Value Chain of Yellow-fin Tuna in Sri Lanka
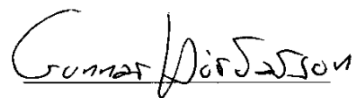
MSc. thesis for fulfilment of degree in business economics at Bifrost University in Iceland

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I confirm that the thesis is my own work and I alone am responsible for the work carried out in order to produce the thesis.

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Kampala 18. December 2008

ABSTRACT

Fisheries are important in Sri Lanka, in particular for domestic supply, but there is also a small but growing export market for high value products. The potential for economic development in the sector is great, especially in the export sector with yellow-fin tuna the most important species.

The fishery for yellow-fin tuna is dynamic and complex. In this thesis, the efficiency and productivity of the yellow-fin tuna value chain in Sri Lanka is studied with a view to assessing structural changes are needed to increase profit within the industry.

An unstructured pre-study was undertaken to get a general description of the value chain, with unstructured interviews during site visits to fishing harbours and fish markets. Based on this preliminary research and theoretical considerations, a framework was designed and used as a guideline to design structured questionnaires for important actors in the value chain. A focus group meeting was held with the processors/exporters. The field studies were conducted from late 2007 until July 2008.

There are two sub-value chains in the yellow-fin tuna industry, the export market and the local market. The export market is characterised by high demand for quality and good prices and relies heavily on landings of foreign vessels. At any rate, the major potential for further growth of exports depends on increasing contribution from local vessels. The local vessels are generally too small and poorly equipped to meet the quality requirements of the exporters. There is considerable scope to improve quality and reduce costs for the local fleet, improving profits and increasing the overall value of the fishery and its contribution to the national economy but lack of knowledge and flow of information between fishermen and processors/exporters is an obstacle.

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LIST OF ABBREVIATIONS AND ACRONYMS

CFC   Ceylon Fisheries Corporation

DFAR   Department of Fisheries and Aquatic Resources

FAO   Food and Agriculture Organization

IOTC   Indian Ocean Tuna Commission

MFAR   Ministry of Fisheries and Aquatic Resources

GoSL   Government of Sri Lanka

EEZ   Exclusive Economic Zone

GNP   Gross National Production

MDB   Multi Day Boat

EU   European Union

SJM   St. Johns Market

1. INTRODUCTION

The fisheries sector in Sri Lanka accounts for little more than two percent of the Gross National Production (GNP) but it provides direct employment for 130.000 individuals and indirect employment to little over 200.000 people (DFAR, 2006). It is also estimated that more than 700.000 people in Sri Lanka will depend on fisheries for their livelihood by the year 2016 (GoSL, 2006). The sector provides sustenance to at least 2.4 million people in fishing households throughout the country, or around 12% of the population (GoSL). Fish is of high nutritional importance for Sri Lanka with more than 65% of animal protein consumption coming from fish or around 20 kg per person a year. However, the annual domestic supply per capita in 2005 was only 11,4 kg, making imported fish a substantial part of the domestic fish supply (Maldeniya, 2008).

A number of reports estimate post harvest losses to be around 25% in Sri Lanka but scarcity of data precludes supporting this assertion, but the waste in terms of deteriorating quality, value and safety is obvious to anybody investigating fish-handling, especially of yellow-fin tuna (*Thunnus albacares*).

Transactions in fisheries are complex and to understand these activities and processes, the concept of a "value chain" is used in this study. Value chain describes the sum of the activities of all members from harvesting the yellow-fin tuna until it is received by the consumer at the local market or the exporter. The value chain illuminates the flow of products and supplies, information and capital within the fisheries, displaying the value of the activities and margins made within the industry. These activities by the handling, trade, transport or processing are building blocks for creating a valuable product for the consumer. The margin is the difference between the value and the cost of performing the value activities (Porter, 1985).

An efficient value chain with constructive flow of information and knowledge including trust and reasonable bargaining power for the players is vital to avoid losses and to maximize profit within the industry. As fish is highly perishable it is important to use the shortest possible distribution channels, with minimum involvement of intermediaries.

Yellow-fin tuna is an important species in the Sri Lankan fisheries with a total production of 39.260 tons in 2007 or around 15% of the total marine catch in the country (MFAR, 2008). Yellow-fin tuna was chosen as the subject for this study because it goes through all the channels of the value chain in Sri Lankan fisheries. It is dried onboard fishing vessels and on shore, sold fresh locally and exported fresh or frozen. The fishing for yellow-fin tuna and processing is therefore not the target of this study per se, but is used as a case study of the different value chains in Sri Lankan fisheries.

The aim of the study is to evaluate the yellow-fin tuna value chain in Sri Lanka and identify problems and opportunities for the future development of the fisheries. Further, the aim is to draw a picture of the status of the value chain today, to provide a baseline which can be used as a tool for future development in the fisheries industry in Sri Lanka. A baseline for the value chain in Sri Lanka provides opportunity for benchmarking with other developing and developed countries. The study can also be used as a base for more detailed research of a similar nature for specific parts of the value chain. Sound information on the functionality of the value chain is important for policy makers and development agencies working in Sri Lankan fisheries.

The purpose of this thesis is to study the efficiencies and productivities of the Sri Lankan fisheries value chain and to suggest structural changes to improve profit. Hence, the research questions in this paper are:

- How efficient and productive is the value chain of yellow-fin tuna in Sri Lanka?
- What structural changes are needed to improve profits in the value chain?

2. SRI LANKAN FISHERIES

Sri Lanka is an island situated in the southern Indian Ocean with an approximate population of twenty million. The country is 65.610 km^2 and has a coastline of approximately 1.620 km including bays and inlets. The total continental shelf area is around 30.000 km^2 with an average width of approximately 25 km, rarely extending beyond 40 km. Sri Lanka received their sovereign 200 mile Exclusive Economic Zone rights (EEZ) in 1978. The EEZ covers about 517.000 km^2, making the narrow continental shelf only about six percent of it (MFAR, 2008).

