Agriculture for Growth: learning from experience in the Pacific

Tonga Root Crops (Cassava and Yams) Case Study

Prepared by

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Table of Contents

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Acronyms

AusAID	Australian Agency for International Development
EDF	
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
HACCP	Hazard Critical Control Point
ISO	International Standards Organisation
LDC	Least Developed Country
MAFFF	Ministry of Agriculture, Forestry, Food and Fisheries
MLCI	Ministry of Commerce, Industry and Labour
MFA	Ministry of Foreign Affairs
NES	National Export Strategy
PACER	Pacific Agreement on Closer Economic Relations
PICTA	Pacific Island Country Trade Agreement
RES	Regional Employment Scheme
SDP7	Strategic Development Plan 7
SDP8	Strategic Development Plan 8
SPS	Sanitary and Phytosanitary
STABEX	EU Export Stabilisation Fund
T$	Tongan Pa'anga (currency)
USA	United States of America
WTO	World trade Organisation

Executive Summary

The Tongan economy is currently struggling in the current global economic setup. As a very small player in the international scene it has very little or no influence on the determination of supply and demand for agricultural exports and must therefore acts productively and efficiently to ensure economic recovery. The benefits of these recovery efforts have to be equitably distributed to improve the livelihood of its general population. To this end investigation of agricultural exports of which Tonga seems to hold competitive advantage will assist with this ambition.

The root crops industry was investigated to determine its capability to accommodate increasing participation by the rural communities to positively contribute towards increasing production, increasing domestic and export demand, increase income and profitability, and to effectively contribute towards improving the welfare of the general population.

The Value Chain Analysis methodology was adopted for this investigation with emphasis on the cassava (*Manihot esculenta*) and yams (*Dioscorea alata* and *D. rodunda*) production and marketing. The components of these chains for both cassava and yams include production, processing and packaging, distribution, and consumption.

Key recommendations that may contribute towards improving the production and marketing of cassava and yams include the followings.

Technical

i) production must be economically efficient. Efficiency considers all factors of production, processing and packaging, distribution, and consumption. To this end researches on production activities such as increasing yields, mechanization and chemicals application rate will contribute towards technical and allocative efficiencies, and subsequently economic efficiency;

ii) for processing and packaging there are needs to establish washing and packing facilities, facilities for production of packages, and blast freezing facilities; and

iii) appropriate and affordable flight and shipping services should be investigated in terms of proper containers and carriers.

Institutional

i) that authorities need to review financial borrowing interest rates (or costs of borrowings) to the primary sector;

ii) ownership and management of facilities to be build for processing and packaging needs closer scrutiny to ensure that the costs to growers and exporters are minimised at the onset and that full transfer is phased out over some years; and

iii) focal marketing centres to be establish at overseas destinations.

Policies

i) the Government needs to review the implication of its CT policy and any other fiscal instruments that act against the financial viability of the agricultural sector;

ii) Government must also ensure that utilities such as water and electricity are supplied at costs that are subsidised to assist with costs of establishing new processing and packaging facilities;

iii) Government can also assist with initial management setup whereby relevant manpower skills can be progressively acquired before the transfer to the private sector; and

iv) individual exporters should be financially and technically assisted to cater for the vigorous competition they currently face both locally and internationally.

A follow up empirical study on the productive efficiency of cassava and yams production should be carried out to determine the allocative, technical, and economic efficiency of these enterprises.

Factors affecting productivity such as hired labour, family labour, varieties, propagation materials, fertilizer, pesticides, tractor hire, soil fertility, and land area should be investigated to determine their impacts on efficiency. Other factors to be investigated may include farm location, gender, experience, number of contacts with MAFFF advisory officers, land ownership, and education.

1. Introduction

1.1 Case Study Background

The need to facilitate the access and involvement of smallholder farmers in the production and export of agricultural commodities has been identified by the FAO as a means for a more equitable distribution of the benefits of economic development in the Pacific region. This is not a new phenomenon and has been identified earlier, in the case of Tonga, by Petelo (1992) whereby increasing participation by the rural population in commercial agricultural activities resulted in deriving domestic and export agricultural cash incomes, and improves the distribution of income amongst rural population.

In recognition of the above the FAO commissioned a regional study on 5 countries on different subsectors of the agricultural sector that are seen to be of significant benefits to the rural and smallholder population of the region. The Tongan root crops sub sector (industry) was chosen for this purpose and case studies were carried out on the cassava and yams chain of production (supply) and marketing (demand) activities.

Cassava and yams have significant economic and social contributions towards the Tongan economy and social setup, and are seen as ideal enterprises to be analysed for potential increase in their contribution towards improving the general welfare of both the rural and urban population. Root crops, given its long history of existence and sustainability, positively contribute towards the national development vision and goals which can complement and contradict each other simultaneously.

Root crops are in the forefront of the development strategies of the Ministry of Agriculture, Food, Forests and Fisheries (MAFFF) to achieve national goals such as food security, increase export earnings, increase rural income as well as improving general economic and social welfare of the country. The agricultural sector is currently struggling to cope with internal competitions for public and private resources, as well as external forces of increasing and decreasing inputs and outputs prices, market competition, and the current overall global economic downturn. The sector, as well as the economy, needs more efficient utilization of resources and root crops may contribute towards this objective through collective efforts of producers and all other national players, including government and the private sector.

1.2 Country Economy and Agriculture Sector

The eighth national strategic development plan, SDP8 (CPD 2007), provided the following information on the Tongan economy:

i) the real GDP grew at a trend rate of 2.7% per annum from 1998/99 level, largely because of a strong contribution from the tertiary sector (all service sub-sectors) which accounted for 55% of GDP, and grew at 3.6%, with the commerce and transport and communications sub-sectors leading the way;

ii) the secondary sector (mining and quarry, manufacturing, construction and electricity and water), which accounted for 17% of total output, grew at 2.9% per year because of increased construction and associated quarrying, and expansion in the electricity and water sub-sector;

iii) the primary sector (agriculture, forestry and fisheries), which accounted for 28% of total output grew at only 0.8% per year, though there was year-to-year variation in both agriculture and fisheries;

iv) real GDP per head in 2005/06 reached approximately T$3,060;

v) depleting foreign exchange reserves and increase government spending worsen currency depreciation and inflation, between 3.2% in 199/200 and 8.0% in 2005/06 with a high of 11.8% in 2003/04; and

vi) money supply became a problem and credit ceilings were imposed by the National Reserve Bank to restrain credit growth and protect foreign exchange.

In sum, the period 2000-2006 was characterised by:

i) modest, fluctuating, economic growth;

ii) rising inflation largely due to currency depreciation forced by low foreign exchange coverage of imports;

iii) continued heavy reliance on private remittances and foreign aid as sources of foreign exchange; and

iv) increasing pressure on Government to maintain aggregate fiscal discipline and improve the strategic allocation of public resources, while simultaneously providing for civil service salary increase.

Agriculture (including forestry and fishery) has always been central to the Tongan society and it has remained one of the principal sectors in the Kingdom. The sector significantly contributes to the local economy as a major source of foreign exchange and employment. Table 1.1, base on current release by the Department of Statistics (2009), highlights the historical importance of the sector.

Agriculture (including forestry and fishery), the dominant sector of the last century, showed declined output from 23.8 percent of GDP in 1994/95 to 20.8 percent in 2007/08. Reductions in both export and subsistence production have largely contributed to this

overall decline in the share of the primary sector in the GDP. However, as a sub-sector, agriculture (including forestry and fishery) was still a dominant contributor to GDP even though the tertiary's sector share increased from 44.7 percent in 1994/95 to 48.7 percent in 2007/08.

Table 1.1 GDP Output Structure (%) in five-year intervals (1994/95-2004/05) and annually (2005/06-2007/08)+

	1994/95	1999/00	2004/05	2005/06	2006/07*	2007/08*
Primary sector	**23.8**	**23.7**	**23.1**	**21.2**	**21.7**	**20.8**
Agriculture, fishery and forestry	23.8	23.7	23.1	21.2	21.7	20.8
Secondary sector	**14.8**	**13.7**	**12.8**	**12.2**	**12.6**	**11.7**
Mining & quarrying	0.6	0.3	0.4	0.4	0.4	0.4
Manufacturing	3.3	4.3	3.2	2.8	2.4	2.2
Electricity & water	1.6	1.3	2.1	2.1	2.0	2.3
Construction	9.3	7.8	7.1	6.9	6.8	6.8
Tertiary sector	**44.7**	**47.3**	**46.9**	**47.9**	**47.9**	**48.7**
Commerce, restaurants & hotels	12.3	11.6	13.5	11.7	11.5	12.9
Transport & communications	6.5	6.7	4.8	4.6	4.6	4.6
Finance & business services	7.0	8.7	10.6	10.6	10.0	10.8
Community & personal services						
Government	13.0	14.8	12.4	15.7	16.3	15.0
Private	4.7	4.7	5.3	5.1	5.1	5.4
Ownership of dwelling	3.7	3.6	3.1	3.1	3.2	3.2
Less: imputed bank service charge	-2.5	-2.8	-2.8	-2.9	-2.8	-3.2
GDP at factor costs*	**83.3**	**84.7**	**82.9**	**81.3**	**81.2**	**81.2**
Plus Net Indirect Taxes	**16.7**	**15.3**	**17.1**	**18.7**	**18.8**	**18.8**
GDP	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Tonga Statistics Department & SPC (2009)
+note variations from SDP8 estimates reported above
*provisional

The Tongan economy, since the period 2000-2006, has been growing on a fairly moderate rate due to the additional significant burden of the deterioration of the international economy, making exports and imports more expensive for international consumers as well as domestic producers. It is also a reflection of the country's reliance on agricultural exports as major contributors towards foreign exchange earnings and overall economic growth. This is also a direct outcome of the decline of the squash export industry which in the 1990s and early 2000s was the mainstay of the economy. Squash contributed around 60 percent of the total agricultural exports in the 1990s and agricultural exports contributed around 75 percent of the total export earnings, subsequently contributing around 45 percent of total national exports (Petelo 2002). This is not the case anymore as the economy is struggling to find a replacement for squash exports to Japan and Korea.

