Value Chain Analysis of Freshwater Mussel or Kai (Batissa violacea) Fishery in Fiji.
Abstract

Kai (*Batissa violacea*) dominate the inland fishery and it is dominantly operated by women. Hence, this research seeks to identify effective pathways to improve processes along the chain and quality of *kai* products for harvesters to attain maximum economic benefit, sustaining of livelihood and improving living standard. The research implemented literature research to provide guidance on the use of the value chain analysis tool and semi structured questionnaires as qualitative and quantitative approach, interviewing one hundred one (101) harvesters, eleven (11) intermediary traders, two (2) exporters, one (1) processor, four (4) restaurants/hotels, five (5) transports and one (1) boat builder. The questionnaires survey was conducted in the provinces of Rewa, Naitasiri, Nadroga, Tailevu and Ba. The data obtained were evaluated using the value chain analysis tool and descriptive statistics. Finding showed that there are three (3) pathways of processes and activities that create the value from the harvesters to the buyers which are harvesters to customers through intermediary traders, harvesters to exporters/supermarkets through processors and harvesters selling direct to the market and restaurants. The main buyers are Fijian of Indian descent (95%) with sizes and quality the major requirement. Women of the Naitasiri district (Kasavu, Waidra, Nakini, Nacokaika, Naganivatu and Natoaika) are the major *kai* supplier to the local markets as well as the export market. Total wealth created through the three (3) pathways identified whereby a harvester sell 83kg *kai* (normal sale volume per week) is estimated at $FJD84.00, through the intermediary traders is estimated at $FJD128.00 and through the processor to the exporter is about $FJD808.00. Other important components of value added identified are the transportation as more mini buses operating in the area (especially Naitasiri district) transporting harvesters to harvesting site and carriers to the market, boat builders and associated fee (market fee, business license, freight, fishing license and consent fee) paid to the relevant authorities. The constraints is faced during the marketing of the product at the local market as there is limited space to cater all the vendors especially in Nausori and Suva and unhygienic standard of all the markets not comply to the Food Safety Act 2003 and Food Regulation Act 2009. The potential solution is to create new and more markets for the harvesters, improve the market standard to comply with the Food Safety Act 2003 and Food Safety Regulation 2009. For sustainable management, size limits and quota to be implemented at the harvesting level.
Keywords: value chain, customers, product requirement, volume, quality, standards, processes, activities, key players, external influences, policies, cost and margin, wealth

Introduction

Freswater mussels (*Batissa violacea*) or kai is a main source of protein and livelihood for communities living near the major rivers of Fiji. Kai is restricted to the lower freshwater reaches of rivers, between the upper limit of saltwater penetration and is common in the *Rewa, Navua, Sigatoka, Nadi, Ba, Labasa, Wainikoro, Dreketi* and some various small rivers around the country.

Kai dominate the inland fishery and is operated almost entirely by women from harvesting to marketing of the product. It is obtained by diving or just squatting in shallows and picking from the river bed and is sold at $3 - $5 per heap at the local markets. There are three (3) distinct ecomorphs of kai known by the locals namely *kai buli* (fat and most rounds), *kai bukivula* (thin and oval shell with eroded umbo) and *kai dina* (intermediate between *kai buli* and *kai bukivula* and found on sandy bottom in moderate current). They appear to be related to river conditions and ecological factors of the environment.

Studied on the distribution and abundance of *kai* in the major rivers of Fiji especially for Rewa and Ba were conducted in the 1990s. Naqasima _ Sobey (1996) estimated the density of *kai* in the Rewa River to be 79 individuals/m$^2$ with the standing crop of 5.9 x 10$^8$ individuals in the 7.5 km$^2$ and the fishery yield of 130 tonnes/annum. Ledua (1996) estimated the density of *kai* in the Ba River to be 270.38 individual/m$^2$ with the estimated total population of 787,608,829 and the estimated total biomass of 1,993,374.5 kg.

The kai fishery has undergone many changes especially the volume of production and the value in relation especially on the increase in marketing of the product over the years for poverty reduction and generation of income and employment. Women are principally involved in marketing and have transferred skills associated with home budgeting and planning to conduct marketing of products (Vunisea 2004). The top priority now is to provide substantial economic and income growth through improvement in business development especially in production, processing and marketing (UNIDO 2011). Hence, this study seeks to comprehend in more details the value, status, problems and potentials of the kai fishery through value chain analysis tool. The intention is to identify effective pathways to improve
processes along the chain and quality of kai product for harvesters to attain maximum economic benefit, sustaining of livelihood and improving living standard.

The study will focus on the following objectives:

1. Mapping of the existing chain from harvesting, processing, transporting and to marketing. This includes determining the current value of production and current demand.
2. Value chain mapping i.e. adding value to the existing chain with the aim of answering the questions listed below as discussed in Brown et al (2010).
   (i) Who are the key customers and what are their product requirements in terms of volume, quality, packaging and standards?
   (ii) Who are the key players and what their roles are?
   (iii) What are the activities and processes along the chain?
   (iv) What are the external influences such as regulatory requirements and policies?
   (v) What are the cost and margin, revenues and income distribution of each actor within the chain?

Methodology

2.1 Literature Research
A literature research was conducted to provide guidance on the use of the value chain analysis tool. Hence, the previous researches conducted on the value chain analysis of seafood products were examined. Brown et al (2010) report on the value chain analysis for sea cucumber in the Philippines provided a conceptual framework for this survey.

Value chain analysis looks at every steps or processes, a fisheries business goes through, from raw materials to the customers or end users (De Silva 2011). The value chain analysis is built on a supply chain and is carried out primarily to identify areas for upgrading within the chain such as the processes, products and the functions. Therefore, the two (2) factors in the supply chain that affect the contribution of each actor to the chain are:

(i) Structural factors which include the
   - Characteristics of food community, example, price, quality, quantity and these are determined by the buyers.
- Enabling environment such as laws, regulations, policies, infrastructures which facilitate and hinders the processes or movement of the product along the chain.
- Relationships among the actors to facilitate product and information flow.
- Supporting markets such as the financial services, transportation, input delivery services.

(ii) Dynamic factors describe how the actors respond to the constraints and opportunities within the chain.

Understanding the processes and functions involved in the chain helps determine how this research is undertaken and assessed.

2.2 Semi-Structured Interview Questions

The information collected from the harvesters (village level), processors, and transporter (transporting services) hotels and restaurants and those selling in the local market is through semi structured interview questions with a face to face interview basically on the volume, specific activities, costing/pricing and the consumer preferences. The questions involved the answering of the questions in the objectives to gauze qualitative data while cost and earnings along the chain entail quantitative data. The questionnaires targeted the following players within the chain:

1. Harvesters: As majority of the sellers are harvesters the interview was conducted in the major markets around Viti Levu especially, Suva, Nausori, Lautoka, Ba, Nadi, Sigatoka and Navua. The interview was also conducted in the harvesting site along the Rewa river from Kasavu to Wainasasi near Nakini. To gauze the number of harvesters and the volume of production at village level, the interview was conducted in three (3) villages, Nadrala along the Sigatoka river, Toga and Natoaika along the Rewa river. Thus the survey areas are: Toga district in Rewa (interview conducted in Muana, Vunisei and Narauyaba), Naitasiri district in Naitasiri (interview conducted in Natoaika village), Conua district in Nadroga (interview conducted in Nadrala). A total of 101 harvesters were interviewed.

2. Intermediary traders: Buy kai from the villages and sell it at the local markets mainly in Lautoka, Nadi and Navua. 63% of the traders are females and majority is selling in the Nadi market. The 27 % male are selling in Lautoka and Navua market only. The
suppliers are from Naitasiri. Only one (1) male interviewed is based in the Coral Coast, buys kai from the Suva market and sell to Warwick and Naviti Resort. The interview question is basically on supply and demand. Total of eleven (11) traders interviewed.

3. Processors: These are traders that buy from the harvesters, processed the product (cleaning, boiling, shelling and frozen) and then sell to supermarkets and exporters. Managed to interview only one (1) as we weren’t able to contact the other three (3) because we do not know their addresses and phone numbers given by supermarkets and exporters are unreachable. The questions are on the steps of processing the product, the volume and value of the processed product sold and the demand from the buyer.

