ANALYSIS OF SELECTED DRIED FISH MARKETS IN BATTICALOA AND COLOMBO

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2019

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A research dissertation submitted in
Partial fulfilment of the Requirement of the advanced course in
Agriculture economics
For the degree of
Bachelor of Agric Business management
Faculty of Agriculture
University of Ruhuna
Mapalana,Kamburupitiya
Sri Lanka
2019

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ABSTRACT

Sea food acts as a main component in the diet of most countries around the world and contributes as a main supply of animal protein. The demand of dried fish is met by both local production and imports but, Sri Lanka is endowed with marine resources. There are so many researches done on dried fish nutrients, supply chain and markets. But the price analysis on dried fish has been done rarely. Price analysis with the analysis of market profitability and efficiency helps the policy makers to discover sustainable and an entire marketing strategies. The research was conducted to find out the pricing mechanism of both rural and urban dried fish markets of Batticaloa and compare them with the Colombo dried fish market using price indices. The research was done with the primary data and the secondary data which was collected from HARTI. The average wholesale and retail prices and their standard deviations were calculated. Spanish mackerel had the highest average prices among the selected varieties of dried fish in both rural and urban dried fish markets. Marketing costs were higher in urban sector than the rural at producer, wholesaler levels and lower in retailer level in the percentage of total costs. Wholesalers had the highest profit margin in both rural (21.2%) and urban (14.9%) sectors as they set high mark-up. Spanish mackerel has the highest producer share (87%) in rural and String rays has the highest producer share (88%) in urban sector. Queen fish and Skip jack tuna have the highest wholesale and retailer share (23%) in rural and Skip jack tuna has the highest wholesale and retailer share (23%) in urban sector. The marketing efficiencies for Queen fish, Mackerel shark, Giant catfish, String rays and imported sprats were higher in urban sector than in rural sector and marketing efficiencies for Spanish mackerel, Skip jack tuna and White sardinella were higher in rural sector than in urban sector. Prices of White sardinella and imported sprats are higher and Spanish mackerel, Mackerel shark and Giant catfish were lower compared to Colombo market price in rural sector at producer level. Retail prices of

Colombo dried fish market are higher than Batticaloa dried fish markets. There was a positive correlation between Colombo dried fish market at retail level yet it was not significant and negative correlation between wholesale level with Colombo dried fish market but it was significant. The dried fish market of urban Batticaloa is better comparing to the Colombo market as well as the Batticaloa rural market. The urban dried fish market of Batticaloa had more varieties of dried fish efficiency compared to the rural dried fish market and it had more producer share as well. Though it had low profit compared to the rural dried fish market, it had low marketing cost with high efficiency. The average prices of wholesale and retail were low in urban dried fish market compared to the rural dried fish market which was a sign of a healthy economy of our nation.

Key words: pricing mechanism, price index, dried fish markets, gross profit margin, market efficiency, price, marketing costs

ACKNOWLEDGEMENT

First and foremost I respectfully express my gratitude to my internal supervisor, Senior Lecturer (Mrs.) Dilanthi Koralagama, Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Ruhuna, for her excellent supervision, advices and encouragement that paved me out during my research period to accomplish the research.

I would like to offer my honest thanks to my external supervisor Mr. Dumindha Priyadarshana, Head of Marketing Food policy and Agribusiness division, Hector Kobekkaduwa Research and Training Institute.

I should extend my gratitude to Prof. G.C. Samaraweera, Head of Department, for her valuable guidance and all other staff members and non academic staff of the Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Ruhuna for their co- operation.

My heartiest grace goes to my loving parents for their encouragement to go through my study. Finally, I thank my fellow undergraduates, for constantly accompanying me and extending their assistance as well as for the warm friendship all the time during my tenure of the work.

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

NARA : National Aquatic Resources Research and Training Institute

HARTI :Hector Kobbekaduwa Agrarian Research and Training Institute

FAO : Food and Agriculture Organization of United Nations

MFARD :Ministry of Fisheries and Aquatic Resources Development

GDP :Gross Domestic Product

DOF : Department of Fisheries

SARMA : Seasonal Autoregressive Integrated Moving Average

CHAPTER ONE

1 INTRODUCTION

This chapter explains the background of the study and gives an insight of the field of research. The problem statement and the aim of the study is explained.

1.1 Background of the study

Though the fisheries sector of Sri Lanka is small-scale, it plays a vital role in food security, providing employment and foreign exchange generation. The 70% animal protein demand in Sri Lanka is satisfied by fish products (www.driedfishmatters.org). Sri Lanka's fisheries sector plays a critical role in improving the economic and social life style by providing direct and indirect jobs opportunities for over 560,000 people and livelihoods for over 2.7 million coastal communities (National Aquatic Resources Research and Development Agency, 2018).

The production of dried fish among the fisheries products has been increased more between 1995 to 2016 (www.driedfishmatters.org). The annual per capita consumption of dried fish is about 3.6 kg, whereas the annual per capita consumption of fresh fish is 11.8 kg in year 2016. The household expenditure on marine dried fish was 4% in 2016 (Development, 2018).

The fish utilization especially, the methods of processing differ by continent, regions, between and within the countries. The African and Asian countries are still using methods like drying, salting and smoking as the postharvest preservative methods of fishes. The developing countries' fishes are smoked, dried or fermented which represents 11% of the human consumed fish. Such labor-intensive methods provide many people who live in coastal areas with livelihood support, and they are important for rural economies (Piracha, 2015).

Highest protein levels in the diet by fish and its by products in Cambodia, comprising 37% of the total protein consumed which is followed by Myanmar at 22%. The lowest level of protein intake by fish and its by products was recorded in India which accounted at 2% (FAO, 2015).

Table 1- Consumption of fish and fish by-products in South Asian region

Countries	Consumption of fish and fish byproducts (kg/capita/year)
Cambodia	63.2
Philippines	40.2
Thailand	31.4
Myanmar	21.0
Lao PDR	19.1
Vietnam	14.6
Indonesia	12.8
Timor Leste	6.1

Globally, fishery and fish products have just about 34 calories per capita per day on average. However, their daily contribution can surpass 130 calories per capita in countries that lack alternative protein foods and have established and experienced a preference for fish (e.g., Iceland, Japan, Norway, the Republic of Korea and many small island states) (Dale, 1994).

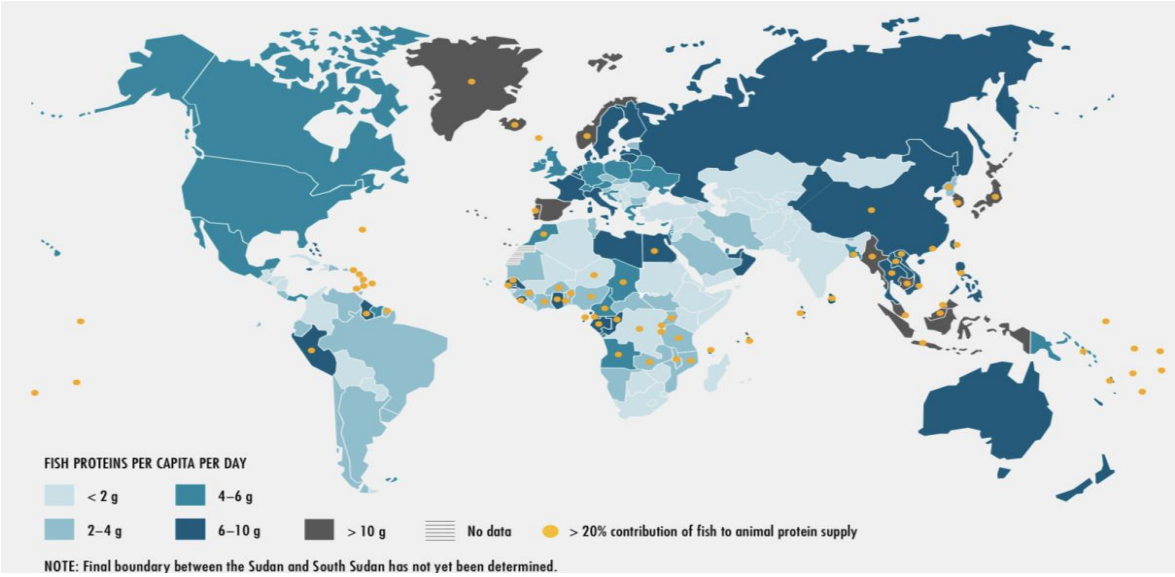

Figure 1-1- Global per capita per day consumption of animal protein

1.1.1 Importance of Dried Fish as an Animal Protein Source in Sri Lanka

Dried fish is considered the protein of the poor man because; it is the households ' main source of animal protein in low-income communities, especially those living in areas other than the coastal belt. Katta, Keeramin, Balaya, Seer, and Maduwa are the principal dried fish species produced in Sri Lanka. The major districts created dried fish are Trincomalee, Mannar, Kalpitiya, Matara and Jaffna. Salted fish has been a staple food in Sri Lanka for decades, as it was less costly than meat and other sources of protein. As great flavoured, more expected quality and long shelf life dried fishes are produced, the traditional salting and drying methods has become popular in Sri Lanka (www.foodmagazinesl.blogspot.com).

Water, fresh, dried and canned, is popular seafood among consumers, contributing almost 56.1 per cent of animal protein consumed in Sri Lanka (FAO, 2011). The per capita intake of fresh, dry, and canned fish was 11.8, 3.6, 1.4 Kg / year. Over the past decade, fresh fish consumption per capita has increased by 30% in 18 people in the region (National Aquatic Resources Research and Development Agency, 2018).

1.1.2 Main dried fish varieties

Though there are many varieties consumed in Sri Lanka, sprats, skip jack tuna, shark, queen fish, giant catfish and smooth belly sardinella were consumed at high quantity than other varieties at nearly 1.7, 0.4, 0.3, 0.2, 0.2 and 0.2 kg per capita per year, respectively and trenched sardinella, trevallies and Spanish mackerel are produced other than these dried fish varieties. The total consumption of dried fish was 24% per 3.7 kg in 2010 (FAO, 2015).

1.1.3 Dried fish producing areas

Trincomalee, Puttalam, Jaffna, Matara and Mannar are the main dried fish producing districts of Sri Lanka. The majority of the dried fish production is done in Northern and

Eastern provinces (www.driedfishmatters.org). Trincomalee, Mannar, Kalpitiya and Jaffna are the main districts of marine dried fish production in northern province. Dried fish industry is mainly carried out as a cottage level industry. Jaffna and Mannar are the main districts which mainly produce sprats. Sprats are produced by drying with or without salt. Sprats produced in Jaffna are called as Iyra in the Sri Lankan market (NARA, 2015).

Rural markets in Batticaloa get fishes for the trade and dried fish consumption from their relative landing areas but, urban markets receive fresh and processed fish from both Kalmunai and Ampara (Lanka *et al.*, 2014).

1.1.4 Dried fish consumption

Figure 1-2 shows the consumption of dried fish which was consumed more after fish among the total consumption of animal protein. Before 2009, dried fish had been consumed more than chicken but after 2009, people have been preferring chicken over dried fish. However, the dried fish consumption level remained constant at low level (MFARD, 2018).

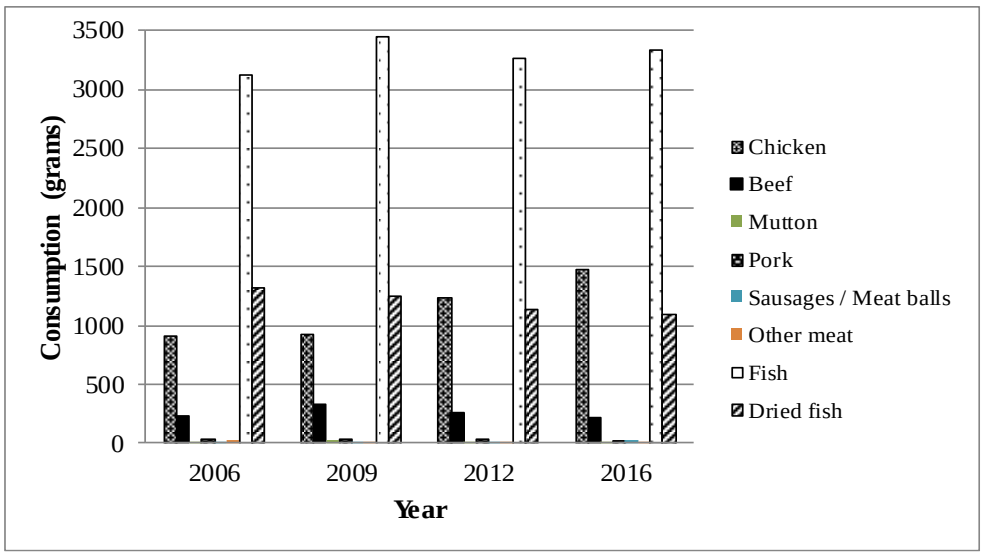

Figure 1-2- Annual per capita consumption of animal protein sources (MFARD, 2018)

Water, fresh, dried and canned, is popular seafood among consumers, contributing almost 56.1 per cent of animal protein consumed in Sri Lanka (FAO, 2011). The per capita intake of fresh, dry, and canned fish was 11.8, 3.6, 1.4 Kg / year. Over the past decade, fresh

fish consumption per capita has increased by 30% in 18 people in the region (National Aquatic Resources Research and Development Agency, 2018).

