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Value Chain Analysis of Fiji Fresh Papaya Export Markets

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Abstract

Fiji is a small, developing agrarian nation. Papaya has been recognized as a productive crop with the possibility to be profitable for smallholders and commercial farmers. Papaya is also an important export fruit commodity of Fiji. Hence, with an increase in demand for papaya in export and domestic markets, analysis of the Fiji fresh papaya value chain provides an opportunity to enhance the success of the sector. Value chain analysis tools were utilized to evaluate the performance, recognize the constraints and to suggest improvement proposals for the future development of the Fiji papaya industry in the export market. The value chain performance was evaluated by assessing the efficiency, flexibility, responsiveness and food quality and the major constraints for the expansion of the papaya industry were identified. Public-private partnership programs need to be framed for the further development of the papaya industry in Fiji.

Key Words: Fiji, papaya, value chain, exports, Nature's Way Co-operative Ltd.

Introduction

The agriculture segment remains important to Fiji's economy for income generation and food security. Agriculture is the third biggest industry in Fiji, representing seven per cent of Fiji's gross domestic product, supporting the livelihoods of 28 per cent of Fiji's people, and it is the fundamental source of work for in excess of 83 per cent of Fiji's regional population. Fijian agriculture is a blend of subsistence and commercial cultivation. Sugar cane was the traditional backbone of the Fiji's economy and it remains the third largest export earner, however that industry's production and performance keep on declining. The Fiji government is focused around expanding the non-sugar subsector's performance (U.S Embassies, 2019).

The government is supporting the production of different types of produce, for example, coconuts, bananas, papaya and grains, with the intention of supplying the tourism sector. Subsequently, non-sugarcane harvests contributed around three times more than that of sugar cane in 2012, despite the fact that as a solitary export, sugar was the most profitable, producing US\$38m. Farming land in Fiji represents around 22.9 per cent of total land (Commonwealth Organisation, 2018).

Most Fijian farm families produce both sustenance and cash crops. The prevailing outputs are from ginger, cassava, taro, kava, bananas, papaya, vegetables and breadfruit, alongside poultry, pigs and dairy cattle.

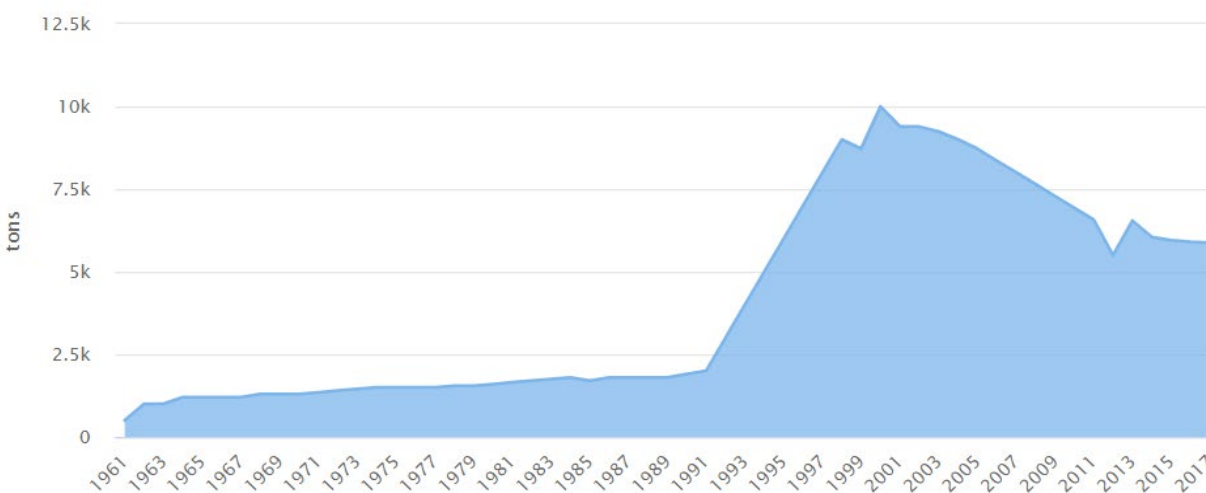
The significant commercial crop is coconuts, to a great extent exported as copra. Root crops like taro and kava are additionally significant exports, while another separate treatment facility has raised exports of new tropical products, for example, papaya, breadfruit and pineapple which are sold mainly to Australia and New Zealand (PHAMA, 2015).

Fiji is in the midst of an exciting and challenging period in its agricultural history. Papaya has been recognized as a productive crop with the possibility to be profitable for both smallholder and commercial farmers. Traditionally papaya cultivation has been viewed as a gardener's activity in Fiji, but presently it is seen as a significant export product offering the opportunity for income and work in regional areas. Fiji has been exporting papaya since 1980 to Japan, Australia and New Zealand (McGregor and Stice, 2014). There is a strong demand for Fiji 'Red' Papaya in these export markets. A detailed analysis of the Fiji fresh papaya value chain should uncover some opportunities for further success in this sector.

Fiji Fruit Sector Analysis

Fiji is home to the production of many tropical fruits, such as banana, papaya, pineapple, and breadfruit. The decline in the sugar industry has strengthened the horticulture sector in Fiji. Fruits are mainly produced for the domestic market and home consumption. However Fiji has a growing export market for vegetables, fruit, and nut food preparations which was valued at US\$7.31 million during 2018 (United Nations Statistics Division, 2018).

Figure 1. Fresh fruit, and other production (in tons), Fiji, 1961-2017



Source: FAOSTAT (2017)

Figure 1 illustrates the total production of fresh fruits and others in Fiji from 1961 to 2017. The significant increase of production in the fruit sector was a result of the decline of the sugar industries during 1990's. The annual production of fresh fruits during 2017 is 5,871 tons (FAOSTAT, 2019). Figure 2 represents the value of Fiji exports of fresh fruit, vegetables and nut fruits in US\$. Fiji mainly exports fresh fruits to New Zealand and Australia.