4. Exporter: one based in Bilavou, Navosa who exports sporadically and one based in Wailada, Lami who exports every week.

5. Retailers: A few supermarkets, restaurants and hotels are buying kai, in frozen packages for supermarkets and value added for restaurants and hotels. The demand from the customers is assessed in this chain. Four (4) retailers were interviewed.

6. Supporting actors: Transportation, Boat Builders and Law Enforcement Agency. These are the actors that support and contribute to the product and services flow within the chain. Assessed from each supporting actor is how much contribution to the kai supply chain and income earned.

2.2.1 Data Analysis of Value Added Along the Chain

The data analysis employed is derived from M4P (2008) and Brown et al (2010). There are two (2) parts of the analysis:

1. Build a detailed map on the existing supply chain of the kai fishery.

2. Build a detailed value chain map by answering the questions that are stated in the objectives. The mapping exercise is both qualitative and quantitative.

(i) In the quantitative analysis the revenues, costs and margins of the value chain is calculated as this determine the potential for scaling up and required investment into the chain. Firstly, the operating costs (fixed and variable) are calculated. In this case, the fixed costs are the boats, fare to harvesting site and market and depreciation (googles, buckets and knife), while the variable costs are the fare for cargo (depending on the effort and sacks of kai taken to
market), market fee (depending on the number of sacks of kai) and meals (harvesting and marketing day). Revenues are calculated by multiplying the volume sold ($Q$) with the selling price ($P$). The Net Income or profit is calculated by deducting total costs from the revenues. Hence, value added is the amount of wealth or profit created by a player in the chain. Also calculated is the relative financial position of each player in the chain. It is determined through the calculation of the percentage total added cost, total profit and retail price from each chain. The analysis of income distribution through the chain is determined through the net income per unit at each level multiplied by the sales volume at each level.

(ii) In the qualitative analysis the information analyzed are the rules, regulations and coordination that are in place the players must comply with in order to participate. Also determine the linkages within the chain and the knowledge, skills, technology and supporting services.

Maps of the Kai Harvesting Area

![Maps of the Kai Harvesting Area](image)

Figure 1: The main collection site for kai (freshwater mussel) in Viti Levu, Fiji Islands.
Figure 2: Data gathering through the semi structured interview questions at Lautoka Market (left photo) and Ba Market (right photo).

Figure 3: Data gathering through measuring the weight of the kai per heaps and sizes at Nadi Market (left photo) and conducting semi structured interview at Wainasasi harvesting site (right photo).

Figure 4: Data gathering through semi structured interview at Sigatoka Market (left photo) and the kai market near Koronivia Research Station for the villages of Toga, Rewa (right photo).
Results

Mapping the Value Chain

Main Customers and their Product Requirement
Ethnicity plays a vital role in the demand function. This is noted in the kai fishery as ninety five percent (95%) of the customers are Fijian of Indian descents who are living locally and in overseas. The exported frozen kai product taken overseas is mostly for Fijian of Indian descent living in Australia and New Zealand.

The sizes and quality is most important in product requirement. The lone active exporter based in Lami prefers the big sizes as well as the local restaurant entrepreneurs and hotels. However, according to the harvesters in Ba, their customers who are mainly Fijian of Indian descent prefer the small sizes.

Most of the customers prefer kai that are harvested from their own area. For example, native people of Nadroga only prefer kai that are harvested from the Sigatoka River and this is the same for the people who grew up beside the Rewa River.

Similar to other products, quality is the most vital. Customers required vital information from the supplier such as where the kai was harvested and the time it was harvested.

Main Actors in the Processes

Harvesters
Women consist of 95% of the harvesters while 5 % are male. Women harvest for both subsistence and commercial while male harvest for subsistence purposes only or either sometimes accompanying the wife during harvesting. The heavily involvement of women is depending on their ability to stay in the freshwater or cold water for longer than men.

The age group of the harvesters ranges from 20 years old to 70 years old but majority of the harvesters are aged between 50 – 55 years old. The years of experience range from 1 year – 50 years, but majority of the harvesters have 20 years (23 harvesters) and 5 (20 harvesters) years experienced.

About 68 % of the women interviewed spent 3 -4 hours per day and 3 -4 days per week harvesting. In areas that are far from the market such as Naitasiri district, kai are collected for two (2) days and then taken to the market, while in areas that are near the market, kai is
collected for one day only and then taken to the market. For example, if collection is conducted during low tides in the morning, then marketing is conducted in the afternoon, if collection is done during the low tides in the afternoon, then marketing will be done in the next day.

The harvesters basically sell their own harvest at the market. Sitting at the market to sell kai takes about the whole day from morning (8am) till the market closes at 4pm and if there are leftover then they will try to sell it outside the market or taken back home. In Nausori, leftover on Saturday were bartered with vendors from the coastal areas for coconuts or fish.

Since the I Qoliqoli is communally owned harvesters can harvest anywhere within their traditional demarcated area, thus they either walk on foot or travel in public transport or private vehicles. In Sigatoka, the harvesters sometimes travelled on horseback to get to the harvesting site. In Naitasiri district the males either husband or son helps carrying the sacks from the river and loading to the transport available (either van/carrier/bus).

**Intermediary Traders**

Intermediary traders are those that sell kai with shell (not processed) to the markets and other outlets. For those that interviewed, 46% are female, 36% male and 18% represent the both involvement of husband and wife in the business. These traders are from villages in the Naitasiri district mainly Naganivatu and Natoaika. There are no intermediary traders involved in Sigatoka and Ba.

The age group is between 30 to 70 years old. The young traders (45 years and below) only sells at Nadi, Lautoka and Navua market while the older traders (between 65 – 70 years old) all females sells at the Nausori market.

In Naitasiri district, males are mainly involved in the marketing of the product as intermediary traders especially when it is sold at the Navua, Nadi and Lautoka. Presumably, because the product is heavy and needs men to lift the sacks.

**Processors**

Processors sell to the exporters, supermarkets and hotels. Processors are those that have processed or cooked/boiled the kai and then sell to the buyer. Most of the processors are based in Nausori as this was confirmed by the buyers (supermarkets and exporters).
There were about five (5) processors mentioned by the buyers (supermarkets and exporters) as they are actively supplying processed product to them however, only one (1) was able to be interviewed. They have been dodging the authority due to the fact that these processors have no proper business license from the Ministry of Health. As a requirement those involved in fisheries food product should pay a fee of $FJD 800 per annum in order to operate.

According to supermarkets that their contacts have been supplying 20kg processed kai (without shell) per week while the exporter confirmed that his suppliers has been supplying 100kg processed kai (without shell) per week.

In Sigatoka, there was a female who was interviewed mentioned that she harvest her own kai processed them and sells per week to three (3) restaurants in Sigatoka Town in a 2L ice cream container at $ 12 per container.

**Local Buyers**

These are the supermarkets, local consumers that are buying from the local market, hotels and restaurants.

About 95 % of the buyers at the markets are Fijian of Indian origin. During the Hindu’s prayer month the sale is down or no sale at all because Hindus become vegetarian. According to the supermarkets, there is a low demand from the consumers. Most of the people buying from the supermarket are Fijian of Indian origin and have been living in overseas. Some buy a small portion for chaser during drinking session or party.

A very small portion is used in the hotels. Four hotels were interviewed. About a mean weight of 10.03 ± 3.81 kg (without shell) of kai is bought by the interviewed hotels per week. The *kai* is used in various dishes such as *lovo*, boil and marinate, cooked in coconut milk and cooked and *Kokoda* marinate. The selling price is between $FJD 15 - $FJD 70.

The restaurants that were interviewed are based in Suva. *Kai* is one of their Fijian menus which is cooked in *lolo*, baked or cooked with pasta. The selling price is between $FJD 7 - $FJD 25 per dish.