1.1.5 Dried fish prices

In the local dried fish industry, Munashinge (1984) recorded a decline as the proportion of total fish catch converted to dried fish declined from 29 % to 9 % during 1959–79. It was due to an improved transport and cold chain network driving increased fresh fish demand. Figure 1-3 shows that today, the availability of imported varieties with low cost can be used as the replacement for the local varieties of dried fish with the highest differential for higher-price varieties. The lower seasonal variability and monthly standard deviations in both wholesale and retail compared to their fresh equivalents are possibly due to this product's strong storage properties and its consequent ability to withstand supply fluctuations (Murray, Koddithuwakku and Little, 2000).

Chicken, beef, and mutton are other essential animal protein replacements consumed locally. While these products show high price stability, their high prices (Rs 144, 125 and 252, mean retail prices in 1999, respectively) are comparable to only the highest marine species, and the consumption of commercial products is small among the lowest income classes (Murray, Koddithuwakku and Little, 2000).

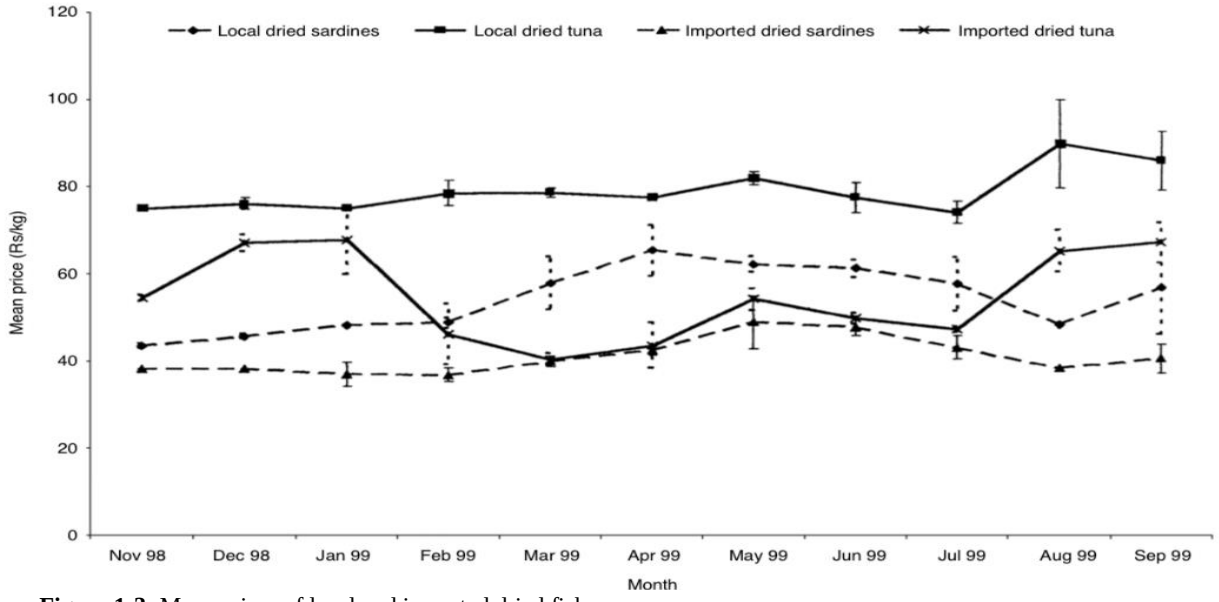

Figure 1-3- Mean prices of local and imported dried fish

1.1.6 Dried fish imports

Sri Lanka is one of the primary fish and fishery items importing countries in nations in the south Asian Region. Because of the low-level household production of dried fish and sprats in the nation, Sri Lanka needs to import a considerable measure of dried fish and sprats yearly from India, Indonesia, Thailand, Pakistan, Maldives and China etc. (NARA, 2015).

The main imported dried fish variety is sprats, which accounts for 70 percent from the total dried fish imported. Thailand is the major supplier of dried sprats (anchovies) (Tissera, n.d.) from where the 78 percent of imported sprats came in 2004. Maldives fish, which is used as a condiment in many vegetable dishes accounts for 6.3 percent of total dried fish imports (MFARD, 2018).

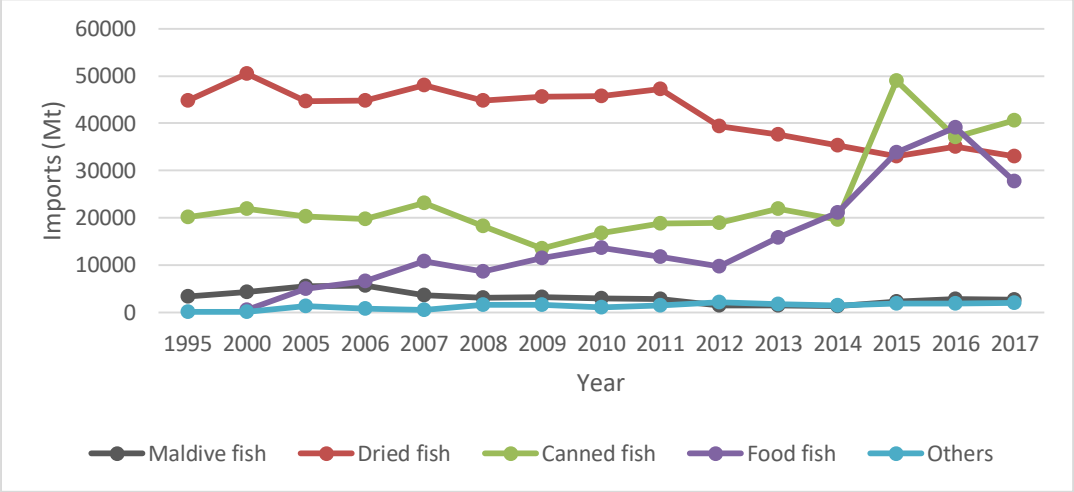

Figure 1-4- Quantity of imported dried fish by year

1.2 Problem justification

A dependable livelihood is always questionable in fisheries industry because of the uncertainties that are available on weather, finding fish for catching. Fishes migrate during the seasonal changes across the main fishing areas in our country, thus coastal fishing is mainly depended on monsoon climate trends (Herath *et al.*, 2017).

A market structure can vary from one area to another. A market chain can be completed by different kinds of stakeholders such as producers, wholesalers, retailers and

their activities (Khileri and Lende, 2015). Small species of low value are more likely to be sold by small-scale bicycle vendors to poorer customers in remote villages, whereas more valuable species are bulked for sale by motorcycle vendors in and around rural villages. During the dry season, the number of entrants and the individual volumes are highest, resulting in intensified competition for market share. During April to June, the time of the south-west monsoon, the highest prices for marine fish occur, bringing stormy weather to the south and south-west coasts providing much of the supply to Colombo (NARA 1999). Short-term demand fluctuations are highest for fresh marine varieties due to the fishery's high vulnerability to adverse weather conditions. The unpredictable short-term nature of fresh sea fish prices is representative of the country's lack of cold-storage space, which may help to smooth out some of the seasonal demand and supply fluctuations, if available. Smaller increases in marine wholesale prices also occur during December (when the NE monsoon reduces the secondary supply to the East Coast) and June, when seasonal winds hinder western coastal fishing. July to November is marine fish high season, during which prices fall to their seasonal low. The availability of low-cost, imported dried marine fish means that it is still the key replacement for local dried varieties, with the largest price differential. Chicken, beef, and mutton are other essential animal protein replacements consumed locally. Although these products show high price stability, their high prices (Rs 144, 125 and 252, mean retail prices in 1999, respectively) are comparable to only the highest marine species, and commercial product consumption is low among lower income classes (Murray, Koddithuwakku and Little, 2000).

Before transporting the dried fishes, they have to be stored for days or weeks. The dried fish price can be varied by numerous factors; species, labor, transport and season. The price can be lower in banned season and higher in peak season. The species availability varies from season to season. When comparing in summer and winter seasons, many varieties are there in winter season. The cost of fish marketing includes transport, insulated

box purchasing, ice, storage, electricity, tax, hired labor etc. and it depends on market distance, species, volume of fish, market infrastructure, labor and transportation mode. The recommendation for a suitable framework for the stakeholders can be provided by examining the efficiency and profitability of the actors who trade fish from the states they were intended to do to the other countries and to help the policy makers to discover sustainable and an entire marketing strategies with the objectives that developed the regional fish trade of Africa and the fishing marketing system (Ojo et.al., 2016)

1.3 Objectives

- To find out the pricing mechanism of dried fish (selected) in Batticaloa district.
- To develop indices for wholesale and retail prices at Colombo dried fish market from the secondary data collected from HARTI.
- Compare and contrast the price differences/variation between two markets at wholesale, retail and producer level.

1.4 Significance of the study

The research is aimed for a price analysis at producer, wholesale and retailer level of Batticaloa dried fish market compared to the Colombo dried fish market. The input of this research will feed into further researches at large scale.

Price and the market can be correlated if the markets are integrated. Prices at different levels are added with transaction costs though they are correlated. It is an insufficient but necessary condition of the market integration. When markets are correlated, commodities are flown between markets and price transmission is triggered from one to another market (Ojo et.al., 2016).

As marketing policies are determined by the markets, it is important to provide marketing information Gordon et al., 2013). The recommendation for a suitable framework for the stakeholders was provided by examine the efficiency and profitability of the actors who trade fish from the states they were intended to do to the other countries and to help the policy makers to discover sustainable and an entire marketing strategies with the objectives that developed the regional fish trade of the nation and the fishing marketing. It also helped the fish marketers to make investment decisions in the relevant areas (Ojo et.al., 2016). At present, there are no reliable policies for this sector. Thus, the finding of this study will benefit to the teachers, students, under graduates and researchers etc. As well as, this research is great importance to the policy makers to help them formulate programs and policies related to the dried fish production and marketing.

1.5 Conceptual framework

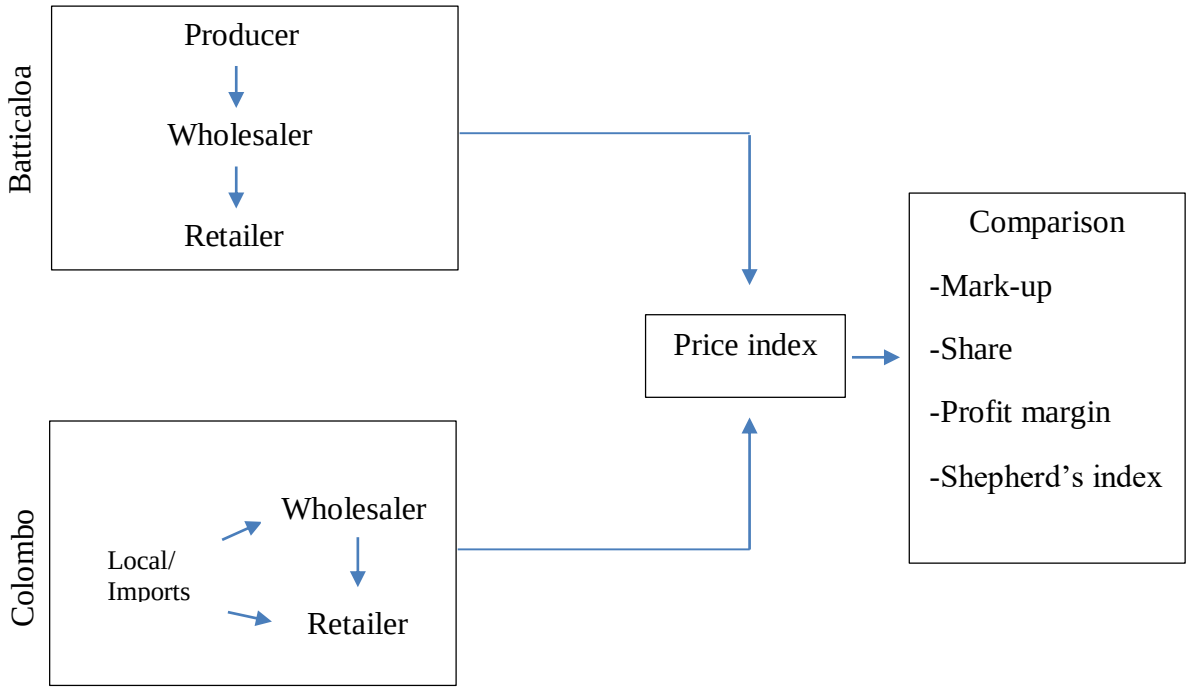

Figure 1-5- Conceptual framework

Figure 1-5 illustrates the plan that was implemented to conduct the research. Wholesaler and retailers were considered in both dried fish markets to do the analysis and the producer level of Batticaloa market was considered to have an idea of the supply chain of Batticaloa urban and rural markets. The price indices of both Colombo and Batticaloa markets were calculated and the comparisons of mark-up, share, profit margin and Shepherd's index were done to find the variations between the markets and market efficiency at wholesaler and retailer level.

