05**	**0.04**	**0.06**	**0.12**	**0.05**	**0.04**	**0.12**	**0.02**	**0.04**	**0.05**
Taro leaves	Quantity (MT)	19.74	28.43	2.65	6.75	12.30	5.80	19.00	27.60	35.38	45.33	13.23	20.07
	Price $/kg	3.50	3.50	3.50	3.50	3.50	3.50	3.50	2.90	25.44	24.27	1.93	2.51
	Value ($M)	**0.07**	**0.10**	**0.01**	**0.02**	**0.04**	**0.02**	**0.07**	**0.08**	**0.90**	**1.10**	**0.03**	**0.05**
Totals	Quantity (MT)	16,007.23	14,594.38	9,562.17	19,962.35	18,245.90	21,696.40	22,161.90	23,443.80	17,766.70	15,889.00	12,270.53	8,274.51
	Value ($M)	**10.01**	**10.45**	**9.64**	**14.15**	**15.07**	**28.35**	**15.97**	**22.63**	**15.08**	**11.77**	**8.08**	**7.69**

Statistics Department. (Foreign Trade report 1996 - 2007)

Exports of Agricultural products (include monthly exports) from Tonga in 2008

Exported Agricultural Commodity [fresh/frozen fruit & vegetables; processed & semi processed products]													**Total export volume (kg)**
Plant products (fruits & vegetables)	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	
Cassava/'manioke'	81,420	61,200	78,893	75,181	90,559	71,086	86,071	83,322	119,961	85,346	68,726	57,527	959,292
Giant Taro/`kape' [*Alocasia*]	48,404	54,999	15,074	20,534	8,515	15,184	18,931	38,144	55,539	100,302	111,372	44,970	531,968
Swamp Taro/`taro tonga` [*C. esculenta*]	35,162	38,142	28,335	27,014	93,710	64,086	76,238	36,930	34,731	40,799	59,971	37,084	572,203
Taro Tarua/`taro futuna-tea' (*Xanthosoma*]	63,243	117,624	86,411	55,458	70,402	26,809	35,311	51,551	36,529	84,119	57,389	39,981	724,827
Yam/'Ufi' [*D. alata*]	28,983	80,607	92,839	137,290	92,131	68,938	80,190	45,857	52,708	33,520	9,339	21,790	744,194
Sweet Yam/'Ufi Lei'	-	-	-	-	18	91	609	355	33	16	-	5	1,126
Japanese Taro [*C. esculenta* var.]	-	-	-	2,710	-	-	-	-	140	230	199	98	3,377
mixed Root Crops	-	-	-	-	-	-	-	-	400	440	-	-	840
Sweet Potato	-	-	-	-	-	-	-	-	-	-	23	-	23
Total wt. root crops exported per month (kg)	257,212	352,572	301,552	318,187	355,335	246,194	297,350	256,159	300,041	344,772	307,019	201,455	3,537,850
Fresh fruits & leaves													
Squash-pumpkin [Butternut]	-	-	-	-	-	-	-	-	-	264,000	264,000	105,600	633,600
Squash-pumpkin [Buttercup] - Normal grades	-	-	-	-	-	-	-	-	-	1,676,060	-	-	1,676,060
Squash-pumpkin [Buttercup] - Baby grades	-	-	-	-	-		-	-	-	-	557,300	-	557,300
Squash-pumpkin [Buttercup] - Process grade	-	-	-	-	-	-	-	-	-	-	243,640	-	243,640
total all Squash-pumpkin [Buttercup]													2,477,000
Taro Tarua Leaves	4,425	2,085	1,643	3,549	5,935	6,796	9,053	6,337	7,625	9,170	5,715	4,042	66,376
Swamp Taro Leaves	-	-	34	-	-	111	-	-	-	-	-	-	135
Avocado	-	-	103	-	-	-	-	-	-	-	-	-	103

Cassava leaves	-	29	-	1,080	-	2,798	2,000	1,211	-	4,758	684	40	12,600
Watermelon	5,600	2,200	8,185	1,950	14,225	2,525	2,000	875	-	3,790	-	40	41,390
Cabbage (Head/English)	-	-	-	-	-	-	250	-	-	-	-	-	250
Tomato	-	-	-	-	-	-	190	150	-	-	100	-	440
Pineapple	-	-	-	-	-	-	-	-	-	-	200	-	200
Banana [Plaintain]	-	-	-	-	-	-	-	-	-	15	-	-	15
Total wt. fresh fruits and leaves per month (kg)	10025	4314	9965	6579	20160	12230	13493	8573	7625	1957793	1071639	109722	5709109
Kava product													
Kava Powder	9,568	10,805	7,592	11,353	8,738	7,396	7,874	10,240	17,951	10,316	14,484	10,254	126,571
Kava Chips & Roots (dried)	1,043	1,260	1,682	420	210	-	-	-	-	150	102	2	4,868
Total wt. kava product per month (kg)	10,611	12,065	9,274	11,773	8,948	7,396	7,874	10,240	17,951	10,466	14,586	10,256	131,439
Coconuts													
Brown Coconut (nuts only)	-	76,432	85,086	29,848	75,106	68,607	48,987	47,217	43,212	82,276	130,816	74,002	761,589
Brown Coconut(with husk)	-	-	9	550	-	-	1	-	-	2	-	13,960	14,521
Green Coconut (nuts only)	7,734	4,802	6,675	13,486	3,581	2,975	2,869	3,856	4,051	3,444	3,373	5,158	62,003
Green Coconut (with husk)	232	16,650	20	-	-	-	-	-	4	7,000	3,538	-	27,444
Total wt. coconuts per month (kg)	7966	97884	91790	43884	78687	71582	51857	51073	47267	92722	137727	93120	865557
Vanilla													
cured vanilla beans	1,317	0	65	5	205	813	9	7	1,666	1	28	5	4,121
Leaves & roots & juice,													
for herbal/medicinal/customary purposes													
Nonu (fresh leaves)	1	1	2	-	2	1	-	-	0	2	1	21	32
Nonu (Juices_concentrates)	-	1,020	1,278	20	36	478	-	48	-	-	-	-	2,880
All other medicinal leaves	36	41	27	25	2	2	35	46	10	1	-	0	225