Located between the latitudes of 6°-10° north and longitudes of 79°- 82° east, the climate is characterized as tropical, with an average sea temperature of around 30°C. There are two monsoon seasons which influence on the fisheries, the south – west monsoon from June to September and the north–eastern monsoon blowing from November to March (Preston, 1998). Fishing seasons are therefore generally associated with the two monsoons, especially for the large number of smaller boats operating within the coastal waters fishing mainly for small pelagic clupeids. Hence, the best fishing season for coastal fisheries on the west coast is usually from November to April, while in the south and east it is from December to August (Dayaratne, 1997). The offshore boats which operate from fishery harbours and anchorages are less influenced by the monsoons and generally operate throughout the year. The monsoons dictate the pattern of fishing and affect fish supply and prices (Dayaratne).

There are 13 operational fishing harbours providing a variety of services, 15 anchorages and over 1.053 minor landing centres scattered along the country's coastline. There are 62 ice production plants with an average daily production capacity of 900 tons. There were twenty-nine registered boat builders in Sri Lanka in 2007 (MFAR, 2008).

The fisheries in Sri Lanka can be categorized into two main sectors; marine fisheries and freshwater aquaculture. The marine fisheries can then be further divided into two sub-sectors; costal and offshore.

2.1 Marine fisheries

Fish production in Sri Lanka grew from around 180.000 tons in 1990 to 300.000 tons at the end of the century when it levelled off before being reduced dramatically after the tsunami in 2004. The growth in fish production is almost entirely due to the development of the offshore fisheries (Figure 1). The total marine fish production in Sri Lanka in 2007 was 252.000 tons, with a value of 421 million USD at current producer price (MFAR, 2008).
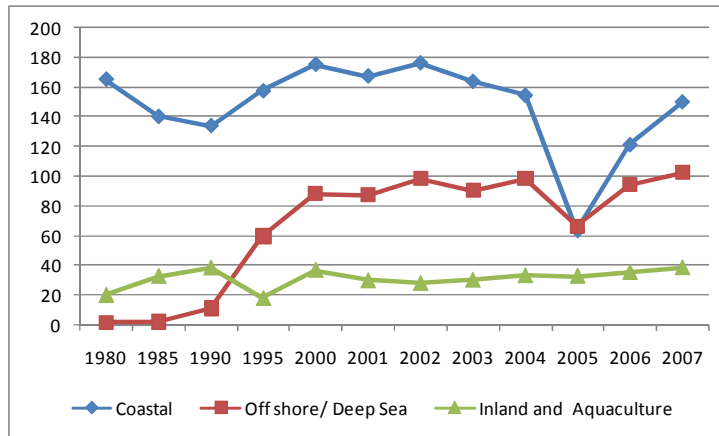
Figure 1 Production in thousands of tons from different fisheries section 1980 – 2007 (MFAR, 2008)

Over 25.000 vessels were destroyed or seriously damaged by the tsunami, 24.248 boats from the costal fleet and 883 vessels from the offshore fleet. In addition, almost 5.000 fishermen were reported dead and over 100.000 displaced (MFAR, 2007).

Political conflicts in Sri Lanka have had an adverse effect on production on the north and the east coasts of Sri Lanka, two of the most important fishing areas around the island. However, due to the recent government victory over rebels in the east and the rebuilding of public administration and infrastructure in that area, economic development is expected to be rapid, also in fisheries, although the military still imposes lots of restrictions on fisheries. In the north where a large part of the country's continental shelf lies within the sovereign fishing area, the infrastructure has been damaged and fishing activities are difficult due to the relocation of fishermen and restrictions imposed for security reasons (GoSL, 2006).

2.1.1 The fishing fleet

The availability and reliability of data on fishing vessels has improved with a new database which was established within a new vessel registry unit by the Department of Fisheries and Aquatic Resources in 2007 (DFAR, 2008). A total of 44.342 vessels were on record in June 2008, divided into five main categories (Wijararathne, 2001; Table 1).

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Table 1 Number of marine fishing vessels in Sri Lanka in June 2008 (DFAR, 2008).

Boat type	Acronym	Number of boats
Multi Day Boats (MDB)	IMUL	3,046
Single day boats (SDB)	IDAY	1,180
Out-board engine Fiberglas Reinforced Plastic Boats	FRP	18,270
Motorized Traditional Crafts	MTRB	1,878
Traditional Crafts	NTRB	19,968
Total		**44,342**

I.   Multi-day boats (MDB) that normally have a crew of five staying out for some weeks for fishing.

II. Single-day boats (SDB) with a crew of three to four people, using inboard engines and staying out fishing for only one day at a time.

III. Out-board engine fibreglass reinforced boats (OFRP) with a crew of two that stay out for fishing overnight.

IV. Motorized Traditional Crafts (TONSRB) are traditional boats fitted with outboard engines.

V.   None motorized traditional boats (NTRB) are planked beach seine crafts or "*paru*"; the outrigger canoe or "*oruwa*"; the log raft or "*teppam*"/"*kattamaran*" and the "*vallam*". These boats were traditionally built out of timber and used by artisanal fishermen but are today mostly made of reinforced fibreglass. Included in this category is the Beach Seine Crafts (NBSB), none motorized vessels used for beach seine fishing operations.

In general the offshore fishing is conducted by MDBs and the coastal fishing by the other types of vessels.

2.1.2   Offshore Fisheries (high seas fishing)

Offshore fisheries are characterized by the so-called multi-day boats staying out for more than one day during single fishing trip fishing outside the continental shelf, even beyond the EEZ. The boats are equipped with engines larger than 50 hp, insulated fish holds, water tanks and facility for the crew to sleep. Some of these boats have radios and satellite navigation systems (DFAR, 2008). The most common fishing gear is driftnet which is often used in combination with a long line. During the peak tuna seasons in November-February and June-August, a normal trip lasts about ten days, but at other times when the catch is poor, trips may last up

to six weeks. These fisheries have expanded rapidly during the last two decades and are still believed to have the largest growth potential (Sydnes & Normann, 2003). Total landings from the offshore fishery are estimated to have been around 102.000 tons in 2007, with yellow-fin tuna accounting for almost 40% of the total catch (MFAR, 2008).

The quality of fish landed by the offshore boats is sometimes poor, not qualifying for the export market which normally pays the best prices (Perera B., 2008; Fernando R., 2007). This is mainly due to the length of fishing trips and poor handling practices on board (GoSL, 2006).