Figure 2. Fiji exports of fresh fruit, vegetables and nut food preparation (in US\$), 2018



Source: U.N. Statistics Division (2018)

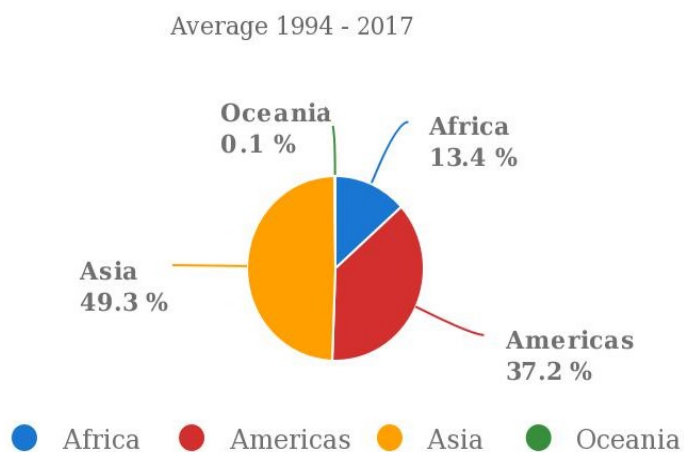
Papaya Sector Overview

Papaya is a tropical fruit belonging to the *Caricaceae* family. The scientific name of papaya is *Carica papaya*. Papaya originated in the tropics of the Americas and Mexico. However, it is presently grown in many countries, especially in the tropical atmospheres of Asia, Africa and Polynesia. Papaya develops as a single-stemmed tree with a crown of huge green leaves rising out of the trunk. The typical life span is around 5–10 years, even though in commercial plantations they tend to be replanted every 3–4 years, or when they are too tall for easy harvesting. The papaya fruit weighs around 250 grams to 3 kilo grams and measures 10-50 centimeters. The size and shape of the papaya varies from one variety to another, but mostly they are oval, round or pear shaped. The firm surface of papaya is either orange (red) or yellow with a bounty of tart and consumable black dark seeds contained inside the focal pit of the papaya fruit (AgriFutures, 2017).

In Fiji mainly “Fiji Red Papaya” are grown for export purpose only. The Fiji Red Papaya project was implemented by the Australian Centre for International Agriculture Research (ACIAR) in collaboration with Nature’s Way Co-operative Limited in order to increase Fiji red papaya production and to strengthen the papaya value chain in the export market. The Fiji red papaya is well-known for its sweetened flavor and it is highly regarded as a healthy fruit which contains vitamins like vitamin A, C and E. To date, worldwide utilization and sale of papaya is not as high as other tropical fruits like banana and pineapple, but Fiji can possibly increase exports of its marked 'Fiji Red' papaya. Fiji stands at 45th position in global papaya production ranking, with 3,434 tons of annual production (2017). The average yield of papaya is 128,153 kg/ ha (FAOSTAT, 2019).

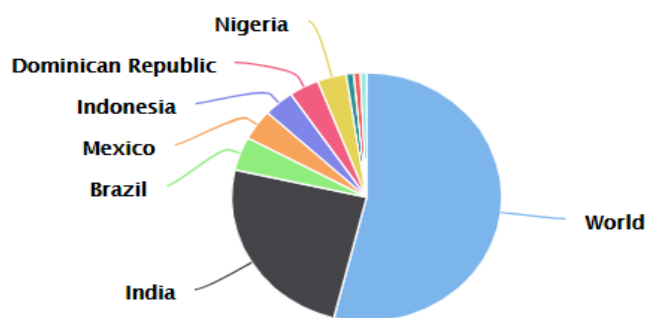
Figure 3 depicts the share of papaya production by region. Asia is the leading continent in papaya production which contributes 49.3 per cent of global production, followed by America, Africa and Oceania contributing 37.2, 13.4 and 0.1 per cent respectively (FAOSTAT, 2019). India is the largest papaya producing country, with 5,940,000 tons of annual production (Figure 4).

Figure 3. Global share of papaya production, 2014-2017



Source: FAOSTAT (2018)

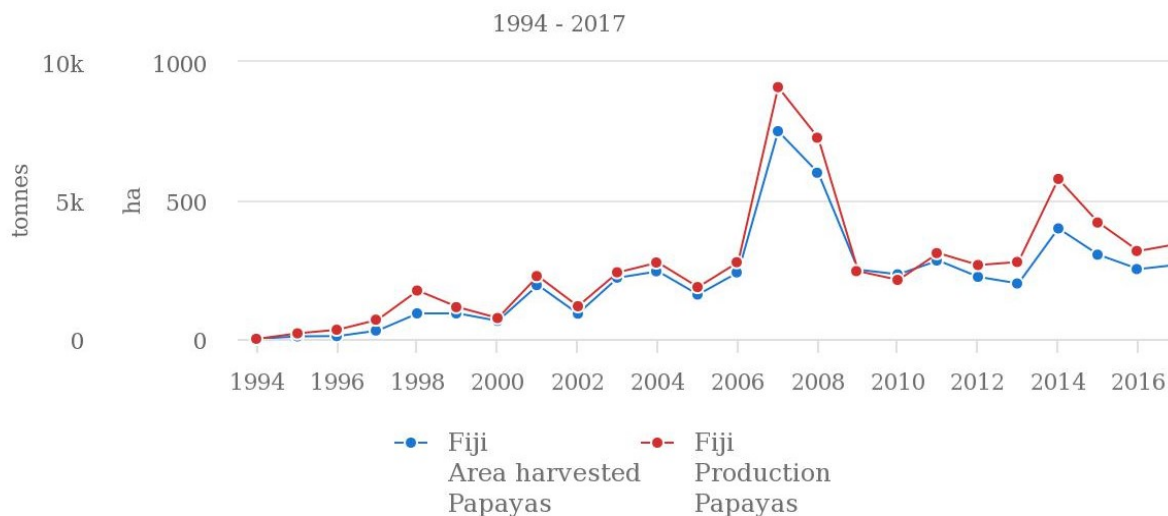
Figure 4. Top 10 papaya producing countries (in tons), 2017



Source: FAOSTAT (2018)

Figure 5 indicates the average production/yield quantities of papaya in Fiji from 1994-2017. Fiji produced 3,434 tons of papaya during 2017 from 268ha, so the average yield was 128,153 kg/ha. Figure 6 illustrates the volume and value of Fiji papaya exports over the period 2012-2018. 286 tons of papaya was exported to New Zealand and Australia during 2017, as well as very small volumes shipped to Canada, Japan, Hong Kong and Nauru which does not require quarantine treatment. The total value of papaya exports was FJD\$1,174,000 (NWC, 2019).