CHAPTER TWO

2 LITERATURE REVIEW

This chapter consists the articles and journals that were referred during the research period on getting ideas on the research topic.

The oceanic resources that Sri Lanka has components of both biologics and non-biologics which has to be protected carefully as there are possibilities to be exploited for country's socio-economic developments (Herath *et al.*, 2017). The fisheries sector has contributed 1.2% to the GDP in 2018 as it is an important sector in Sri Lanka (Central Bank report, 2018). The marine sector which includes deep sea, coastal and off shore, contributes 85% to the fisheries sector in 2017 (Fisheries Sector Outlook, 2017).

In many countries, seafood protein is an important nutrional component, particularly where the total protein intake levels are small. In 2013, seafood offered at least 20 percentages of their consumption of animal protein to more than 3.1 billion people (FAO, 2016b). Compared to other commodities, the proportion of internationally traded seafood products produced globally is very high and growing, mainly due to globalization and the geographical disparity between aquaculture production (mostly in Asia) and demand for seafood (mostly in Europe, North America and Asia). In almost every developing country, the globalization of the seafood industry makes it possible to find seafood from around the world (Asche et al. 2015; Gephart and Pace 2015; Watson et al. 2015, 2016, 2017). In 2014, the share of global fishing and aquaculture production entering international trade was 36% (FAO 2016b), the highest among food and agricultural commodities, compared to about 10% for meat and 7% for milk and dairy products, for example (Natale et al. 2015). While 78 per cent of the processed seafood is exposed to international competition (Tvetera ° s et al. 2012). Watson et al. (2015) explored the ability oceans would have to satisfy potential demand for

seafood; while Watson et al. (2017) found that a large portion of long-distance catches from developing countries were replaced by imports.

2.1 Dry fish processing and its importance

An often ignored yet extremely important aspect of global food and nutrition security is the role of fish in finding food and nutrition protection for all. Fish is rich in nutrients and provides high-quality protein, low in saturated fat and rich in polyunsaturated fats, especially eicosapentaenoic acid (EPA) omega-3 fatty acids and docosahexaenoic acid (DHA). Fish have played a significant role in the first step of the development of a global economy and have played a special role in foreign trade growth, before becoming an globally traded commodity (Akintola and Fakoya, 2017).

Traditional fish processing contributes to food and nutrition protection in terms of person or household, regional and national market use, quality, and price stability. Smoked products provided the healthiest advantage with the lowest values of saturated fatty acids, atherogenicity index, thrombogenicity index and the highest omega-3/-6 ratios, which are essential in food consumption for the reduction of coronary heart disease (CHD). Considering that seafood nutrients are cheaper than other sources of animal nutrients, the consumption of processed fish products (reported to be even better compared to raw fish) offers accessible high quality protein. Modern fish processing methods for salting, burning, and sun-drying are currently at the forefront of ensuring fish protein, food health, and nutritional well-being (Akintola and Fakoya, 2017).

Increasing the shelf life of fish is the effectiveness of drying by reducing growth of microorganisms by reducing the availability of water. Drying is the process of removing water from solid. In case of air- drying of either whole or split fish or fillets, the liquid water must diffuse from its surface, pass through any skin or surface layer and evaporate into surrounding air (Gopakumar k, 2002).

2.2 Dried fish value chains

In general, the supply chain for marine dried fish consists of many stakeholders such as manufacturers, wholesalers, intermediaries, distributors and, eventually, the consumers at the end. But the number of intermediaries and stakeholders in the supply chain research was found to vary depending on the size of the industry; the supply chain was too short for localized business. Four intermediary players, such as dry fish dealers, wholesalers, medium-sized operators and retailers, have been found to typically exist between producers and consumers in a typical marketing chain in the domestic marketing pattern of the country. Value added begins from the very first dealing of raw fish from its harvesting stage. The fishermen were found to sell the catch to the commission agents as a mixed composition (Ahmed, no date).

Small species of low value are more likely to be sold by small-scale bicycle vendors to poorer customers in remote villages, whereas more valuable species are bulked for sale by motorcycle vendors in and around rural villages (Murray, Koddithuwakku and Little, 2000).

Analysis of the supply chain is an comprehensive look at the behaviors of different trading partners, e.g. Suppliers of raw fish, dried fish processors, middle men / aratdars, wholesalers, distributors, customers. Understanding the relationships between these trading partners and their positions within the supply chain is crucial for understanding the product and the flow of knowledge. It has been found that various groups of stakeholders and their actions complete the chain (Ahmed, no date). Quality stream mapping is one of the best instruments for defining and preparing a process's opportunities. Value stream mapping and Value Stream Analysis is one of the most common supply chain analysis techniques focusing on material flow and knowledge required to deliver a product to a customer (Wattanutchariya, Tansuchat and Ruennareenard, 2016).

Cultural norms in rare instances limit women's involvement in post-harvest activities at landing sites, thereby limiting post-harvest activities to men. Women often participate in fish processing as their primary economic activity or combine it with activities upstream or downstream of the value chain or entirely outside of fishing. Processor–sellers / traders form another group that consists mainly of women who combine processing and marketing functions. Finally, women only trading processed fish buy their goods on either wholesale or retail markets. Also, they sell to through market intermediaries through commission agents or brokers (Akintola and Fakoya, 2017).

2.3 Dried fish pricing mechanism in the world

2.3.1 Cost components and price formation of dried fish market

Costs can be variable as well as the fixed costs. Variable costs can be varied according to the output. Fixed costs are not depended on output level. The analysis of the costs and the revenues gives us an idea of how much actors at levels earn from businesses (Bui Nguyen, 2011). The final product cost includes the costs added at different actors at different nodes. Added costs can be calculated by subtracting the total cost from the purchasing price at each level of the supply chain. Added cost is the level of efforts given by the actors at each node to the final product (Bui Nguyen, 2011). Marketing costs includes costs of storage, preservation, labour etc. shows the performance of different marketing functions that happen to replace the commodity from the production place to the targeted consumer. Farmers and traders includes transportation costs when replacing their products through the marketing chain to the targeted consumers (Shepherd, 2007).

For many consumer goods, price determination is always a function of manufacturing costs and a desired degree of markup. The determination of prices by this optimal markup amount is also referred to as cost-plus pricing, mark-up pricing or maximum cost pricing. There are some "rules-of-thumb" about the pricing of mark-ups. For example, some retailers that sell to customers can plan pricing products above their cost by 20 to 100 percent. However,

there is a fine line between the desired discount, production costs and the price the consumer can bear. Both of these components need to be understood and valued with care.

The price the market would bear, for example, is in fact a function of demand. A 20 per cent mark-up, for example, will yield a sale price that is less than what the consumer is going to accept. Luxury goods and niche products often demand a premium above the set markup. This is why manufacturing costs, the desired markup and market demand should all be measured when deciding the selling price of a commodity.

The actual cost of manufacturing a product on a per unit basis must be known to me to assess the sale price of a product using the mark-up process. Total cost would cover all expenses incurred to deliver the commodity to the point of sale. This will include but not limited to cost of materials, labour, payroll costs, cost of shipping, cost of warehousing, cost of distribution and cost of marketing. In certain cases, the sale price can be set depending on the cost of production being contrasted with the price the consumer can bear.

We do not confuse the notion of mark-up pricing with income margins and gross margins. The profit margin is the difference in dollar value between price of sale and overall expense. Although the gross margin is commonly known to be profits less the cost of the product sold, the gross margin rate is the percentage of the sales price of the profit margin. Where a target gross margin amount is defined, the gross margin formula may be adjusted to determine the sales price (Holland, 1998).

2.3.2 Price variations

The markets were classified as rural and urban where urban market is operated daily and rural market is operated for 3 to 4 days per week to find Factors influencing prices of fish in central region of Malawi and its implications on the development of aquaculture in Malawi (Brummett, 2000). The price of the fish, including wholesale and retail prices has been increased comparing to the other animal food commodities more than the last five years

(Herath *et al.*, 2017). The presence of more intermediaries in the marketing process is the reason why the price of goods rises (Iqbal *et al.*, 2015).

The retail price is generated by the marketing margins of actors at different levels of the value chain. Marketing margin shows the revenue distribution of different actors of the value chain as it is calculated by the differences between selling price at the next stage and the purchasing price at the previous stage and the profit consists the profits accrued at different nodes of the value chain (Ojo , 2016). Size of the dried fish, transportation costs, availability of dried fish and season influences on the retail prices of dried fish (Iqbal *et al.*, 2015).

Cost of the supply chain is applied with the commodity in all networks. So price is gradually increasing, too. First of all, fish moves from fishing man to processor. Fisherman activities include expense. Fisherman passes it on to the processor at a price that exceeds his expense. This price addition may be different due to variability in styles and times (Iqbal *et al.*, 2015).

A large quantity of species is used for dried fish production, depending on the seasonal availability. Of others, sardines, mackerels, ribbon fish, lizard fish, turtles, threadfin bream and snappers are the most widely used species. The packaged polyethylene bag items are sold in urban and suburban areas through convenience outlets, open markets and night markets. The prospects available for this field are better product development and presentation (INFOFISH –FAO, 2008).

It is an advantage as the feeding cost of small fishes are lower compared to the larger fishes and as small fishes have high dry weight basis, they cost high. But weight was important in urban markets. In rural area the fishes are judged visually before buying which is subjective but in urban areas they are sold out on the importance of weight. But the supply determines the price more than the weight. Selling of small fishes is an indication of over

fishing as the over fishing can be determined by changes in sizes and species composition. The price also depends on the species of fishes (George Matiya, et al., 2005).

Fishes migrate during the seasonal changes across the main fishing areas in our country, thus coastal fishing is mainly depended on monsoon climate trends. Some of the operators who do the fisheries operations at large scale have adapted modern trends but most of them do the operations at small scale (Anon, 2008). During April to June, the time of the south-west monsoon, the highest prices for marine fish occur, bringing stormy weather to the south and south-west coasts providing much of the supply to Colombo (NARA 1999). Short-term demand fluctuations are highest for fresh marine varieties due to the fishery's high vulnerability to adverse weather conditions. The unpredictable short-term nature of fresh sea fish prices is representative of the country's lack of cold-storage space, which may help to smooth out some of the seasonal demand and supply fluctuations, if available (Murray, Koddithuwakku and Little, 2000).

2.3.3 Price efficiency

The price efficiency can be there if the marketing margin is improved by reducing transportation costs and improving market information and communication systems. A Decision- Making Model was suggested to be in need to make linkage between marketing costs and margins and production costs and profits for agricultural products. The research was conducted to find an integrated model which focuses on fluctuating prices and is able to compare the problem solving techniques. A simple model can be implemented assuming a farmer wants to increase his gross margin annually with restrictions on labour and inputs and water and land and it can be extended with a sub-model on optimizing margins of market participants such as wholesalers, retailers and assemblers at a certain time (For, Selected and In, 2011).

Modelling fisheries prices give an idea about the price flow over the past years and in the future. The price performance can be forecasted by using techniques such as Ordinary Least Square method (OLS) or Seasonal Autoregressive Integrated Moving Average (SARIMA). The fisheries prices of each month were forecasted by Floros and Failler using SARIMA models. Accurate forecasting of fisheries prices is in need as there are no any updated and accurate forecasting models available. Colombo Consumer Price Index (CCPI) was the price deflator which is published by the Department of Census and Statistics of Sri Lanka, used to measure the changes of prices at general level of goods and services that a representing group pay for consumption.

Even we are thinking about the forward price movement in supply chain. Yet often backward movement of price can occur. Market demand is always weak, and it is time for aratdar (Dhaka cities) to set dried fish prices. Processor, middle man and others get the commodity price according to the fixation by aratdar. Backward pricing mechanism often causes a great loss to the manufacturer or fisherman as it only ensures the gain of rich intermediaries in the supply chain (Iqbal *et al.*, 2015).