The decline in performance of the squash export industry is portrayed in Table 1.2 which provides the agricultural export volumes and values for the 2004-08 five-year period.

Table 1.2 Tongan agricultural exports 2004-08

	2004		2005		2006		2007		2008	
Product	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**
Other crops										
Squash	13,169,000	9,237,224	13,100,000	8,318,263	10,614,000	5,566,465	5,055,000	2,659,200	3,639,000	1,796,325
Vanilla	7,024	912,950	4,582	334,579	47	610	10,149	261,610	2,977	42,937
Kava	42,612	950,637	19,048	423,200	63,781	967,468	46,499	796,241	29,042	538,774
Total others	***13,218,636***	***11,100,811***	***13,123,630***	***9,076,042***	***10,677,828***	***6,534,543***	***5,111,648***	***3,717,051***	***3,671,019***	***2,378,036***
Root crops										
Yams	829,128	1,056,411	613,479	614,229	572,975	599,567	1,272,331	2,275,795	497,867	869,656
Giant taro	112,468	113,544	61,122	60,034	127,368	164,826	149,556	144,858	371,395	523,114
Swamp taro	213,660	204,483	201,000	192,494	181,934	170,335	73,130	81,989	500,854	692,720
Taro Tarua	277,655	245,328	151,238	119,500	207,895	187,257	626,111	571,258	580,556	609,941
Cassava	1,428,320	962,192	681,615	474,439	345,644	219,014	680,376	378,395	845,858	691,914
Total root crops	***2,861,231***	***2,581,958***	***1,708,454***	***1,460,696***	***1,435,816***	***1,340,999***	***3,459,504***	***3,452,295***	***2,796,530***	***3,387,345***
TOTAL	**16,079,867**	**13,682,769**	**14,832,084**	**10,536,738**	**12,113,644**	**7,875,542**	**8,571,152**	**7,169,346**	**6,467,549**	**5,765,381**
% Others	***82.2***	***81.1***	***88.5***	***86.1***	***88.1***	***83.0***	***59.6***	***51.8***	***56.8***	***41.2***
% Root crops	***17.8***	***18.9***	***11.5***	***13.9***	***11.9***	***17.0***	***40.4***	***48.2***	***43.2***	***58.8***

Source: Tonga Trade (MLCI) (2009)

The followings are evident from Table 1.2:

a) that squash export, as the major agricultural and national foreign exchange earner, shows significant reductions in terms of volumes and values. Total volume consistently declined from 13,169 tonnes in 2004 to 3,639 tonnes in 2008, a reduction of 9,530 tonnes or 73.3 percent. The corresponding reductions in values are T$9,237,224 to $1,796,325, a decline of T$7,440,899 or 80.6 percent; and

b) the trend seemed to be reversed for root crops, increasing from 2,862,231 kilograms (T$2,581,958) in 2004 to 3,459,504 kilograms (T$3,452,295) in 2007, an increase of 597,273 kilograms (T$870,337) or 20.9% (33.7%). The volume decreased in 2008 to 2,796,530 kilograms, a decline of 662,974 kilograms (-19.2%) and the value declined by T$64,950 (-1.9%).

Given the decline in squash export as the major source of foreign exchange and income for rural farmers and population, farmers reverted back to the more traditional source of income such as the export of root crops to the overseas markets in New Zealand, Australia, and the Unites States of America.

With the significant influence of agriculture in the economy the performance of this sector will always impose multiplier effects on other sectors as well as the overall performance of the local economy. Despite the fact that the sector's performance has

been characterized by fluctuating production, it should be recognized that agriculture has been the backbone of the economy and will continue to be one of the most important economic sectors in the Kingdom.

Employment creation is one of the major facets of the agricultural sector. The sector provides approximately 40-50 percent of total employment in Tonga (CPD 1999). However, over 64 percent of Tongan households (10,102) are involved in agriculture, out of which 59 percent are subsistence, 38 percent are involved in subsistence agriculture with cash crops and only about 2 percent are fully commercial crop producers (Agriculture Census 2001). The agriculture sector therefore is important for employment, as a source of domestic food supply, for cash income, foreign exchange earnings, and for raw materials in processing and handicrafts. This indicates that agriculture has remained the primary source of livelihood for most of the Kingdom's population. Recent experiences, *a la* the squash export industry, kava and vanilla exports, show that the population is ready to mobilise and support any industry when the '*price is right'*, meaning that expected profits and returns on investment are attractive.

1.3 National and Sector Policy Framework

The National Strategic Development Plan 8 (2006/07 – 2008/09) (SDP8) sets the National Vision as follow:

> To create a society in which all Tongan enjoy higher living standards and a better quality of life through good governance, equitable and environmentally sustainable private sector-led economic growth, improved education and health standards, and cultural development.

The Vision expresses the aspirations of the Tongan people and the ultimate aims of all the development efforts that will be undertaken during the SDP8 period. Achieving the vision, and at what degree of achievement that is deemed desirable, is up to individual interpretations. The measurement of this success can be sometimes quantifiable and a common general and acceptable rule of welfare economics is that of achieving *Pareto Optimality*, i.e., *some are made better off and no one is made worst off*. The acceptable optimal level of welfare is up to individual value judgment but government must state measurable expected outcomes as a means of analysing expected outcome.

Goals have been established to realise the Vision. The goals are presented in Annex and listed below.

There are eight national development goals of SDP8 (2007). They are:

i) create a better governance environment;

ii) ensure macroeconomic stability;

iii) promote sustained private sector-led economic growth;

iv) ensure equitable distribution of the benefits of growth;

v) improve education standards;

vi) improve health standards;

vii) ensure environmental sustainability and disaster risk reduction; and

viii) maintain social cohesion and cultural identity.

Table 1.3 Relevant SDP8 Goals and Strategies for the development of the Agricultural sector

Goal	Strategy
2: Ensure macroeconomic stability	*Strategy 5*: Continue to manage the exchange rate to achieve the foreign exchange reserves target level
3: Promote sustained private sector-led economic growth	**Business Environment Strategies** *Strategy 1:* Engage in policy dialogue with the private sector *Strategy 6*: Continue to implement trade liberalization and trade facilitation policies in accordance with multilateral and regional trade agreements. *Strategy 7*: Pass and implement the Trade and Investment Bill. *Strategy 8*: Pass and implement the new Employment Bill. *Strategy 10*: Review and implement transparent and consistent administrative processes relating to the processing and registration of applications relating to land tenure. *Strategy 11:* Replace the Price and Wage Control Act 1947 with modern price control legislation under which all monitoring and control of prices is conducted (including utility prices). *Strategy 12:* Review existing competition law with a view to introducing a prohibition on price fixing and eliminating any unnecessary competition prohibitions. *Strategy 13:* Continue and strengthen the provision of business development services. *Strategy 16:* Upgrade inter-island sea transport services by introducing a new ferry and new landing craft. *Strategy 18:* Improve domestic air services by consolidating the corporatisation of airports and ensuring continuity of service provision **Economic Sector Strategies** *Strategy 1:* Continue to improve the Ministry of Agriculture and Food, Forests and Fisheries' core services delivery to client groups throughout the country (farmers, district and village agriculture committees, growers' organizations, women's groups and NGOs. *Strategy 2:* Accelerate trials on domestic production or various types of vegetables for export markets and of import-substituting mutton production. *Strategy 3:* Improve infrastructure that supports agricultural development (roads, ports, air and sea transport). *Strategy 4.* Review and improve the agricultural policy environment in order to promote small and medium-sized agricultural enterprises. *Strategy 5:* Examine the feasibility of an export credit guarantee scheme as a means of encouraging agricultural production for export.
4. Ensure equitable distribution of the benefits of growth	*Goal 3, Business environment strategies 15, 16, 17 and 18* *Strategy 4 Implement the donor-supported Regional and Rural Development Program* *Goal 3, Economic Sector Strategy 1*

Source: Adapted from Kingdom of Tonga, Strategic Development Plan 8, 2006/07-08/09, pp41-45

Of greater relevance to the agricultural sector are goals ii), iii) and iv). But successfully achieving the other goals will also benefit the sector through existing forward and backward economic and financial linkages, as well as multiplier effects within and between the sectors. To achieve these goals a set of strategies is identified. These strategies will provide the framework within which government agencies will formulate and update their medium-term plans. The relevant goals and strategies for the agricultural sector are presented in Table 1.3.