Fisheries targeting tuna have developed rapidly in Sri Lanka since the mid -1980s, particularly with the expansion of fisheries into the offshore and well beyond the country's EEZ. Pelagic drift gillnets targeting skip-jack tuna, sharks and billfishes is the dominant fishing gear along with tuna long lines and hand lines used as secondary gear to target sub-surface resources such as large yellow-fin and big-eye tuna. There is a gradual increase in the number of vessels being converted to dedicated tuna long liners fishing for the export market (Abeyratne, Fernando, Weerasinghe, Weeratunga, & Wickremasinghe, 2008).

2.1.3   Coastal fisheries

Coastal fisheries are characterized by boats that stay out for less than 24 hours and generally fish within the continental shelf. In 2007 33.000 vessels were registered in the coastal fleet contributing 150.110 tons, more than 59% to the country's total marine catches (MFAR, 2008).

The motorized costal fleet normally set small mesh gillnets in the afternoon, hauling them around midnight (Maldeniya, 2008).

The NTRB type of boats contribute most to the rest of the costal production using mainly ring nets, hand lines, trawls and cast nets (Maldeniya, 2008). Under this category are the only trawlers operating in Sri Lanka, artisanal shrimp canoes powered by sails fishing in shallow brackish waters off river mouths. Finally there is beach seining. Beach seine crafts "*madel parus*" operate from sandy beaches with two boats. The seines are set parallel to the shore and thereafter pulled ashore by hand, involving ten to fifteen people at either end.

According to recent studies the coastal resources are over exploited and many stocks are in decline (Sydnes & Normann, 2003). Catch per unit effort in the small pelagic gillnet fishery along the north-west, west and south coast's fell from 95,2 kg in 1979 to 33,8 kg in 1993. A sound management system is needed in these fisheries but law enforcement and compliance are weak (Sanders & Dayaratne, 1998). The management and enforcement authority for fisheries is under the MFAR, but the fisheries sector is still under-developed, unscientific and lacks proper management (Ariyasena, 2006). When the coastal fleet was motorized in the seventies the government introduced synthetic fishing nets to the industry but failed to introduce adequate management measures. Over-exploitation of fishing resources will eventually cause lower productivity in the industry (Samarayanke, 2003).

2.2 Inland and Aquaculture Production

The river systems in Sri Lanka consist of 103 rivers flowing from the highland with a total collective length of 4.560 km and large areas are flooded during the monsoon seasons. There are no natural lakes in the country but there are large numbers of reservoirs built mainly for irrigation and power generation. These man-made lakes are used for fisheries, often based on the release of hatchery produced juveniles. At the river mouths the brackish water makes excellent nursery grounds for shrimp spawns, used for prawn production in large ponds on sandy beaches (Joseph, 2004). Inland fisheries and aquaculture contributes around 10-14%
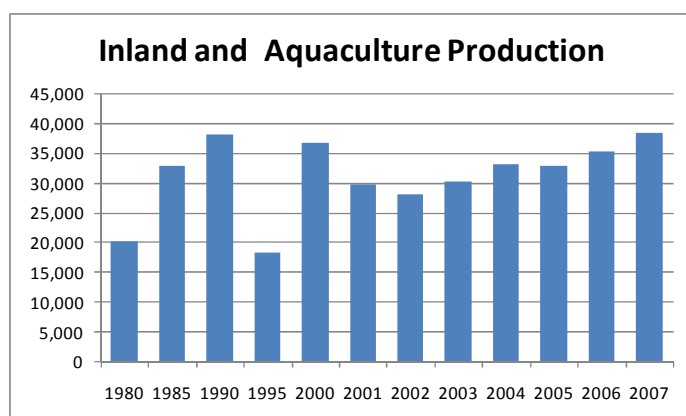
Figure 2 Inland and aquaculture production from 1980 to 2007 (MFAR, 2008)

to total fisheries production in Sri Lanka and has remained relatively constant in recent years (Figure 2). The production in 2007 was 38.380 tons with most of it sold fresh in domestic markets, but drying is common in the informal sector which uses mainly low quality fish, not suitable for the fresh fish market (MFAR, 2008).

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The export market is also operating with whole fish but production of fillets and loins, fresh or frozen is common.

2.3 Processing and marketing

Twenty eight processors were registered with the DFAR in January 2008 with twenty three of them having approval for exporting to the EU markets. Most of the exporters were processing and exporting fish but a considerable number were involved in shrimp- and lobsters processing (Wickramasinghe, 2008). Fish drying is also important in Sri Lanka with a 36.200 tons production in 2007 (MFAR, 2008). Dried fish is mainly poor man's food, mostly consumed in rural areas and sold for lower prices than fresh fish, considering the yield of the process (Sewalanka, 2007). The raw material is of low quality not accepted by the local markets (Perera, 2007).

2.3.1 Fish trade

The general flow from harvesting to consumer is; fishermen, assembler, wholesaler/commission agent, retailer, consumer. But the real world is much more complex where consumers sometimes purchase fish from fishermen or retailers purchase from fishermen or assemblers. A simplified version of the Sri Lankan value chain is illustrated in Figure 3.
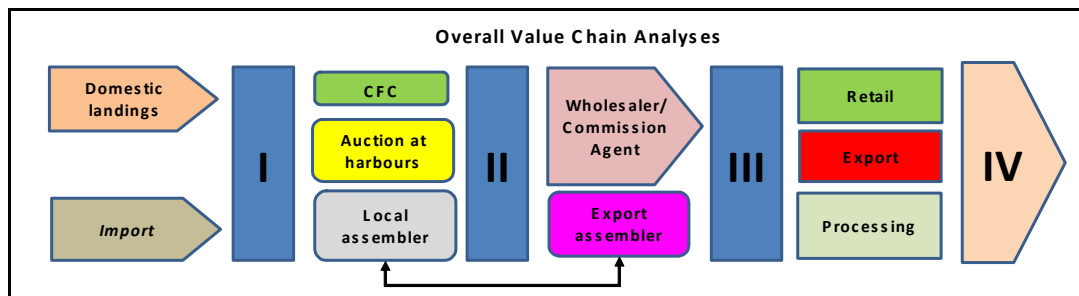
Figure 3 Value chain of fisheries in Sri Lanka

Assemblers normally purchase fish from auction markets but sometimes assemblers own fishing vessels or have contracts with vessel owners. Wholesalers do not make outright purchases from assemblers but undertake sale on their behalf for a

commission. A large number of retailers in the fish trade operate all over the country and can be categorized into two types; fixed retailers (stall, shop and market retailers), and mobile retailers (motor bikes, bicycle retailers, vans, three-wheelers and "*pingo*[1]" carriers).