Tongan medicine													
Ginger_Tumeric/'Angoango'	5	0	2	1	2	1	-	7	0	0	0	1	19
Maile leaves, for Leis	-	-	-	-	15	-	-	-	-	-	-	-	15
Total wt.leaves, roots, juices	42	1062	1309	46	57	482	35	101	10	3	1	22	3171
other products													
Tissue cultures_plantlets [Calla Lily spp.] Calla Lillies (Tissue Culture)	-	-	60	192	-	-	-	-	-	-	-	-	252
Coffee Bean (dried & roasted)	-	-	-	255	-	-	-	-	-	-	-	-	255
Handicrafts_carvings/mats/tapas etc.	1,370	500	170	218	75	312	500	1,192	710	782	574	-	6,403
Sandal-wood	-	-	15,994	7,669	-	-	4,824	-	-	-	-	-	28,486
Total wt. other products per month (kg)	1,370	500	16,224	8,334	75	312	5,324	1,192	710	782	574	0	35,396
Total Agricultural Export per month (kg)	287,226	468,397	430,114	388,803	463,262	338,196	375,933	327,338	373,604	2,406,538	1,531,546	414,575	10,282,522

Source: Quarantine Department. 2008 Annual Report.

ATTACHMENT 4 – MAFFTONGA – TALAMAHU MARKET REPORTS (2005-2009)

QUANTITY AND VALUE OF MAJOR CROPS AT TALAMAHU MARKET FOR 2004 - 1st Quarter 2009.

Commodities		2004				2005				2006				2007				2008				2009
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
YAM (Early)	Quantity (MT)	26.60	57.04	45.20	14.57	19.64	55.22	47.63	11.24	31.84	45.64	9.24	11.93	6.50	11.18	9.37	9.49	10.03	4.75	2.87	9.41	8.92
Basket	Ave.price/CTU	72.04	54.25	64.92	81.70	82.27	54.35	70.99	79.50	74.97	56.52	71.24	64.00	57.05	49.56	52.36	67.92	48.96	32.71	62.46	56.50	53.47
	Ave.price/KG	2.82	2.04	2.44	3.34	3.42	2.09	2.42	3.43	3.46	2.18	3.98	4.31	2.92	2.10	2.39	3.38	2.46	2.33	3.59	2.93	2.61
YAM (Late)	Quantity (MT)	0.00	20.12	18.95	4.36	0.79	24.34	18.45	5.52	1.86	22.03	14.07	0.63	0.00	1.05	5.55	1.62	2.14	1.14	1.43	1.74	4.00
Basket	Ave.price/CTU	0.00	27.36	28.38	32.70	41.67	29.55	32.60	40.28	34.11	31.33	35.22	20.42	0.00	32.82	30.49	21.74	13.13	29.93	34.38	33.75	11.39
	Ave.price/KG	0.00	1.23	1.34	1.52	2.25	1.32	1.40	2.09	2.10	1.44	2.05	2.17	0.00	1.49	1.74	1.46	1.19	1.80	1.98	2.49	1.38
GIANT TARO	Quantity (MT)	3.54	3.85	0.63	8.39	19.39	5.82	2.94	9.22	10.69	4.30	7.79	12.39	0.80	0.00	1.40	11.75	2.12	0.38	2.17	6.89	3.43
each	Ave.price/CTU	13.50	14.68	10.02	13.39	14.64	12.10	10.86	12.80	12.84	11.67	15.32	10.60	3.72	0.00	13.92	12.47	7.86	9.54	13.25	13.28	8.78
	Ave.price/KG	1.11	2.09	0.88	0.94	1.12	0.99	0.81	0.82	0.95	1.07	1.19	0.90	1.21	0.00	0.92	0.75	0.57	0.88	0.74	0.76	0.82
TARO TARUA	Quantity (MT)	16.32	24.96	13.81	21.95	14.07	29.74	13.78	25.15	26.93	36.12	77.24	29.34	8.91	18.46	27.41	38.66	30.65	21.18	20.04	24.09	36.79
Basket	Ave.price/CTU	13.55	13.15	13.61	12.45	12.51	13.11	14.18	16.14	13.23	15.17	16.58	10.51	10.75	10.23	10.34	10.33	9.36	8.11	10.89	9.33	9.47
	Ave.price/KG	1.08	0.78	0.78	0.73	0.79	0.78	1.09	1.06	0.75	0.95	1.15	0.86	0.75	0.64	0.71	0.65	0.65	0.63	0.69	0.66	0.82
SWAMP TARO	Quantity (MT)	3.13	11.39	5.47	14.58	6.34	20.76	5.38	15.07	6.40	16.47	8.04	9.42	1.36	10.11	15.98	8.05	13.31	18.65	9.14	12.41	12.28
Bundle	Ave.price/CTU	14.77	11.57	13.29	13.23	15.72	14.89	16.26	15.81	14.29	16.47	13.85	12.81	13.41	12.24	13.23	17.75	13.80	10.64	11.74	14.51	11.50
	Ave.price/KG	1.10	0.97	0.99	1.16	1.70	1.20	1.41	1.18	1.34	1.33	1.97	1.33	1.30	1.14	1.10	1.35	1.19	0.93	1.11	1.17	0.81
SWEET POTATO	Quantity (MT)	50.25	34.57	38.53	25.18	70.40	39.20	41.36	29.15	82.19	36.02	53.71	32.01	9.97	17.79	24.39	20.54	4.95	9.15	4.59	9.94	7.25
Basket	Ave.price/CTU	11.85	12.02	12.47	13.33	15.55	15.37	16.49	18.46	17.81	16.31	16.46	13.12	10.16	9.89	13.00	19.08	16.87	13.93	16.78	16.01	11.72
	Ave.price/KG	0.69	0.62	0.67	0.80	0.88	0.84	0.97	1.02	0.97	0.99	1.34	0.92	0.60	0.53	0.79	1.06	0.96	0.96	1.31	1.01	0.68
CASSAVA	Quantity (MT)	47.89	52.24	175.09	64.97	134.23	56.49	172.22	78.42	107.32	60.72	100.94	18.24	6.88	27.67	48.08	49.76	18.42	21.89	17.20	24.35	16.00
Basket	Ave.price/CTU	9.48	7.96	7.04	6.51	6.94	6.52	7.71	7.96	8.56	9.44	10.13	7.88	9.33	9.21	8.03	9.33	8.88	8.04	8.92	9.50	8.89
	Ave.price/KG	0.48	0.38	0.35	0.34	0.36	0.31	0.40	0.41	0.43	0.54	0.65	0.69	0.56	0.48	0.46	0.46	0.39	0.47	0.48	0.52	0.52
POTATO	Quantity (MT)	0.90	1.68	0.11	0.26	0.25	0.42	0.07	0.31	0.53	0.35	1.00	0.85	0.04	0.43	0.33	0.54	0.55	0.07	0.60	0.52	0.65
p/Bag	Ave.price/CTU	4.10	4.27	3.66	3.83	3.66	4.35	4.33	3.66	4.18	4.71	3.87	3.60	3.42	4.65	4.84	4.69	4.98	4.67	3.83	3.96	4.33