2.4 Marketing of dried fish in SriLanka

More than a great many angling networks around the waterfront belt in Sri Lanka were effectively associated with the creation and showcasing of dried fish and they have kept up their jobs and inspire the financial status. These dried fishes have demand on both in the local and universal markets (Payra *et al.*, 2016).

An inventory network is just the way of an item as it moves from the makers to the last shoppers. At the end of the day, it is the arrangement of go-betweens and the advertisers through which products go from makers to buyers. Supply chains are vital in assessing advertising framework since they show how the different market members are composed to achieve the development of an item from the maker to the last customers. The promoting

framework was worked through a lot of middle people doing valuable business purposes in a tie creation from makers to the last buyer (Daily News, 2012). People groups who engaged with the dried fish production network include moderately some esteem and make the benefit (Faruque *et al.*, 2012).

Dried fish processors buy crude fish from fish landing focuses and conveyed to their own handling/drying plants (Faruque *et al.*, 2012)). Some anglers delivered dried fish in their angling vessel, following getting the fish in the ocean (Payra *et al.*, 2016). They needed to perform distinctive exercises in handling plants to make prepared available to be purchased. Thing shrewd expense of drying included stacking and emptying, transportation, wage and compensations of work and utilization of handling materials (Faruque *et al.*, 2012).

The difference between the actual price gained by the producers and the price that the customers paid. The marketing efficiency is evaluated by finding the total marketing costs, the net price that the producers received and marketing margins of Thanjavur and Thiruchirappalli ('Analysis of Marketing Efficiency', no date).

Producer's Share in Consumer's Rupee refers to the complex and subject to shift proportion of vegetable producers in consumer rupee. There is a beneficial relationship between the share of the manufacturer and the efficiency of marketing. Higher the producer's share greater would be the marketing efficiency or vice versa. It specifies the price the vegetable producer earns and displays in percentage of the rupee (Narasalagi and Shivashankar, no date).

Market integration, now preferred as price integration is the technically applicable study used for the market analysis. Price and the market are correlated if the markets are integrated. Prices at different levels are added with transaction costs though they are correlated. It is an insufficient but necessary condition of the market integration. When markets are correlated, commodities are flown between markets and price transmission is

triggered from one to another market. It is a sufficient and necessary condition of market integration. When markets are correlated, the prices are correlated but vice versa is not possible as the price can be correlated because of unobserved factors as well (‘Assessment of Marketing Nodes and Structure for Fish Trade Along Nigeria-Cameroon-Chad Border By Ojo , Deborah Olufunke Matriculation Number : 187167 a Project Report Submitted in Partial Fulfilment for the Award of Master of Science Degree in the Departm’, 2016).

Market integration was identified using bivariate correlation coefficient analysis (Oladapo et al, 2007). There was an efficient price and market communication co-integration for sorghum between Khartoum market and other markets like Damazin, El Obeid and Gedaref and the results were not like the previous one for millet markets. As the market conditions and prices are not related to each other markets, there is a market segmentation in transport market which is contrast to the market integration. Hunger can be occurred locally as market segmentation happens which is harmful to both consumers and producers (For, Selected and In, 2011).

2.5 Credit facilities for the traders

The main cause of the producers' price exploitation was non-institutional money lending which forced producers to go for' conditional involvement' in the fish drying sector. They were: a) cash to cash, b) kind to cash and kind and c) kind to cash. In case of cash loan form the interest rate was found to be higher. Despite higher interest rates, villagers have been found to socially embrace these types of loans as they have little access to formal institutions and loans have been available throughout the year. Typically, the wealthy and rich owners of fishing vessels provide fishermen with fishing permits and loans, and pay them for their catch without providing them any other profit. Fishermen serve literally as fishing labourers in the contract system. People who are heavily indebted and belong to the low-income community receive contract loans from aratdar or mahajan, whereas middle-income groups receive loans from either NGOs or entrepreneurs (Ahmed, no date).

The traders do savings using a chit fund called, ‘Seetu’. A chit fund is a type of revolving savings and credit association system practiced in India. Financial institutions, or among friends, relatives, or neighbors that organize chit fund schemes informally. The savings are for a particular reason in certain variants of the chit funds. Chit funds are also organizations involved in microfinance. A chit fund, called subscribers, comprises a group of members. An leader, a business or a trusted friend or neighbor, puts the group together and oversees the group's activities. The organizer is either paid for their efforts every month, or at the time of withdrawal (www.Wikipedia.com).

CHAPTER THREE

3 METHODOLOGY

This chapter present the comprehensive view of the methodology adopted for the investigation, the study area, source of data and analytical techniques applied for the study.

3.1 Study area

Batticaloa district is situated in Eastern province of Sri Lanka. Batticaloa is endowed with a lot of marine sources. Valaichchenai and Batticaloa town were selected as rural and urban areas of Batticaloa district as my research was intended to do in both rural and urban areas.

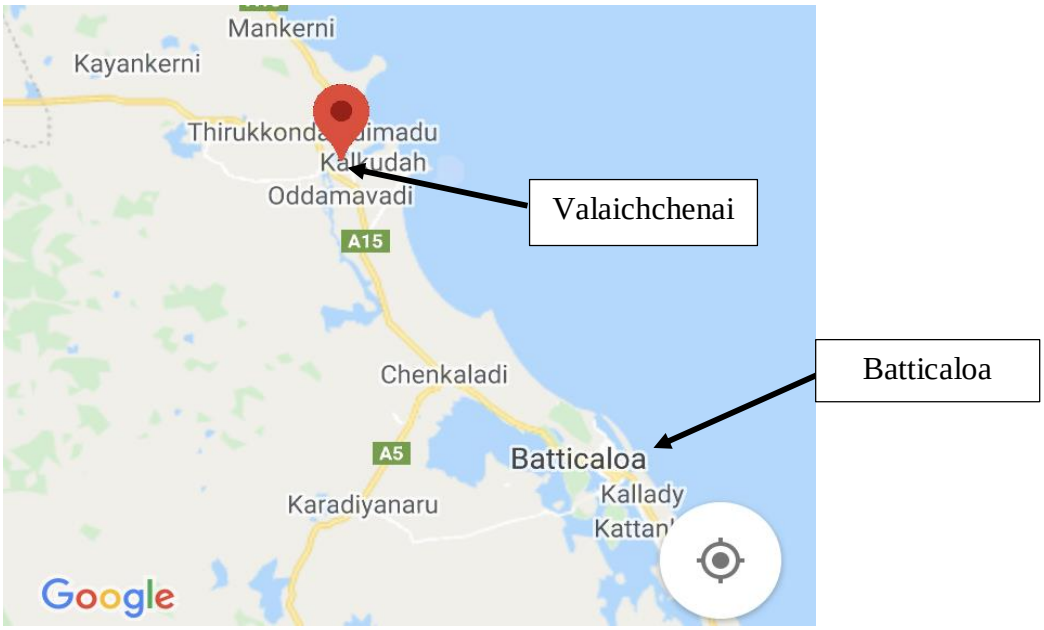

Figure 3-1- Research area

3.2 Sample selection

The main target population was the producers, wholesalers and retailers from Valaichchenai and Batticaloa town who are engaged in dried fish production. Four producers, six wholesalers and ten retailers were selected from each area using snowballing sampling technique as there was no any relevant list of dried fish traders. I did a field survey

and collected data from producers, wholesalers and retailers of each area that I have selected as they were the main dried fish producing areas in Batticaloa.

3.3 Data collection

Primary data was collected by a questionnaire survey in the field and informal discussion with the dried fish producers, wholesalers and retailers. The questionnaire mainly focused on the sources, wholesaler and retailer prices of selected dried fish varieties. Most of the data collection were done during the peak hours of their business. Weekly prices at wholesaler and retailer level in both urban and rural dried fish markets of Batticaloa were collected for nine weeks from 49th week of November, 2019 to 4th week of January, 2020 from the key informants over the phone. But, the data collection was done only during the rainy season. The key informants were the people who were selected during the interview for collecting further data. Field observation was also done to get the real picture of the study area.

Secondary data was collected from HARTI weekly food commodities bulletin and other relevant organizations such as Department of Census and Statistics and Ministry of Fisheries and Aquatic Resources Development. Some relevant secondary data were collected from books, articles, journals and research reports which were related to the study as well.

3.4 Variables and measurements

3.4.1 Objective 1 [To find out the pricing mechanism of dried fish (selected) in Batticaloa]

Table 2- Variables and measurement of first objective

Variables	Measurements
Gender	Nominal
Job type	Nominal
Process learning (Producers)	Nominal
Main supporters (Producers)	Nominal
Fresh fish source (Producers)	Nominal
Labour source (Producers)	Nominal
Varieties	Nominal
Purchasing difficulties (wholesalers and retailers)	Nominal
Social status and networking	Nominal
Average wholesale prices	Rs/ kg
Average retail prices	Rs/ kg
Marketing costs (labour and transportation costs)	Rs/ week
Average food cost	Rs/ month
Savings	Rs/ month
Purchasing difficulties (wholesalers and retailers)	Nominal
Main issues	Nominal
Suggestions	Nominal

3.4.2 Objective 2 [To develop indices for wholesale and retail prices (for both markets at Colombo and Batticoloa)]

Table 3- Variables and measurements of second objective

Variables	Measurements
Wholesale prices	Rs
Retail prices	Rs
Base year prices (2018)	Rs

3.5 Data analysis

3.5.1 Descriptive analysis

Descriptive analysis was done to get an idea about the market of Batticaloa dried fish market at producer, wholesale and retail level using bar charts and pie charts. The economic status and the relationship among with the customers were also identified through the analysis. Pricing mechanism of the market was identified using the primary data collected during the survey.

3.5.2 Market analysis

Average wholesale and retail prices of each dried fish varieties from the primary data and the panel data collected for nine weeks were used for the market analysis.

The efficiency pricing of the domestic market can be revealed using analysis of the marketing costs and margins and it helps to find out the significance of the transaction costs that the traders and middlemen face and help them to identify the problems and reduce the marketing costs.

The difference between the retail price and the farm gate price can be computed as a percentage of the farm gate price to give the percentage total mark-up.

The percentage of mark-up is calculated to know how much of profit the traders have fixed on the cost.

$$\text{The mark-up percentage} = \frac{Sales\ price - Sales\ cost}{Sales\ cost} \times 100$$

Producer's and middlemen's share are the price they receive as the percentage of consumer's price.

$$\text{Producer's share} = \frac{Price\ received\ by\ the\ fishermen}{Retail\ price} \times 100$$

$$\text{Middlemen' share} = \frac{Retail\ price - Price\ received\ by\ the\ fishermen}{Retail\ price} \times 100$$

Gross profit that is made on sales is measured by the gross profit margin.

$$\text{Gross profit margin} = \frac{Revenue - Cost}{Revenue} \times 100$$

(For, Selected and In, 2011)

The marketing efficiency can be computed using Shepherd's index,

$$\text{Shepherd's index} = \frac{Retail\ price}{Total\ marketing\ costs} \times 100$$

(Aswathy, N. & Abdusamad, 2013)

Laspeyres index was used to find the price index for both dried fish markets. It calculates the change of a fixed basket of goods and services that are commonly purchased by the majority of households over a period of time.

$$\text{Price index} = \frac{Current\ year\ price}{Base\ year\ price} \times 100$$

(Hill, 2004)

The correlation between the Colombo dried fish market and the Batticaloa dried fish market and its significance were calculated using the SPSS.

CHAPTER FOUR

4 RESULTS AND DISCUSSION

This chapter illustrates the findings of the collected data from both Colombo and Batticaloa rural and urban markets at producer, wholesaler and retailer level. The first section illustrates the socio-economic aspects of producers, wholesaler and retailers of dried fish markets. The second section illustrates comparison among both rural and urban dried fish markets of Batticaloa and the third section illustrates the variation between Colombo and Batticaloa dried fish markets on price indices. The final section is about the problems related to the industry in Batticaloa and the suggestions.

4.1 Socio-economic aspects of selected dried fish producers, wholesalers and retailers

The information related to gender, job type, learning process, main supporters, fresh fish supply and labour source for producers, dried fish varieties, social status and networking.

4.1.1 Gender distribution among the traders

Figure 4-1 and figure 4-2 illustrate the gender involvement among producers, wholesalers and retailers in both rural and urban areas of Batticaloa. The study is mostly dominated by Muslim communities (80%). Following the cultural aspects, majority of the work force in the industry are male, which accounts for 95%. However, women involvement also visible at a lesser percentage (5%) in both areas because of the cultural norms followed by the above mentioned Muslim traders.