The biggest wholesale market in Sri Lanka is the St. Johns Market (SJM) in Colombo, handling more than 30% of total domestic production (Maldeniya, 2008). The market is located in the old centre of Colombo at Pettah, opposite the city's commercial harbour on the ground floor of a large multi-storied building. A plan to build a new fish market is well underway, with substantial improvements and equipped with refrigerated rooms and cold storage. The new market will be located at Peliyagoda, 12 km away from the city of Colombo, and will be owned and operated by MFAR (Perera B., 2008).

2.3.2   Export and Import
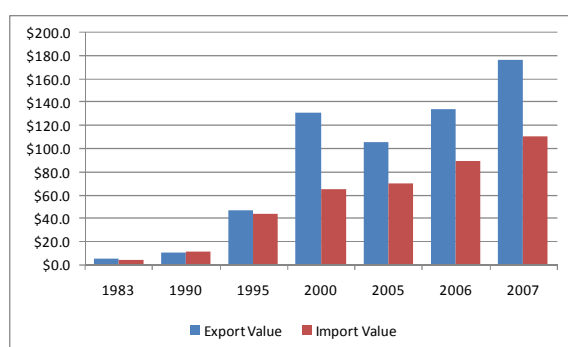
Figure 4 Export and import in million USD from 1983 to 2007 (MFAR, 2008)
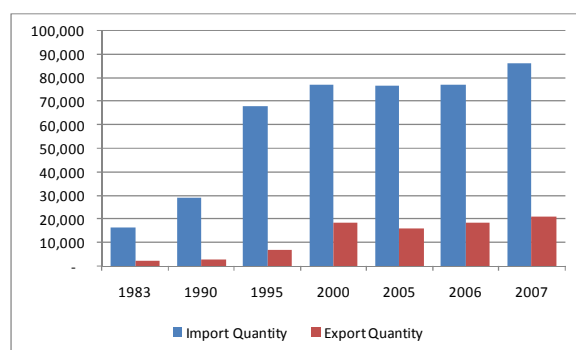
Figure 5 Export and import in tons from 1983 to 2006 (MFAR, 2008)

The total export of fish products from Sri Lanka was 21.422 tons in 2007 with a value of nearly 177 million USD (MFAR, 2008). Import was 86.156 Tons with value of almost 111 million USD (Figure 4). Imports exceed export by volume (Figure 5), but by value it is the other way around since 1995.

About three quarters of the exports are fish. Shrimp account for about 10% and the rest is made up of lobster, chank, beche de mer, jellyfish etc. Tuna is the most

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[1] A man selling fish on foot, carrying the fish in two cane baskets tied at either end of a stick resting on his shoulder

important fish species with yellow-fin accounting for most of the export value (MFAR,2008).

2.4 Marine Resources Management

The Ministry of Fisheries and Aquatic Resources (MFAR) is the policy making body for the country's fisheries and it is responsible for general development and management of the sector. MFAR coordinates the activities of agencies and institutions within the fisheries sector that carry out regulatory, research, training, extension and welfare functions. The MFAR has six divisions (Sydnes & Normann, 2003);

- planning and monitoring
- export development
- social development
- monitoring, control and surveillance
- finance
- administration

DFAR is the executive arm of the MFAR responsible for daily administration of the fisheries resources.

Fisheries management is a multidisciplinary subject that has to be based on sound biological expertise with strong economic and social considerations. Fisheries management, overlooking economic issues, may succeed from the biological perspective but will likely lead to a waste of resources like investment funds and labour with consequences for a country's economy in general (Samarayanke, 2003). The Sri Lankan fisheries management is an open access system without property rights giving both privileges and responsibilities. Fishery resources are viewed as common property and almost no active management exists on behalf of the Government of Sri Lanka (GoSL), (Preston, 1998). There are a few exceptions such as the Fishing Operations Regulations providing the regulatory framework for certain fishing gears such as beach seines with traditional individual fishing rights. However, there are no regulations for the gill- and drift-netting, the main fishing gears in Sri Lanka that contribute to more than 80% of total catches. The country has no existing rules such as minimum mesh sizes (except in inland fisheries where gillnets over 3 ½" mesh are banned), control regulations or limits on new entrances

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into the fisheries. New fishermen are free to enter the fisheries sector and existing fishermen may upgrade or expand their operation at their own will (Preston). Increasing number of boats fishing on the narrow continental shelf has led to over-exploitation of the coastal stocks (Preston). But with the scarcity of reliable data in Sri Lanka in mind, it is difficult to estimate accurately the extent of over-exploitation of coastal resources.

The Foreign Fishing Boats Act of 1997 has general provisions for issuing licenses to foreign vessels. However, no such licenses have been issued and no foreign vessels are fishing legally within the Sri Lankan EEZ today (Wickremasinghe, 2008). The GoSL has recently implemented new measures to monitor the activities of vessels operating under its flag and foreign vessels calling to ports in Sri Lanka.

The GoSL introduced a ten year development plan for the fisheries sector in 2006, with a new vision for Sri Lanka and a ten year developmental framework for the years 2006 – 2016. The strategy is articulated under the national development plan "Mahinda Chintana" prepared by the Department of National Planning and Ministry of Finance and Planning. Even in this plan there are no intentions of taking direct action to change the open access policy for the use of fisheries resources or to implement any kind of further restrictions to fishing within the EEZ (GoSL, 2006). GoSL is expecting a substantial growth in both coastal and offshore fishing in the future and, according to Mahinda Chintana, their vision is for "*Sri Lanka to become a leader in the South Asian Region in sustainable utilization of fisheries and aquatic resources*" (GoSL).

The policy objectives for the next 10 years are;

- to improve the nutritional status and food supply of the people by increasing the national fish production
- to minimize post-harvest losses and improve quality and safety of fish products to acceptable standards
- to increase employment opportunities in fisheries and related industries and improve the socio-economic status of the fishing community
- to increase foreign exchange earnings from fish products
- to conserve the coastal and aquatic environment

The GoSL is to reconstruct the fishing fleet and the numbers of MDB boats are predicted to rise to 3.303 vessels by 2013. The plan was based on the assumption

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that the MDBB fleet was around 1.500, but the fleet had already grown to 3.046 in July 2008 (DFAR, 2008). The fleet development plan was based on meeting the fish production targets for 2007-2016 (GoSL, 2006).