	Ave.price/KG	2.70	2.61	2.24	2.01	2.08	2.84	2.32	1.87	2.52	2.82	2.19	2.06	2.40	3.13	3.07	2.79	3.45	3.33	2.82	2.51	2.67
BANANA	Quantity (MT)	10.64	7.02	6.74	5.96	15.06	10.42	7.15	6.84	9.73	5.59	4.00	2.14	1.99	2.58	3.09	2.98	3.30	1.99	1.82	1.13	3.59
Bunch	Ave.price/CTU	11.42	8.80	9.20	8.54	8.46	7.44	6.07	6.38	9.50	8.15	6.35	6.34	7.83	7.49	6.31	7.38	7.99	6.32	6.21	4.96	7.11
	Ave.price/KG	0.65	0.52	0.68	0.66	0.54	0.46	0.62	0.48	0.58	0.80	1.04	0.65	0.47	0.57	0.51	0.54	0.53	0.54	0.64	0.46	0.44
PLANTAIN	Quantity (MT)	10.44	5.70	2.59	2.42	16.01	6.47	2.78	2.58	11.86	3.91	3.24	1.77	4.32	3.16	3.15	4.49	4.45	3.14	1.91	2.14	4.16
Bunch	Ave.price/CTU	13.47	11.17	11.49	16.78	16.65	14.24	11.19	14.02	17.32	13.45	6.80	12.12	12.40	11.51	9.64	10.71	10.80	11.99	11.70	13.42	11.19
	Ave.price/KG	0.88	0.64	0.89	1.07	0.84	0.88	1.14	1.17	0.96	1.22	1.67	1.45	0.82	0.73	0.93	0.90	0.87	1.01	1.07	1.14	0.90
PATA	Quantity (MT)	2.34	2.18	1.72	2.94	5.57	5.42	1.44	2.54	3.78	2.84	0.00	0.00	0.00	2.34	0.00	0.00	2.09	1.13	1.14	0.89	4.68
Bunch	Ave.price/CTU	5.39	0.00	4.17	4.59	4.68	4.63	4.95	4.75	3.75	3.52	0.00	0.00	0.00	5.31	0.00	0.00	0.95	0.88	0.92	0.89	3.42
	Ave.price/KG	1.23	0.00	1.01	0.38	0.43	0.31	0.56	0.52	0.40	0.39	0.00	0.00	0.00	0.56	0.00	0.00	0.38	0.41	0.43	0.44	0.32
RIPE BANANA	Quantity (MT)	2.50	1.62	2.21	1.31	0.46	1.24	2.03	1.09	2.27	1.55	1.03	0.78	1.15	1.38	2.18	3.61	1.81	0.95	1.28	0.97	2.33
Hand	Ave.price/CTU	3.93	2.91	2.98	3.26	2.58	3.32	4.02	3.39	3.08	3.07	2.43	3.59	3.53	3.44	3.47	3.48	3.78	3.37	2.79	3.55	3.09
	Ave.price/KG	2.91	2.33	2.20	2.47	2.98	3.28	3.43	2.72	1.90	2.07	4.17	4.03	2.27	2.48	3.12	3.01	2.45	2.62	2.82	2.88	1.77
PAWPAW	Quantity (MT)	2.95	1.68	1.68	1.76	0.82	1.65	2.64	1.91	1.40	1.33	1.88	2.38	1.50	1.51	2.28	2.28	0.79	0.89	0.94	0.59	0.75
Piece	Ave.price/CTU	2.23	1.66	1.61	1.33	1.56	1.94	1.70	1.77	2.04	2.35	1.68	1.60	1.66	1.84	2.56	1.99	1.42	2.14	1.77	1.71	2.01