MAFFF (2007) has also identified its own key development strategies as follow:

i) continue to support food security and expand exports by improving productivity and production of traditional crops and other products;
ii) provide essential infrastructure especially post harvest facilities to support commercial and export growth;
iii) strengthen research into potential and new export and high value crops including niche markets;
iv) improve marketing through more aggressive intelligent market research and development;
v) apply research and development to facilitate development of agro-food processing;
vi) develop appropriate agriculture, forests and fisheries policies and legal framework;
vii) improve efficiency and effectiveness of delivery of the Ministry's core functions;
viii) actively promote development of livestock (and livestock feed) particularly piggery, poultry, ducks, cattle and sheep for domestic consumption and import substitution;
ix) actively support and facilitate access by the farming communities to donor agencies for funding assistance; and
x) promote development of fisheries to maximize economic benefits to the communities and to ensure sustainable management, utilization and conservation of our aquatic resources.

The FAO (2009) reported that the draft National Strategic Planning Framework to precede SDP8 stated MAFFF's medium term development strategies are set out in the MAFFF Corporate Plan 2007/08-2010/12. They are:

i) strengthening policy and legal frameworks;
ii) improving agricultural production and productivity to facilitate expansion of exports and ensure food security;
iii) import substitution through introduction of new livestock breeds and production of cheaper alternative feeds;

iv) improve infrastructure and competitiveness of produce for export markets;

v) develop high value and niche market crops;

vi) improve market intelligence, marketing and market access;

vii) facilitate agro-processing to create greater value-added for import substitution and exports; and

viii) sustainable development, management, utilization and conservation of aquatic resources to improve livelihoods.

It is therefore evident that the sector has been well catered for in term of policies and strategies. But actions and implementations have been the major challenge, and sometimes setback. Limited public resources will always hinder the implementation of these strategies and efficient use of available resources through sector prioritization must be exercise prudently.

On the macro-economic front proper management of the foreign exchange rate will benefit both the export sector as well as the economy as a whole. In general the stronger our foreign exchange rate is the more expensive our local export commodities are, and the lower the overseas demand for our exports. Foreign exchange earnings will be adversely affected. The weaker our exchange rate the cheaper our export goods are and more demand from the overseas market for our goods. When this happens, foreign exchange earnings increase and our term of trade improves.

Unfortunately it is not as easy as it is described above. A dilemma also occurs when our exchange rate is strong against overseas currencies. This means imports of goods and services will be cheaper which in turn improve our purchasing power on overseas goods and services. *Cetris paribus* (everything else being kept equal), profitability should increase as well as viability of the export production sectors. However if our foreign exchange is weaker the costs of imports will increase and the costs of production will increase, imposing a negative effect on profitability and viability.

In the Tongan situation it is basically true for all export sectors that the exchange rate regime is externally controlled and given. Tonga is a small, open economy, and is a price taker in the international market. It can hardly influence most of the indicators of international trade and therefore take the prices both for agricultural inputs and outputs.

Our best bet is based on the strategies of goals 3 and 4. It is here that we may have internal control on the factors of production. With the business environment strategies a level playing field will be provided to all actors of the private sectors for fair competition. With the economic sector strategies they will facilitate ease of production and marketing

in the agricultural sector which should improve their productive performance (or efficiency) and improve income generation and profitability.

Tonga's membership in the WTO was approved on 15 November 2005. The Government of Tonga ratified its membership and officially became a member on the 27 July 2007. With this membership Tonga has unlimited access to the markets of all the WTO's 251 members which opened up huge potential for its agricultural export sector. Tariff barriers are coming down and non tariff barriers are also being eliminated. Tonga can now export most agricultural commodities to New Zealand, Australia and the USA subject to the quarantine and importing standards of those countries. The same apply to the rest of the WTO members.

Tonga is also a member of the Pacific EU EPA negotiation process to open up more EU markets on goods and services. It is also a member of PACER and PICTA agreements between the Pacific Island, New Zealand and Australia. Again all these efforts are to ensure that Tongan exporters have access to overseas markets of goods and services. Root crops stand to benefit from these negotiations and agreements.

1.4 Introduction to the selected sub-sector

The sub-sector selected for this study is the root crops sub sector, in particular cassava (*Manihot esculenta*) and yams (*Dioscorea alata* and *D. rodunda*) enterprises. The sub-sector was selected base on the fact that it is the most participated sub-sector of the whole agricultural sector. It is estimated (MAFFF 2008) that around 80-90 percent of farming households engage in some form of root crop production at any one time during the year. This is basically due to the fact that root crops forms a high component of the national diet and that domestic consumption is very high compare to exporting amount.

Table 1.4 Estimates of Annual Root Crop Production

Crops	Area (ha)	Estimated Yield (tons)	Total Production (tons)
Cassava	1168	12	14,016
Sweetpotato	291	8	2,328
Yam	945	10	9,450
Xanthosoma	728	10	7,280
Alocasia	286	8	2,288
Taro	887	8	7,076
Totals	**4,305**		**42,438**

Source: FAO/Tonga (2001)

The Agricultural Census 2001, Table 1.4, reported 4,300 ha of root crops were harvested in the country during the year. Based on this data a conservative total root crops production is estimated to be more than 40,000 tons per annum. The total export of

root crops is about 3,000 tons (7.5%) every year the remainder is for domestic consumption and stock feed.

Focusing on cassava and yams, both crops have been historically part of the smallholders farming system for the past century or more. Yams have been more a social crop before it is now becoming more economically oriented. A person's social status improved with the kind of yams that is cultivated and owned. Yams, together with kava and pigs, form the 'complete set of goods' require for a proper social function. A rich person's status in past was measured more with the amount and number of yams, kava plants and pigs that he owned.

Cassava has been around since the last century and has been mainly grown for domestic consumption and stock feed. With the increasing number of Tongans migrating overseas to New Zealand, Australia and the USA, demand for root crops have risen and yams and cassava have been the major commodities here.

Table 1.5 Yams and cassava exports 2004-08

	2004		2005		2006		2007		2008	
Product	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**	**Vol (kg)**	**Value (T$)**
Yams	829,128	1,056,411	613,479	614,229	572,975	599,567	1,272,331	2,275,795	497,867	869,656
Cassava	1,428,320	962,192	681,615	474,439	345,644	219,014	680,376	378,395	845,858	691,914
Total root crops*	***2,861,231***	***2,581,958***	***1,708,454***	***1,460,696***	***1,435,816***	***1,340,999***	***3,459,504***	***3,452,295***	***2,796,530***	***3,387,345***
% yams	***29.0***	***41.0***	***35.9***	***42.1***	***39.9***	***44.7***	***36.8***	***65.9***	***17.8***	***25.7***
%cassava	***50.0***	***37.3***	***39.9***	***32.5***	***24.1***	***16.3***	***19.7***	***11.0***	***30.2***	***20.4***
TOTAL*	**16,079,867**	**13,682,769**	**14,832,084**	**10,536,738**	**12,113,644**	**7,875,542**	**8,571,152**	**7,169,346**	**6,467,549**	**5,765,381**
% Root crops	***17.8***	***18.9***	***11.5***	***13.9***	***11.9***	***17.0***	***40.4***	***48.2***	***43.2***	***58.8***
% yams	***5.2***	***7.7***	***4.1***	***5.9***	***4.7***	***7.6***	***14.9***	***31.8***	***7.7***	***15.1***
% cassava	***8.9***	***7.0***	***4.6***	***4.5***	***2.9***	***2.8***	***8.0***	***5.3***	***13.0***	***12.0***

Source: Tonga Trade, MLCI (2009)

*total exports from Table 1.2

Table 1.5 provides export results for cassava and yams for the period 2004-08.

Cassava and yams have consistently contributed towards total root crops exports, both in volumes and values, between 2004 and 2008. They have accounted to more than 50% of total annual volumes and values of total root crops exports. Yam is valued higher than cassava and has also dominated root crops exports volume since 2006. Cassava exports volume peaked in 2004 and has struggled to repeat this performance since. This may be a market-determined result and may need more investigation at this end. At the same time it is potential challenge for the industry to improve on these performances.

Demand for root crops exports is relatively high given the increasing numbers of Pacific Islanders living overseas. There is strong competition from countries such as Fiji

and Japan but the Tongan products have managed to create a position and competitive advantage which will assure increasing demand in the future.

2. Study Methodology

The study followed the suggested methodology of using the Value Chain Analysis to investigate the following objectives:

i) to critically review the challenges and opportunities for smallholder agriculture to play an important driving role for economic growth, increased employment and income earning in the Pacific Island Countries (PICs), set against the backdrop of volatile commodity and oil prices, and a deepening global recession;

ii) to identify and investigate bold initiatives and emerging successes and screen these against the key constraints for agriculture development in the region;

iii) elaborate the main lessons, refine policy options, and identify realistic opportunities to scale-up successes to promote improved rural livelihoods in the Pacific region; and

iv) to define "commercialisation" of agriculture in the Pacific context and identify possible pathways for commercialisation that is inclusive of smallholder farmers.

Data and information were collected mainly from i) secondary sources such as reports from various ministries and departments, and other regional reports; ii) direct consultations with appropriate personnel from government, private sector and individual growers; and iii) direct questionnaire on strengths, weaknesses, opportunities and threats (SWOT) analysis with root crops farmers. The SWOT analysis covers the three main islands of Tongatapu, Vava'u and Ha'apai.