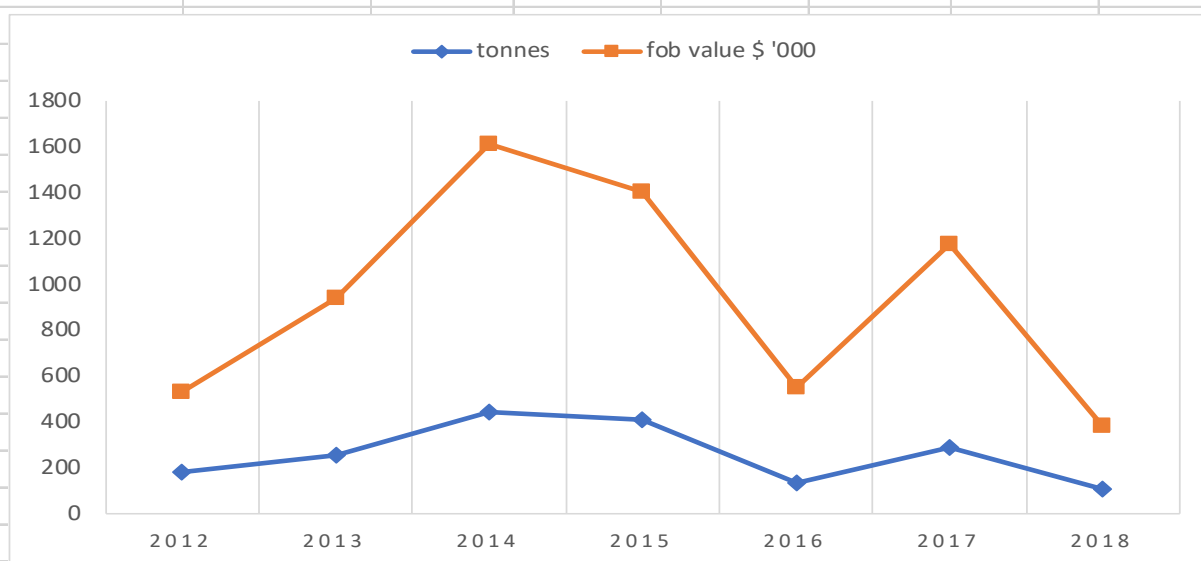
Figure 5. Production/yield quantities of papaya in Fiji, 1994-2017



Source: FAOSTAT (2017)

Figure 6. The volume and value of Fiji papaya exports, 2012-2018

	2012	2013	2014	2015	2016	2017	2018
tonnes	182	252	445	409	133	286	107
fob value \$ '000	529	943	1,609	1,404	549	1,174	381



Source: Fiji Ministry of Agriculture (2018)

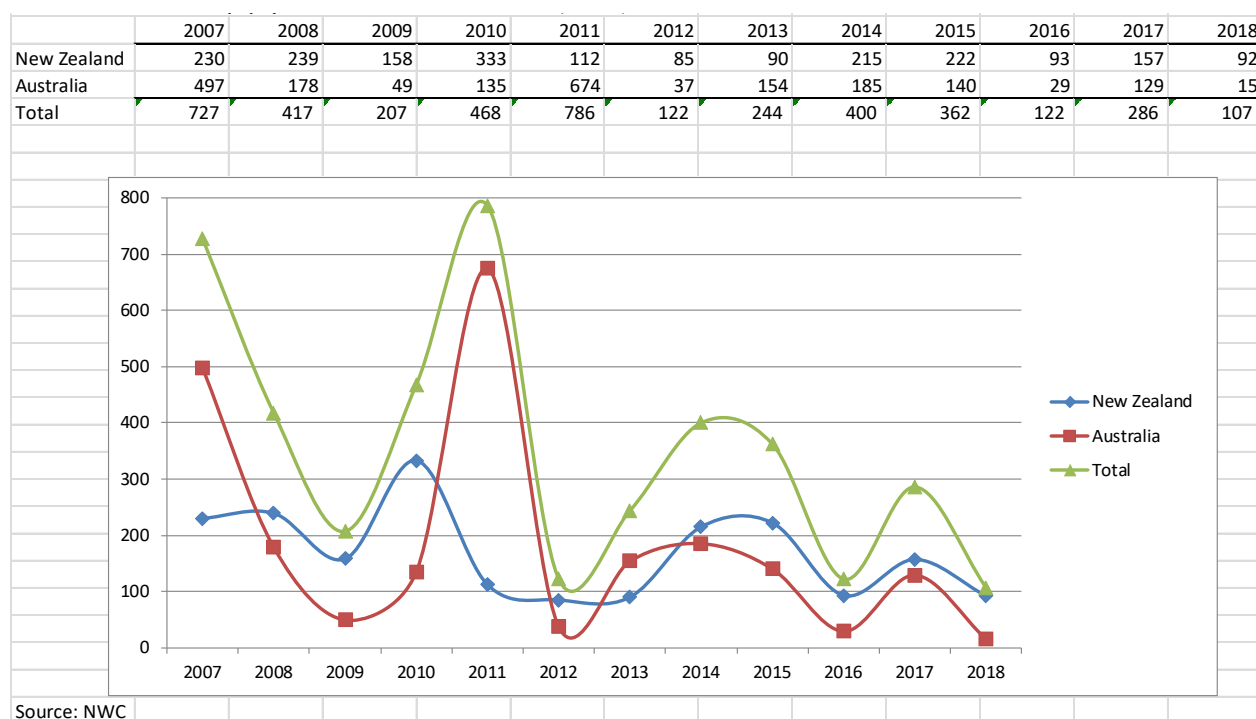
Market Analysis

Papaya has a realistic capability of turning into a significant horticultural export industry and food security crop in Fiji and other Pacific Island Countries (MOA, 2018). While papaya is produced mainly for household consumption and the domestic market, exports are growing annually to New Zealand, Australia and other countries using the High Temperature Forced Air (HTFA) quarantine treatment. The HTFA treatment is mainly done at Nature’s way Co-Operative Fiji Limited (NWC).

Papaya export markets

The volumes of HTFA-treated papaya exported to New Zealand and Australia over the period 2007 to 2018 are presented in Figure 7.

Figure 7. Volume of HTFA treated papaya exported to Australia and New Zealand: 2007 -2018 (tonnes)



Source: Nature’s Way Co-Operative Limited (2019)

Several market studies have identified potential markets in the United States. On the positive side, a notable papaya disease (papaya ring spot virus (PRV)) is absent in Fiji. However, papaya is regarded as a host to the Pacific fruit fly (*Bactrocera passiflorae*), hence the need to use HTFA quarantine treatment for exports to Australia and New Zealand. Since NWC began providing quarantine treatment for export papaya, there have been 13 exporters involved. This includes Sako Bhusan who used NWC’s facilities to export papaya to Japan in the early 1980s. Papaya from Fiji can be exported to Japan without quarantine treatment, however, the company chose to utilize the NWC fruit packing facilities. There are currently eight exporters using the HTFA facility for exporting papaya to New Zealand and one to Australia.