	Ave.price/KG	1.76	1.38	1.23	1.02	1.17	1.61	1.53	1.48	1.57	2.04	2.12	1.51	1.76	1.52	2.07	1.69	1.53	1.87	1.71	1.52	1.46
PINEAPPLE	Quantity (MT)	3.91	1.34	0.71	1.87	1.53	0.89	0.87	2.32	0.84	0.95	1.09	5.99	1.64	2.63	4.14	15.20	2.31	1.29	1.43	10.02	3.11
Piece	Ave.price/CTU	3.56	3.84	4.88	4.23	2.99	4.09	5.41	3.64	3.88	5.81	5.85	3.35	1.50	2.52	1.53	3.37	3.78	5.81	4.03	3.45	2.81
	Ave.price/KG	3.49	3.60	5.66	3.52	3.41	4.28	5.33	3.44	5.17	5.95	5.25	3.90	2.05	6.54	5.40	3.39	6.08	5.44	5.97	3.93	4.20
AVOCADO	Quantity (MT)	0.08	0.03	0.01	0.05	0.10	0.26	0.00	0.06	0.02	0.10	0.00	0.00	0.49	0.06	0.05	0.00	0.51	0.06	0.05	0.05	0.46
Piece	Ave.price/CTU	1.13	0.93	1.07	1.09	1.45	1.33	0.00	2.00	1.28	1.68	0.00	0.00	0.80	0.65	0.63	1.53	1.74	0.98	0.50	0.45	1.55
	Ave.price/KG	2.43	2.30	3.54	3.17	2.58	1.37	0.00	2.28	2.25	2.25	0.00	0.00	4.89	4.44	4.25	3.37	3.13	3.30	2.07	4.44	2.36
ORANGE	Quantity (MT)	0.44	4.26	2.00	0.00	0.23	4.79	1.51	0.00	0.03	3.47	0.00	0.00	0.60	4.32	0.72	0.00	0.25	0.52	0.24	0.00	0.25
Heap	Ave.price/CTU	1.00	1.88	2.00	0.00	2.00	1.88	2.00	0.00	2.00	1.88	0.00	0.00	0.50	1.50	1.50	0.00	0.75	2.63	0.75	0.00	2.56
	Ave.price/KG	0.79	1.38	2.05	0.00	1.70	1.52	1.76	0.00	2.00	2.20	0.00	0.00	0.92	2.30	2.68	0.00	2.32	4.19	2.55	0.00	2.31
LEMON	Quantity (MT)	0.10	0.22	0.49	0.04	0.06	0.20	0.56	0.05	0.03	0.15	0.24	0.00	0.34	0.95	0.48	1.42	0.22	0.21	0.26	0.17	0.26
Heap	Ave.price/CTU	1.88	1.78	2.00	2.00	2.00	1.97	2.00	2.00	2.00	2.00	1.47	0.50	0.83	1.50	2.00	1.67	1.58	3.00	2.63	1.75	2.16
	Ave.price/KG	3.38	3.05	2.08	4.31	3.45	2.36	3.07	5.12	3.23	3.47	3.53	5.38	1.79	2.18	2.88	5.40	6.33	4.69	7.32	7.98	5.00
COLA	Quantity (MT)	0.91	0.98	0.87	0.25	0.11	0.44	0.66	0.08	0.36	0.26	0.17	0.38	0.89	0.58	0.70	1.28	0.35	0.30	0.37	0.13	0.48
Heap	Ave.price/CTU	2.00	1.92	2.00	2.00	2.00	1.98	2.00	2.53	1.98	2.00	1.12	1.17	1.50	1.83	1.50	2.00	2.48	2.93	3.00	2.49	2.66
	Ave.price/KG	3.15	1.79	1.58	5.31	3.29	2.06	2.32	8.99	3.92	3.47	4.00	7.07	2.08	1.85	3.45	6.43	4.43	4.94	7.56	11.41	2.75