The Value Chain Analysis is being considered scientific in that it collects data and information and use to describe specific situations. The concept of intervention between the chains is very useful in analysing links between production and marketing situations. However it should be noted that it is not scientifically possible to statistically test the significance of the findings as only time series data are possible to be collected and that no empirical analysis is possible.

Determining the links or the chains can be *ad hoc* to some degree, however understanding appropriate steps, basic functions, chain operators, and other components of the chain is prerequisite to the preceding analysis.

3. Key Findings & Discussion

3.1 Value chain of the targeted products

The value chain maps for cassava and yams are presented in Figures 1 and 2. The prices are obtained from two estimates by Manu (2007) and Tofa (2009). These are presented below.

The maps for cassava and yams are fairly similar reflecting the fact that both root crops are produced within the same farming system as well as marketed within the same marketing framework. The difference is reflected only in the prices of out puts and costs of production.

Table 3.1: Cassava value chain approximation

Value chain links		**Approx selling prices T$/kg**	**Approx cost T$/kg**	**Value retained T$**	**Analysis**	**Intervention**
Supermarket price Auckland (NZ$2.99/2kg)						
Fijian cassava Flea mkt price Auckland (NZ$40/20 kg)		**$2.93**	**$1.28**	**$1.65**	Highest value addition	Expand market range to supermarket
		$2.80-4.20	$1.28	**$1.52-2.94**	Highest value addition	Market centre in Auckland
Exporter cost			**$0.12**			
	Quarantine & custom fee		$0.11		Leakage	
	Transport		$0.01		Leakage	
Freight			**$0.28**		Highest leakage	
Exporter cost			**$0.44**			
	Peeling manual ($3/20 kg bag)		$0.15		Addition	Establish washing and packing facilities
	Washing manual ($2/20 kg bag)		$0.10		Addition	
	Packing & packaging ($1/bag)		$0.06		Leakage	Establish facilities for production of packages
	Blast freezing		$0.10		Addition	Establish blast freezing facilities
	Electricity cost for containers					Reduce time of processing from 2 weeks
	Transport		$0.03		Addition	
Production			**$0.38**			
	Land preparations (4 acres)					Improve yield to greater than 2.5

	plough 4 hours $70/hr)					mt/acre by improve production methods
			$0.08		Addition	
	Planting material & planting (10 man, 4 hours $6/hr)		$0.06		Addition	Improve yield
	Weeding (3 times) (10man, 4 hours $6/hr)		$0.06		Addition	Use herbicides
	Harvesting (4-6) times (10 man, 4 hours $6/hr)		$0.11		Addition	Mechanized harvesting
	Transport		$0.05		Addition	

Source: Manu (2007)

Table 3.2 Costs and benefits of Exporting Cassava and Yam from Tonga to Auckland, NZ

Cassava	$	Yams	$
Costs		**Costs**	
Purchasing cassava	5,000.00	Purchasing cassava	10,000.00
Freight	5,500.00	Freight	5,500.00
Storages	2,000.00	Storages	2,000.00
Phones	300.00	Phones	300.00
Labour	2,720.00	Labour	2,720.00
Transport	1,000.00	Transport	1,000.00
Marketing	1,300.00	Marketing	1,300.00
Customs & quarantine	2,500.00	Customs & quarantine	2,500.00
Total Costs	20,320.00	**Total Costs**	25,320.00
Sales		**Sales**	
600 bags (20 kg each) @ NZ$40	24,000.00	600 bags (20 kg each) @ NZ$80	48,000.00
Net profit	3,680.00	**Net profit**	22,680.00
Return per kg	0.31	**Return per kg**	1.89

Source: Tofa (2009)

Yams commanded a higher price in the market but the purchasing power of consumers, both domestic and overseas based, may not allow the purchase of these product at a rate that allows higher throughput that may result in increasing amount and income.. However recent 2007 export data (Table 1.5) show that yams export overtook cassava in terms of volume and value by around 100 percent.

Figure 1: Cassava Value Chain

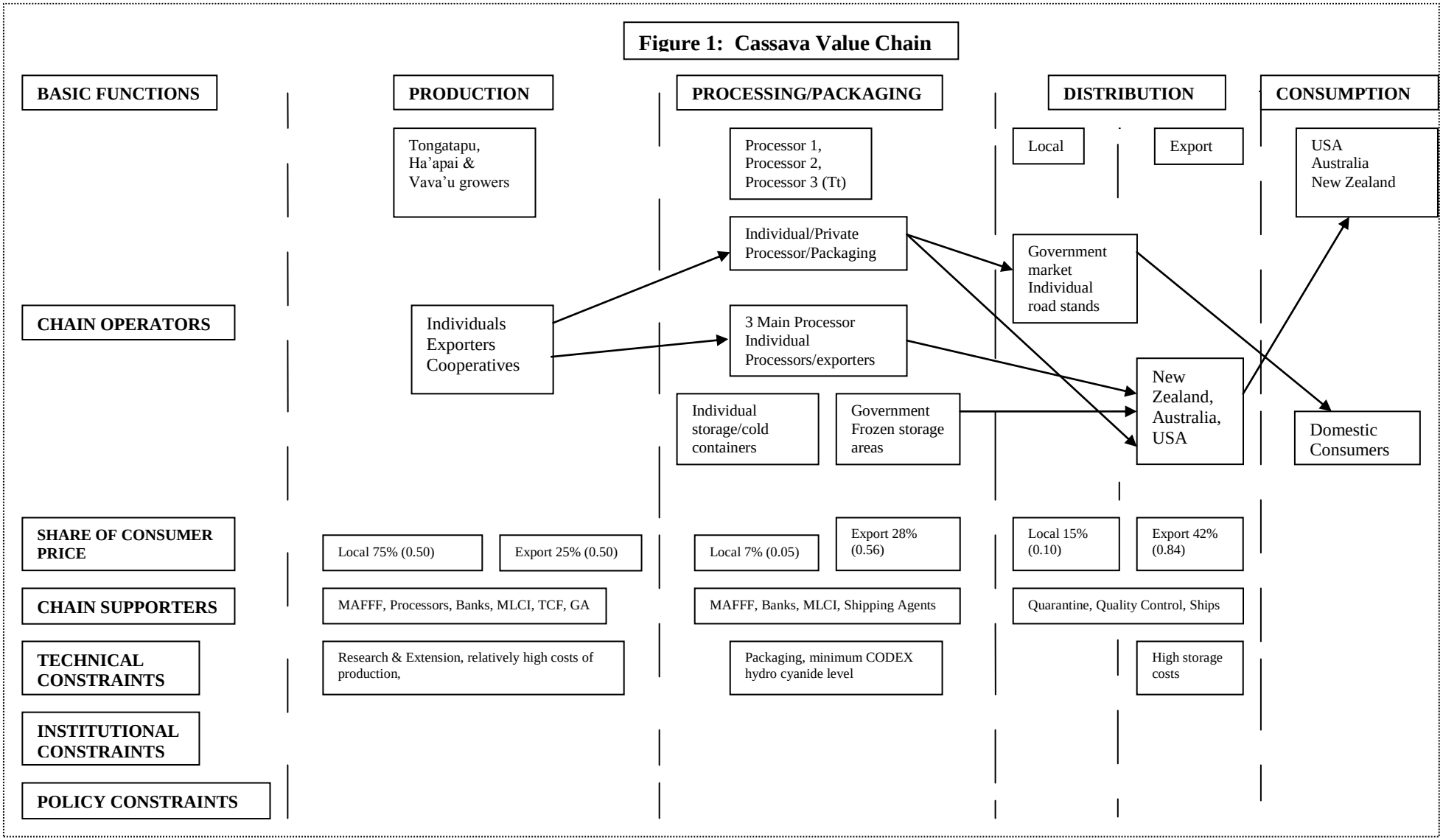
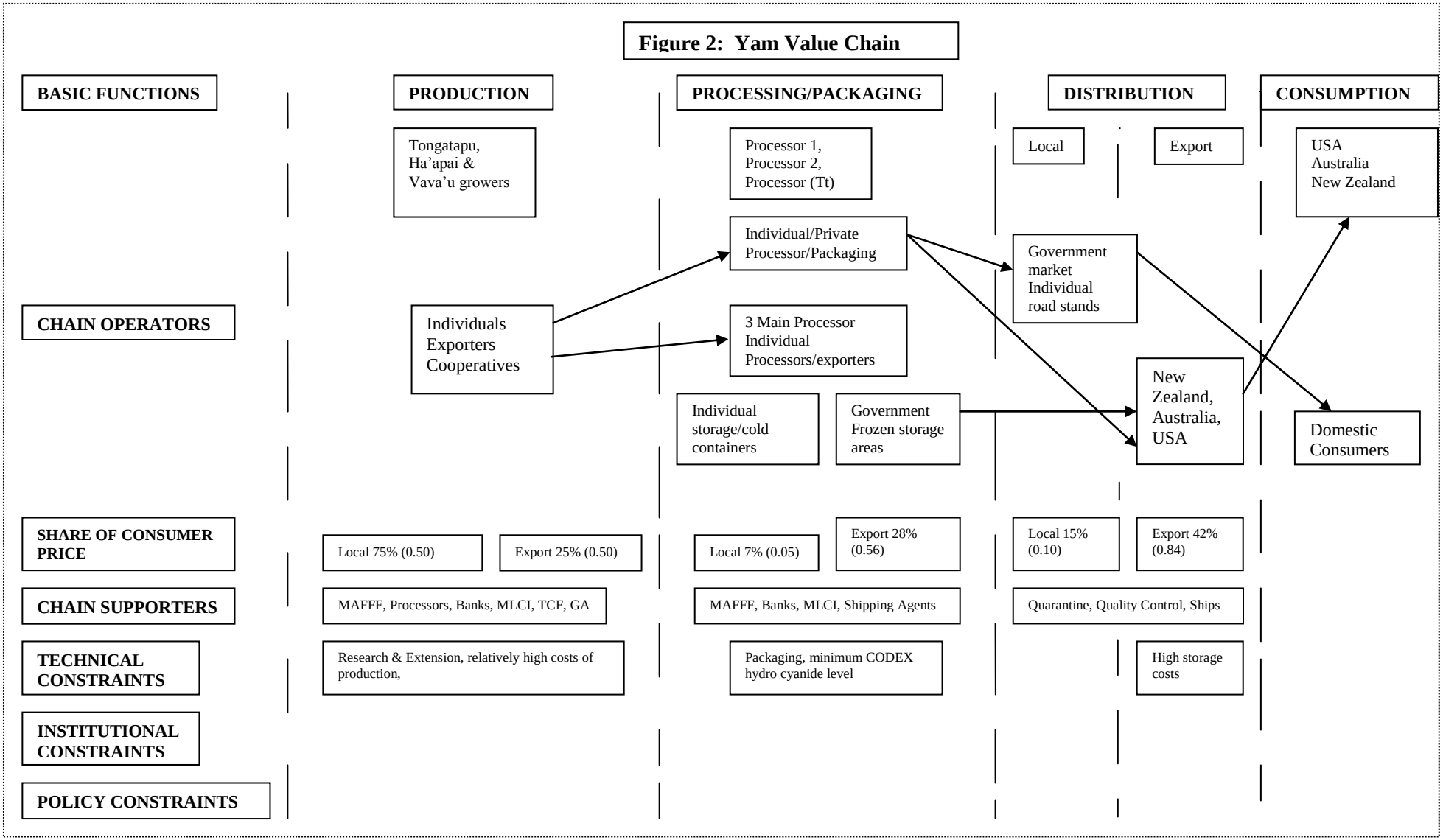