**Exporters**

There are two (2) exporters who were interviewed. One based in Sigatoka valley road and the other in Wailada, Lami.
The one based in Sigatoka valley exports sporadically with a maximum of 20kg per export. It basically depends on the request from his contact in New Zealand and Canada.  *Kai* is bought from Naroro village at $50 per 25 kg crest bag. He has 10 employees who are involved in the process of cleaning, boiling, shelling, packaging and freezing the product. The exporter’s main exporting commodities are vegetables and fruits.

The exporter based in Wailada, Lami has been exporting since last year (2014) and exports at a maximum of 100kg *kai* meat (without shell) per week. His supplier is a processor based in Nausori and his buying price is $FJD 14 per kilograms and the selling price overseas is a markup price of 50% per kilograms. He exports to Australia and New Zealand. He has six (6) employees involved in *kai* as well as some other products. His main exporting commodity are dalo and cassava, however, he wants to diversify to other fisheries products.

![Figure 5: Main players in the value chain of Kai Fishery](image)

**Core Processes, Activities and Costs in the Kai Fishery Value Chain**

*Kai* fishery represents a simple value chain which involves the harvesting of kai from the river using varying harvesting methods. The method used in the Rewa River differs from the method used by the harvesters in the Sigatoka, Ba and Korovou River. The equipment used to collect *kai* in the Rewa River includes (i) wooden boat without engine/bamboo raft/wooden
canoe (ii) knife to dig the *kai* out (iii) swimming googles or underwater mask (iv) neck basket known as the *ikata* (made from coconut leaves or metal wire) (v) buckets. Instead of boats/canoe/bamboo and neck basket or *ikata*, the harvesters of Sigatoka, Ba and Korovou River used floating chub. This is to store *kai* while out in the water and the cloth material hanged around the neck to collect *kai* from the bottom.

*Kai* is harvested and then sorted into sizes especially in the Rewa River where they still have big sizes which are often sold to the intermediary traders. Figure 5 depicts the players involved. The mean size of *kai* harvested in the Rewa River is about 71.30 ± 1.25 mm. In Sigatoka and Ba, the *kai* is not sorted because of the heavy occurrence of medium and small sizes. In the Ba river, the mean sizes of *kai* is about 32.22 ± 1.45 mm while in the Sigatoka the mean sizes is about 53.00 ± 3.26 mm.

The costing of harvesting per day varies at different rivers. Harvesters in the Naitasiri district approximately spending about $FJD12 per day costs while the harvesters of Ba and Sigatoka approximately spends about $FJD16 - $FJD17 on both harvesting and marketing. The difference is that harvesters in Naitasiri only come to the market on Friday or Saturday whiles the harvesters in Sigatoka and Ba comes to the market after every harvest.

Once sorted *kai* is packed into either 50kg/10kg flour bag or 25kg crest chicken feed bag or garlic bag ready for the market. Usually the *kai* bought by intermediary traders are packed fully in a 50kg flour bag (approximately 83 kg). While those sold at the nearby market by the harvesters are packed in a 25kg (approximately 50kg) crest chicken bag or 10 kg flour bag (approximately 32kg) or garlic bag (approximately 18kg). Those that are packed for the processors depend on the volume requested by the buyers. The processor that was interviewed indicated that once the *kai* is cooked then it is packed in a big plastic bag and taken to the buyer mainly through the public transport. The buyers then cleaned the product again, packed, labelled and then frozen.

*Kai* that are sold directly in the major markets such as Nausori, Suva, Navua, Korovou, Sigatoka, Nadi, Lautoka and Ba are sold in heaps (Figure 1 & 3). A heap is measured using the cut off 4 gallon plastic bottle or 2L ice cream container or baby formula milk tin (Figure 12). The mean weight, numbers and sizes per heap varies for each market (Table 1). Ba market has the least mean weight and sizes per heap but high number of individual per heap.
The costing of marketing *kai* at the Nausori and Suva Market by vendors from the Naitasiri district is about $FJD 23.00 per week or one (1) day of marketing. The male intermediary traders marketing cost in a week is about $FJD 409.00 while the female marketing cost per week is about $FJD 61.00. The processors total cost of operation is about $FJD 158.00. The license fee ($FJD 800.00) to process fisheries product is not included because most of these processors are not comply as it is expensive. There are processing standards in the Food Safety Act that a food processor must comply with. However, most of these processors are processing from their own kitchen. According to the processor interviewed, the revenue earned is not enough to renew the license every year. The exporter total costing on the operation is about $FJD 1,997.00 per week.

![Diagram of Kai Fishery value chain](Image)

**Figure 6: Core processes in the Kai Fishery value chain**

**Flow of Product from Source to the Buyers**

The flow of product form source to the buyers varies greatly for each site. There are factors involved that affect the flow of product.

1. Accessibility of the harvesting area to the market.
2. Availability of transport.
3. Road improvement.
4. Number of players involved in trying to get the product to the market.

In the case of Sigatoka, Ba, Kasavu in Naitasiri and Toga in Rewa, there is less time used to get the product to the market than villages in the upper Rewa River (Naitasiri district).
these areas travelling time is about 10 minutes – 30 minutes. In the case of Ba, harvesting is conducted near the Morris Headstrom supermarket, thus if collection is done after lunch then the kai sacks is taken straight to the market awaiting the sale on the next day. If diving is conducted in the morning, then the divers will bring their change of clothes with them because after diving they go straight to the market.

In Sigatoka River most are selling along the improved valley road highway targeting farmers in the area and people living in the highland of Navosa. The sellers are mostly women from Narata and Nawamagi village located on the opposite side of the Sigatoka River. After harvesting in the morning, harvesters swim across or wade in the bamboo raft to sell the product near Nacocolevu Research Station.

The only areas that are facing difficulty in the transport services are the villages in the upper Rewa River or the Naitasiri district. Harvesters have been complaining of the lack of transport services in the area. The buses and mini buses have small space to transport the big sacks. There are only 2 carriers involved in transporting harvesters to the market every Friday and Saturday morning, however, because of more harvesters it could not accommodate them all.

The stages involved in taking the product from source to the end user varies at the different site surveyed. In the Rewa River the processors are involved in buying from the harvesters and sell to the supermarkets and exporters and from the intermediary traders to the local market. It takes about more than twelve (12) hours to reach the customers in Nadi and Lautoka. The processor can spend about one (1) whole day processing and then sell the next day. There is no processor involved in the Ba River while in Sigatoka a harvester processes her own harvest and sell to three (3) restaurants in Sigatoka Town. The processing time is similar to the processor in the Rewa River. The exporter buys directly from the harvesters and processing takes about two (2) days, it has to be deep frozen before exported.

**Information Flow and Knowledge**

The quality requirements, consistency of the supply and prices are important information that is required by the next player.

For those intermediary traders selling in the Navua, Lautoka and Nadi market required big sizes of kai to sell as well as good quality. Hence, they asked the harvesters to harvest the kai
one day before they picked it up in the afternoon. They always negotiate the price because of the long distance they have to travel to sell the product and big bills (hire of carrier and accommodation and meals in town) they have to pay.

The intermediary trader who is selling at the hotels along the Coral Coast has moved to buy from Suva instead of Sigatoka because of the small sizes sold in Sigatoka.

For consistency of supply, the exporters/hoteliers request the good quality product from the processors. Also the processors to comply with regulations and rules in placed.

Table 1: The flow of information and knowledge between players at each process. The flow are going both direction with the trader tells the harvester about product requirement and harvester gives the trader about product availability.