New Zealand

New Zealand's papaya imports are dominated by the Philippines, with Fiji being the second largest supplier (Table 1). Papaya from the Philippines are mainly sea freighted - "piggy backing" on banana shipments made by the multinational Dole company. In New Zealand papaya is sold in four different market sectors namely: supermarket chains; specialty fruit and vegetable stores; traditional shops (mainly Indo Fijian dairies); and local markets. Fiji accounted for all the papaya sales made in the local markets and traditional shops and around 40 per cent of the papaya sales made in specialty fruit shops (McGregor and Stice, 2009). However, Fiji made no papaya sales in the much larger market of the major supermarkets – which was entirely dominated by Dole papaya from the Philippines. Since 2009 there has been significant growth in New Zealand papaya imports. Fiji, however, is yet to make any penetration into the larger supermarket chain market. McGregor and Stice (2009) concluded that to capture a share of the supermarket market, Fiji papaya would need to be sea freighted to New Zealand to achieve the volume and price to compete with Dole papaya – despite "Fiji red" papaya being regarded as being of superior quality.

Table 1. New Zealand papaya imports (tonnes), 2010-2018

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Australia	0	0	0	4.3	16	43.3	48	13.4	28.2
Cook Islands	8	0	0	0	0	0	0	0	0
Fiji	256	281	86	51	163	183	56	127	86
Philippines	511	538	762	858	755	548	424	487	489

Source: Stats New Zealand (2018)

Australia

In Australia papaya is also known as pawpaw. Australia is also one of the major papaya producing countries. Papaya consumption in Australia is estimated at around 0.7 kg per capita. In 2017, over 18,000 tonnes of papaya were grown in Australia which had a wholesale market value of around \$AU37 million (Hort Innovation, 2019). Australia consumes mostly domestically produced papaya as they are one of the leading producers. The average annual imports of papaya from Fiji (the only country permitted to export papaya to Australia) over the last decade has been about 185 tonnes. The Fijian papaya are mainly exported to the southern markets of Melbourne and Sydney.

A market study by McGregor et al. (2009) found it particularly notable that in Harris Farm Markets, a chain of high value fruit and vegetable stores, Australian "Solo" papaya was labelled as "Fiji Red" papaya (Figure 8). This study estimated that Fiji could realistically realise a papaya market share of 10 per cent (around 1,500 tonnes). Papaya are mainly air freighted to the Melbourne market, via Auckland. There is only one active exporter (Sunrise) who has been exporting papaya from Fiji to Australia over the last seven years.

Domestic markets

A very substantial spin off benefit from NWC developing "Fiji red" papaya for export markets has been the availability of superior quality papaya for the domestic market – both for the tourist sector and for local consumers. This market has grown substantially over the last two decades and has brought with its substantial income benefits to farmers and health and nutrition benefits to consumers.

Figure 8. Superior quality Australian papaya marketed as "Fiji red" papaya (July 2009)



Source: NWC (2009)

According to data provided by the Ministry of Agriculture, Economic Planning and Statistics (EP&S) Division, the average production of papaya over the period 2010 to 2017 was 3,400 tonnes. The average annual export of papaya over the same period was 300 tonnes. Based on these statistics the local market consumption of papaya could be as much as eight times more than the volume exported. However, this would not have occurred unless the effort had been put into the development of HTFA-treated papaya for exports.

Tourism sector

The tourism sector has benefited significantly from being able to serve Fiji visitors with world class “Fiji red” papaya. The first, and the most comprehensive study, of the tourism sector’s demand for fruit and vegetables, was conducted by Young and Vinning (2006). Following a comprehensive survey involving 45 hotels they estimated annual consumption of papaya by the tourism sector to be 181 tonnes (Young and Vinning, 2006). A much more recent, but less comprehensive, study estimated annual consumption of papaya by hotels and resorts to be 238 tonnes (for a wholesale value of \$369,000) (IFC, 2018). This figure would seem to be a substantial under-estimation considering that there has been a more than two-fold increase in tourist arrivals over the last decade or so, the increased availability of high quality “Fiji red” papaya, and observed papaya offering in hotels.

Local consumers

High quality Fiji “red papaya” is now commonplace in municipal markets and most roadside stalls. However, data is not collected on the quantity of produce sold on local markets. Of the 3,400 tonnes of papaya produced annually, over 2,000 tonnes (around 2.2kgs/capita) is available for sale annually to local consumers. While this number is probably somewhat of an over-estimation, it is indicative of how substantial is the local market for papaya.

The Fiji Fresh Papaya Value Chain

The Fiji papaya industry is currently comprised of various actors which consists of growers (including large and small farmers), exporters, wholesalers, retailers and the HTFA (quarantine) treatment facility (MacGregor and Stice, 2014).

The various stakeholders involved in the Fiji papaya value chain are as follows:

- Input suppliers (Seedling) – There are seven in number.
- Papaya growers
- Research and Development Partners – Fiji, Ministry of Agriculture, PHAMA and ACIAR.
- Extension Officers – NWC extension officer, Extension department, Ministry of Agriculture.
- Local Traders - roadside vendors, wholesalers and middleman.
- Transportation and Storage - NWC, exporter, Air Terminal Services (ATS).
- Exporters - There are eight papaya exporters.
- Quarantine Check - Biosecurity Authority of Fiji (BAF).

Figure 9 explains the various stakeholders and market system mapping (Hamburger model) of the Fiji papaya value chain.

Input suppliers

These are the stakeholders who supplies input materials such as seeds, fertilizers etc. to the papaya growers. There are currently seven “Fiji Red” seedling suppliers. Three are based in the Nadi area and one each in in the Sigatoka, Lautoka, Ba and Tavua areas.

Producer

The papaya plant growers are the producers. According to the last agricultural census (2009), there were 465 papaya farmers planting 220 ha – with 285 located in Nadroga (mainly in Sigatoka valley), 31 in Ra and seven in Ba. This represented an increase from 54 papaya farmers at the time of the 1991 agricultural census. There are currently 37 papaya farmers who have BQA registration of which 19 supplied papaya to be treated for export at the HTFA facility over the last two years.

Quarantine treatment

Fresh papaya has been exported using HTFA quarantine treatment. The HTFA treatment is provided at NWC. For the export of fresh papaya, the HTFA treatment provides quarantine treatment required to conform to bilateral quarantine agreement (BQA) with importing countries (especially New Zealand). Packing and grading services are also provided by NWC. The cost incurred for HTFA treatment is paid by the exporters.

Exporters

Exporters are the stakeholders who purchases papaya from producers and arrange for HTFA treatment and air freight for exporting. Eight papaya exporters have used the HTFA facility in 2018. These exporters operate almost exclusively out of the Sigatoka Valley (lower valley Bilalevu and the East Bank). The three main papaya exporters - Sunrise (East Bank), Mahens Exports and Manasa Export (Bila Levu) – all have their own nucleus production with supplementary purchases from independent growers.

Biosecurity

To ensure the requirements of bilateral quarantine (BQ) are met the biosecurity process is done at Nadi International Airport. The biosecurity process is usually carried out by the Biosecurity Authority of Fiji (BAF).

Transport

Transportation for Australia and New Zealand is through air freight. Trucks and local transports are used in domestic market. Air freight is done from Nadi Airport to Auckland every week.