Figure 2: Yam Value Chain



Productions

Production of root crops, including cassava and yams, face the same issues that have been experienced in the past. These include the price and availability of production inputs, production yields, supply and demand for root crops, pests and disease, and harvest practices.

Production inputs are mostly given in terms of land, labour and capital. Land can be a constraint if the farmer has to lease. Capital, in terms of finance, can be a constraint if the costs of borrowing are high as currently experienced in Tonga. Labour is readily available but can be expensive when national labour scheme such as those available for New Zealand and Australia are in place. There are many varieties of cassava and yams available for production and the right varieties to be grown should be demand-led and market studies should be carry out accordingly.

Production of root crops must endeavour to meet the demand for these crops. It is not possible at this point in time to determine the exact equilibrium amount where supply meets demand but it is believed that huge demand potential is yet to be met especially overseas demand for root crops. This presented significant potential for market research and promotions.

The estimated total root crops production of more than 40,000 tons per annum, of which 3,000 tons (7.5%) is exported to overseas markets. The current demand is considered well below that to what Tonga is capable to produce. The 15,000 tonnes of squash pumpkins per year between 1990 and 2005 harvested and exported in just one month shows clearly what Tonga can potentially grow and export when the level of demand is high.

Pests and diseases are natural to any cropping systems. Mono cropping is more prone to these biological organisms and controls are mostly done by chemicals. Yields will be greatly affected if control is not applied. On farm research is needed again on this area, especially on the appropriate chemical application rates that will sustain or increase yield as well as protecting the environment and the surrounding ecosystems.

Processing/packaging

On processing and packaging, export packaging is considered the most important, especially when supermarkets are targeted. The Tonga NES Draft Report (2009) identified the following issues with regards to packaging for exports:

i) due to lack of resources, all packaging materials are imported from Fiji, New Zealand, Australia and the USA; and

ii) costs of packaging materials are high, including consumption tax (CT) imposed at the wharf but refundable after 2-3 months;

To solve these problems establishing a packaging manufacturer in Tonga can assist as well as the removal of the CT upfront upon arrival. The manufacturing option must be clearly viable to avoid additional financial burdens on exporters. Government is planning through the EU STABEX 7th and 8th EDF to provide this service.

Processing of cassava and yams involves activities that are labour intensive in terms of peeling and washing. The hygienic status of these activities need to be looked at closely especially individual processors/exporters that are using simple technologies such as half cuts 44 gallon drums, etc. The adoption of international CODEX standards will ensure that more care will be taken during these activities. The establishment of the post harvest handling, processing and market infrastructures will assist here. However exporters may have to bear extra costs.

Distribution

Domestic distribution is not a problem given the availability of appropriate infrastructures. There is increasing road side marketing along the main roads in Tongatapu that eliminate the need for establishing more government owned formal market place. Consumers seem willing to travel some distance to obtain cheaper commodities than those sold at the formal centred market in Nuku'alofa.

On the export front the informal means of distributing root crops seems to be the most appropriate way. Exporters send their frozen containers to private homes in Auckland, Sydney or Los Angeles and promote their products to the indigenous Tongans and Pacific Islanders there. The advantage of this arrangement is that packaging becomes a non-issue as selling of the products do not take place at the more formal imports setup of these countries. Overall cost is thus reduced through the informal channel.

Promotion and marketing costs can be significant since Tonga is not the only country that can supply fresh and frozen root crops. In New Zealand, China, USA. Fiji, Vietnam, Japan, Thailand, and Korea are also exporting root crops to New Zealand.

Consumption

Quality is the major determinant of demand from any goods - cassava and yams are no exception. Maintaining quality through freezing for a long period is the main challenge for exporters of cassava and yams. This is especially important for private exporters who must bear the costs of electricity while the crops are still in storage. Hence the quicker the crops are sold the lesser the costs of electricity and the larger the profit

margin can be. By way of 'mouth and ear' consumers are aware of the quality of imported cassava and yams and are willing to pay if the quality is good.

3.2 SWOT Analysis and key success factors (including factors that encourage smallholder participation in the value chain)

Three separate SWOT analyses were done for the islands of Tongatapu, Vava'u and Ha'apai. Each analysis was done with two major components: i) production of root crops (yam and cassava); and ii) marketing of root crops (yam and cassava). Results are presented and Table 3.1.

Table 3.1 SWOT Analysis of Production and Marketing of Root Crops in Tongatapu, Vava'u and Ha'apai September-October 2009

Production of root crops (yam and cassava)

Strengths	i.	Farmers own good agricultural land
	ii.	Farmers are skilled in root crops production
	iii.	Root crops grow well throughout Tonga
	iv.	There are farmer groups supporting the individuals
	v.	Farmers could meet quantities the market demands
	vi.	Planting materials are readily available
	vii.	There is strong support from MAFFF Extension service
	viii.	There are laws that encourage farming
Opportunities	i.	There is amble and fertile land for farming
	ii.	Farmers are skilled in root crop production
	iii.	There is opportunity for domestic as well as export
	iv.	There is a number of exporters
	v.	There is regular overseas shipping service for export in Tongatapu and Vava'u.
	vi.	A mean of employment for youths
	vii.	A mean of and in some cases the only mean of finance for some families
	viii.	MAFFF is present to provide technical support
Threats	i.	Natural disasters (droughts, cyclones, tsunami etc).
	ii.	Pests and diseases including rats, birds and flying-foxes, pigs, horses and cattle
	iii.	Thieves
	iv.	Cassava bitterness
	v.	Soil becoming infertility.
	vi.	Unavailability of agricultural chemicals when needed
	vii.	Talk of closing down the MAFFF office in Ha'apai

Marketing of root crops (yam and cassava)

Strengths	i.	There are available markets both local and export
	ii.	There is regular ship for export
	iii.	Reliable means of communication (phone, internet)
	iv.	Good currency exchange rate
	v.	There is high level of skills in production and marketing
	vi.	Could ship produce for marketing in Tongatapu
Weaknesses	i.	Costs of export are high including freight
	ii.	Lack of proper post-harvest facilities
	iii.	Lack of marketing and agro-business skills
	iv.	Lack of capitals
	v.	Low level of export
	vi.	Low level of quality control on exports

	vii.	Lack of commitments amongst farmers and exporters
	viii.	Lack of control on export
	ix.	High costs of local transportation
	x.	Lack of market research
	xi.	Lack of research on processing
	xii.	Lack of accountability amongst exporters, eg. prices of produce that has been shipped
	xiii.	High cost of production eg. land preparation
	xiv.	Lack of cooperation amongst farmers on marketing
	xv.	High level of commitments to obligations besides farming and marketing
	xvi.	Changes on shipping schedules
	xvii.	Lack of standard measure for marketing of root crops
	xviii.	Lack of proper planning and scheduling of planting
	xix.	Lack of exporting opportunity in Ha'apai
	xx.	High cost of space for sale of crops at local market place.
	xxi.	Short trading hours at local market eg. Ha'apai
Opportunities	i.	A number of available markets.
	ii.	Many root crop consumers in New Zealand
	iii.	There is high demand for root crops (local and overseas)
	iv.	There are good communication systems in place
	v.	There is available assistance that could help eg. EU-Stabex funds, FAO and Government.
	vi.	There are available training programs on business training including Agribusiness.
	vii.	Regular overseas ships
Threats	i.	Natural disasters (droughts, cyclones, tsunami etc).
	ii.	Fluctuations in rate of foreign money exchange
	iii.	Fluctuations in prices at the market place
	iv.	Unreliability of power (electricity) and water supply
	v.	Changes in shipping schedules
	vi.	Damage by animals (pigs and cattle)
	vii.	Thieves

The production SWOT analysis revealed the fact that farmers are very optimistic about their ability to produce cassava and yams with given limited resources and opportunities. Weaknesses were not identified reflecting the argument that Tonga root crops growers can mobilise and produce any of the root crops when the price is right. Factors of production seem to be available and affordable and that current technologies are available to be utilised.