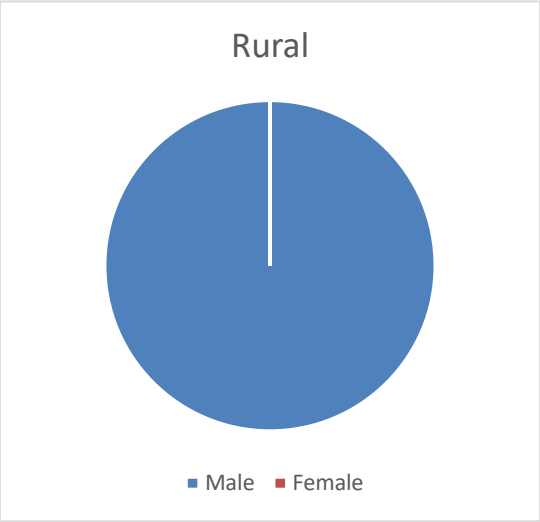

Figure 4-1- Gender distribution of rural dried fish market of Batticaloa

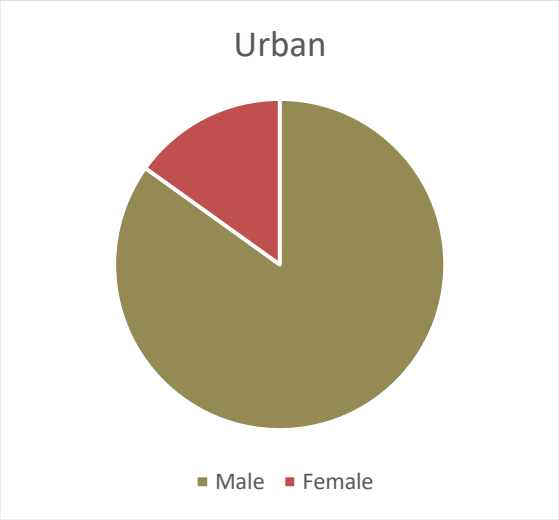

Figure 4-2- Gender distribution of urban dried fish market of Batticaloa

4.1.2 Job type

Figure 4-3 illustrates how many traders have been involved partially and fully in the dried fish business in the selected sample in both rural and urban areas of Batticaloa. As most of the producers' and wholesalers' main income were form the dried fish business, most of the them were doing a full time business (87.5%), but same number of retailers were doing part time as well as the full time business. Most of the wholesaler were doing a full time business (83%) where lesser number (17%) of wholesaler are doing part time business. Mainly in the urban area, the retailers were selling dried fish as one of the commodity in their shops

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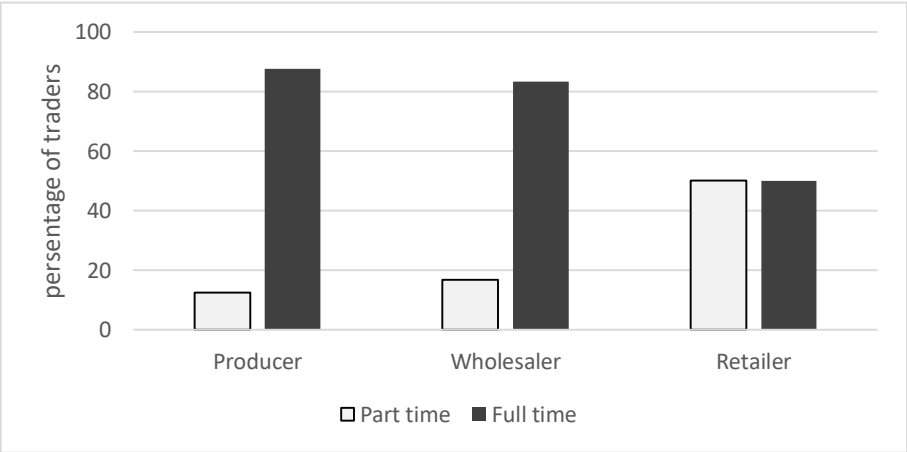

Figure 4-3- Job type of traders

4.1.3 Awareness on processing (producers)

Figure 4-4 illustrates from whom the producers got to learn the processing technique. Most of the producers learned the processing technique from others (50%) which mainly includes their relatives. Less number of producers had a family background of dried fish business. Most of the rural producers learned the processing technique from their relatives and continuing it as a family business. Lesser number of producers learned the process from their parents (12.5%) and friends (12.5%).

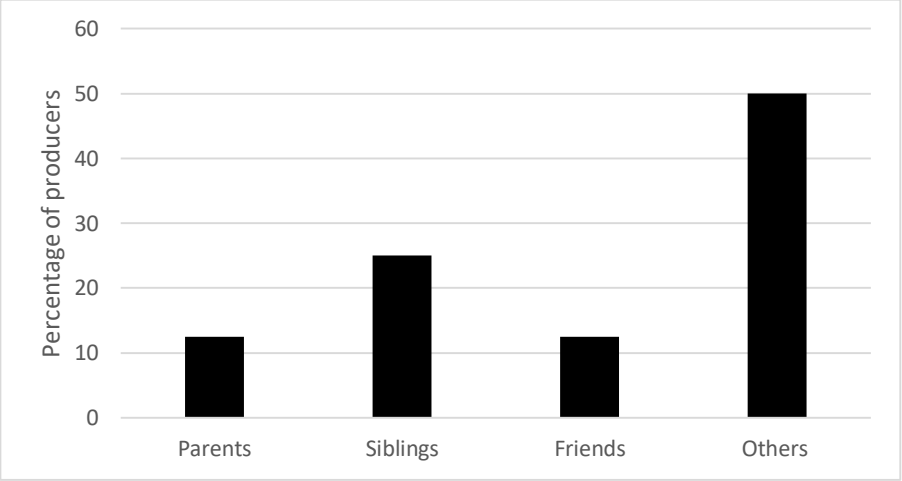

Figure 4-4- Awareness on processing (producers)

4.1.4 Main supporters (producers)

Figure 4-5 illustrates the people who support the producers on process of dried fish. Most of the producers get support from their family. Government gives places for most of the rural producers (75%) for trading dried fish through the Divisional Secretariat office. They have to pay the rent and electricity bill to the Divisional Secretariat office monthly. Some of the urban producers got license under the Divisional Secretariat office (25%) and they have to pay certain amount of money to the Divisional Secretariat office monthly. All of the rural producers get loan from Rs. 10,000 to 100,000 from a private organization called Diamond Enterprise.

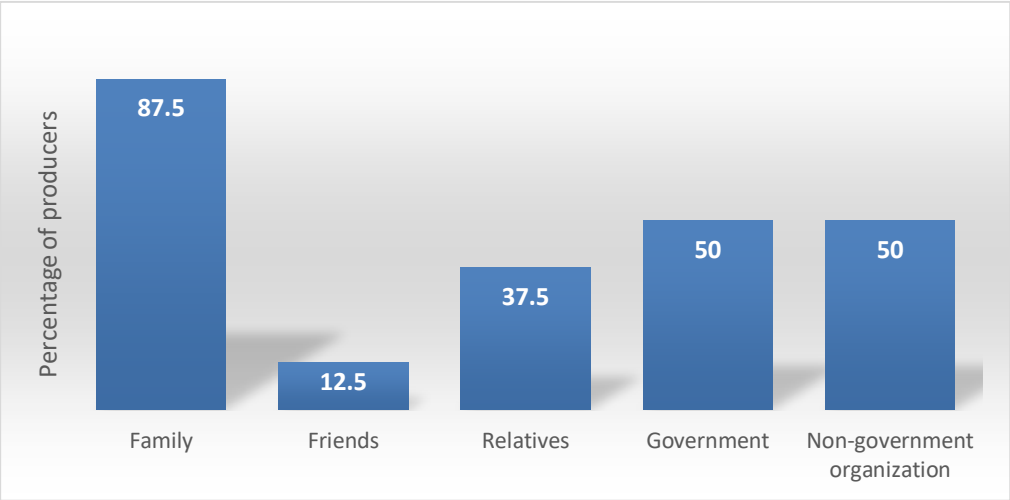

Figure 4-5- Main supporters for the traders in both rural and urban dried fish markets

4.1.5 Fresh fish source (producers)

Figure 4-6 illustrates the common fish varieties used by all of the producers to make the selected dried fish varieties in both rural and urban areas of Batticaloa. Most of the producers get fresh fish from the boat owners and fishermen at a low price at landing centers. The producers who make dried fish in rural areas mostly get the fresh fish from their relatives' catches. Producers mostly get String rays from fishermen especially when it is abundantly available during April in a year. The other fishes are purchased from their own fishing, fishermen, boat owners and fish traders as well.

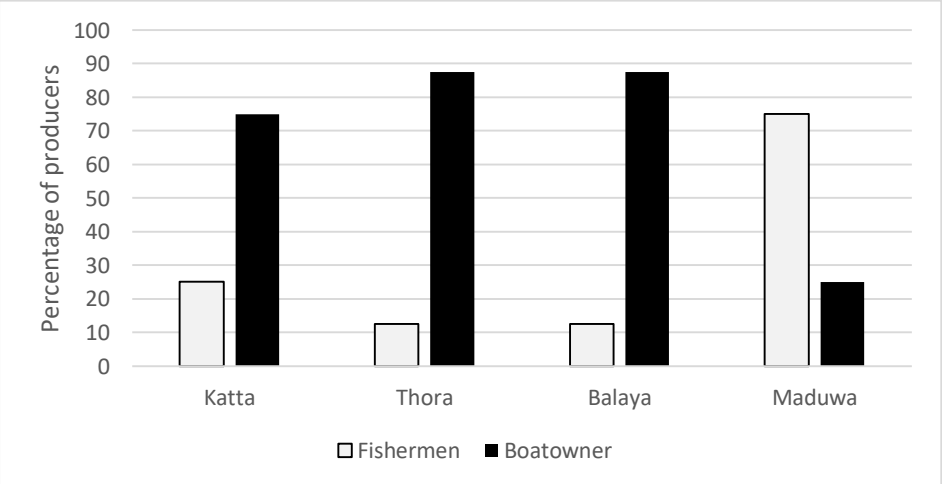

Figure 4-6- Fresh fish source for the dried fish process (producers)

4.1.6 Labour source (producers)

Figure 4-7 illustrates the labour source that the producers get to make dried fish. Most of the producers get hired people (70%) for the process of dried fish making. As most of the rural producers were young, they hire people not involving family members. But in urban areas, producers het help from family members (30%) and hire people as well. They involve these labours for unloading the fresh fish, dried fish making and packaging.

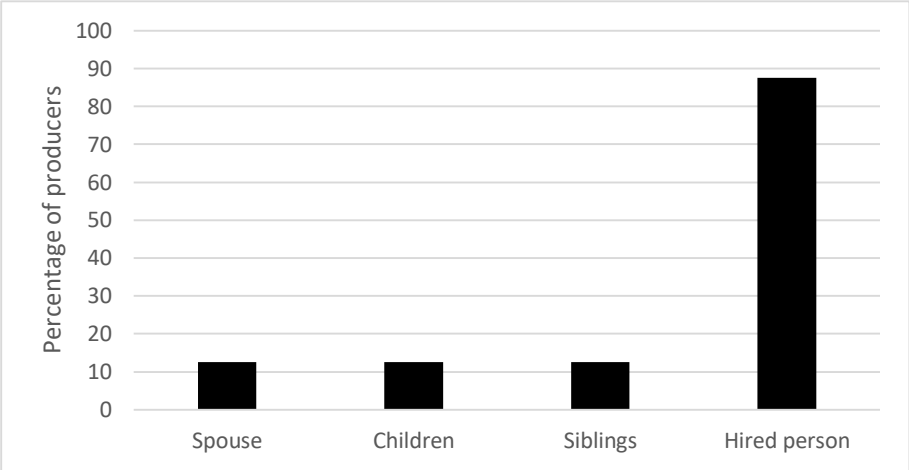

Figure 4-7- Labour source for producers for the dried fish process

4.1.7 Social status and networking

Figure 4-8 illustrates the social relationship and networking of producers, wholesalers and retailers. Both social relationship and networking play a vital role in the profit of a business. The consumers in urban areas have limited number of shops to buy dried fish, therefore the retailers in urban areas have good relationship and networking with the consumers. Therefore, the producers and wholesalers in both the rural and urban dried fish markets have a certain number of loyal customers (e.g.: University canteen and police quarters contracts). Whenever the availability of some seasonal dried fishes are low, the wholesalers and retailers get dried fishes from outside the district such as Negombo, Mannar and Kinniya wholesale markets. The continuous availability of dried fish, easy access to the location and high quality of dried make the customers loyal.