Importers/ Wholesalers

The importers are responsible for receiving the papaya from Fiji and carrying out processes like ripening and storage. They distribute the papaya to the local retailers. They have the full rights to accept or decline the products.

Retailers

The retailers play a very important role in the value chain. They are responsible for the distribution/ marketing of papaya to the end consumers. The retailers may be supermarkets, specialty fruit and vegetable shops or ethnic shops. They also advertise, promote and serve the final product.

Consumers

The consumers are rewarded as the final end users of the value chain.

Figure 10 illustrates the pictorial representation of Fiji fresh papaya value chain. It shows how the papaya is carried out in different stages of the supply chain from input supply till it reaches the customers. It also shows how the papaya are harvested, packed and supplied to the quarantine treatment. The HTFA treatment is mandatory for the exporting of fresh papaya to New Zealand and Australia. Figure 11 illustrates the complex Fiji fresh papaya value chain.

Performance of the Papaya Export Value Chain

A value chain approach relies on achieving a suitable strategic scope and strategic fit for the supply chain of a specific product, which aims at maximising the value of the product in the value chain (Chopra & Mendil, 2012). The following four categories were evaluated to assess the performance of the Fiji fresh papaya value chain: efficiency, responsiveness, flexibility and food quality (Aramyan et al., 2007).

Efficiency

Efficiency is one the main criteria which is assessed to evaluate the performance of value chains. Efficiency aims at maximizing the value adding by the process and minimizing the cost absorbed in inventories. The efficiency of the value chain is measured by assessing various aspects such as production cost, profit, productivity and price (Aramyan et al., 2007).

Figure 9. Stakeholder/ market system mapping (Hamburger Model) of Fiji papaya

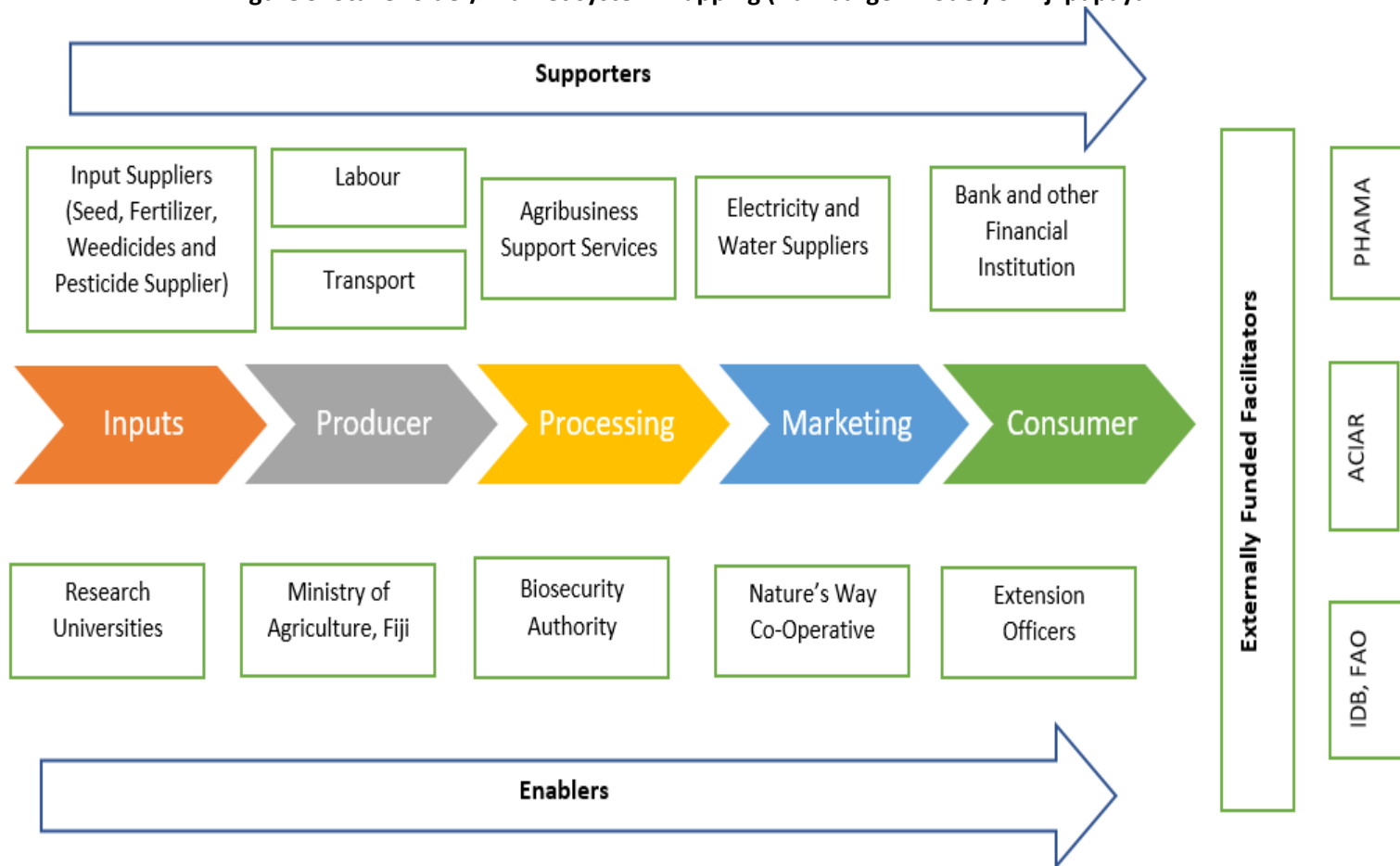
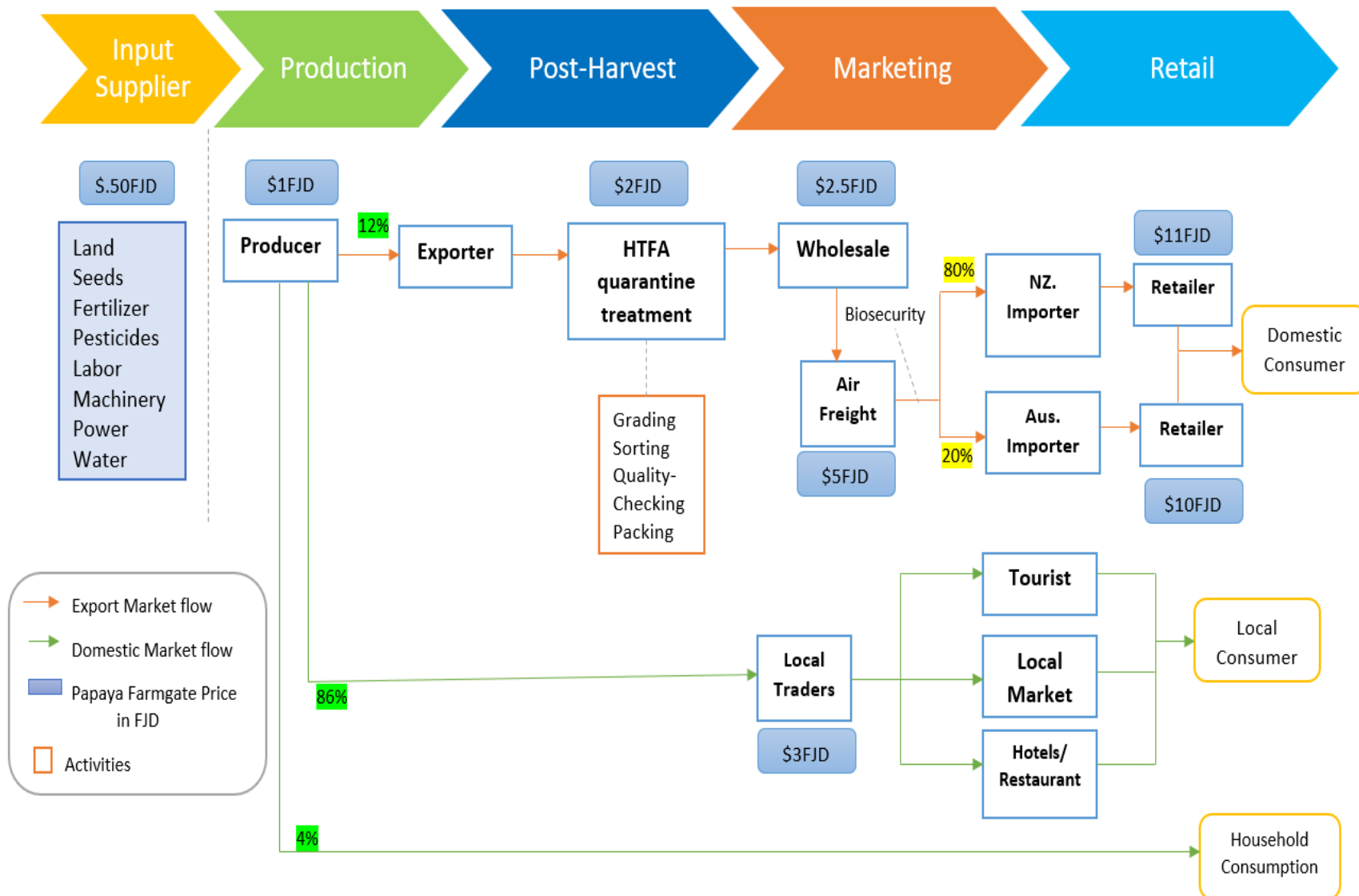