MANGO	Quantity (MT)	2.08	1.47	0.00	0.46	37.27	0.27	1.88	1.21	0.04	0.11	0.00	0.45	0.83	0.00	0.00	0.30	0.10	0.17	0.11	0.36	0.10
Heap	Ave.price/CTU	2.00	2.00	0.00	2.00	1.93	1.88	2.00	2.00	2.00	2.00	0.00	0.75	1.47	0.50	0.00	1.50	0.50	0.50	0.50	2.22	1.75
	Ave.price/KG	2.38	1.74	0.00	1.79	0.71	1.18	1.69	1.82	1.81	1.72	0.00	2.08	2.34	0.87	0.00	2.72	1.11	0.83	2.11	2.83	2.94
WATERMELON	Quantity (MT)	83.95	65.19	41.14	74.62	54.78	72.18	57.05	227.00	49.37	77.96	44.00	38.74	26.69	65.68	70.87	281.38	121.28	107.16	98.54	206.19	152.49
Piece	Ave.price/CTU	6.93	5.23	6.35	8.10	4.98	7.23	8.76	8.98	12.90	6.25	6.56	3.56	5.75	3.96	6.24	6.81	6.16	5.45	4.32	4.89	3.91
	Ave.price/KG	0.96	0.77	1.30	0.95	0.82	1.11	1.44	0.80	1.46	0.92	1.38	0.90	1.18	1.01	1.30	1.00	1.18	1.14	1.14	0.86	1.17
BREADFRUIT	Quantity (MT)	3.43	8.31	2.42	1.09	1.49	12.58	0.73	1.36	5.93	12.76	0.84	0.81	0.52	3.83	0.00	0.00	1.30	0.41	0.47	0.43	2.19
Basket	Ave.price/CTU	9.06	6.07	9.50	9.83	5.00	6.92	12.00	9.33	8.75	9.58	10.20	11.25	2.33	6.32	0.00	10.00	8.73	5.67	8.92	3.75	6.19
	Ave.price/KG	0.67	0.32	0.60	0.72	0.43	0.46	0.92	0.63	0.62	0.68	0.80	0.88	0.18	0.45	0.00	0.69	0.66	0.61	0.76	0.70	0.50
MATURE COCONUT	Quantity (MT)	28.38	38.51	37.96	43.39	28.93	47.60	46.91	35.89	27.64	51.04	59.76	34.04	11.94	25.25	26.26	29.28	28.78	19.54	15.89	16.30	30.30
Basket	Ave.price/CTU	5.26	4.97	4.63	4.72	5.00	4.97	5.00	5.18	5.15	5.21	4.22	3.60	5.21	5.42	4.47	4.92	4.99	4.58	4.58	4.54	4.56
	Ave.price/KG	0.44	0.32	0.27	0.30	0.35	0.31	0.31	0.39	0.38	0.32	0.33	0.41	0.45	0.39	0.30	0.34	0.38	0.33	0.34	0.30	0.32
GREEN COCONUT	Quantity (MT)	9.55	5.74	5.40	3.96	4.84	4.69	8.69	22.71	22.60	5.14	6.23	14.85	8.46	13.89	13.88	17.55	12.63	10.91	11.87	8.15	11.63
Piece	Ave.price/CTU	0.98	0.96	0.96	1.03	1.01	0.99	1.18	1.10	1.13	1.15	2.00	1.02	1.08	1.07	1.20	1.24	1.31	1.21	1.05	1.13	1.35
	Ave.price/KG	1.01	0.96	0.92	0.99	0.99	0.98	1.11	1.03	1.09	1.13	1.03	1.27	1.03	1.06	1.10	1.19	0.99	1.04	1.03	1.13	1.14
TOMATO	Quantity (MT)	14.00	4.22	12.23	14.41	10.87	3.02	8.77	16.55	5.28	2.23	23.31	16.04	3.84	6.50	7.68	7.62	4.55	3.97	6.19	5.85	5.36
Heap	Ave.price/CTU	2.00	2.00	1.99	1.97	2.00	2.00	2.00	1.88	2.00	2.08	2.00	1.83	1.82	2.00	2.00	2.00	2.77	3.00	2.48	2.44	2.97
	Ave.price/KG	2.40	3.94	2.54	1.39	4.33	3.90	2.29	1.22	4.37	6.15	1.79	1.03	2.67	6.64	3.83	1.83	4.37	6.12	2.76	1.22	7.81
BEANS	Quantity (MT)	1.42	1.66	4.96	3.65	0.80	1.00	2.60	4.67	1.03	1.01	2.51	1.70	0.83	1.05	0.66	1.14	0.62	0.68	0.64	0.54	0.64
Heap	Ave.price/CTU	2.00	2.00	2.00	1.96	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.82	1.50	2.00	1.68	2.00	2.83	3.00	2.46	2.75	2.75
	Ave.price/KG	7.53	6.89	4.19	6.12	6.59	5.82	4.47	4.41	9.69	7.29	3.30	4.10	4.93	6.52	6.40	4.06	7.62	7.81	6.91	5.82	10.79
CAPSICUM	Quantity (MT)	3.69	2.34	1.75	1.09	1.60	1.60	1.27	1.72	3.15	1.51	7.92	4.58	1.27	1.35	1.28	1.16	1.13	1.07	1.25	1.48	1.18
Heap	Ave.price/CTU	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.99	1.83	1.83	2.01	2.00	2.00	2.78	3.00	2.51	2.71	2.96
	Ave.price/KG	4.69	5.40	6.28	6.59	5.40	6.51	6.34	4.05	7.06	7.66	5.22	4.21	6.05	10.44	8.25	6.69	12.30	11.53	8.42	6.90	12.94
CARROT	Quantity (MT)	8.36	1.67	5.07	2.65	3.41	1.01	3.39	3.15	5.43	1.25	7.69	8.22	2.28	2.19	2.79	1.49	1.46	1.21	2.33	3.15	1.64
Heap	Ave.price/CTU	1.97	1.96	1.97	1.94	1.92	2.00	1.97	1.93	2.00	2.00	1.99	1.83	1.83	2.00	2.00	2.00	2.83	2.97	2.48	2.42	2.96
	Ave.price/KG	1.83	5.59	2.77	1.95	4.07	5.48	4.01	1.85	3.39	4.70	2.75	1.23	1.66	4.99	3.72	3.18	6.16	7.59	4.54	1.82	5.18
ONION (bulb)	Quantity (MT)	1.37	1.75	1.87	0.69	0.39	1.07	1.36	0.42	0.28	1.32	0.40	0.30	0.14	0.38	0.61	0.37	0.34	0.36	0.47	0.30	0.31
p/Bag	Ave.price/CTU	2.00	2.00	2.00	1.92	2.00	2.00	2.00	2.00	2.00	2.00	1.99	1.83	1.48	2.00	2.00	2.00	2.69	2.84	2.43	2.75	2.98