The productive efficiency issue will be a concern here, and although not directly a focus of this study it is worth discussed here. Production efficiency measures the ability to generate maximum output with given inputs and technology. It can be determined by estimating the 'best-practice' production frontier. The discrepancy between frontier output and the individual producer's output (for a given level of input use) is a measure of inefficiency.

A producer may be inefficient for several reasons, e.g., failing to obtain maximum output from a given level of input usage (technical inefficiency), utilizing inputs in wrong proportions given their prices (allocative inefficiency), and failing to achieve the optimum scale of operation (scale inefficiency). Inefficiency reduces production, increases cost and, *ceteris paribus*, reduces profit. Identifying factors affecting efficiency and sources of inefficiency are paramount to promoting efficient utilization of resources and enhancing profit.

An earlier study examined in detail the production efficiency of the squash export industry in Tonga (Petelo, 2002). Given current levels of efficiency, current technology, and current factor and output prices, *the costs of inefficiencies in this context refer to the benefits foregone by farmers and the industry due to the existence of inefficiencies in the system*. Because of technical and allocative inefficiencies, potential higher economic efficiency[1] is not realized, and therefore potential benefits are foregone. These potential benefits are benefits that could have been achieved with less inputs and higher output, *ceteris paribus*.

The implication of efficiency to this study is the need to make root crops farmers aware of the difference between *efficiency* and *productivity*. These terms are used interchangeably and are sometimes interpreted to mean the same thing. Productivity deals with only one input at a time relative to output. In agriculture land is the major input of consideration. So an enterprise is said to be productive if *yield per unit area* is higher than the norm. Efficiency, in the other hand, considers all the factors of production relative to output. So an enterprise can be productive (high yield) but inefficient (using more of the other inputs). Stakeholders need to understand the implications of productive efficiencies on their financial and economic performances.

Weaknesses appear at the marketing SWOT analysis which indicates that growers are aware of the risks they face if they efficiently produce their crops but cannot access the right market or access the right market but at very low prices.

3.2.1 Encouraging factors of production and marketing

In terms of production farmers are confident of the availability of the factors of production (inputs) as well as supports from the MAFFF and other sectors. Financial and physical infrastructures are in place to assist production. From a marketing point of view

[1] Economic efficiency is the product of technical and allocative efficiencies.

markets are available and accessible locally and for exports. New markets are being negotiated overseas. Potentials exist to increase market share and production, and prices can cover average variable costs of production, and therefore generate positive profits at the end.

3.3 Technical, institutional and policy issue

The following parameters are being investigated to reflect their impacts on the production and development of the root crops industry.

3.3.1 Access to land

The current land tenure system allows the ownership of a eight and a quarter (8.25) acre tax allotment by each natural Tongan male 16 years old and over. Women can inherit land through their spouses as caretakers. However ownership is reverted back to the heir apparent, the eldest male offspring, when they passed away. Anyone can lease a piece of land for any purpose, a practice now increasingly used by commercial agricultural producers.

The land area of the Kingdom of Tonga is 747 km^2 and is a very scarce resource for any huge export development effort. Agriculture is the predominant user of available arable land and naturally therefore the leading contributor towards export earnings as well as employment numbers and employment creation.

Given the limited land area of the country the private sector has to be economically efficient in their operations. This will ensure increasing productivity using the same combination of production inputs from the same land area thus increasing total revenue and therefore increase profitability. From a sustainable perspective as well as a supply-led marketing economy it is also possible to use less production inputs such as land, labour and capital to produce the same desired output or more. In this way the environment is protected from detrimental impacts of toxic inputs such as pesticides, herbicides and fertilizers heavily use in agricultural production these days.

Security of land tenure is well catered for by current legislations. Lease agreements are bounded by law and the term and value of lease agreements rest between the leasee and leasor.

Farm holdings size can be categorized under three categories: small (≤ 8 acres), medium (8-20 acres) and large (≥ 20 acres) (Petelo 2002). The Tongan farm system is based on small-hold farmers with average farm size of 8 acres. Small-holder farmers

usually cultivate around 4 acres at any one time. The root crops enterprise, like any other agricultural enterprise evolved around this system. The land tenure system as described above, allows leasing of land for expanded production and through time accommodated increasing demand for land by commercial root crops producers.

Of an estimated 42,000 ha of arable land in the Kingdom, around 42 percent is currently farmed. Traditional agriculture is based on small holding of 3.3 hectares and is largely rain-fed. Root crops (yam, taro, sweet potatoes, *Alocasia*-kape and cassava) dominate the cropping system and these crops occupy an estimated 28 percent of the farmed land. Root crops are principally for domestic consumption, but export is gaining significant importance in recent years, with an increasing volume of export (particularly yam, taro, cassava and kape). Cassava, followed by *Xanthosoma* taro and sweet potatoes are the most widely consumed edible root crops in the country. These crops have gained great importance over the years, mainly because of their short growing period and because they are tolerant to drought.

The Tongan soil is generally categorised as being fairly fertile. It is the foundation of the ability of the agricultural sector to keep producing various agricultural enterprises for a sustained period of time. However, increasing cultivation leads to reduction in soil fertility. Nutrients supplements in the form of chemical fertilizers are now being increasingly applied to almost all of the commercial crops grown in the Kingdom. Root crops are considered to require low nutrients supplements, especially cassava which certainly is the last crop in most rotation cycles before the land is left barren to recover. Yam is always the first crop in the rotation cycle as it needs more fertile land to thrive.

3.3.2 Labour availability

Overall labour availability is considered high for both family and hired labour. Family labour is often treated as free labour and do not form part of production costs whereby opportunity costs of labour is not considered essential. Farm labour costs ranges from T$5-15 per hour depending on the crop and season of production. Squash production, for example, hired labour requirement is around 30 percent of the total labour requirement (Petelo 2002) mainly at growing, harvesting and processing activities. Family labour makes up most of labour requirement, around 70 percent (Petelo 2002) during the crop's life. Similar proportion can be argued for root crops.

Root crops production is now a heavily mechanized operation. From land preparation to processing the involvement of machines such as trucks, tractors, ploughs,

discs, harrows, etc cannot be separated. This is against the norm of 30 to 50 years back when social and economic pressures on the sector were not as high as are experiencing in the presence. Hence most of the tasks that were manually performed are currently being mechanized. Labour substitution is increasingly evident which may be cost effective in terms of size but can be highly detrimental in terms of environment and soil degradation.

Subsistence food production is a highly contested topic when it comes to commercial versus domestic production and consumption. Root crops form a large component of the national diet, supplemented by locally produced vegetables, meat and fish, as well as increasing and dominant food imports from overseas countries. It is safe to say that the country is self sufficient in terms of root crops and can therefore increase production for exports to increase foreign exchange and improve its overall deteriorating terms of trade. However, foreign exchange that are generated by export commodities are being more than eroded or washed back overseas by increasing demand for overseas imports of food and other goods.

3.3.3 Finance

The National SDP7 (2001/02 – 2003/04) focused more towards restructuring for higher sustainable economic growth, ensuring financial stability, and investing in people. To this end its investment emphasis was laid down in a Rolling Public Sector Development Program of T$44,766,000 in 2001/02, T$30,327,000 in 2002/03 and T$23,903,000 in 2003/2004. Around 80 to 90 percent of these targets were achieved during the planning period.

The SDP8 (2006/07 – 2008/09) shifted this emphasis towards *directly assisting* the private sector. This means shifting emphasis in the *decision making process* with the private sector involving more in determining what to produce and how to produce through utilization of both public and private sector funds.

The private sector has very little financial resources to offer towards implementing a national export strategy. This is understandable given the fact that private operators are utilizing their own funds to operate their private business. They are expecting government to assist more with promoting their products overseas and also making accessible conditions towards facilitating easier access to financial capitals to operate existing and new export initiatives.

The public source of funds available for private sector development has *traditionally been fairly low* relative to public sector development investments. This is

again understandable as public funds have been seen as contributing mainly towards supplying public goods for the betterment and increasing welfare of all people and not only to a particular group of the society such as the private sector. This school of thought has been recently criticized with the notion of multiplier effects whereby benefits are created somewhat in a chain-reaction like manner. This in itself opens for further criticism given the (*in*)*equitable distribution of economic growth syndrome*.

The banks also have funds that are available for private entrepreneurs at *costs that are considered too high* by the private sector. The Tonga Development Bank used to receive concessional loans from financial lenders such as the ADB, the World Bank and therefore lend to its customers at relatively low costs. This is not the case any more. The TDB is now operating as a commercial bank and compete in the market with other banks. As such they need *bankable projects to reduce the risks* of writing off bad debts in the future. The Government, *in special circumstances*, lends its assurances to banks and guarantees special projects which it deems *beneficial in the interest of the society at large*.