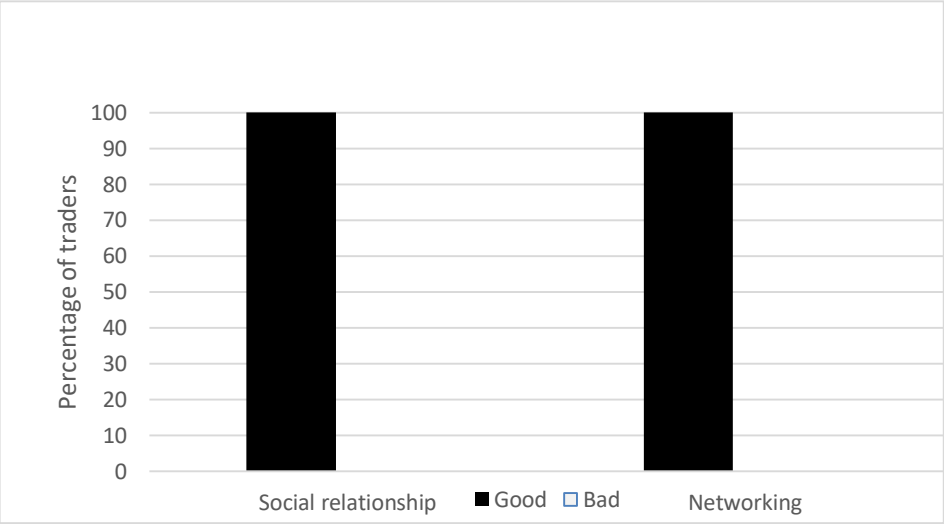

Figure 4-8- Social relationship and networking of the traders in both rural and urban dried fish markets

4.1.8 Average expenditure on food (per month)

Figure 4-9 illustrates the average food cost of the traders per month. Most of the traders have the average food cost of Rs. 25,000 to 30,000 per month. As most of them have four to five members in their family, their average monthly food expense ranges between this range. The average food cost is one of the main cost component for the dried fish traders.

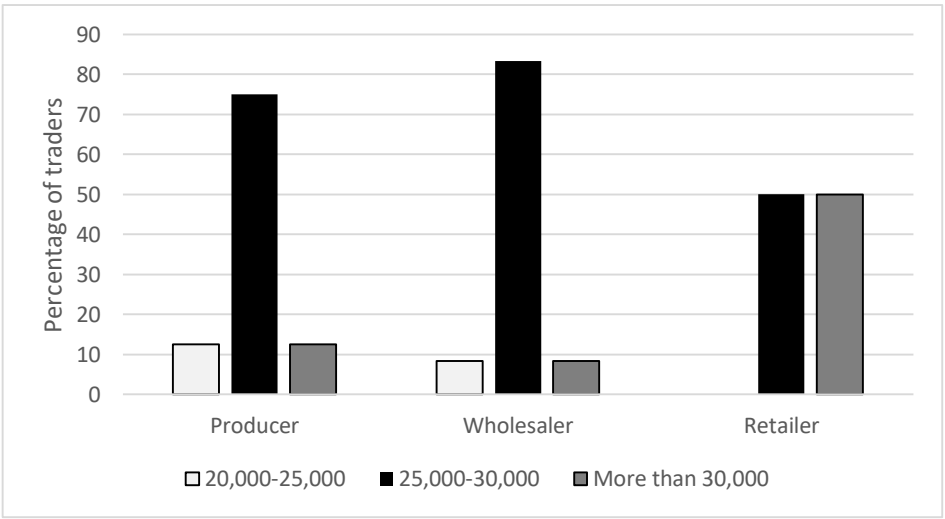

Figure 4-9- Average food cost per month of traders in both rural and urban dried fish markets

4.1.9 Savings per month

Figure 4-10 illustrates the savings of the producers, wholesalers and retailers per month. Most of the traders save money from the chit fund, called 'Seetu'. It is a rotating savings and a system of credit association which is practised locally in Sri Lanka. It is usually done among neighbours, friends or relatives. Therefore, most of the traders get a saving of Rs. 5,000 to 10,000 per month.

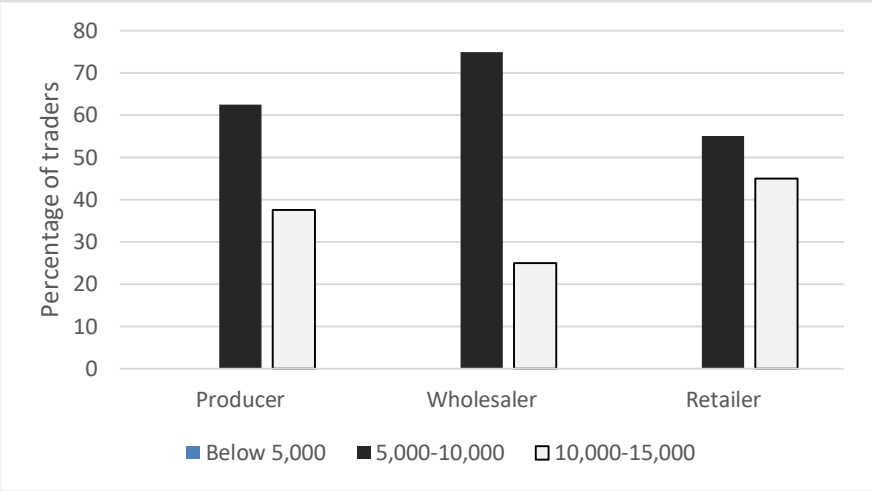

Figure 4-10- Savings per month of traders in both rural and urban dried fish markets

4.2 Market analysis of dried fish

4.2.1 Average wholesale prices

Table 4 illustrates the average weekly wholesale prices of the collected panel data of dried fish in rural dried fish market of Batticaloa. Spanish mackerel had the highest average price Rs. 1350.00 among the selected dried fish varieties in rural and urban dried fish market. Talang queen-fish and Mackerel shark had the next highest prices after Spanish mackerel with Rs. 1086.11, Rs. 950.00 in rural dried fish market. White sardinella had the lowest price of Rs. 416.67 rural dried fish market. As producers get White sardinella at a low price at landing centers, the price of its dried fish is also low. The prices for the dried fishes are set with a certain mark-up percentage in order to get profit. White sardinella and imported sprats have the value of standard deviation below 50 at wholesale level in rural area which means the data are highly reliable and closer to the mean of the data collected. Giant catfish and

String rays had the standard deviation over 100 which means they are lowly reliable and not closer to the mean value of price at wholesale level in rural area. Other fish varieties have the standard deviation between 50 to 100 which means they are somehow reliable. Skip jack tuna and Giant catfish had skewness value more than 1 which means the price is outside the range of normality and as it was positive in value, it is right skewed and others had skewness less than 1 and negative in value which means the price is not outside the range of normality which is considered as normal and left skewed.

Table 4- Wholesale prices of rural dried fish market

	Mean	Minimum	Maximum	Standard Deviation	Skew	Kurtosis
Talang queen-fish	1086.11	900	1200	99.30	-0.58	-0.01
Spanish mackerel	1350.00	1250	1400	59.76	-0.67	-1.20
Mackerel shark	827.78	700	900	66.67	-0.97	-0.30
Skip jack tuna	572.22	500	750	93.08	1.27	0.275
Giant catfish	638.33	500	950	140.89	1.46	2.36
String rays	642.50	480	800	119.74	-0.28	-1.06
White sardinella	416.67	350	450	35.36	-0.61	-0.29
Imp sprats	616.67	550	650	37.50	-0.70	-0.80

Table 5 illustrates the average weekly wholesale prices of the collected panel data of dried fish in urban dried fish market of Batticaloa. Spanish mackerel had the highest average price Rs. 1202.78 among the selected dried fish varieties in urban dried fish market at wholesale level. Talang queen-fish and Mackerel shark had the next highest prices after Spanish mackerel with Rs. 950.00, Rs. 819.44 in urban dried fish market. White sardinella had the lowest price of Rs. 427.78 in urban dried fish market. As producers get White sardinella at a low price at landing centers, the price of its dried fish is also low. Mackerel shark, Giant catfish, String rays and imported sprats have the value of standard deviation below 50 at wholesale level in urban area which means the data are highly reliable and closer to the mean of the data collected. White sardinella had the standard deviation over 100 which

means they are lowly reliable and not closer to the mean value of price at wholesale level in urban area. Other fish varieties had the standard deviation between 50 to 100 which means they are somehow reliable. White sardinella had skewness value more than 1 which means the price is outside the range of normality and as it was negative in value, it is left skewed and others had skewness less than 1 and positive

in value which means the price is not outside the range of normality which is considered as normal and right skewed. Seer fish (little), White sardinella and imported sprats had positive kurtosis which means they are not outside the range and the distribution is tall.

Table 5- Wholesale prices of urban dried fish market

Fish type	Mean	Minimum	Maximum	Standard Deviation	Skew	Kurtosis
Talang queen-fish	950.00	850	1100	100.00	0.60	-1.02
Spanish mackerel	1202.78	1100	1300	68.97	0.27	-0.89
Mackerel shark	819.44	800	850	24.30	0.55	-2.01
Skip jack tuna	491.67	350	625	93.54	0.04	-1.22
Giant catfish	491.67	450	550	30.62	0.30	0.83
String rays	416.67	400	450	21.65	0.83	-1.08
White sardinella	427.78	200	550	110.00	-1.35	1.36
Imp sprats	502.78	450	575	38.42	0.83	0.49

4.2.2 Average retail prices

Table 6 illustrates the average retail prices of the collected panel data of dried fish from rural dried fish market of Batticaloa. The average retail prices show the similar variations as wholesale prices among the selected dried fish varieties. Spanish mackerel had the highest average price among other varieties of Rs, 1506.25 in rural dried fish market. White sardinella had the lowest price among other varieties of Rs. 519.44 in rural dried fish market. Talang queen-fish, Giant catfish and String rays had the standard deviation value higher than 100 which means they are lowly reliable and not closer to the mean value of price at retail level in rural area. White sardinella and imported sprat had standard deviation

less than 50 which means they are highly reliable and other fish varieties had the standard deviation between 50 to 100 which means they are somehow reliable. White sardinella and Giant catfish had the skewness value more than and positive which means the price is outside the range of normality and as it was positive in value, it is right skewed. Talang queen-fish and Spanish mackerel had the skewness value more than and negative which means the price is outside the range of normality and as it was negative in value, it is left skewed. Talang queen-fish, Spanish mackerel, Skip jack tuna and Giant catfish had positive kurtosis which means the distribution is outside the normal range and tall.

Though the imported sprats do not have any production cost that vary among other varieties, the prices of them vary in both rural and urban dried fish markets. As the countries that the producers and wholesalers import differentiate (e.g. Iran, Dubai, Thailand and Vietnam), the prices vary in both rural and urban dried fish markets. The average prices of both wholesale and retail were low during the weeks I have collected data, as it was the rainy season where the fishes usually breed.

Table 6- Retail prices of rural dried fish market

Fish type	Mean	Minimum	Maximum	Standard Deviation	Skew	Kurtosis
Talang queen-fish	1308.33	1100	1425	104.58	-.1.00	0.70
Spanish mackerel	1506.25	1350	1600	72.89	-1.39	3.37
Mackerel shark	936.11	800	1000	78.17	-0.97	-0.53
Skip jack tuna	652.78	600	850	85.19	1.85	3.38
Giant catfish	736.11	600	1000	128.76	1.01	0.97
String rays	745.83	600	900	110.02	-0.00	-0.90
White sardinella	519.44	475	550	32.54	-0.35	-1.81
Imp sprats	697.22	650	750	38.41	-0.30	-1.56

Table 7 illustrates the average retail prices of the collected panel data of dried fish from rural dried fish market of Batticaloa. The average retail prices show the similar variations as wholesale prices among the selected dried fish varieties. Spanish mackerel had the highest average price among other varieties of Rs, 1400.00 in urban dried fish market. White sardinella had the lowest price among other varieties of Rs. 511.11 in urban dried fish market. Talang queen-fish, Skip jack tuna and White sardinella had the standard deviation value higher than 100 which mean

they are lowly reliable and not closer to the mean value of price at retail level in urban area and String rays and imported sprats had standard deviation value below 50 which means they are more reliable. Other fish varieties had the standard deviation between 50 to 100 which means they are somehow reliable. The dried fish varieties except Spanish mackerel, had skewness below 1 which means the distribution is not outside the range and can be considered as normal. Spanish mackerel, Mackerel shark and White sardinella had positive kurtosis value which means the distribution is taller than the normal distribution.