	Ave.price/KG	3.68	3.42	2.42	2.18	2.59	3.66	3.00	2.88	3.46	2.54	2.93	3.80	3.24	4.20	3.89	3.73	3.97	4.09	4.51	5.17	4.67
ONION (spring)	Quantity (MT)	0.19	0.31	0.41	0.26	0.05	0.20	0.24	0.25	0.06	0.09	0.08	0.22	0.18	0.48	0.36	0.12	0.15	0.15	0.52	0.31	0.16
Bundle	Ave.price/CTU	1.92	2.00	1.96	2.00	2.00	1.97	1.92	1.92	2.00	2.00	2.00	1.83	1.50	1.83	2.00	2.00	2.80	2.75	2.50	2.72	2.94
	Ave.price/KG	11.42	13.65	6.15	7.17	14.03	9.31	8.54	7.78	20.79	18.76	12.90	9.74	9.00	10.99	11.63	10.42	23.15	41.53	30.25	15.23	25.74
LETTUCE	Quantity (MT)	0.43	0.70	1.39	1.24	0.07	0.59	1.42	1.50	1.41	0.54	4.50	2.69	0.77	1.76	2.74	1.60	1.13	1.43	2.07	1.45	1.11
Piece	Ave.price/CTU	2.01	2.00	1.16	1.53	2.25	2.06	1.60	1.57	2.49	2.18	1.81	1.09	1.30	1.78	1.86	1.88	2.12	2.24	1.41	1.75	2.86
	Ave.price/KG	18.96	14.32	3.92	5.15	20.58	11.39	4.00	4.58	16.43	13.34	3.53	2.54	9.93	10.81	5.84	5.10	11.51	13.06	6.40	6.59	26.80
HEAD CABBAGE	Quantity (MT)	5.86	5.73	13.80	13.57	2.13	7.45	21.46	18.08	2.00	7.30	18.54	10.17	1.62	6.63	10.08	3.69	4.45	5.98	5.69	4.51	5.06
Piece	Ave.price/CTU	3.48	2.95	1.55	1.97	3.13	2.80	2.30	2.68	4.05	3.77	1.62	1.55	2.09	2.48	2.67	2.91	3.63	3.66	2.14	1.86	3.56
	Ave.price/KG	2.76	4.35	0.95	1.41	5.00	3.00	1.48	1.38	5.25	4.51	0.85	0.75	4.48	3.06	2.45	2.32	4.11	6.23	1.87	1.25	4.20
CH/CABBAGE	Quantity (MT)	2.60	6.29	10.95	4.52	0.20	3.30	10.79	7.71	1.14	3.63	7.20	0.75	0.52	3.51	4.57	3.30	1.93	1.80	2.11	0.99	0.88
Piece	Ave.price/CTU	1.35	1.73	1.58	1.22	1.42	1.68	1.94	1.57	2.31	1.65	1.79	0.57	0.47	1.41	1.27	1.42	1.83	1.55	1.38	0.67	0.31
	Ave.price/KG	2.33	2.10	1.07	2.21	4.16	2.47	1.18	1.56	3.66	2.33	1.07	0.83	2.90	3.05	1.51	2.10	4.30	3.46	1.62	1.18	6.71
CUCUMBER	Quantity (MT)	5.40	2.89	5.22	1.89	1.54	3.33	4.29	3.58	3.32	3.89	7.08	3.12	2.07	4.86	4.06	5.55	6.06	2.75	4.09	3.02	7.16
Heap	Ave.price/CTU	2.00	1.83	1.77	1.91	1.95	2.00	2.00	1.97	2.00	2.34	2.00	1.83	1.82	1.83	2.00	2.00	2.78	3.00	2.50	2.68	2.96
	Ave.price/KG	1.71	2.08	1.47	1.90	2.10	1.74	2.25	1.10	1.92	2.11	1.49	1.54	2.07	1.66	1.82	1.34	1.29	1.59	1.34	1.29	1.87
PUMPKIN	Quantity (MT)	0.00	0.00	0.00	0.26	0.05	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Piece	Ave.price/CTU	0.00	0.00	0.00	1.95	5.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94	0.00	0.00	0.00	0.00	0.00
	Ave.price/KG	0.00	0.00	0.00	1.01	1.82	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42	0.00	0.00	0.00	0.00	0.00
EGGPLANT	Quantity (MT)	0.07	0.39	0.09	0.20	0.08	0.54	0.03	0.13	0.02	0.17	0.06	0.14	0.00	0.00	0.17	0.02	0.33	0.11	0.19	0.07	0.41
Heap	Ave.price/CTU	1.94	1.83	1.52	1.57	2.00	2.00	1.75	2.00	2.00	2.01	1.53	1.00	0.00	0.00	1.17	1.25	2.71	3.00	2.50	2.75	3.00
	Ave.price/KG	2.72	4.47	1.92	1.53	2.50	2.28	2.67	1.89	3.40	4.90	3.75	1.03	0.00	0.00	4.67	4.38	3.51	3.63	4.57	2.95	3.93
ZUCCHINI	Quantity (MT)	0.01	0.04	0.06	0.11	0.00	0.02	0.05	0.06	0.01	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Piece	Ave.price/CTU	1.45	1.63	1.58	1.63	0.00	2.00	1.83	2.00	1.67	2.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ave.price/KG	2.72	1.91	1.42	2.10	0.00	1.69	2.07	1.07	2.31	3.69	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LU (taro leaves)	Quantity (MT)	4.81	3.77	7.98	4.88	5.78	3.37	4.93	8.18	4.31	3.71	5.17	5.02	1.31	1.92	2.19	2.44	1.85	1.08	1.31	1.28	1.88
Bundle	Ave.price/CTU	1.83	1.58	1.33	1.71	1.96	1.95	1.92	1.94	1.83	1.94	1.90	1.57	1.50	1.70	1.89	1.88	2.03	1.64	1.46	1.33	1.78
	Ave.price/KG	3.84	2.56	2.28	3.58	3.45	3.36	3.49	2.69	3.07	3.15	2.87	2.10	2.59	3.07	3.26	2.46	2.52	2.64	2.99	2.48	2.78
PELE	Quantity (MT)	6.48	4.78	4.02	1.88	5.21	3.05	2.69	2.05	3.05	2.76	2.06	1.03	0.54	1.18	1.31	1.25	0.79	0.56	0.75	0.67	1.07
Bundle	Ave.price/CTU	1.47	1.45	1.71	1.75	1.75	1.70	2.03	2.01	1.92	1.89	1.98	1.79	1.83	1.92	2.00	2.00	2.31	1.99	1.81	2.09	2.15