<table>
<thead>
<tr>
<th>Players</th>
<th>Harvester s &amp; Traders</th>
<th>Intermediary Traders</th>
<th>Processors</th>
<th>Exporters/Hoteliers/Restaurants Entrepreneurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Information Flow</td>
<td>Prices per sack</td>
<td>Consistency of the supply</td>
<td>Quality of the product</td>
<td>Quality of the product.</td>
</tr>
<tr>
<td></td>
<td>Big sizes</td>
<td>Big sizes</td>
<td>Big sizes</td>
<td>Big sizes</td>
</tr>
<tr>
<td></td>
<td>Quality of the product</td>
<td>Prices per sack</td>
<td>Prices per kilogram</td>
<td>Prices per kilogram</td>
</tr>
<tr>
<td></td>
<td>Time of harvest to minimize spoilage</td>
<td>Quality of the product</td>
<td>Business to be registered and follow relevant requirements from the Health Authority for consistence supply of product.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harvesting area due to the taste preference.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mature season (months) for kai.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cold weather and rainy season.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Volume and Value of Products and Jobs Created

About 77% of the volume harvested are sold by the harvesters themselves at the market, while the remain percentage are sold to intermediary traders and restaurants entrepreneurs. For the 15% supplied to the male intermediary traders about 90% are sold directly to consumers at the market especially in Navua, Nadi and Lautoka, while the remaining percentages are sold to the hotels. The female intermediary traders sell all her products to the consumers at the market.

Kai sacks sold to the intermediary traders packed fully in a 50kg flour bag with a estimated weight of 83 kg (with shell)at about $FJD 50 - $FJD60. The kai sold at the Nausori market is from $FJD 3 (small sizes) - $FJD5 (big sizes) per heap. Those that are sold at the Ba market is $FJD2 per heap. When the kai is not sold at the Ba market they have a discount of 3 heaps for $FJD2.

There are twenty seven (27) villages and two (2) settlements that are involved in the harvesting. Overall there are approximately five hundred (500) harvesters. For the retailers, the kai has contributed to the revenue of the company through the sale. It allows the farmers to be diversifying to other products that create employment and poverty eradication.

There are other job opportunities created such as boat building and transportation. In the Rewa River, there are three (3) boat builders and two (2) carriers that are directly transporting vendors to the market on Friday and Saturday. Two (2) carriers are used for hire to take the product to Nadi and Lautoka. About seven (7) vans are transporting harvesters to the harvesting site every day and also to the market on Friday and Saturday.

Logistics Issues and External Influences

There are constraints faced by each player in the chain. Table 3 shows the constraints and potential solutions to the problems faced.

At the production level, the consumers are complaining about the small sizes they are buying especially in the Ba and Sigatoka River. According to the harvesters about 30 – 40 years back there were abundant of big sizes but now there are abundances of smaller sizes. It is also confirmed by the harvesters in Rewa River that they used to harvest bigger sizes in the shallow area but now the bigger sizes are only found in the deeper part of the area. In the Sigatoka, the bigger sizes can only be harvested by men since they can dive in the deeper
part. However, in the Rewa a few women are able to dive in the deeper part of the river for the big sizes.

Figure 7: The volume of product at each stage. An overview of the size of different channels within the value chain.

The prevalent selling of small sizes in the Ba Market has urged the local authority to review the current policy in placed. The Fisheries Department could not confiscate the small sizes because there is no regulation on the *kai* size limit in the Fisheries Act.

Dredging and gravel extraction in the Ba River has a major impact on the health and productivity of the river ecosystem. Harvesters have been complaining on the extraction of gravel in the upper part of the Ba River which destroys the *kai* breeding ground. Harvesters used to collect big sizes in the current gravel extraction site. Now harvesters have moved down the river near Morris Headstrom supermarket. In the lower part of the Ba River, dredging occurs which has destroyed the *kai* population near Nailaga village.
Lack of transport to the take the kai bags to the market is the biggest problem faced by the harvesters of the Naitasiri district. The public transport and the two (2) carriers that transport all the harvesters cannot accommodate the number of harvesters in the area that are coming to the market early morning.

The biggest challenges faced by the harvesters are during the marketing of the product at the major markets. Listed below are some of the difficulties faced during marketing.

(i) The lack of space to accommodate all the *kai* vendors.
(ii) Unhygienic selling area that does not comply with the Food Safety Act
(iii) No proper shade in the selling area, vendors has to provide their own shade even though they are paying the market fee.
(iv) No proper table for selling and they have to sit on the ground and provide their own tarpaulin for displaying of product.
(v) Kai frequently need water to stay alive and taps are located far from their selling area. No proper drainage for water sprinkled on the kai, makes the surface slippery creating accident at the selling area.
(vi) Since the selling area is on the ground, the product collects all the dust in the market.

High cost of the food business license makes it difficult for processors to obtain one. In a year, once has to pay $FJD800.00 in order to run a fisheries product business. There are HACCP standards in placed as according to the Food Safety Act a processor must comply with. This makes us difficult to interview processes because all of them do not comply with the requirements and thought we are from the Health Department. Most of this processing is done in their own kitchen without a proper HACCP plan.

On the marketing of the product, there is little promotion on the product. There is a lack of presentation of the product to make it sell especially to hotels. In most of the supermarket, there is no proper labelling with the nutrition fact attached on the product.

**Value Added Along the Chain**

The value added of players involved along the chain is shown in Table 5 – 9. The export price of the kai is a mark up 50% of the buying price from the processor. The value added is calculated after the deducting costs of intermediate inputs. Hence, the value added at the export level is about $FJD 700.00. The freight costs to the importer including the associated
fees as well as payment of labor are the components of value added. Thus when all these services and permit fees are deducted then the remaining value added of $FJD103.00 is left to cover the overhead costs, management, capital and realize profit (Brown et al 2010).

The cost of product to the exporter is $FJD 1,400.00($14 per kilogram at 100 kilogram per week) represents the value transferred to the preceding player (processor). The value added at this point is estimated at $FJD1, 242.00 after deducting the intermediate inputs and other service and fees.

Since the processor is only one supplying to one exporter, the supplier of kai to the processor is also one (1) or two (2) if the persistent supplier does not meet the demand of the processor. Thus, the value transferred to the harvesters is about $FJD150.00. At the harvesters there is no cost of production since the kai is collected from the wild.

In the case of male intermediary traders, the value transferred to the harvesters is $FJD290.00. The value added by the player is estimated at $FJD 767.00 and the value added service at this point are the hiring of transport to take the kai to Lautoka and Nadi, accommodation (rent) fee and market fee in Lautoka.

The value transferred by the female intermediary traders to the harvesters is less than the male counterparts. Simply the volume of the product required is less. Hence the value transferred to the harvesters is about $FJD 50.00.

The value transferred to the harvesters by selling their own product at the market differs for each harvesting site. Table 10 depicts the harvesting site and the value added. The value added services provided by the harvesters are the transportation fare in travelling to the harvesting site and to the market. This opens up transport business in the area with some villagers operating mini buses services from the village to Nausori Town and back. Also open doors for three (3) boat builders, two (2) are building wooden boat and one (1) building the canoe.

Value added represents the wealth created as a result of employing the different factors of production (Brown et al 2010). There are three (3) channels of how wealth is created in the Kai Fishery.
1. Selling direct to the market (Harvester selling direct to the market). Total wealth created by harvesters of Naitasiri district by selling 83kg of kai (1 full 50kg flour bag) normal sale volume per week is estimated at $FJD 84.00. This value is calculated from the usual gross value received every week which is $FJD 120.00. However if all kai is sold then per bag (83kg) one could earned $FJD 168.00 and the valued added at $FJD 132.00. The constraints mentioned in Table 3 prevent them from earning more. The valued added for other site is shown in Table 10.

2. Selling through the intermediary traders: Total wealth created in Naitasiri district on selling through the intermediary traders on the same volume of kai, 83kg (1 full 50kg flour bag) is estimated at $FJD 128.00 ($FJD 43.00 value added from harvester for selling at $FJD 55.00 per bag).

3. Selling through the processors to the exporters and retailers: Total wealth created in Naitasiri district on selling through the processors to the exporters on the same volume of kai, 83kg (1 full 50kg flour bag) is estimated at $FJD 808.00.

Relative Financial Position of Actors in the Value Chain

The intention in this step is to determine the financial position of a player compared with the other in the chain. Figure 5 shows the supply of 83 kg kai (1 full 50kg flour bag) from the suppliers to the exporters. It is evident that the processor incurs low costs and has a bigger profit than the exporter which incur higher costs and little profit. The harvesters incur very little costs but a good profit.