2.5 International Relations in Fisheries

The influence of markets on international regulations is increasing and demands for the sustainable utilization of fisheries resources are growing and so is international cooperation, especially on managing highly migratory fish stocks in international waters. The Food and Agriculture Organization of the United Nations (FAO), The World Trade Organization (WTO) and the Indian Ocean Tuna Commission (IOTC) are all important international bodies regulating international fisheries.

The WTO was established in 1995 as the successor to the General Agreement on Tariffs and Trade (GATT). WTO has had significant implications for food safety and quality requirements for seafood in the international trade through the Technical Barriers to Trade (TBT) agreement (WTO, 2004). As a benchmark for the TBT agreement, FAO recommended a global Code of Conduct for Responsible Fisheries (CCFRF). The Code (FAO, 2005) was unanimously adopted at the 28th Session of the FAO Conference of Fisheries (COFI), and provides a framework for national and international efforts to ensure sustainable exploitation of resources in harmony with the environment. Article 6.14 states:

 "*Countries should promote trade of fish produced-either by aquaculture or capture fisheries in a responsible way, or could prohibit trade in fish products not produced in such a manner. This can include undersized fish specimen, fish caught by irresponsible fishing techniques, fish caught exceeding a quota or fish caught during a fishing ban period*"

Fisheries and utilization of fish stocks, especially highly migratory stocks, do not have boundaries like EEZs, but are international matters. Fishing nations trading on the world market are going to have to meet international demands and have close collaboration with the international community in the future.

Eco-labelling is becoming an important requirement for the trading of fish and fishery products, particularly in markets in EU, USA and Japan. Driven largely by consumer demand, countries exporting fish and fishery products to these markets are required to show that the fish has been caught in well managed fisheries with

due considerations to environmental protection and bio-diversity. Such "*labelled*" products receive higher consumer preference and a higher market share, and many importers in these markets are demanding that the imports are not only from well managed and environmentally compatible fisheries but also that internationally accepted best practices are adopted in catching, handling, preservation, processing and transport of fish from catch to consumer (Joseph, 2005). In the not so distant future, Sri Lankan exporters may have to comply with such requirements and label their products or, obtain a certificate from an internationally recognized accreditation agency (such as the Marine Stewardship Council of the U.K.) to confirm that the exported product is from a well managed fishery. Good Practices Guides (GPG) is being introduced to many exporting countries to promote compliance with the stringent requirements required for certification (Joseph).

The IOTC is an intergovernmental organization established under Article XIV of the FAO constitution. It is mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. The Commission is to promote cooperation among its members with a view to ensure, through appropriate management, the conservation and optimum utilization of stocks covered by this agreement and encourage sustainable development of fisheries based on such stocks (IOTC, 2006). The IOTC has at present 27 members and three cooperating parties. Sri Lanka was the first country to endorse the IOTC agreement on June13[th] 1994 (Herrera, 2008).

The IOTC compiles fisheries data for tuna and tuna-like species in the Indian Ocean, which are highly migratory and exploited by many countries.

Reports based on IOTC's monitoring of Indian Ocean tuna fisheries and associated scientific studies have indicated that the yellow-fin tuna stock is fully exploited. In recent years the IOTC has implemented measures intended to limit the capacity of industrial fleets operating in the Indian Ocean. The overall capacity of IOTC industrial and artisan fisheries will need to be estimated for the IOTC to be able to set an optimum fishing capacity for the Indian Ocean. For this purpose, IOTC has requested that all states with industrial vessels or other vessels fishing beyond their EEZs to seek authorization from them in order to be able to fish within the IOTC area. Coastal countries are also invited to provide fleet development plans. Sri Lanka is yet to seek authorization for its boats with the IOTC but a fleet development plan is under preparation (Herrera, 2008).

3. THE VALUE CHAIN – THEORETICAL DISCUSSION

Introducing the concept of a value chain, Porter (1985) stated that a value chain is a "*systematic way of examining all the activities a firm performs and how they interact is necessary for analyzing the sources of competitive advantage*" (Porter, 1985, p. 33). Porter introduced the value chain as a basic tool to analyse strategically relevant activities and to understand the behaviour of cost and sources of differentiation. He explains how a firm can gain competitive advantage using a strategy to perform the most important activities with a cost and quality advantage over its rivals.

3.1 The structure of the value chain and the main actors and activities

Kaplinsky & Morris (2000, p. 4) describes the value chain concept as a "*...full range of activities required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use*" It is a systematic way of exploring all the activities a company performs and how it interacts with other firms. In other words it is helpful when attempting to analyze sources of competitive advantage and performance. The idea is to split up a company's most strategically relevant activities, to cut through the complexity to understand the behaviour of value adding in production (Kaplinski, 2000). By analysing the value chain the key elements of an industry can be pointed out to find the most important variables within the value chain and how it works. By analyzing these key elements and using the value chain concept for mapping activities it can break down the total value chain earning into rewards achieved by different parties in the chain. This can be helpful to understand the earnings of each party in the value chain but not only the gross returns trade statistics will explain (Kaplinski & Morris, 2000).

The value chain is often illustrated in a simplified way to understand and abridge a complex matter, but in the real world it is a complex phenomenon. For research it is necessary to have a clear focus and simplify the pathway through the value chain. Figure 6 compares a simplified model and how complex the chain of events can be in the real world (Brown, Bessant, & Lamming, 2000). Mapping the flow of the input into the value chain or value adding, allows each firm to examine its own

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activities and anyone else's behaviour and the impact of these variables on the firm's success.