Figure 10. A pictorial representation of the Fiji fresh papaya value chain



Source: McGregor and Stice (2014)

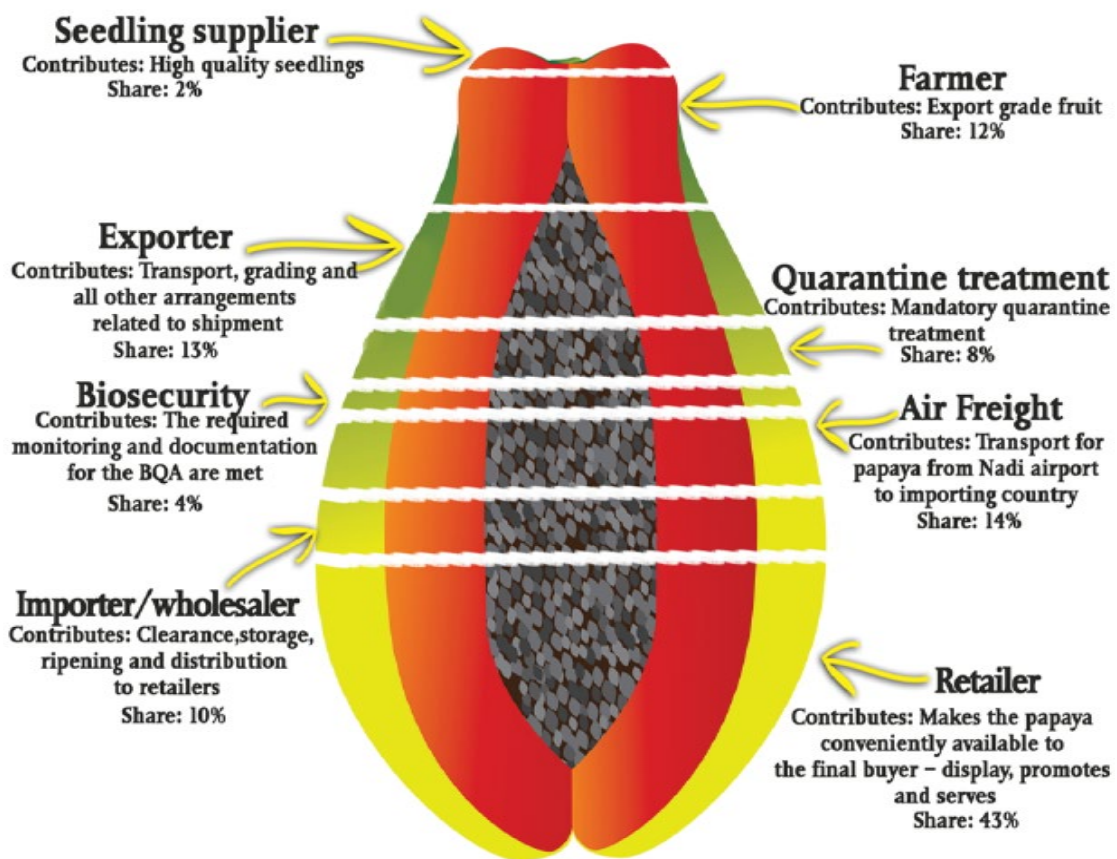
Figure 11. Fresh papaya value chain for domestic and export markets



Cost of production: Cost of production includes the total cost incurred to produce one kg of papaya. The average cost of production of papaya in Fiji is \$US0.23/kg, whereas the cost of production in other Island producing countries like Philippines is approximately \$US0.14/kg. This shows that the cost of production of Fiji papaya is much higher compared to other global competitors. The high production cost is mainly due to high input supply cost. Hence, there is need for the reduction of cost of production to compete in international markets.

Profit analysis: Figure 12 illustrates the share of consumer price at different stages of the papaya value chain.