This suggests the unequal sharing of cost and margin within the chain. Several observations can be derived from the graph. Firstly, the harvester is selling the product (83kg kai bag) at a cheap price to the processor at a rate of $FJD 60 per bag. If the bag is sold in the market then the revenue would be an average of $FJD 120 per day. Assuming a 55% conversion (shell is 55% of the total weight) from the weight with shell to the weight without shell. The 83kg kai (with shell) would become 42kg (without shell) and sell them for $FJD 14.00 per kilograms to the exporter and the revenue received would be $FJD 581.00.

Secondly, the processor is using a simple and clean area to process the product and some even use their own kitchen. There is no capital investment such as processing facilities, delivery trucks and labor. Unlike for exporting companies, the standard requirement is for every exporter to have processing facilities and labor.
Harvesters incur a good profit with less cost simply because the product is extracted from the wild. Some are getting the product for free without paying any fishing license ($FJD6.10 per annum) and consent fee ($FJD20.00 per annum varies in different I Qoliqoli) simply they don’t want to.

Figure 5: Division of costs and margin depicts the position of each player in the chain. The calculation is based from a 1 bag (83kg) of the normal sale per week and the total cost involved in getting the 1 bag to the market and how much revenue and profit is earned by the players involved.

**Discussion**

Value added represents the wealth created as a result of employing the different factors of production (Brown et al 2010). In the case of *kai*, wealth is created from the harvesters through the processes along the chain to the end user. These includes the value transferred to the preceding player in the chain and the associated services such as transportation, boat building, and other associated fees paid to relevant authorities.

Basically there are three (3) channels in the *kai* value chain that the product flows through to get to the end users. These are: (i) harvesters through intermediary traders to consumers (ii) harvesters through processors to supermarket/hotels/export (iii) harvesters selling own product to the consumer at the market. It is evident in the result that processors have been reaping the most profit than any other player in the chain. This is using the normal sale
volume per week (83kg) and the conversion of 55 % (shell consist of 55% of the total weight). This indicates the unequally sharing of costs and margins in the kai value chain.

To upgrade the chain, intervention project must be in order such as advice the harvesters to increase the price of one (1) bag to be similar to the selling price at the market. If they increase to the selling price, the processor will still have profit. It should be noted that these processors are living near the harvesting site and have no capital investment in the business. Setting up the fisheries product processing facility is very expensive and the associated costs involved in processing and keeping the facility at the HACCP standard. We could only manage to interview one (1) as the others were cautious to come forward, due to the fact that some have been processing without proper HACCP standard. The intervention that can be proposed at this stage is to assist the processors in the provision of funding assistance or subsidy. Also proper training on HACCP and food safety must be conducted so that they are aware of their important role in the chain.

Another project is to link the harvesters directly to the exporter in order to receive a premium price. Linking them to the exporter will solve all the marketing problems that have been highlighted in the results and Table 3 of the Appendix. The marketing problems have restricted them from earning the full revenue of their sweat. A vendor always lose about $FJD48.00 revenue per week an equivalent to twelve (12) heaps). As stated, kai that cannot be sold on Saturdays are taken back or bartered with vendors from the coastal area for coconuts and fish.

The only opportunity is to create a new market to cater the unsold product to avoid the loss of resource. The twelve (12) heaps (13.4 kg without shell) if sold to the exporter at the current price ($FJD14.00 per heap) an approximately revenue of $FJD185.00 could be earned. Looking at the management and conservation aspect, the harvesters who are mainly the resource custodians should be trained on resource management. This will address the undersize that has been prevalent in the Ba and Sigatoka Market. However, to prevent the selling of small sizes, size limit must be determined by the relevant authority.

To address the question of over harvesting for resource to be inherited by our future generation, harvesting and exporting quota to be in place. Now, we have determined that approximately 60kg (with shell) of kai can definitely be bought from each seller at the market on Saturdays thus the harvesting quota for each harvester should be at 60 kg per harvester. In
the case of Ba, the quota should decrease to 30 kg or close the fishery for some time for the recruitment of big sizes. To secure food security in Fiji, the number of exporter could be limited to 1 exporter per year. Also due to the small range of customers living in overseas (Australia and New Zealand) who are mainly Pacific Islanders.

**Conclusion**

This research reveals the wealth created by the kai fishery to the communities who are living in the major rivers of Viti Levu. The fishery has been supporting the livelihood of the local people for over the centuries but this paper reveals the lack of market opportunities and the poor market condition that restrict the number of vendors selling per day. Also the lack of HACCP standard of processing companies that supplying to the supermarkets and export markets. In order to improve the value chain these issues must be addressed to assure the smooth functioning of each player within the chain.

Now globalization has promoting the *kai* product to the overseas market with Pacific Islanders living in Australia, New Zealand and even Canada and USA. This is confirmed by Pickering et al (2013) the export potential of kai to Pacific Islanders living in Australia and New Zealand. In order to participate in the global economy for substantial economic and income growth, the food safety issue must be addressed.

Hence, training of harvesters and processors on food safety to be conducted and the enforcement of the Food Safety Act 2003 and Food Regulation 2009 on the local markets around the country. Most of these markets are not in HACCP standard to sell fisheries products.

To conclude, value chain is a powerful tool for stakeholders to identify the processors, activities, players, flow of product and information and value. Without conducting this analysis, a player’s wealth including value and services provided could not be evaluated and upgraded to improve the processes and efficiency within the business.

**References**


13.


Appendices

Appendix 1: Mean weight (kg), number and length (mm) per heap at the major markets.

Table 2: The mean weight (kg), number and length (mm) per heap at the major collection site in Viti Levu. The measurement was taken from the major markets; Nausori, Kasavu, Nadi and Lautoka represent kai harvested from the Rewa River, Sigatoka Market for the Sigatoka River and Ba market from the Ba River.

<table>
<thead>
<tr>
<th>Markets/Outlets</th>
<th>Mean Weight (kg) per Heap</th>
<th>Mean Number per Heap</th>
<th>Mean Length (mm) per Heap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausori</td>
<td>2.63 ± 0.09</td>
<td>71 ± 8.1</td>
<td>64.95 ± 1.15</td>
</tr>
<tr>
<td>Ba</td>
<td>1.17 ± 0.12</td>
<td>146.33 ± 14.29</td>
<td>31.89 ± 1.23</td>
</tr>
<tr>
<td>Nadi</td>
<td>1.22 ± 0.07</td>
<td>53.1 ± 9.4</td>
<td>54.25 ± 2.00</td>
</tr>
<tr>
<td>Kasavu</td>
<td>2.78 ± 0.14</td>
<td>111.83 ± 27.3</td>
<td>58.10 ± 2.13</td>
</tr>
<tr>
<td>Navua</td>
<td>2.09 ± 0.16</td>
<td>46.4 ± 7.29</td>
<td>63.94 ± 5.18</td>
</tr>
<tr>
<td>Sigatoka</td>
<td>2.64 ± 0.05</td>
<td>172.6 ± 12.03</td>
<td>53.00 ± 3.26</td>
</tr>
<tr>
<td>Lautoka</td>
<td>1.93 ± 0.3</td>
<td>66.5 ± 14.9</td>
<td>57.58 ± 3.98</td>
</tr>
</tbody>
</table>

Appendix 2: Jobs created and number of players involved per chain

- **Boat Builders**: Number of boat builders: 3; Employees: The owner of the business is the only one involved in boat building.
- **Harvesting**: Number of villages: 27 villages and 2 settlements; Number of harvesters: 500.
- **Transport**: Number of transport involved: Public Transport (buses, Minibuses/3L); however, 3 Carriers (3 ton) are directly transporting the harvesters from Nausori to the market.
- **Retail**: Local market: 10; Retailers: 3; Supermarket: 4; Restaurants: 10; Hotels: 8; Export: Part time: 2; Full time: 1.
- **Consumers**: Major buyer: Fijian of Indian origin (90%).

Figure 9: Mapping the number of players involved per stage in the Kai Fishery
Appendix 3: The flow of product from the end users in relation to transformation of product (raw to end product) and time.