The squash export industry to Japan received such a treat through a T$7 million loan in the 2005 and 2006 seasons to stabilize the market price to farmers. This acknowledged the huge contribution the industry made throughout its 17-18 years existence estimated at around T$200 million plus with the belief that the price will pick up in the future and will ensure full payments in the agreed term. This industry continued to *face negative profit in the last four years* (2005-2006) and the *outlook for the future does not look good at all*. *There is lesser number of farmers now growing reduced acres than before*. *(In)equitable distribution of benefits* can be a concern in this case.

Financial resources are also available for private sector initiatives from i) regional and international institutions such as the Forum Secretariat, the Commonwealth Secretariat, the World Bank, the International Monetary Fund, and the FAO; and ii) bilateral aid donors such as Australia, New Zealand, Japan, the EU, France, etc. *These resources are available but are not easy to obtain*. There is no such thing as *'free lunch'* anymore and private operators must be prepared to face *the costs of borrowing funds* and receiving aid assisted resources. Too often aid funds are treated as free for all but donors are demanding concessions from recipient governments like Tonga.

3.3.4 Human resources

Tonga's population is estimated at 100,000 spreading over 36 islands of which two thirds reside in Tongatapu and about one quarter in the urban areas. The population growth rate is approximately 2 per cent. The UN Human Development Index (2003) rates Tonga at 0.810 ranking Tonga at 54th out of 177 countries. This ranking is considered in the high development group. The population below the national basic needs poverty line (2001) is about 23%.

Tonga's education indicators are the highest in the Pacific. In 2003 the literacy rate was 98.9% and gross enrolment ratio for primary, secondary and tertiary was 83%. In respective comparisons Samoa recorded rates of 98.7% and 71%, Fiji: 92.9% and 79%, Vanuatu: 74% and 58%, Solomon: 76.6% and 52%, and PNG: 57.3% and 41%. In this respect the human resource endowment of Tonga is well equipped for most development activities.

There is concern however that these high indicators reflect only academic achievement with very little expertise in technically practical skills that are required to successfully operate appropriate development initiatives in the country. A relatively large proportion of the high academic achievers (Bachelors, Master, Medical Doctors and PhD holders) in the country, of which Tonga has one of the highest per capita ratio in the world, are leaving the countries for higher salary jobs overseas. This is a huge loss to the economy and this brain drain continues to affect the performance of the economy in the short to medium terms.

Overall the Tongan human resources endowment is well trained and qualified to implement export oriented activities identified in the upcoming National Export Strategy. These resources may be heavily underpriced but are willing to contribute to improving the national economy and the general welfare of the society.

The RSE program to New Zealand and Australia will undermine any development efforts. There will be direct competition for able and experience labour since the return to labour for the RSE may be considerably higher than any development initiative. The RSE is aiming at temporally sending 5,000 workers to New Zealand and Australia, a strategy that will affect the supply and cost of labour to the export industries in the very near future.

3.3.5 Access to production inputs

It is difficult for the export sector, including root crops export production, to solicit limited and scarce resources that are available to the nation to promote overseas export. Resources by definition are scarce in nature. In economic terms, given the limited availability and scarcity of resources, the prices (and opportunity costs) of these resources determine their utilization. Tonga is characterized by its smallness and lack of resource endowments. It is also situated fairly far off from the main markets of factors of production and its export produce. This implies a *'high cost of production and low profitability'* economy and given its price-dominating nature producers tend to find it hard to break even in the export market.

A strategy, like increasing the production of root crops for exports, in itself is a *necessary but not sufficient condition* to achieve stated goals and objectives. There is a need for ample resources to be available to ensure that relevant activities are carried out in an efficient and effective manner. This is important to ensure that the desired outputs are achieved and that the intended impacts and effects of these outputs are also realized in a sustainable and timely manner. These resources include *financial capital, land, ocean, and human resources*. Sources of these resources include the *public and the private sectors* as well as bilateral and multilateral aid assistance and loans.

For root crops production most of the inputs are available locally (land, labour and capital) with the exception of fertilizer and agrochemicals. Fortunately, these inputs are readily available through local agents but at costs that are considered mostly high. Organic farming was introduced in the 1990s but has not picked up well for commercial purposes. The advantage for the root crop industry industry is that the demand for these inputs is fairly low but can still be major costs component when the final margin is analysed.

3.3.6 Infrastructure

Road transport has been greatly improved through Government development programs financed by aid funds from countries such as New Zealand, Australia and the EU. Most farms are accessible. Wharves are also in good standard for the major islands, especially in Vava'u and Tongatapu where exports are possible by sea. Airports are also well developed for air transport in all major islands.

Post harvest infrastructure is not as well developed as the others. Government is now in a position to develop this area utilising the EC STABEX 7^{th} and 8^{th} EDF to develop, amongst other components, export commodities intensification and

diversification (Euro1,140,630) and post harvest handling, processing and market infrastructures (Euro644,620). The post harvesting components includes i) upgrading quarantine office, fumigation chamber and facilities; ii) blast freezing, cooling, packaging and labelling facilities; iii) renovations and upgrading of Tu'imatamoana market and ice-making machines; and iv) slipway improvement to fisheries wharf in Vava'u.

There is no food testing laboratories available in the Kingdom. All testing are done in Fiji or New Zealand. The Ministry of Health's laboratories at the hospital are not capable of doing the necessary testing required. While it is time consuming the current position may be the most cost effective one as establishing a testing unit and managing and running it will be very expensive.

3.3.7 Information

The country has access to most communication technologies currently available, including radio (AM and FM channels), TV (domestic as well as Sky TV channels), internet connections, telephones (mobile, home lines, etc). Most household seem to afford the radio, telephone, and TV services (Sky TV to some extent) while internet café services are available at affordable prices.

3.3.8 Technology

Economic sectors are always on the lookout for available and affordable technologies that may initiate innovation in production, value adding and marketing. For the root crops industry most affordable productive technological advancements are being in use, especially the mechanized technologies. Processing, packaging, and storage technologies are being selective on what is affordable. Assistance in this area will boost production and exports.

3.3.9 Facilitation and linkages

The root crops industry has been well facilitated and linked through producer organization, NGOs, government services, private companies, public-private partnerships, industry bodies and development projects.

3.3.10 Key person dependency

There are key people in place with regards to cassava and yams production and marketing. They are influential in terms of what variety and production method adopt for certain root crops, especially in the case of yams. These farmers are found in most villages and districts and these arts (or secrets) of production are hand in from generation to generation. Farmers do share these secrets and more innovative farmers do develop these knowledge further in the long run. In this way sustainability of production methods is maintained and developed within the industry.

3.3.11 Contracts

Forward contracting of agricultural export commodities has been in practice in the past and the success and failure of this marketing method depends on the quality of commodities supplied. Recently squash exports to Japan were done this way in the 1990s and farmers were paid before their crops were exported. Unfortunately squash export quality was not maintained and importers refused to honour any such arrangement.

Contracts are viable for commodities that can be arranged direct to foreign importers. Root crops have yet to adopt this method given the irregularity of supply and the need sustain market demand in a more formal setup such as supermarkets and delivery chains. Private exporters are capable of arranging and negotiating export contracts.

3.3.12 Marketable products

Cassava can only be marketed frozen, be it to the informal channel or to the formal marketing channel. This is because the shelf life of freshly harvested cassava is about 2 days. Deterioration of the fresh product starts from the time of harvest.

Yams have a shelf life of up to 5 months and can be either exported fresh or frozen. Fresh exports do require fumigation process to control insects as quarantine requirement of all importing countries of New Zealand, Australia and Fiji. This greatly affects the shelf life of yams and also the final quality. Frozen yams are more the norm now for the formal marketing channel as the quality of the product is maintained longer and thus command a higher price overseas.

MAFFF's Quarantine Division imposes national and international standards requirement for every import and export goods. Phytosanitary certificates are issued for every export consignment by air or sea. Standards, certification, branding and labelling are areas to be developed further as the industry progressed more towards the formal marketing channels. Promotion of cassava and yams in overseas destination may be an

issue if more consumers, other than the traditional Tongans and Pacific Islanders, are targeted. This is especially applicable to the increasing Asian population in these destinations.

3.4 Maintaining a competitive advantage

Overseas markets currently available for cassava and yams are limited to expatriate Tongans and Pacific Islanders in New Zealand, Australia and the USA. Fijian cassava are said to maintain a competitive advantage through its quality and packaging. There is a belief that the Fijian variety now grown in Tonga is currently competing well with Fijian cassava. The quality is maintained and targeting the formal channel of supermarket and other distributors need to be investigated for possible increase in market share.

There is a move towards formalising exports of root crops through agreements between government and overseas importers. Government intervention is necessary at this early stage but the private sector must be given the responsibility to take over in the short run. This requires formation of national farmers' organization to arrange production and exporters must be seen to involve only with the exporting process. The conflict of exporters also becoming growers, experienced for the Squash Export Industry, should be a lesson for any formal market arrangements, whether by government or the private sector.

Maintaining quality of exporting commodities is a major challenge for exporters of root crops, especially yams and cassava. Overseas consumers seem to show some nationalistic feelings and obligations through purchasing commodities from the islands first. They do however switch quickly to other sources if the qualities are not met and maintained.