Figure 6 Value chain mapping; theory and reality (Brown, *et al.*, 2000)

A firm's activity is to design, produce, market, deliver and support its product after sale (Porter, 1985). Porter uses the concept of value chain to represent these activities creating a value for the firm, and divides them into two categories, *primary activities* and *secondary activities* (Figure 7). Value is the total revenue the firm is making, reflecting the price and quantity of its products. The firm makes a profit if the value exceeds the cost involved in making the product.
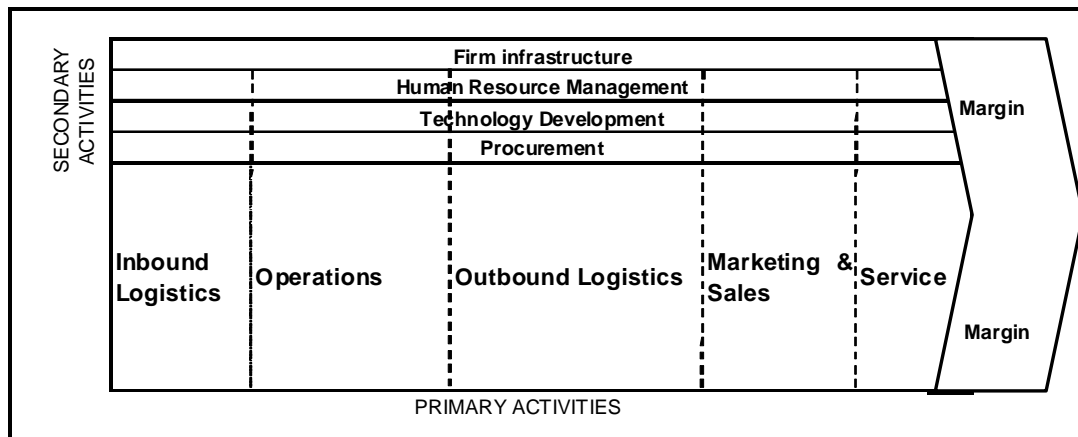
Figure 7. A generic value chain (Porter, 1985).

In competitive terms the value concept could be used instead of cost, because firms often deliberately raise their cost to deliver more value. The cost of manufacturing an automobile like Ferrari is much higher than producing a Toyota, but the value is also much higher and the Ferrari customer is expecting much greater value than if he had been buying the latter.

The difference between the total value added to a product and the total cost of producing it represent the margin of the value chain. Therefore a value chain needs to generate sufficient value by satisfying its customer and fulfil his/her expectations for a less cost than value, to make a profit. And for a value chain to be sustainable,

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it needs to distribute its margins fairly among the actors of the chain (McEachern & Schröder, 2004).

In the next part of this chapter attention will be paid to the most important factors in evaluating or analyzing value chains.

3.1.1   Key actors and activities

The whole value activity within a value chain is always dependent upon cooperation between firms with no firm spanning the entire chain of its operation. In a general value chain a supplier supplies raw material to processors, who process products/services and channel it to its customers who distribute it to consumers. There can be suppliers to suppliers and customers to customers, all depending on the diversity of the overall value chain. Everyone in the value chain has to understand the overall cost and profit margin and be able to identify it, since the end user is ultimately paying the total value added (Shank & Govindarjan, 1992; Galbraith & Kazanjian, 1986). A value chain can be divided into two parts; upstream and downstream. Upstream competitors are suppliers of raw materials where value is often added by minimizing the raw material cost with standardized commodities and homogenous products. But downstream actors are closer to the end user with more emphasis on marketing. In between are the processors changing raw material into more complex products and passing it through to the down-streamers (Galbraith & Kazanjian)
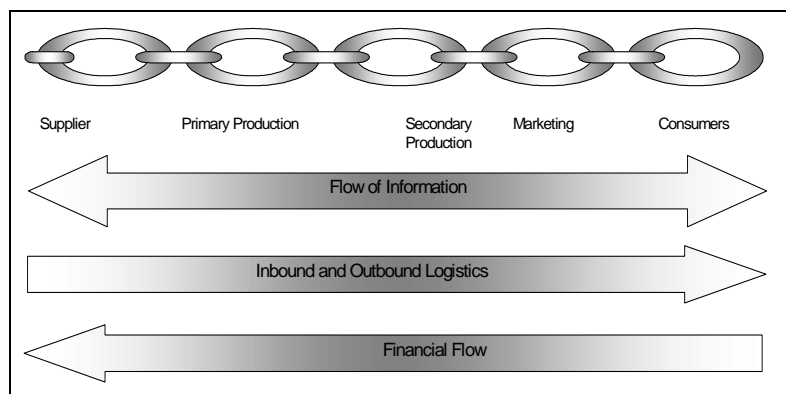
Figure 8 The flow of information, logistics and finance (Anonymous)

Value activities are executed from supplier to primary production onwards to secondary production and then further on to marketing and consumer. These flows from upstream raw material supplier through the value chain to the downstream of end user are explained by flow of information, inbound and outbound logistics and flow of finance (Figure 8).

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Information flows in both directions, upstream and downstream, for example information on consumer preference flows through the marketing sector, secondary production, and primary production and all the way to the supplier. The supplier therefore gets information on important matters to increase customer satisfaction. At the same time information also flows through the chain from supplier to consumer on topics like ingredients of the product. Inbound and outbound logistics flow downstream towards the customers and financial activities flow upstream through the value chain where the final payment comes from the consumer.

3.2 Relationships within the Value Chain

It is a strategic decision of a firm what kind of relationship with its suppliers and customers will give it maximum competitive advantage. Gummerson (2002) points out how important close cooperation between actors in the value chain can be, where suppliers, retailers and customers are working together as partners to increase their mutual value, or what is called a "*plus-sum game*" (Gummerson 2002 cited in Pitta, *et al.*, 2004). In contras he describes how some firms put the emphasis on winning at the cost of others and use their bargaining power to gain as much as possible for themselves, thus engaging in what he calls a "*zero-sum game*". Gummerson claims the use of bargaining power can be useful to gain competitive advantage; however, firms using strong bargaining power without coordination with their suppliers could lose opportunities because they will not exploit supplier's capacity to increase value (Gummerson 2002 cited in Pitta, *et al.*, 2004). Porter (1985) talks about value chain linkages between value activities, not only referring to activities within a firm's value chain, but also to the value chain between different firms. One activity is linked to another and can affect the performance of other firms, like for instance a firm's procurement procedure can affect production cost and quality. Increased quality inspection can reduce costs of faulty products, minimizing customer dissatisfaction and after sale service costs. Firms do not always realize the significance of procurements when calculating manufacturing costs or that the quality of raw material determines the quality of the product.