Figure 8: The flow of product from source to the end users at the Sigatoka and Ba River. It involves identifying the products at each stage as they are transformed from raw material to final products.
Figure 8: The flow of product from source to the end users at the Sigatoka and Ba River. It involves identifying the products at each stage as they are transformed from raw material to final products.

Appendix 4: The value of the *kai* product at different level
Figure 10: The value of the kai product from the harvesters to the consumers. The volume and the prices vary from the point of commencement to the end user.

Appendix 5: Equipment used to measure the heaps of kai per at the markets around Viti Levu

Figure 12: Containers used to measure the heaps of kai: 1. Used in Nausori Market 2. Nadi market 3. Lautoka Market 4. Ba market

Appendix 6: The relationship and linkages with the players within the chain
Figure 11: The relationship players have with each other. There are three (3) types of relationships: (1) persistent relationship and spot market relationship.
Appendix 7: The flow of services to the chain that affect the logistic support and external influences

Figure 13: The services that feed into the chain or the logistic support and external influences that affect the service delivery.
### Appendix 8: Constraints and Potential Solution

Table 3: constraints and potential solutions

<table>
<thead>
<tr>
<th>Input</th>
<th>Harvesting</th>
<th>Transporting</th>
<th>Marketing</th>
<th>Processing</th>
<th>Hotels &amp; Retailers</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Clear water</td>
<td>Warm weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Diving in deep area &amp; shallow area</td>
<td></td>
<td>Cleaning</td>
<td>Value adding</td>
<td>Cleaning Packaging</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lifting sacks onto the roadside</td>
<td></td>
<td>Boiling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Packaging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Frozen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actors</td>
<td>Boat builders</td>
<td>Harvesters</td>
<td>Transporters</td>
<td>Harvesters</td>
<td>Intermediary traders (male &amp; female)</td>
<td>Intermediary traders (male &amp; female)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Consumers</td>
<td>Consumers</td>
</tr>
<tr>
<td>Constraints</td>
<td>Frequent flooding</td>
<td>Abundance of small sizes</td>
<td>Inadequate vehicle to transport kai bags to the market</td>
<td>Unhygienic market condition</td>
<td>Unhygienic processing space</td>
<td>Lack of promotion.</td>
</tr>
<tr>
<td>Feasible solutions</td>
<td>Farming to be conducted 100m away from river bank</td>
<td>Liaise with town councils to improve market condition</td>
<td>Conduct training on food hygiene</td>
<td>Promotion of product to create demand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimize use of pesticides</td>
<td>Create more and new markets.</td>
<td>Provision of funding assistance</td>
<td>Liaise with Health Authority on proper requirement and certification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determine the size limit</td>
<td>Provide business training</td>
<td>Provide business training</td>
<td>Create more market opportunities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Product promotion to create demand.</td>
<td>Promotion of product to create demand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Value adding of current product</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Flooded with kai due to more people selling and also during the Hindu prayer week.  
- On food hygiene
## Appendix 9: Analysis Cost and Margins

Table 4: Step by step process involved in harvesting kai, the corresponding resources needed, and associated weekly costs, Naitasiri.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Costs (FJD/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
</tr>
<tr>
<td>Travel to the harvesting site</td>
<td>Vehicle Fare</td>
<td>1.36</td>
</tr>
<tr>
<td></td>
<td>Foot</td>
<td>-</td>
</tr>
<tr>
<td>Harvesting (Diving &amp; Squatting)</td>
<td>Canoe/Boat (good for 5 years)</td>
<td>8.42</td>
</tr>
<tr>
<td></td>
<td>Knife (good for 3 years)</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Googles (good for 3 years)</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Traditional basket (I kata) (good for 3 years)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Bucket (good for 3 years)</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Charcoal &amp; oil (suntan lotion)</td>
<td>0.10</td>
</tr>
<tr>
<td>Sorting &amp; Packing</td>
<td>10 -50kg flour bag</td>
<td>0.50</td>
</tr>
<tr>
<td>Travel back home</td>
<td>vehicle</td>
<td>1.36</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>$12.41</td>
</tr>
</tbody>
</table>
Table 5: Step by step process involved in marketing kai at the market by the harvesters themselves, the corresponding resources needed, and associated weekly costs and the value added at this level for harvester in Naitasiri district.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Value in $FJD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross value received (1 full bag of 50kg flour bag)</td>
<td></td>
<td>120.00</td>
</tr>
<tr>
<td>Intermediate Inputs: Travel to the market</td>
<td>Plastic</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Fare</td>
<td>2.05</td>
</tr>
<tr>
<td></td>
<td>Product Fare</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td>Wheel barrow fare</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>8.98</td>
</tr>
<tr>
<td>Cost of services &amp; fee</td>
<td>Cost of harvesting</td>
<td>12.41</td>
</tr>
<tr>
<td></td>
<td>Travelling to sell</td>
<td>3.65</td>
</tr>
<tr>
<td></td>
<td>Market fee</td>
<td>5.60</td>
</tr>
<tr>
<td></td>
<td>Product fare</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td>Wheelbarrow fare</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>26.59</td>
</tr>
<tr>
<td>Value added</td>
<td></td>
<td>84.43</td>
</tr>
</tbody>
</table>
Table 6: Step by step process involved in marketing kai at the market by the male intermediary traders, the corresponding resources needed, associated weekly costs and the value added at this level. This represents the traders from the Naitasiri district.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Value in $FJD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value received on sale at the market for $FJD4 per heap (83 kg/sack)</td>
<td>About 42 heaps sold at the Lautoka &amp; Nadi market @ $FJD4/heap with average of 7 bags per week</td>
<td>1,176</td>
</tr>
<tr>
<td>Cost of Intermediate Inputs</td>
<td>Cost of product</td>
<td>290</td>
</tr>
<tr>
<td>Other Intermediate Inputs</td>
<td>Packing sacks</td>
<td>2.63</td>
</tr>
<tr>
<td></td>
<td>Plastics</td>
<td>4</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td>296.63</td>
</tr>
<tr>
<td>Less cost of services &amp; permits/fee</td>
<td>Hire of 2 ton truck (4 intermediary traders shared the cost) Total cost of hire is $470 to Lautoka. Contributions depend on the number of kai bags/trader. Total cost of return trip</td>
<td>85</td>
</tr>
<tr>
<td>Travelling to market</td>
<td>Rent fee ($FJD100/week)</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Market fee</td>
<td>2</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td>112</td>
</tr>
<tr>
<td>Value Added</td>
<td></td>
<td>767.37</td>
</tr>
</tbody>
</table>

*The calculation above depicts the trader’s normal sale every week. Based on this the value added earned in one (1) bag (83kg) is approximately $FJD85.00.*
Table 7: Step by step process involved in marketing kai at the market by the female intermediary traders, the corresponding resources needed, associated weekly costs, and value added at this level. This represents the traders from the Naitasiri district.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Value in $FJD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value received on sale @ $FJD 4 per heap for 1 bag full (50kg flour bag) approx... 83kg. Estimation of 42 heaps</td>
<td>The average sale per 1 market day is $FJD120: instead of $FJD 168 (42 heaps X $FJD4).</td>
<td>120</td>
</tr>
<tr>
<td>Cost of Intermediate Inputs</td>
<td>Cost of product (1 bag full (50kg flour bag)</td>
<td>50</td>
</tr>
<tr>
<td>Other Intermediate Inputs</td>
<td>Sacks</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Plastics</td>
<td>2.00</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td>52.30</td>
</tr>
<tr>
<td>Less: Cost of services and fee</td>
<td>Travelling to market</td>
<td>4.10</td>
</tr>
<tr>
<td></td>
<td>Market fee</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td>Wheel barrow fee</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.90</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value Added</td>
<td></td>
<td>58.80</td>
</tr>
</tbody>
</table>
Table 8: Step by step process involved in processing *kai* by processors to be sold to exporters, the corresponding resources needed, associated weekly costs, and value added at this level.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Value in $FJD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value received on sale to exporter at $FJD14 per kg for 100kg kai product</td>
<td></td>
<td>1,400</td>
</tr>
<tr>
<td><strong>Cost of Intermediate Inputs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of product ($FJD60/bag)</td>
<td>2 ½ bags of 50kg flour bag (83kg)</td>
<td>150.00</td>
</tr>
<tr>
<td>Other intermediate inputs</td>
<td>Packing materials</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Fuel (Firewood)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td></td>
<td>150.31</td>
</tr>
<tr>
<td><strong>Less cost of services and other permits.</strong></td>
<td>Transport to buy the product</td>
<td>10.00</td>
</tr>
<tr>
<td></td>
<td>Transport to market</td>
<td>60.00</td>
</tr>
<tr>
<td></td>
<td>Business license in order to operate, $FJD800.00/annum (Most do not comply)</td>
<td>15.38</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td></td>
<td>85.38</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td></td>
<td>235.69</td>
</tr>
<tr>
<td><strong>Value Added (Gross value received less total expenses)</strong></td>
<td></td>
<td>1,1164.31</td>
</tr>
</tbody>
</table>