Figure 12. Share of consumer purchase price in Fiji papaya value chain



Source: McGregor and Stice (2014)

All the links in the supply chain are important and should have enough profit to remain in business (Mcgregor & Stice, 2014). From Figure 12 we can predict that the retailers will receive the higher profit in the value chain compared to other actors, whereas the producer and processor will receive lower profit and have little bargaining power.

Productivity: From Table 2, Fiji had a yield of 128,153 hectograms per hectare during 2017. The yield of papaya in Fiji is very low compared to more productive producing nations, for example Dominican Republic

and Indonesia. Fiji is in 41st position globally in productivity (FAOSTAT, 2017). However, this low ranking could be improved by increasing papaya plantings and using better agronomical practices.

Table 2. Productivity of major papaya producing countries, 2017

Country	Global Ranking	Papaya Productivity (Hectogram/ ha)
Dominican Republic	1	2,816,452
Indonesia	2	921,464
India	5	443,284
Philippines	18	214,526
Australia	19	213,035
Fiji	41	128,153

Source: FAOSTAT (2017)

Price: The volume and value of Fiji papaya in export markets is highly variable because of cyclone incidents in Fiji. Table 3 illustrates the total quantity of papaya exported, the value of exported papaya and the unit value from 2012 to 2018. The volume of papaya exported varies greatly, however, the unit value has increased step by step over the period. In 2012, Fiji papaya exports were \$2,906 per ton while for other significant papaya exporters, for example, Philippines and India, papaya unit value was \$US 1,034 and \$US 1,565 per ton, respectively (FAO, 2017). This infers Fiji papaya pricing was high in the global market.

Table 3. Export volume, export value and unit value of Fiji papaya exports, 2012-2018

Year	Export Volume (tons)	Fob Value \$ 'ooo	Unit Value (\$/tons)
2012	182	529	2,906
2013	252	943	3,742
2014	445	1609	3,615
2015	409	1404	3,432
2016	133	549	4,127
2017	286	1174	4,104
2018	107	381	3,560

Source: Fiji Ministry of Agriculture (2018)

Customer satisfaction: Customer satisfaction plays a very important role in the value chain. Fruit taste, quality, packing, pest and diseases and health benefits are the important factors which customers care about. Fiji red papaya has its own taste, and which attracts many customers in New Zealand and Australian markets. Because of all the various steps involved in the handling of papaya across the supply chain there is sometimes damage noticed in the markets and Fiji papaya also faces some post-harvest rot diseases

during the wet season. While Fiji red papaya is a healthy product like all other papaya, it has the additional advantage that customers regularly imagine that it is delivered in a solid, "immaculate" condition. Customers who are unhappy with Fiji papaya are mainly concerned about the higher prices in the market compared to Philippine papaya. It is worth noting that there is no patent for Fiji red papaya (Mcgregor & Stice, 2014).

Volume flexibility: Fiji papaya is highly variable in the volumes that have been exported. Table 3 clearly indicates that papaya exports are based on production not on the demand in the market. Fiji has faced severe cyclones during past years. The recent cyclone in April 2018 affected many papaya production areas especially in Sigatoka valley. The volume of papaya export is high when they have favorable climatic conditions.

Lost sales: Lost sales is defined as an order that is lost due to produce being out of stock. Fiji papaya is not much affected by any diseases except for a few outbreaks of post-harvest rot reported during the wet season in Fiji (April-June). Cyclone events will also have impacts on the number of lost sales as export contracts cannot be filled. This leads to a loss in customer confidence on Fiji red papaya and consequently emerges as a potential boost in income for other global papaya exporters.

Responsiveness

Responsiveness is the extent to which the value chain responds and handles a range of quantities demanded, a variety of products, service level, supply constraints, lead times, and building innovative products (Chopra & Meindl, 2012).

Linkages and relationship: Strong linkages and relationships between stakeholders strengthen value chains, so the best performing value chains are those that put resources into connections, as well as making sure individual needs are met. This shows each stakeholder the role they play in conveying an item to the purchaser. In an effective value chain, every stakeholder is cooperating to reinforce the entire value chain (Mcgregor & Stice, 2014). In the Fiji papaya export chain all the stakeholders are linked, but these could be stronger to increase the efficiency of the business.

Information flow: A good flow of information across all the different actors in the value chain is very important to keep the chain strong and sustainable. Each stakeholder requires goods and services from each other, but frequently information about these necessities just passes between the two stakeholders who are directly connected. Good, widely available information prompts good decision making (Mcgregor & Stice, 2014). In the Fiji papaya export chain there are poor flows of information between exporters and producers which is constraining the development of the papaya business in the export market.

Response time: Due to the lack of information flow between exporters and producers in the value chain, and the weak linkages among them, it is evident that the Fiji papaya value chain has a higher response time when compared to its competitors in the international market. The Fiji papaya value chain has been unable to address the imbalance in trust between the exporters and growers. This has resulted in weak linkages in the upstream value chain participants and higher response times.

Food quality

Food quality can be evaluated through product and process quality.

Product quality: Product quality comprises sensory assessment, shelf-life, High Temperature Forced Air (HTFA) Treatment and product consistency (Aramyan et al., 2007).

Sensory evaluation. The superior quality of papaya is identified as little to medium in size, which are fresh and ripened with yellow surface on the skin and flesh with reddish orange color. High quality papayas are sweet to the taste and have a butter-like texture. Fiji red papayas are well known in global markets due to its high quality and because it is produced in a pristine environment.

Shelf-life. For wholesalers, produce shelf-life is vital because the papayas are usually stocked for 1 to 2 days before they are distributed to retailers where they are stored and marketed over the next 3-4 days (Maunahan, et al., 2015). Suitable packaging and storing can improve the shelf-life before it reaches the customers. However, importers/wholesalers face issues with branding of the Fiji papaya and sometimes it may lose color and maturity before it reaches them.

High Temperature Forced Air Treatment (HTFA). Fiji fresh papaya requires High Temperature Forced Air Treatment (HTFA) to access export markets in Australia, the US and New Zealand. Other older markets such as Japan, and other countries do not require any treatment (Stice, 2019). However, papaya post-harvest rot and fruit fly might still appear in papayas. Thus, they undergo biosecurity checks at Nadi Airport before they are exported.

Product reliability. Fiji papaya has relatively low product reliability during the cyclone incidents in Fiji as well as biosecurity issues.

Process quality: Production and marketing subsystems comprise process quality (Aramyan et al., 2007).

Production subsystem. Development is required in the production subsystem in order to decrease losses from non-compliant Fiji papayas due to safety issues. Because of poor pest management and other quality issues, importing countries like Australia and New Zealand may demand additional biosecurity checks to meet their standards, or in some cases suspend imports (Maunahan, et al., 2015). Lack of post-harvest handling processes due to lack of storage facilities and inappropriate packing of papayas are also reasons for the refusal from the wholesalers.