The world business environment has been changing from the *zero-sum game* to the *plus-sum game* placing more emphasis on cooperation where a network of actors work together in transforming raw material into distributed goods to provide a

beneficial outcome for the customers (Pitta, Franzak, & Little, 2004). Vertical coordination between firms, from up-stream to down-stream actors is often complicated but the gain of such coordination must be clear to both parties. Sometimes it is easier to achieve a *plus-sum game* with coalition partners or a sister company than with an external company where linkages require a flow of information and coalitions such as exist within a company's own value chain (Porter, 1985). Coalitions between firms are long-term agreements and require cooperation that goes beyond the normal market transactions but falls short a merger. It is a way of broadening the scope of the company instead of enlarging the company itself. Nonetheless, the same applies to the gain of coalitions as for coordination; the gain for both partners has to be clear and transparent and it has to be in their mutual interest to work together (Tveteras & Kvalöy, 2006).

Using the value chain for analyzing the competitive advantages of firms can be more appropriate than emphasizing value adding by competing firms in the value chain. Value adding often puts emphasis solely on purchasing raw materials at a low price and selling at a higher price, missing the importance of increased margin by close relationships and collaborations between suppliers and customers, creating mutual value among firms within the value chain. The value added concept ignores activity made further upstream, before raw materials enter a factory and also after they are shipped out on their way further downstream in the chain, missing the opportunity to lower costs at these steps in the value chain. A good example is a chocolate firm supplying raw material for a confectionery in large ten pound bars. To lower the mutual cost of both firms, the firm starts supplying the chocolate in liquid form in tank cars. This could be an extra cost for the firm but total cost of supplier and customer is considerable lower and if the arrangement is shared between the firms, both stand to gain from it (Porter, 1985). Using the value chain concept and viewing all participants (suppliers, producers and retailers) as one system (i.e. value chain), creating a higher margin for the whole system rather than focusing on parts of it, can be beneficial to everyone involved in the process of production (Porter). This mentality of collaboration by working closely with other actors of the value chain to create mutual benefits and maximising the margin and customer satisfaction is very important for competitive advantage and strategy alignments. The value and supply chain should be viewed as a *plus-sum game* with

everybody gaining from collaboration (Morven, McEachern, & Schröder, 2004). As long as the actors within the value chain can see more benefits from cooperation than self –serving behaviour, they will pursue the *plus-sum game.* If buyers have specific or non-standard requirements with respect to product, then such a *plus-sum game* with vertical coordination between supplier and processor can be a necessity (Tveterås & Kvaløy, 2006).

The buyer – seller relationship is important and researchers have investigated this with an emphasis on the importance of understanding the quality of the relationship. For a long-term relationship between members of the value chain, dissemination of knowledge on how to fulfil customer desires is of high importance. This flow of information between suppliers of the value chain and its customers can create extra value that is shared in the value chain. For a sustainable *plus-sum game* a long term relationship is important for the value chain to succeed in delivering value with maximum margin. Such collaboration will increase as a result of long term cooperation of individual actors and well managed relationships (Crosby, Evans, & Cowles, 1990).

Companies have come to realize that direct activities in internal operations are often a fraction of the total product cost. Large part of the cost is external and it can be important to realize this for cutting the total cost in the value chain. The Toyota Motor Company in Japan introduced the *"just in time system"* (JIT) for minimizing the stock-in-trade and cut down its inventory costs in late 1970, followed by *"total – quality – management"* (TQM) for continuous quality improvements. But the company realized it was only controlling around 60% of the cost of manufacturing a car, the rest of the value adding came from suppliers. It was therefore of obvious importance to introduce these new methods, JIT system and TQM, to the company's suppliers and thereby cut down cost throughout the whole value chain, not only in Toyota's value chain (Kaplinski & Morris, 2000).

3.2.1   Information and learning

In organizations the layers of management often work as gatekeepers for information, they collect information, evaluate it and assess its use, and channel it on to other units within the organisation (Drucker, 1998). Drucker tells the story of one of the largest defence contractors in United States examining the sources of

information for its top operating managers, needed to do their job. Where it came from, in what form it was and how it was flowing through the company. Out of a total of 14 management layers around six of them had no other role than pass information on to the next layer. These six layers were really redundant and could be shut down by better organized flow of information. Drucker uses the metaphor of a large symphony orchestra and how information flows through it and knowledge is spread within the unit. There is only one conductor (CEO in an organization) controlling up to one hundred players without any middlemen passing on information. Indeed the players have their score telling the musicians what to play and when. It is also a guideline for the conductor what to expect and when. But the important issue here is that the players have the knowledge and only need the right information from the conductor to perform their music. They are specialists in what they are doing, and artists, having the score and sufficient information to execute their task (Drucker). Businesses do not have a score to play by but an information based organization can have its goals with a clear expectation of performance from the management, giving specialists the opportunity to perform these expectations by giving the sufficient information and knowledge.

But information is not only flowing within organizations but also between them with information and knowledge shared for mutual benefit for all partners in the value chain. Companies need to interact with other firms, not only as buyers and sellers, but also as partners cooperating to provide value for their customers and to strengthen their competitive advantage within the value chain like a network of actors transforming raw material into finished goods attracting the consumers (Pitta, *et al*., 2004). This collective action by all members of the chain when responding to customers' satisfaction needs to focus on knowledge flowing upstream and downstream the value chain, giving relevant responsiveness of the value chain members to each other. The importance of the flow of information is crucial for maximizing mutual margins and creating superior value for the customer (Frunert *et al*., 2002).

Firms have to acquire and share information of the market, competitors and customers to develop new products or improve existing ones. The key to innovation and performance in the value chain is the ability to learn and to share

knowledge between people and firms using close collaboration and a *win-win* scenario[2] (Calantone *et al*., 2002 in Pitta *et al*., 2004).

The ability to create superior value for customer drives continuous improvements of products and processes that can give firms competitive advantage and build up barriers for others to enter the industry (Kaplinski & Morris, 2000). Hence, the capacity to innovate and the need to sustain exclusive competitive advantage can be at risk when a firm shares information to create additional value through the collaboration and integration among other actors within the value system. The more specific and unique the information is, the riskier it becomes and can lead to a loss of competitive advantage (Carr 2004 cited in Pitta, *et al*., 2004).

The search of entrepreneurs to come up with new combinations of products and thereby go from the normal rate of profit into super profit is what fuels the innovation process and drives firms to gain higher profit. Scarcity gained by purposive actions, as well as from nature, can give the entrepreneurial the upper hand in the business and can work as a barrier for others to accesses the industry. This return on innovation, giving the opportunity to escape the normal rate of profit, is fuelling the progress and drives capitalism forward (Kaplinski, 2000).