*3 bags of 50kg full = 83kg (with shell) and 50% of the total weight = shell, thus total weight per sack without shell = 42 kg. Based on this the value added earned from one (1) bag (83kg) is approximately $FJD527.00
Table 9: Step by step process involved in processing by exporters, the corresponding resources needed, associated weekly costs and value added at the export level.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Resources Needed</th>
<th>Value in $FJD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross value received on sales of 100 kg kai ($FJD21/kg)</td>
<td></td>
<td>2,100.00</td>
</tr>
<tr>
<td>Cost of Intermediate Inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of product ($FJD14/kg)</td>
<td>Kai (100kg)</td>
<td>1,400</td>
</tr>
<tr>
<td>Other intermediate inputs</td>
<td>Packing materials</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Cellotape</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Labelling</td>
<td>0.02</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td>1,400.06</td>
</tr>
<tr>
<td>Less cost of services and other permits</td>
<td>Shipment to final</td>
<td></td>
</tr>
<tr>
<td></td>
<td>destination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Registration fee/annum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exporting fee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food processing fee</td>
<td></td>
</tr>
<tr>
<td>Permits and other fees</td>
<td></td>
<td>486</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td>597.05</td>
</tr>
<tr>
<td>Total Expenses</td>
<td></td>
<td>1,997.11</td>
</tr>
<tr>
<td>Value Added (Gross value received less total expenses)</td>
<td></td>
<td>102.89</td>
</tr>
</tbody>
</table>

*The normal sale every week. However, to calculate the value added earned from a 83kg (1 bag) is approximately $FJD288.00. It should be noted that kai is a small proportion of the overall commodities exported. It is approximately less than 10% thus the intermediate input costs and fees is only <10% of the total cost.
Table 10: Revenue received from marketing per day and the value added at each collection site.

<table>
<thead>
<tr>
<th>Harvesting Area</th>
<th>Total Cost ($FJD)</th>
<th>Revenue ($FJD)</th>
<th>Value Added ($FJD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naitasiri</td>
<td>22.50</td>
<td>120</td>
<td>84.43</td>
</tr>
<tr>
<td>Ba</td>
<td>16.00</td>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td>Sigatoka</td>
<td>17.00</td>
<td>40</td>
<td>23</td>
</tr>
<tr>
<td>Rewa</td>
<td>17.00</td>
<td>57</td>
<td>40</td>
</tr>
<tr>
<td>Tailevu</td>
<td>21.00</td>
<td>42</td>
<td>21</td>
</tr>
</tbody>
</table>

*Calculation above is based from the revenue earned from the normal sale volume brought to the market per week, 83 kg (1 bag full of 50 kg flour) with 2.1 kg per heap at $4 per heap
Appendix 10: Questionnaires Form

QUESTIONNAIRE 1. Harvesting of Kai from The River:

Name: ________ Gender: ________ Age: ______ Village: __

Tikina: __________________________ Province: ________ Date: __

A. Harvesting Frequency

1.1 How many years have you harvesting kai?
________________________________________

1.2 What month /season kai is abundant and mature?
________________________________________

1.3 Do you consume kai as part of your daily diet?

☐ Often ☐ Sometimes ☐ Rarely ☐ Never

1.4 What is your normal harvest or number of buckets (FMF biscuit)/sacks do you normally collect?

Number of sacks (50kg flour/potato bag):

Number of Buckets:

1.5 How much of the catch is for consumption at home?

☐ Bucket (FMF) ☐ Sack (10kg) ☐ Basin

1.6 How much of the catch is for sale?

☐ (1 – 2) 50 kg bag (flour) ☐ (3 – 4) 50kg bag (flour)

1.7 Do you give it to your neighbor if you have more than enough harvest?

☐ Yes ☐ No

1.8 Do you also use it as barter system?

☐ Yes ☐ No
1.9 Do you also use it as gift to your family in town and other areas?
☐ Yes ☐ No

1.10 Whom do you sell kai?
☐ Sell my own at the market ☐ Sellers at the market ☐ Middlemen comes to the village
☐ Restaurants ☐ Companies ☐ Supermarket ☐ Hotels

Name the buyers
(restaurants/companies/supermarket/hotels______________________________)

B. Harvesters

1.11 Do you harvest for subsistence or for commercial or both for kai?
☐ Subsistence ☐ Commercial ☐ Both

1.12 Name the collecting site:

1.13 How did you collect kai?
☐ Collecting by hand in shallow area ☐ Diving in deep area

☐ Other (please explain): ______________________________________________

1.14 Name the equipment used for collection

1.15 Does any family member help you to collect kai?
☐ Husband ☐ Father ☐ Son ☐ Brother

☐ Wife ☐ Mother ☐ Sister ☐ Daughter

☐ None ☐ Others ____________________________
1.16  How many hours per day do you spend to collect kai?

☐ □ □ □  □
1 -2 hours  3 -4 hours  5 - 6 hours  More than 6 hours

1.17  How many days per week you spend collecting kai?

☐ □ □
1 – 2 days  3 -4 days  5 – 6 days

1.19  How many hours does it take to reach the harvesting site?

☐ □ □
< 1 hour  1 -2 hours  > 2 hours

1.20  How do you get to the harvesting site?

☐ Foot    ☐ Bus/Carrier    ☐ Canoe    ☐ Bamboo raft    ☐ wooden boat with engine

☐ Wooden boat without engine.

1.21  If you use boat with engine how much fuel do you use per trip  & if you use the bus/carrier how much is your fare? ____________________________

1.22  How do you store the kai after harvest?

☐ Buckets [FMF Biscuit buckets] with water

☐ Sacks soaked in the river

☐ Large containers with water

☐ Other: ...........................................................................

1.23  How do you transport kai to the market?

☐ Village carrier/van  ☐ Bus  ☐ Private vehicle

1.24  What is the total cost of travelling on return trip? 

______________________________________________

C.  Marketing and Income Source
1.25 How much do you earn from your last sale?

1.26 Do you have any other source of income?

_____ Yes  _____ No

1.27 Can you rank which sources of income you get most of your money from and which you get less money from?

_____ Agriculture  _____ Salary  _____ Government support

_____ Harvesting kai  _____ Money from family members in Fiji

_____ Money from family members overseas

Other: ..................

1.28 If you could no longer harvest kai which source of income above do you think would become most important?

_____ Agriculture  _____ Salary  _____ Government support

_____ Harvesting kai  _____ Money from family members in Fiji

_____ Money from family members overseas

Other: ..................

1.29 Are you satisfied with the income you get from kai?

☐ Very satisfied  ☐ Mostly satisfied  Not  ☐ satisfied

☐ Very unsatisfied  ☐ Indifferent

1.30 Do you have difficulty selling kai?

_____ Yes  _____ No

1.31 If Yes, please identify?

1.32 What is the price per heap? (with shell)

1.33. Table for weight of each heap and number per heap
Total heap present:

<table>
<thead>
<tr>
<th>Heap NO</th>
<th>Weight (with shell)</th>
<th>Numbers per heap</th>
<th>Sizes (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.34 In percentage, what ethnic group buys a lot of kai?