Marketing subsystem. Poor quality of Fiji papayas is the result of a poorly performing marketing subsystem. Poor linkages along the supply chain, particularly between producers and exporters, prevent the growers from obtaining marketing information. There are also poor flows of information across the value chain which results in failure to meet the optimal quality requirements desired by the Importers. The higher cost of production and transportation also leads to failure in competing with other international markets.

Major Constraints of the Papaya Export Value Chain

The above value chain analysis clearly shows that there are considerable constraints on the papaya industry in Fiji especially in export marketing but that there is realistic scope for papaya to become a much larger horticultural export industry. However, the major constraints need to be addressed for the industry to realise its full potential.

A concentration of growers in the traditional Sigatoka Valley growing areas

Papaya farmers remain concentrated in the Bilalevu area of the lower Sigatoka valley and the Kavanigasau area on the east bank. This is despite efforts in the past to establish significant plantings of papaya in other western Viti Levu areas such as by Kumu farms in the Sabeto Valley, and in Ra by Fiji water. The continued concentration of papaya farmers in the flood prone areas of the Sigatoka Valley increases the vulnerability of the industry to natural disasters. This is what occurred in 2016 and 2018, with papaya exports falling to their lowest level in more than a decade.

Lack of entry of substantial new exporters

Of the early HTFA papaya exporters, only three remain active (Mahens Exports, Manasa Exports and Green Valley Fresh). These companies were joined in 2014 by Sunrise Produce who has become the largest papaya exporter and has significant expansion plans. Over the years, several significant papaya exporters have ceased exporting operations due to a variety of reasons, including key person dependency (e.g. National Exports, PSL and Ram's Valley Fresh) natural disasters (Fiji Water) and a change in business focus (UNO, Turners and Growers, and Sanko Agriculture Ltd).

Market access to the United States

The United States continues to offer a major market opportunity for quality "Fiji red" papaya. Thus, it is disappointing that after some 23 years of HTFA operation, market access for papaya to the United States is still not in place. If good market facilities can be found in the US, expansion in production will occur.

Airfreight freight capacity



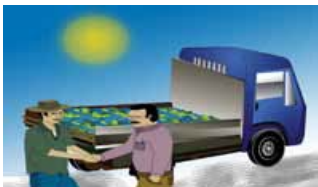


The development of papaya exports, and of all other HTFA commodities, has been must constrained by the inadequacy of airfreight capacity. Papaya has to be exported to Melbourne through Auckland because there are no direct flights. However air freight increases costs, so there is a need to identify alternate ways to export through sea freight in the future.



Requirements for a Sustainable Expansion of the Fiji Papaya Export Industry

Table 4 illustrates some different interventions at different stages of the value chain that need to be considered and planned to increase the efficiency of the Fiji papaya value chain.

Some of the interventions require effective public-private partnerships in order to further commercialise the Fiji papaya Industry. Fiji is a very small country that lacks technologies and exports very low volume of papaya every year. Cyclones and other natural disasters are major threats to the agriculture and horticultural industries. The Ministry of Agriculture and other government departments are assisting to expand and improve export market opportunities for Fiji papayas. Nature's Way Co-Operative Fiji Limited is a co-operative business established between growers and the exporters. NWC is providing excellent extension activities for the exporters and growers in order to expand the Industry. They have undertaken many research activities in order to overcome the threats to the development of the papaya industry.

Table 4: Suggested improvements to the Fiji papaya value chain

Actors	Interventions
<p>Input Supplier</p> 	<ul style="list-style-type: none"> a. Training should be provided for selected farmers about seed collection techniques. b. Enabling the establishment of seed and seedling supply firms. c. The certified nurseries only should supply the papaya planting materials to the out growers.
<p>Farmer</p> 	<ul style="list-style-type: none"> a. Effective extension service on recommended planting materials and seeds should be advised to the producers. b. Introduce enhanced farm practices to decrease the post-harvest rots. c. The development of "Ideal Practice" for papaya production in order to mitigate the catastrophe and climatic change.
<p>Exporter</p> 	<ul style="list-style-type: none"> a. New Technologies like usage of newspapers for fruit wrapping should be introduced in order to reduce the production cost. b. Expanding the production area with new contracts with farmers in expanded geographical area. c. Attracting new substantial papaya exporters.
<p>Quarantine Treatment</p> 	<ul style="list-style-type: none"> a. New Techniques of Papaya treatment with low time consumption need to be developed b. Need to fix better equipment to cut down post-harvest rots. c. The treatment cost should be reduced with appropriate techniques to reduce input cost.
<p>Biosecurity</p> 	<ul style="list-style-type: none"> a. Subsidies should be provided to reduce the treatment charges from the BAF and MOA. b. Need to focus on improving market access and the Bilateral Quarantine Agreement (BQA). c. Improvement of the Biosecurity Authority of Fiji (BAF) to expand the services, cut down cost and to enhance efficiency.

<p style="text-align: center;">Freight</p> 	<ul style="list-style-type: none"> a. Negotiation of the air freight charges need to be undertaken with airways authority. b. New sea freight research and development should be developed.
<p style="text-align: center;">Wholesalers/ Retailers</p> 	<ul style="list-style-type: none"> a. Need to address with new marketing strategic plan for Fiji 'Red' papaya to attract the supermarket customers and compete with the Dole papaya in NZ supermarkets. b. Expansion of the markets should be taken place by advertising the importance of Fiji 'Red' Papaya across the various markets. c. Enhanced marketing plans need to be implemented.

Donor organisations from Australia, New Zealand and the European Union have also aided with fruit and vegetable R&D. The Australian Centre for International Agricultural Research implemented the “Fiji Red Papaya” project for the expansion of the papaya industry in Fiji. Market studies were conducted by the NWC in collaboration with the European Union and the Technical Centre for Agriculture Research to find suitable international markets for Fiji red papaya.

Conclusions

Papaya is an important tropical fruit grown in and exported from Fiji. There is an increasing demand for papaya internationally (especially in Australia and New Zealand) and it was ranked in the top ten most traded tropical fruits in 2018 (Ministry of Agriculture, 2018). Papaya is playing an important role in the Fiji horticultural Industry with huge potential in both domestic and international markets.

Fiji 'Red' papaya has been branded with its own specialties in global markets and has attracted many customers from its unique attributes. The value chain analysis has inferred that there are possibilities to grow the export segment, and the advancement and development of the papaya business would be beneficial for the country. An appraisal on the performance of the value chain recognized significant constraints such as frequent natural disasters, limitations in airfreight capacity and postharvest losses in the wet season. Interventions were suggested to enhance the productivity of the value chain. Ongoing support and investment from government and other donor organizations will be critical for the future development of the Fiji papaya industry.

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