	Ave.price/KG	1.14	1.14	1.33	1.49	1.47	1.56	1.73	1.44	1.56	1.57	1.70	1.47	1.43	1.08	1.24	1.38	1.48	1.72	1.75	1.79	1.23
CORN	Quantity (MT)	0.04	0.23	0.06	0.26	0.11	0.16	0.07	0.24	0.03	0.09	0.01	0.20	0.00	0.09	0.07	0.23	0.31	0.11	0.06	0.19	0.41
Heap	Ave.price/CTU	1.44	1.10	2.00	1.83	1.67	1.82	1.75	2.00	2.00	1.33	0.80	1.00	0.00	1.00	0.50	0.83	1.06	0.75	0.63	1.13	1.50
	Ave.price/KG	1.97	1.41	2.27	1.66	1.88	1.75	2.13	2.12	2.27	1.30	2.53	2.05	0.00	1.62	2.23	2.52	2.54	3.78	2.94	2.26	1.98
GINGER	Quantity (MT)	0.00	0.02	0.03	0.02	0.02	0.01	0.01	0.03	0.01	0.02	0.03	0.08	0.03	0.14	0.05	0.05	0.01	0.01	0.06	0.05	0.04
Heap	Ave.price/CTU	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.83	2.00	2.00	1.40	1.67	1.48	1.67	1.83	2.00	2.83	2.49	2.48	2.74	2.72
	Ave.price/KG	8.42	9.84	10.89	11.78	12.71	14.07	12.87	13.91	19.48	12.86	11.67	11.25	9.94	8.79	7.84	8.15	17.24	16.12	10.79	10.26	13.04
CHILLI	Quantity (MT)	0.19	0.32	0.08	0.08	0.08	0.18	0.02	0.05	0.04	0.15	0.08	0.16	0.37	0.12	0.12	0.08	0.19	0.08	0.23	0.03	0.21
Heap	Ave.price/CTU	1.97	1.94	1.96	1.98	2.00	2.00	2.00	1.98	2.00	1.97	1.66	1.83	1.83	2.00	2.00	2.00	2.83	3.00	2.44	2.75	3.00
	Ave.price/KG	6.05	6.20	8.79	8.77	16.28	11.39	13.28	12.84	15.26	11.61	21.75	9.28	6.45	7.58	10.43	10.79	16.31	15.23	19.42	13.88	13.20
PEANUT	Quantity (MT)	1.57	0.79	0.60	0.39	1.26	0.20	0.13	0.38	1.05	0.21	2.21	0.48	0.06	0.14	0.15	0.17	0.19	0.18	0.14	0.15	0.27
Bag	Ave.price/CTU	1.03	1.00	1.00	0.98	1.00	1.00	1.04	1.08	1.00	1.00	1.11	0.89	1.00	1.02	1.00	1.14	1.38	1.07	1.05	1.75	1.83
	Ave.price/KG	10.57	12.12	12.53	11.10	12.94	11.68	12.70	11.51	11.23	11.28	7.14	7.74	9.03	7.82	9.74	10.03	10.39	13.06	7.78	19.28	21.95