I Taukei                Fijian of Indian origin                Fijian Chinese                Rotuman

European  Others

D. Kai Poisoning

1.35. Does shellfish poisoning occur in your area/ or has there been complaining of people getting sick from eating kai?

_____Very frequently  _______Frequently  _______ Rarely

1.36. If it happens when is the time of the year?

______________________________________________

1.37. If it does not happen in your area, does it also affect your sale?

_____Never  _____Often  _____sometimes  _____rarely

E. Local Management

1.38 What do you think about the status of kai in your harvesting area?
If declining or depleted, why do you think so?

- Stocks declining as a natural change
- More people involved in harvesting
- Too much kai harvested
- Pollution (e.g. sewage outlets, agricultural run-off)
- Other: .................................................................

1.39 What management measures are in place??

- Tabu areas
- Size limits
- Catch limits quotas) None

1.40 What are your biggest challenges?


1.41 What areas of the business are possible growth areas?


QUESTIONNAIRE 2. Middlemen

General questions

2.1 Who are your suppliers? List the name of the villages/markets.
Bought from the village          Bought from the market          Supplier in the village

Other: ..........................................

Please name the village and market you obtain kai from? -

________________________________________

2.2 How many kilos do you often buy from each village/market listed above?

________________________________________

2.3 What is the price per kilos?

Price per kg ____________  Price per bag ____________  Other __________

2.3 Who are your buyers? List them down.

__________________________________________________________________

__________________________________________________________________

2.4 How many kilos do they often buy?

__________________________________________________________________

2.4 How much do you sell it for?

2.5 How many workers are involved?

<table>
<thead>
<tr>
<th>Process</th>
<th>Number of workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying</td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td></td>
</tr>
<tr>
<td>Shelling</td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
</tr>
</tbody>
</table>

2.6 How do you collect and transport kai?

__________________________________________________________________
2.7 How do you store during transportation?

2.8 How often do you buy from your supplier?

☐ Weekly  ☐ Daily (except Sunday)  ☐ Monthly

2.9 How often do you supply to your buyer?

☐ Weekly  ☐ Daily (except Sunday)  ☐ Monthly

2.10 How much you earn from your last sale?

2.11 Do you have any other source of income? ☐ No  ☐ Yes

2.12 How much did you earn from all income sources? ________

2.13 Are you satisfied with the income you get?

☐ Very satisfied ☐ Mostly satisfied ☐ Not satisfied

☐ Very unsatisfied ☐ Indifferent

2.14 Have you received reported cases of kai from your customers?

☐ Very Frequently ☐ Frequently ☐ Rarely.

2.15 What are your biggest challenges in this business?

______________________________________________________________________________

2.16 What areas of the business are possible growth areas?

______________________________________________________________________________

QUESTIONNAIRE 3: Processing Company/Export

3.1 Where do you buy kai from?

______ Villages  ______Middlemen _______ Local markets  ______Others
Please name the markets & villages

_______________________________________________

3.2    At what price?

_______________________________________________

3.3    Where do you sell kai?

[ ] Local supermarkets  [ ] Hotels  [ ] Restaurants  [ ] Export

Name your buyers

_______________________________________________

3.4    What is your selling price and production?

<table>
<thead>
<tr>
<th>Outlets</th>
<th>Price/kg</th>
<th>Kg per week or month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.5    What are the steps in processing kai for your customers?

_______________________________________________

3.6    How many employees are involved in each step?

_______________________________________________

3.7    Which outlets have the big demand?

Local supermarkets ________

Hotels _________________

Restaurants _________________

Export _________________

Others _________________
3.8  What are the preferences for each market?


3.9  Did they come up with the preferences or your own idea and you sell the idea?
Own idea _____________  Outlets come up with the idea _________________

3.10  What is the demand like?

<table>
<thead>
<tr>
<th></th>
<th>Local supermarkets</th>
<th>Hotels</th>
<th>Restaurants</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special occasion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.11  Do you process any other food products?
_____ Yes  ____ No

3.12  Which has the big demand?

3.13  Has there any complain on people getting sick by consuming your product?
_____ Very frequently  ____ Frequently  _____ Rarely

3.14  What were the biggest challenges in processing this product (kai)?


3.15  What areas of the business do you think are possible growth areas?
QUESTIONNAIRE 4. Supermarkets

4.1 Where do you buy kai from?
________ Local market  _____ Village  ____Middlemen _____ Supermarket  
______ Processor

List the name of supplier:
___________________________________________________

4.2 How many kilos you often buy from each source?

4.3 At what price?
With shell __________________

Without shell (Meat Only) __________________

4.4 If you process the Kai, how many workers are involved per step?

<table>
<thead>
<tr>
<th>Steps in Processing</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying &amp; Transporting</td>
<td></td>
</tr>
<tr>
<td>Cleaning &amp; Shelling</td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td></td>
</tr>
<tr>
<td>Delivery to Supermarkets</td>
<td></td>
</tr>
</tbody>
</table>

4.5 What is the demand from the consumers
_____ Very high  ____high  ____ low

4.6 In percentage what ethnic group buys from the supermarket?
I Taukei  Fijian of Indian origin  Fijian Chinese  Rotuman

European  Others
4.7 Has anyone got sick from buying kai from your supermarket?

Very Frequently  Frequently  Rarely

4.8 What were the biggest challenges in processing this product (kai)?

________________________________________________________

4.9 What areas of the business do you think are possible growth areas?

QUESTIONNAIRE 5. Restaurants/Hotels

5.1 Where do you buy kai from?

Local market  Village  Middlemen  Supermarket  Processor

Name the supplier:

5.2 How many kilos you often buy from each source?

________________________________________________________________________

5.3 At what price?

5.4 What are the most popular kai dishes? (From most favorites to the least)

<table>
<thead>
<tr>
<th>Dish</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.5 How many days per week you serve kai dishes?

☐ 1 day  ☐ 2 days  ☐ 3 days  ☐ More

5.6 Is the demand for kai dishes high?

_____ very high  _____high  _____ low

5.7 In percentage, what group of ethnicity that frequently orders kai dishes?

I Taukei  Fijian of Indian origin  Fijian Chinese  Rotuman  European  Others

5.8 Has anyone got sick by eating kai at your restaurant/hotels?

Very Frequently  Frequently  Rarely

5.9 What were the biggest challenges in processing this product (kai)?

5.10 What areas of the business do you think are possible growth areas?

QUESTIONNAIRE 6. Transportation

6.1 What is your position in the company?

6.2 What areas in the kai chain you involve in?

Transporting from village to market ______

Transporting from market to processor ______
Transporting from village to processor______
Transporting from processor to supermarket ______
Transporting from village to restaurants/hotels ______
Transporting from processor to restaurants/hotels_______

6.3 **What type of vehicle do you have to transport kai?**

☐ Carrier  ☐ Van  ☐ Car  ☐ Bus

6.4 **How many bags/buckets/packages/cartons do you often transport?**

6.5 **What is the cost of transporting kai?**

…………………………………………

6.6 **Approximately how many days a week do you spend providing these services?**

1 day ______  2 days _____  3days _______  More _________
Acknowledgement

I would like to thank the IUCN and the French Embassy for funding the field work activities that enabled the completion of my MS 411 course at the University of the South Pacific.

Special acknowledgement to Dr Milika Naqasima Sobey and Mr Epeli Nakautoga of IUCN for their support.

Appreciate the guidance of Professor Ciro Rico of the University of the South Pacific.

I would also like to thank my team at the Department of Fisheries, Research Unit, for assisting me in the data collection, without you Team I would not be able to collect the information needed in a short time. Vinaka vakalevu to you:

1. Vishal Nand
2. Tarisi Shaw
3. Lavenia Lau
4. Pretika Kumar
5. Viliame Tuiwakaya
6. Adriu Bukaroro
7. Kini Waradi
8. Tomasi Rainima

Last, but not least, I would like to thank and acknowledged the guidance, support and words of encouragement given by my supervisor, Dr Jimaima Lako at the University of the South Pacific.

Vinaka vakalevu