Table 7- Retail prices of urban dried fish market

	Mean	Minimum	Maximum	Standard Deviation	Skew	Kurtosis
Talang queen-fish	1122.22	900	1300	139.44	-0.28	-1.40
Spanish mackerel	1400.00	1300	1550	67.32	1.19	3.43
Mackerel shark	950.00	850	1100	75.00	0.86	0.83
Skip jack tuna	594.44	400	750	126.72	-0.11	-1.41
Giant catfish	611.11	500	675	61.38	-0.92	-0.68
String rays	525.00	500	575	29.88	0.67	-1.20
White sardinella	511.11	250	700	135.85	-0.88	0.72
Imp sprats	602.78	550	650	36.32	-0.243	-0.62

4.2.3 Marketing costs (percentage of total costs)

The final product cost includes the costs added at different actors at different nodes. Added costs can be calculated by subtracting the total cost from the purchasing price at each level of the supply chain. Added cost is the level of efforts given by the actors at each node to the final product (Bui Nguyen, 2011). Marketing costs includes costs of storage, preservation, labour etc. shows the performance of different marketing functions that happen to replace the commodity from the production place to the targeted consumer. Farmers and traders includes transportation costs when replacing their products through the marketing chain to the targeted consumers (Shepherd, 2007).

Total costs include the purchasing costs of dried fish and fresh fish, transportation and labour. Though there were other costs of packaging and salt, it was difficult to know the quantity of their usage as their usage vary season by season and according to the availability of fish that varies day by day.

Figure 4-11 illustrates the percentage of marketing cost differs among the producers, wholesalers and retailers. The rural traders had high percentage of marketing costs compared to the urban traders. But retailers in urban area had high percentage of marketing cost (1.8%) compared to the retailers in rural areas (0.9%) as most of them travel outside the district such as Kinniya and Mannar to purchase dried fish. According to the figure, producers spend high percentage of marketing costs compared to wholesalers and retailers as they spend more money on bringing fresh fish from landing centers by more than one trip and the producers in rural area produce high quantity of dried fish compared to the producers in urban area.

As most of the retailers in both rural and urban areas receive the dried fish from wholesalers and pay them the transportation cost, comparatively they have low marketing costs than producers and wholesalers.

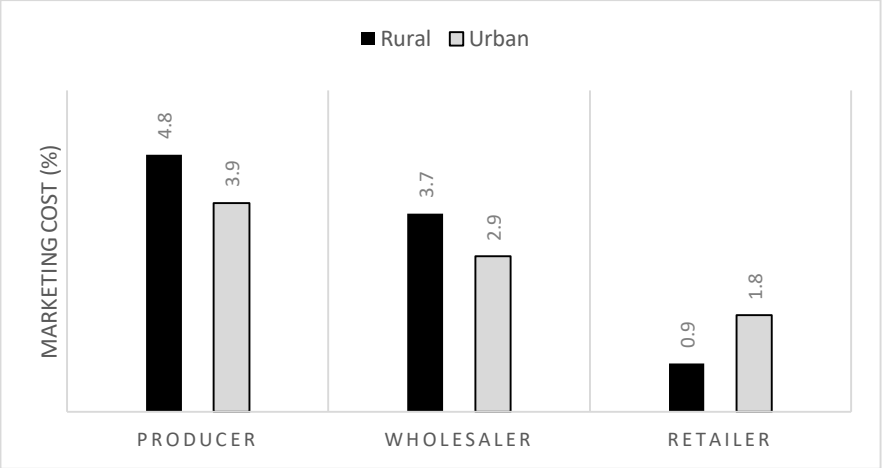

Figure 4-11- Savings per month of traders in both rural and urban dried fish markets

4.2.4 Mark-up percentage

The mark-up percentage can be determined after finding the cost of production. The total cost of production includes labour, transportation and other costs. A price that the market bears should be fixed by considering the demand. The correlation between the cost of production, desired mark-up and the price should be considered.

Different percentage of mark-up is fixed at each node of the supply chain in order to get a fair profit. White sardinella had the highest percentage of mark-up at producer level in both rural (58.71%) and urban (20%) dried fish markets. As White sardinella usually has the high demand and it can be purchased at low price, it is fixed with higher percentage of mark-up. String rays and Seer fish (little) had the higher percentage of mark-up after White sardinella with 27.62% and 21.05% in rural dried fish market respectively. White sardinella had highest percentage of mark-up (77.42%) at wholesaler level in rural dried fish market. Skip jack tuna has the highest percentage of mark-up (37.5%) at wholesaler level in urban dried fish market followed by White sardinella (33.33%) and Mackerel shark (21.43%). Talang queen-fish had the percentage of mark-up at retailer level in rural dried fish market. Talang queen-fish is the fast moving and high demanded dried fish in both rural and urban dried fish markets.

Table 8- Retail prices of urban dried fish market

	Mark-up					
	Producer		Wholesaler		Retailer	
	Rural	Urban	Rural	Urban	Rural	Urban
Talang queen-fish	5.71	5.64	17.86	15.49	14.73	16.67
Spanish mackerel	7.25	9.72	11.54	18.06	6.07	16.84
Mackerel shark	17.14	14.29	25.71	21.43	10.14	14.63
Skip jack tuna	16.56	16.67	33.13	37.5	13.33	23.91
Giant catfish	21.05	9.76	31.58	19.51	11.11	17.46
String rays	27.62	10.53	36.9	21.05	8.46	19.05
White sardinella	58.71	20	77.42	33.33	11.79	33.33
Imp sprats	17.81	8.39	31.51	18.88	12.96	9.52

4.2.5 Producers' and middlemen's share

Table 9 illustrates the producers' and middlemen's share of both rural and urban dried fish markets. When the producer fixes high and the middlemen fix low mark-up, the share that producer receive might get high. According to the table, Talang queen-fish and Skip jack tuna got the highest percentage (23%) of middlemen's share in both rural and urban dried fish dried fish markets. It was comparatively fixed with lower percentage of producer mark-up and higher percentage of wholesaler and retailer mark-up. String rays got 88% of producer share in urban dried fish market, where the percentage of mark-up at producer kevel (10.53%) was lesser than at wholesaler (21.05%) and retailer (19.05%).

Spanish mackerel had the highest percentage (87%) of producer share in rural dried fish market. Skip jack tuna got the highest percentage (23%) of middlemen share in urban dried fish market. As a whole, producer share for each dried fish variety was high, which means the markets were efficient on dried fish business.

Table 9- Market share of producers and middlemen

	Share			
	Producer		WS & Retailer	
	Rural	Urban	Rural	Urban
Talang queen-fish	77	84	23	16
Spanish mackerel	87	84	13	13
Mackerel shark	80	83	20	20
Skip jack tuna	77	48	23	23
Giant catfish	80	81	20	20
String rays	82	88	18	18
White sardinella	78	63	22	22
Imp sprats	80	82	20	20

4.2.6 Gross profit margin

Figure 4-11 illustrates the gross profit margin of both rural and urban dried fish markets. The wholesalers of both rural and urban dried fish markets had the highest percentage of gross profit margin as they have loyal customers. Though their marketing costs show the same range, they profit a lot. As the loyal customers regularly purchase certain amount of dried fish and during the weekends the tourists who visit those rural places purchase dried fishes, the wholesalers profit more (21.2%) than producers and retailers. In urban areas, there are only limited number of shops to buy dried fish, therefore consumers don't hesitate to buy even if the prices are high from the retailers. Therefore, they profit more (12.85%) than the rural retailers.

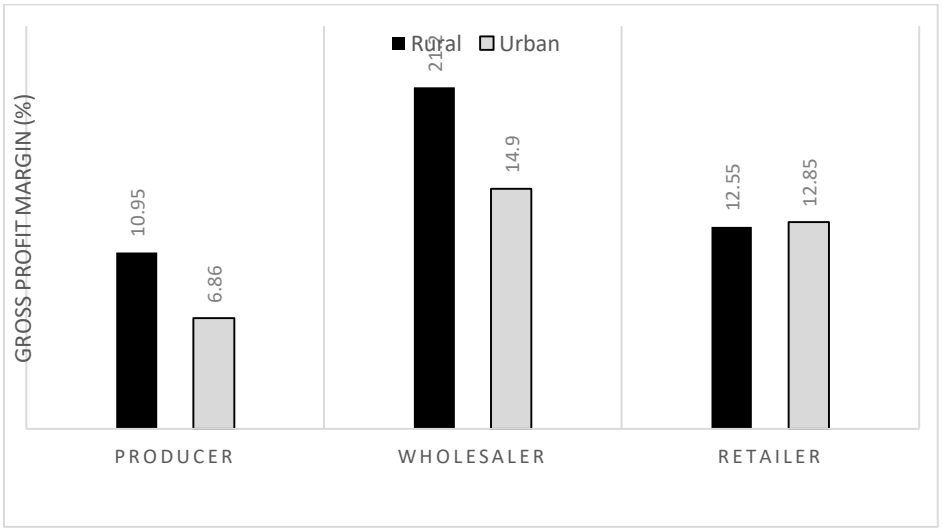

Figure 4-12- Gross profit margin of selected dried fish in both rural and urban dried fish markets

4.2.7 Shepherd's index

Table 10 illustrates the shepherd's index which indicates the market efficiency of the selected dried fish varieties. Spanish mackerel (4.23%), Skip jack tuna (1.95%) and White sardinella (2.5%) of rural dried fish markets had higher percentage of index than the urban dried fish market and other fish varieties had higher percentage of index in urban dried fish market.

The market efficiency can be indicated by the above mentioned market share as well. In rural dried fish market, the producer shares of Spanish mackerel (87%), Skip jack tuna (77%) and White sardinella (78%) were high that indicate the efficiency of each variety of dried fish. Such efficient marketing system returns a fair amount to the producers and products with high quality to the customers.

Table 10- Shepherd's index of rural and urban dried fish markets

	Queen fish	Spanish mackerel	Shark	Skip jack tuna	Giant catfish	String rays	White sardinella	Imp sprats
Rural	2.69	4.23	2.18	1.95	1.97	1.41	2.5	2.93
Urban	3.78	3.2	2.67	0.71	2.86	3.9	1.11	3.13

4.2.8 Laspeyres price index

Table 11 illustrates the price index calculated using Lesphyres method. The price indices were calculated for Colombo and Batticaloa rural and urban dried fish markets. Laspeyres index is usually used for a typical basket of goods and that is considered as 100 in the calculation, but as dried fish was only considered in this calculation, the index was calculated for 100 using the data of 2018 as base year. The base year was selected as 2018 as the consumer habits and family income on the demand side and the supply side are similar to the year from which the data were collected.

Seer fish (little) (130), Spanish mackerel (121), White sardinella (119), Skip jack tuna (116) and Talang queen-fish (111) of Colombo wholesale dried fish market had the index values more than 100 which means the prices had been increased compared to the

prices of 2018. Talang queen-fish (114), Spanish mackerel (117), Giant catfish (112) had the higher value of index in Colombo retail dried fish market compared to the base year prices. The price of the imported sprats (100) of Colombo retail dried fish market had not been changed compared to the base year.

The prices of Spanish mackerel, Mackerel shark and Seer fish (little) of Batticaloa wholesale dried fish market were less compared to the wholesale prices of Colombo markets. The prices of White sardinella and imported sprats of Batticaloa wholesale dried fish market were high compared to the wholesale prices of Colombo markets. The prices of all selected varieties of dried fish of Batticaloa retail dried fish market were less than the retail prices of Colombo dried fish market.