The informal channel is where the majority of growers and exporters are operating from. Small growers do send some good through a focal exporter who from time to time advertised their services in the media (mainly the radios). Some exporters buy from small hold farmers and take the effort themselves to travel to the exporting destination and personally do the marketing and promotion of their goods. Overseas consumers can now ring and order from these sources and goods are delivered on demand. This informal channel should be encouraged and maintained so that growers still have options for marketing their crops.

3.5 Opportunities for scale-up and replication

The opportunities to scale up and replicate the root crops industry export performance rests mainly on international demand for these goods. Any increase in overseas demand will be beneficial for domestic growers but they must be productively efficient to be sustainable in the long run.

There are opportunities for scale-up and replication where new technologies are available at affordable costs. Tonga does not want to replicate the experience of the desiccated coconut factory of the 1970s and 80s whereby the factory was established and the supply did not meet the capacity of the factory at time of decreasing demand for desiccated coconut. The same was experienced for the Hot Air Treatment Plant.

4. Conclusions

The Tongan economy will always face the full impacts of international competitions given that it is a price taker on both factors of production and outputs. The significant decrease in the volume and value of national exports, and in particular agricultural exports in the last 5 years, pose a looming challenge on the welfare of its population, and in particular rural community dwellers.

It has been documented that when more people participate in development opportunities the more equitable is the distribution of income and the more well off the general population is. This has been proved with the squash industry when it was performing well during the 1990s and the early 2000s. Farmers' purchasing power increased and overall spending increased, stimulating growth of the overall economy.

This analysis concentrated on the root crops industry, represented by cassava and yams production, with its past production and export performance, existing and potential markets available, and factors that directly and indirectly affect production and marketing, through a chain analysis methodology. On these chains the following recommendations can be derived.

4.1 Production

Technically, cassava and yams production must be productively economic efficient to ensure sustainable viability in the industry. To this end a lot of research and development is required in terms of chemicals used, increasing yield, and appropriate mechanization. These are factors within the farmer's control and achieving optimal results in this areas will assist with improving the productive efficiency of the industry, as

well as profitability, equitable distribution of income, improving general welfare of the rural population, and positively contributes toward overall economic growth.

The institutional set up of the primary sector may be considered *necessary but not sufficient* to facilitate accelerated development in the agricultural sector. Public institutions, in terms of physical infrastructure, are in place to support the sector, including MAFFF, MLCI, banks and other finance institutions, etc. But the costs of utilizing the services of these setups are becoming increasingly more expensive, especially the costs of borrowings. Banks interests rate on agricultural loans is not considered differently from commercial and construction loans. The TDB is no longer offered concessional rates to the primary sector but instead operating on the same commercial rates as the BOT and other financial institutions. It is therefore recommended that authorities need to review financial borrowing rates to the primary sector.

Taxation policies need to be reviewed to stimulate root crops production. Consumption tax on production inputs affected the cash flow status of many growers and exporters. Although refundable after 2-3 months, financial pressure by this expense may force operators into bankruptcy and financial solvency. Government needs to review the implication of its CT policy and any other fiscal instruments that act against the financial viability of the agricultural sector.

4.2 Processing and packaging

Technically the following areas need to be looked at: i) establish washing and packing facilities; ii) establish facilities for production of packages; and iii) establish blast freezing facilities. Achieving these establishments may reduce time of processing from 2 weeks to less than 1 week.

The Tongan Government is currently planning to establish these facilities soon through the EU STABEX 8th and the 8th EDU.

The institutions needed to improve the processing and packaging process are those mentioned above for the technical component. Ownership and management of these facilities need closer scrutiny to ensure that the costs to growers and exporters are minimised at the onset and that full transfer is phased out over some years.

Government intervention through this type of institutional set up must be well planned and private ownership and management to be controlled by Government until the private sector is ready for the benefits of the sector in the long run,

Policies required for developing processing and packaging again depend on the government's drive to improve the quality and storage of exported cassava and yams. A major cost anticipated is that of electricity. Government must ensure that electricity is supplied at a cost that is subsidised to assist with costs of this phase.

Government can also assist with initial management setup whereby relevant manpower skills can be progressively acquired before the transfer to the private sector.

4.3 Distribution

Technical innovation to promote the distribution of cassava and yams in overseas markets is fairly limited. Most technical requirements are available at these destinations. Appropriate and affordable flight and shipping services should be investigated in terms of proper containers and carriers

In terms of the formal market channel a focal marketing centre will assist with the storage and distribution of root crops once they arrive at overseas destination. There are central warehouses available at places like Auckland and Sydney of which the Tongan Government can investigate to set up these centres. The assistance of these Governments through bilateral aid agreements will facilitate the setup of these centres.

Strengthening of the informal sector through appropriate distribution policies will ensure the sustainability and viability of exporting through this channel. Individual exporters should be financially and technically assisted to cater for the vigorous competition they currently face both locally and internationally.

4.4 Consumption

Demand for root crops such as cassava and yams in overseas markets are based on factors such as taste and purchasing power of the final consumers. Pacific islanders still have the taste for the root crops and the income to purchase these goods.

Promotion of these commodities can be effective especially on Pacific Islanders who have resided in the importing countries for a number of years as well as those born in these countries. There is strong competition in these countries from competitive products such as rice and potatoes. Consumers can still choose root crops if the quality and the price are good and affordable, respectively.

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Annex (to include any detailed sector data not included in body of report and any details of consultations carried out)

Annex 1 Goals and Strategies of the Tongan Strategic Development Plan 8 2006/07 – 08/09

There are eight national development goals of SDP8. They are:

Goal 1: Create a better governance environment

Good governance is seen as underpinning achievements in all areas of economic, social and political development and hence is the first goal. This encompasses the political system, public sector management and core governance institutions.

Goal 2: Ensure macroeconomic stability

Macroeconomic stability is a prerequisite for sustainable economic growth that raises living standards and reduces poverty. It is especially important in the SDP8 period because of the potential fiscal and economic implications of the September 2005 civil service wage settlement.

Goal 3: Promote sustained private sector-led economic growth

Tonga's private sector is the source of most domestic production and employment. Creation of income-earning and employment opportunities in the formal and informal private sectors therefore is essential to increasing living standards. The private sector's performance is also an important determinant of public sector capacity because it is private sector activity that ultimately is the source of taxation revenue and the donations received by the churches and voluntary organizations.

Goal 4: Ensure equitable distribution of the benefits of growth

As noted, there is inequality in the distribution of income between household and regions, growing unemployment, especially of youth and hardship for some groups. Government is committed to addressing these issues through the Regional and Rural Development Program, and developing other pro-poor policy interventions, as well as through achieving Goal 3.

Goal 5: Improve education standards

There have been commendable achievements in education, but concerns have arisen over issues of equity of access to, and quality of, the education being provided, as well as readiness of school graduates for employment in a market economy. Government intends to achieve three specific objectives in order to improve education standards: i) improve equitable access to and quality of universal basic education for all children in Tonga up to

Year 8 (Form 2); ii) improve the access to and quality of post-basic education and training, to cater for the different abilities and needs of students; and iii) improve the administration of education and training so that the quality of educational performance is enhanced.

Goal 6: Improve health standards

As infectious and communicable diseases have been brought under control, non-communicable diseases (NCDs) have increased and now constitute a major public health challenge. Tonga's health system therefore confronts two task: i) to maintain control of infectious and communicable diseases by providing essential primary health care services and controlling some lingering infectious diseases and respiratory diseases; and ii) preventing, controlling and curing non-communicable diseases.

Goal 7: Ensure environmental sustainability and disaster risk reduction

Performance in regard to environmental health indicators of access to safe water and sanitation is encouraging. However, a number of environmental concerns have arisen in recent years. Growth in the urban population has resulted in the subdivision of agricultural allotments on the outskirts of Nuku'alofa and settlement in swampy areas. A boom in housing construction and other infrastructure development has seen heavy demands on sand and gravel and the removal of mangroves, which removes habitat of juvenile fish and crustaceans and increase soil and coastal erosion. Poorly-drained areas often face inundation from the sea and heavy rain, exposing residents to water-borne diseases and other health risks associated with sewage problems.

Pollution is a problem largely arising from increasing utilisation of fossil fuel, improper solid waste disposal, pesticide and fertilizer runoff into the groundwater lens and sea, and random waste disposal by seagoing vessels. Also, Tonga's renewable natural resources have been under growing pressure, and Tonga has experienced 16 major natural disasters in 1950-2004.

Environmental conservation and management, urban management and disaster management are policy challenges that will be confronted during SDP8.

Goal 8: Maintain social cohesion and cultural identity

Tongan culture and society have been dynamic for many centuries, welcoming and adapting to may foreign influences, and taking advantage of overseas opportunities through migration. However, demographic and social change has accelerated in recent decades and posed new and demanding challenges. People under 21 now comprise the majority of the population; more young people are searching for work today than ever

before; more students are dropping out of school; many families are under pressure; domestic violence has become an issue of concern; drug abuse is on the rise; and the rate of crime is increasing rapidly. Many of society's leaders are concerned over the erosion of traditional values and attribute this, at least in part, to the importation of cultural values and behaviours regarded by them as anti-social. These imported values are thought to cause some young people to question their identity and to lose their commitment to the education and personal development necessary to find productive employment.