ATTACHMENT 5 – TONGATAPU ROADSIDE MARKETS SURVEY BY TINOPAI FARM (May to September 2009)

Saturday	**Swamp taro (14kg bundles)**	**Tarua taro (16kg baskets)**	**Yam (23 kg bundles)**	**Sweet potato (15kg baskets)**	**Giant taro (7kg per piece)**	**Cassava (18kg baskets)**	**Total (tonnes)**
25/4/09	250	369	86	346	2	477	
2/5/09	227	232	72	368	-	467	
9/5/09	167	143	76	475	2	419	
16/5/09	316	191	95	502	-	449	
23/5/09	188	119	60	374	4	426	
May total	*1,148*	*1,054*	*389*	*2,065*	*8*	*2,238*	
Tonnes	**16.07**	**16.86**	**8.95**	**30.96**	**0.06**	**40.28**	**113.18**
30/5/09	221	156	98	460	-	407	
6/6/09	131	254	159	328	-	482	
13/6/09	264	178	77	377	-	519	
20/6/09	203	257	75	335	2	543	
27/6/09	192	125	55	259	6	267	
June total	*1,011*	*970*	*464*	*1,759*	*8*	*2,218*	
Tonnes	**14.15**	**15.52**	**10.67**	**26.39**	**0.06**	**37.60**	**106.71**
4/7/09	156	128	48	130	-	469	
11/7/09	250	269	99	158	-	507	
18/7/09	99	282	61	223	4	603	
25/7/09	135	305	85	132	3	510	
July total	*640*	*984*	*293*	*643*	*7*	*2,089*	
Tonnes	**8.96**	**15.74**	**6.74**	**9.65**	**0.05**	**37.6**	**78.74**
1/8/09	167	421	46	244	10	660	
8/8/09	127	345	125	174	2	265	
15/8/09	192	406	101	236	12	544	
22/8/09	130	382	78	132	21	411	
29/8/09	205	389	73	171	13	471	
August total	*821*	*1,943*	*423*	*957*	*58*	*2,351*	
Tonnes	**11.49**	**31.09**	**9.73**	**14.36**	**0.41**	**42.32**	**109.40**
5/9/09	143	316	117	208	9	259	
12/9/09	219	276	76	205	7	375	
19/9/09	95	297	49	38	35	409	
26/9/09	233	251	106	211	45	554	
September total	*690*	*1,140*	*348*	*662*	*96*	*1,597*	
Tonnes	**9.66**	**18.24**	**8.00**	**9.93**	**0.67**	**28.75**	**75.25**
5-month total (tonnes)	*60.33*	*97.45*	*44.09*	*91.29*	*1.25*	*188.87*	*483.28*
Monthly average (Tonnes)	**12.1**	**19.5**	**8.8**	**18.3**	**0.3**	**37.8**	**96.8**
%-age of total rootcrops	*12.5*	*20.2*	*9.1*	*18.9*	*0.3*	*37.8*	*100.0*

ATTACHMENT 6 – NEW ZEALAND STATISTICS - FROZEN ROOT CROP IMPORT STATISTICS (2006-2008)

Frozen Sweet Potatoes

Imports - Annual Totals

0714201000-Vegetable roots and tubers; sweet potatoes, with high starch or insulin content, cooked and preserved by freezing, not containing added sugar, whether or not sliced or in the form of pellets-Kgms

			Jan 2006 - Dec 2006			Jan 2007 - Dec 2007					Jan 2008 - Dec 2008	
Country	**Qty**	**CIF**	**VFD**	**Qty**	**CIF**	**VFD**	**Qty**		**CIF**		**VFD**	
China, People's Republic of	73,030	89,052	69,968	58,410	67,866	55,060	78,778	P	107,995	P	89,927	P
Korea, Republic of	0	0	0	14	69	61	0		0		0	
United States of America	0	0	0	0	0	0	13,096		35,485		32,080	
Viet Nam	0	0	0	480	471	379	0		0		0	
Countries specified for 0714201000	73,030	89,052	69,968	58,904	68,406	55,500	91,874	P	143,480	P	122,007	P
All Countries for 0714201000	73,030	89,052	69,968	58,904	68,406	55,500	91,874	P	143,480	P	122,007	P

Source: Statistics New Zealand

Frozen Cassava

Imports - Annual Totals

0714101000-Vegetable roots and tubers; manioc (cassava), with high starch or inulin content, cooked and preserved by freezing, not containing added sugar, whether or not sliced or in the form of pellets-Kgms

			Jan 2006 - Dec 2006			Jan 2007 - Dec 2007					Jan 2008 - Dec 2008	
Country	**Qty**	**CIF**	**VFD**	**Qty**	**CIF**	**VFD**	**Qty**		**CIF**		**VFD**	
Fiji	0	0	0	0	0	0	39,780	P	53,527	P	50,134	P
Thailand	0	0	0	290	520	478	1,245		3,924		3,522	
Tonga	57,240	17,182	10,366	161,095	57,031	32,517	277,732	P	112,506	P	64,802	P
United States of America	1,191	1,140	977	0	0	0	0		0		0	
Viet Nam	1,703	2,050	1,546	0	0	0	8,820		7,084		5,460	
Countries specified for 0714101000	60,134	20,372	12,889	161,385	57,551	32,995	327,577	P	177,041	P	123,918	P
All Countries for 0714101000	60,134	20,372	12,889	161,385	57,551	32,995	327,577	P	177,041	P	123,918	P

Source: Statistics New Zealand

Frozen Roots and Tubers – Others

Imports - Annual Totals
0714901000-Vegetable roots and tubers; arrowroot, salep, Jerusalem artichokes and similar roots and tubers with high starch or insulin content, cooked and preserved by freezing, not containing added sugar, whether or not sliced or in pellet form; sago pith-Kgms

			Jan 2006 - Dec 2006			Jan 2007 - Dec 2007				Jan 2008 - Dec 2008	
Country	**Qty**	**CIF**	**VFD**	**Qty**	**CIF**	**VFD**	**Qty**	**CIF**		**VFD**	
China, People's Republic of	100	204	188	0	0	0	11	42		39	
Fiji	2,000	3,446	3,214	960	1,332	1,191	600	1,042		958	
India	0	0	0	0	0	0	271	571		512	
Japan	190	715	679	1,318	4,396	4,108	430	1,001		955	
Viet Nam	0	0	0	15,971	24,451	19,369	0	0		0	
Countries specified for 0714901000	2,290	4,365	4,081	18,249	30,179	24,668	1,312	2,656		2,464	
All Countries for 0714901000	2,290	4,365	4,081	18,249	30,179	24,668	1,312	2,656		2,464	

Source: Statistics New Zealand