Table 11- Average price index of selected dried fish in both Colombo and Batticaloa dried fish markets

	Average price index					
	Colombo		Rural		Urban	
	WS	Retail	WS	Retail	WS	Retail
Talang queen-fish	111	114	122	108	107	93
Spanish mackerel	121	117	116	95	104	88
Mackerel shark	98	103	97	82	96	84
Skip jack tuna	116	107	129	77	111	70
Seer fish (little)	130	112	79	68	61	57
String rays	98	93	116	94	75	66
White sardinella	119	99	146	82	150	80
Imp Sprat	92	100	117	97	96	84

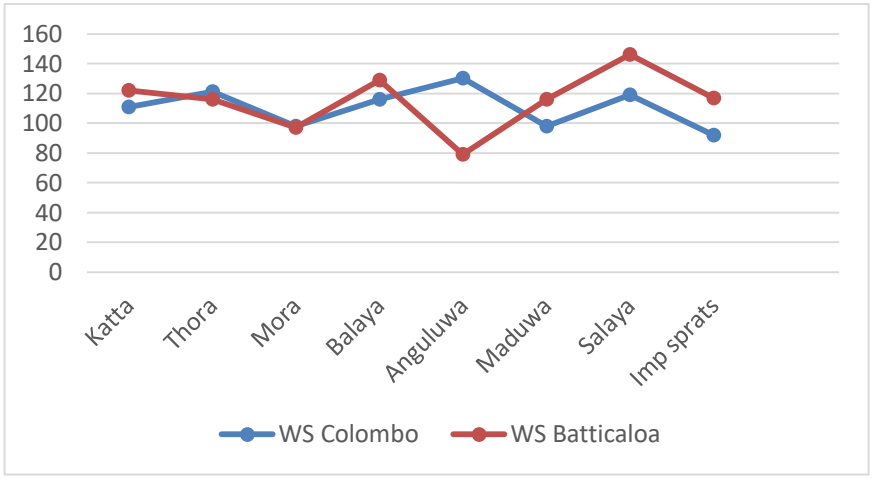

Figure 4-13- Comparison between price indices of wholesale dried fish markets of Colombo and Batticaloa of rural area

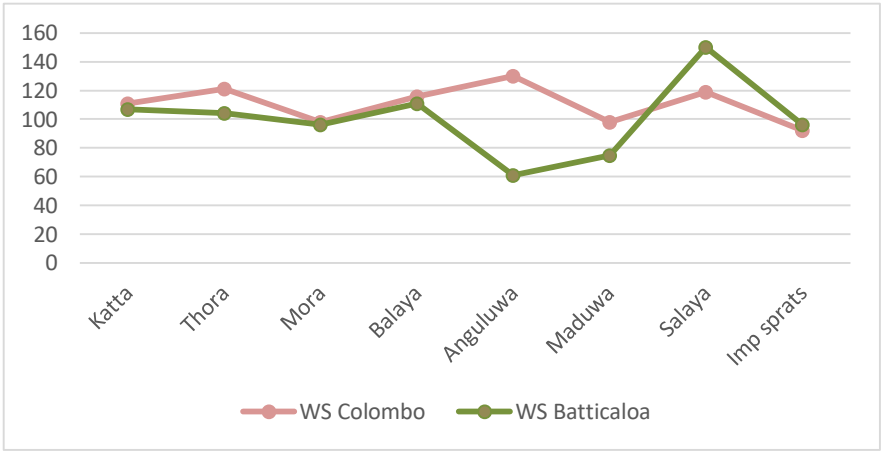

Figure 4-14- Comparison between price indices of wholesale dried fish markets of Colombo and Batticaloa of urban area

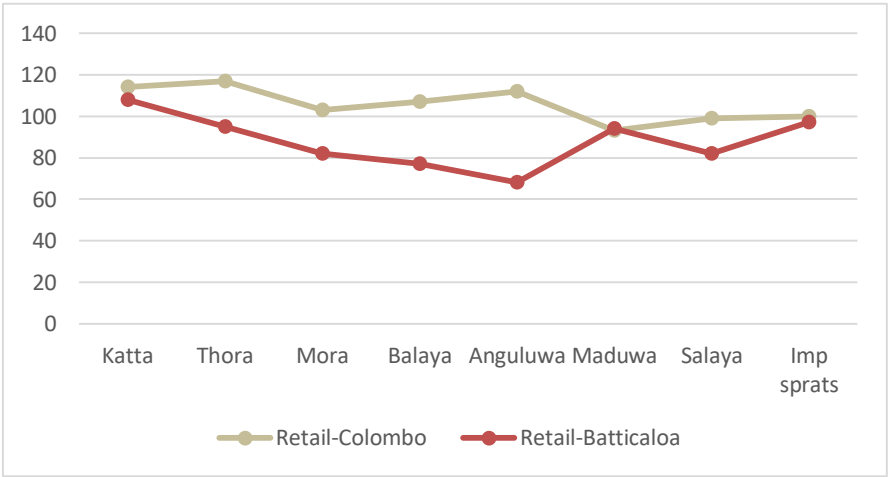

Figure 4-15- Comparison between price indices of retail dried fish markets of Colombo and Batticaloa of rural area

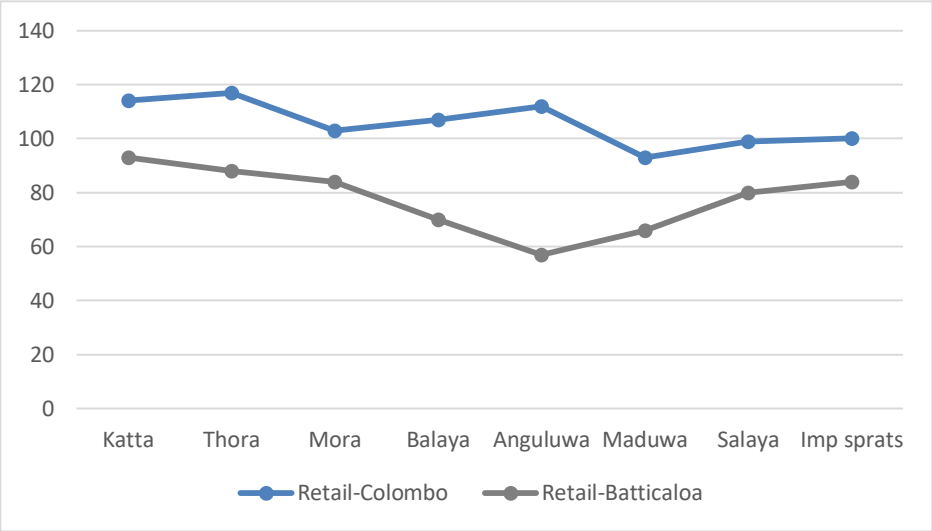

Figure 4-16- Comparison between price indices of retail dried fish markets of Colombo and Batticaloa of urban area

The above mentioned results were ensured using the SPSS by finding the correlation between the prices of Colombo and Batticaloa wholesale and retail prices. The correlation coefficients were negative for Batticaloa wholesale dried fish markets of both urban (-0.703) and rural (-0.753) areas and they were significant. The correlation coefficients were positive for Batticaloa retail dried fish markets of both urban (0.342) and rural (0.430) areas and they were not significant. Significance is depended on the number of population therefore, positively correlated markets did not show the significance.

Table 12- Correlation between the Colombo and Batticaloa wholesale dried fish markets

		Batticaloa wholesale (urban)	**Batticaloa wholesale (rural)**
Colombo wholesale market	Pearson correlation	-0.703	-0.753
	Significance	0.035	0.019

Table 13- Correlation between the Colombo and Batticaloa retail dried fish markets

		Batticaloa retail (urban)	**Batticaloa retail (rural)**
Colombo retail market	Pearson correlation	0.342	0.430
	Significance	0.407	0.288

The efficiency of dried fish markets was calculated by marketing cost, producer share, shepherd's index and gross profit margin. Consumers will get quality products and the producers will get enough profit if the marketing system is efficient and healthy. According to the above mentioned analysis, urban dried fish market of Batticaloa is more efficient than the rural dried fish market of Batticaloa. The rural dried fish market had high percentage of marketing costs, but the traders got more profit compared to the urban dried fish market. But urban dried fish market of Batticaloa had more varieties of dried fish efficiency compared to the rural dried fish market and it had more producer share as well. Though it had low profit compared to the rural dried fish market, it had low marketing cost with high efficiency. The average prices of wholesale and retail were low in urban dried fish market compared to the rural dried fish market which was a sign of a healthy economy of our nation.

CHAPTER FIVE

5 CONCLUSION

Sea food acts as a main component in the diet of most countries around the world and contributes as a main supply of animal protein. The annual per capita consumption of dried fish is about 3.6 kg, whereas the annual per capita consumption of fresh fish is 11.8 kg in year 2016 (MFARD, 2018). The research was conducted to know the pricing mechanism of both rural and urban dried fish markets of Batticaloa and compare them with the Colombo dried fish market. The price mechanism and the comparison between each market was done using mark-up, producer's and middlemen's share, gross profit and Shepherd's index. When comparing rural and urban dried fish markets of Batticaloa, the marketing costs and gross profit margin were higher in rural dried fish market. The price indices were calculated using 2018 as the base year to find the variations among the Colombo and Batticaloa urban and rural dried fish markets. Spanish mackerel, Skip jack tuna and White sardinella had high efficiency in rural market compared to urban markets with 87%, 77% and 78% respectively. There was a significant but negative correlation between Colombo and Batticaloa wholesale markets and non-significant but positive correlation between Colombo and Batticaloa retail markets. As a whole, the urban dried fish market of Batticlaoa is more efficient compared to the rural dried fish market of Batticaloa.

The recommendation for a suitable framework for the stakeholders can be provided by examining the efficiency and profitability of the actors and help the policy makers to discover sustainable and an entire marketing strategies with the objectives that developed the fish trade and the fishing marketing systems of the country. It also helps the fish marketers to make investment decisions in the area. The above analysis would be a starter of a policy that satisfies the demand of the consume especially the rural poor of Sri Lanka.

CHAPTER SIX

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7 ANNEXURES

A socio-economic analysis on the supply chain of dried fish in Batticaloa

B.Sc in Agribusiness Management (Final year)

Questionnaire for the dried fish producers

1. Name: 2. Age:
3. Gender: Male ☐ Female ☐ 4. Village: Urban/ Rural
5. Do you produce dried fish: Part time ☐ Full time ☐
6. How did you learn dried fish processing:

☐	Parents	☐	Friends
☐	Siblings	☐	Training
☐	Spouse	☐	Other

7. How do you get the fish for processing?

Fishermen	☐	Friends	☐
Fish trader	☐	Boat owners	☐
Own fishing	☐		

8. What are the fish varieties you use for dried fish processing:

Type of fish	Conversion rate	Source of supply	Buying price/kg	Months of the year	Time needed for drying

9. How do you find the labours for dried fish processing?

Source of labour	Gender	Wage (Rs/day)	Hiring period
Spouse			
Children			
Siblings			
Relatives			
Neighbour			
Hired person			

10. What are cost component of dried fish processing?

Types of costs	Average cost/ week	Satisfaction level				
		+2	+1	0	-1	-2
Fish						
Labour						
Salt						
Transportation						
Packaging						
Wastage						

5. What do you do with the dried fish waste?

_____

6. Do you purchase dried fish from shops for your consumption?

Dried fish variety	Place of purchase	Price	Reason

7. What are the economic statuses of dried fish processors?
   - Savings: _____Rs/month
   - Food source: _____Rs/month
   - Occupation: main/ supplement
   - Social relationship: good/ bad
   - Networking: good/ bad

8. What are selling prices of dried fish? (Rs/kg)

Dried fish variety	wholesaler		Retailer	
	Selling price	Cost	Selling price	Cost

9. How do you trade the dried fish?

	Cost/ week	Quantity/ week	Reliability
Wholesaler			
Retailer			
Consumer			

10. Who are the main supporters in dried fish processing?
    I. _____
    II. _____
    III. _____
    IV. _____

11. What are the cultural/ social problems in the dried fish processing?

I. _____
II. _____
III. _____

12. Do you face any difficulties due to the imported dried fish? If yes, what are they?

_____

I. _____
II. _____
III. _____

13. Main issues in dried fish processing?

I. _____
II. _____
III. _____

14. Are you involved in any community based organization? If yes, what?

_____

_____

15. How does that contribute to the dried fish processing?

_____

_____

16. Do you get any support from government? If yes, what are they?

_____

I. _____
II. _____

17. How much are you satisfied with your dried fish processing?

_____

18. What are your suggestions to improve the fisheries industry?

_____

_____

_____

Questionnaires for retailers / wholesalers

1. Name: _____
2. Age: _____
3. Gender: Male ☐ Female ☐
4. Village: _____
5. Do you produce dried fish: Part time ☐ Full time ☐
6. What are the fish varieties you use for dried fish trading:

Type of fish	Source of supply	Average buying price/kg	Average selling price/ kg

5. What are the fish varieties you use for dried fish processing:

Type of fish	Conversion rate	Source of supply	Buying price/kg	Months of the year	Time needed for drying

6. Do you sell any imported dried fish varieties? If yes, how do you get them?

   _____

Type of dried fish	Average buying price/kg	Average selling price/ kg	To whom

7. What are cost component of dried fish processing?

Types of costs	Average cost/ week	Satisfaction level				
		+2	+1	0	-1	-2
Fish						
Labour						
Salt						
Transportation						
Packing						
Wastage						

8. What do you do with the unsold dried fish?

_____

9. What are the economic statuses of dried fish processors?
   - Savings: _____Rs/month
   - Food source: _____Rs/month
   - Occupation: main/ supplement
   - Social relationship: good/ bad
   - Networking: good/ bad

10. What are selling prices of dried fish? (Rs/kg)

Dried fish variety	Retailer	Consumer

11. How do you trade the dried fish?

	Cost/ week	Quantity/ week	Reliability
Retailer			

12. Who are the main supporters in dried fish processing?

V. _____
VI. _____
VII. _____
VIII. _____

13. Difficulties on purchasing and selling of dried fish?

Purchasing difficuties	Selling difficulties

14. What are the cultural/ social problems in the dried fish processing?

IV. _____
V. _____
VI. _____

15. Main issues in dried fish processing?

IV. _____
V. _____
VI. _____

16. Are you involved in any community based organization? If yes, what?

_____

_____

17. How does that contribute to the dried fish trading?

_____

_____

18. Do you get any support from government? If yes, what are they?

_____

III. _____
IV. _____

19. How much are you satisfied with your dried fish processing?

_____

20. What are your suggestions to improve the fisheries industry?

_____

_____

_____