3.2.2 Power and Trust

Collaboration, commitments and dependency are essential for a long time sustainable relationship between firms (Gummerson 2002 cited in Pitta, *et al*., 2004). Many researchers have investigated the relationship between a seller and a customer and the value it can construct. Crosby (1990) emphasized the importance of understanding the concept of quality in a relationship of firms and how important it is for them to seek knowledge to build up a long term relationship. Such a relationship can create value shared between the firms within the value chain and will determine the effectiveness and longevity of the relationship and like Gummerson (2002) phrases it, "*the core values of relationship marketing are found*

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[2] Calantone use win-win scenario were Gummerson use plus-sum game. This is the same consept.

in its emphasis on collaboration and the creation of mutual value" (cited in Pitta, *et al*., 2004, p. 513). Such collaboration emphasises the *plus-sum game* and looking at all actors within the value chain as partners in creating value rather than adversaries. Gummerson states that, *"If relationship is important, we are dependent on it and we must then commit ourselves to making it work"* (cited in Pitta, *et al*., 2004, p. 513). Moreover there will always be a risk and uncertainty in a relationship and trust is the most important initiative to avoid that, with power sharing and adaptation of the relationship crucial for longevity.

In a strategic relationship between firms, trust has for a long time been considered to be one of the key incentives for successful alliances (Alter & Hage, 1993 cited in Knútsson, 2001). A lack of trust is one of the most damaging elements of a firm's relationship, using *plus-sum game* and depending heavily on a few or even a single supplier. There is a fear the supplier's bargaining power can become too strong and due to his monopoly he will raise his prices and increase the firm's raw material costs. The most important prerequisites for sustainable *plus-sum game* relationship are trust and positive attitudes. But such trust and positive attitudes have to be built on solid foundations like willingness to cooperate and as such it will not be bought or built on formal contracts alone (Knútsson, 2001).

Use of power and the way it is distributed is also an important element in cooperation between firms, influencing the level of trust between them. Power can be distributed unequally in the value chain, but it does not have to be destructive, as long as all parties are successful and the adoption of the relationship is built on trust and fairness.   As long as all parties in the value chain benefit from the relationship with a good success of the entire value chain the cooperation will be successful. But for a long term relationship in the value chain the adaptation process, how the relationship is built up, is essential with firms treating each other with loyalty and respect (Pitta, *et al*., 2004)*.*

Weber (1974) viewed power as the ability to get others to do what you want them to do, even if this was against their will (cited in Buchanan & Huczynski, 1997). Power is the capability of one person to impose his will on another to achieve his desired goal or result and as such power is a building block of influence. Power can be formal, like the government's authority or company's hierarchy, but it can also be built on informal pillars like recourses or information. A firm controlling access

to scarce recourses is in a strong position to gain power over those in need of it. But information is also a strong power base with information being; *"... a life blood of all organizations, and the main currency of exchange between its members"* (Buchanan & Huczynski, 1997, p. 692).   Who has the information has the power and to have the information a person needs to be centrally located. That is having access to information from all sources like managers, co-workers, external contacts and their subordinates. According to Buchnan and Huezynski (1997 p. 693) the *"Information power depends on knowing and interacting with others"*

Information power within organizations has been widely discussed in the literature. Power is important between firms and its impact on their relationship and cooperation with in the value chain is crucial. A customer having vast information about market situations and technical information on the product, being centrally located, and having this above his suppliers, will gain strong bargaining power over them. This strong bargaining power can disarray fruitful price determination and raise transaction costs within the value chain, by giving the powerful actors a super profit.

This complex coordination between supplier and customer can lead to considerations of the power structure within an industry and how decisions are taken on different activities. These activities in the value chain, within firms and in the division of labour between them, are the subject of what Gereffi (1994) introduced as; *"governance"* of the value chain   He defined this concept as the *"authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain"* (cited in Pietrobelli & Saliola, 2002, p. 4)

3.2.3   Transaction Cost

A transaction cost (TC) is cost associated with reaching and enforcing agreements between actors in the value chain, including planning, adapting and monitoring economic activities. This cost can be influenced by the relationship between supplier and customer and the cooperation can be close or build on the free market situation where bargaining power is used to reach the right prices. Firms have to estimate their need for liaison with other firms and what kind of cooperation is

appropriate for the business, if strong bargaining power is suitable or if more collaboration is appropriated to lower their TC.

Tveterås & Kvaløy (2006) discuss how the divergent degree of vertical coordination, from open market to vertical integration, can affect this TC as illustrated in Figure 9.

Open Market	Marketing Contract	Production Contract	Joint Venture	Vertical Integration	Degree of vertical Coordination
Low				**High**	
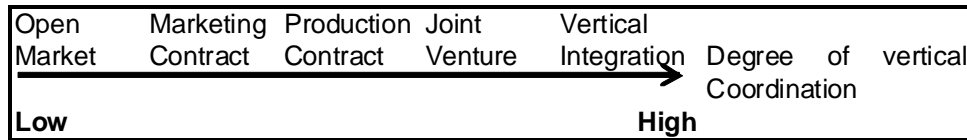
Figure 9 Degrees of vertical coordination (Tveterås and Kvaløy, 2006)

They claim that *asset specificity* in an exchange relationship between supplier and customer can have an effect on TC. The asset specificity is further broken down into tree types of specificity:

1. Physical specificity for special purpose equipments and other specialized investment requirement to achieve economies of scale.
2. Site specificity like when a supplier locates himself in the neighbourhood of a processor to lower transport costs.
3. Temporal specificity referring to timing of delivery and its effect on product value, such as finding alternative processors for perishable products like fish, at a short notice.

TC and the relationship between per unit of goods sold and degree of asset specificity under different forms of vertical coordination in transactions between the actors is intertwined. Their conclusion is when *asset specificity* cost is not counted the TC is lowest in open markets, like auction markets, but a contract gives the second lowest cost and vertical integration is most costly. But when asset specificity is high, the vertical integration system has the lowest TC and the open market the highest with contracts in between. This means that with more complexity in trading with higher asset specificity, the open market has higher TC than vertical integration or contracts.

The reason for this is that specificity cost gives rise to quasi rents, i.e., the difference between value of an asset in its best use and its second-best use. An example could be an owner of a tuna vessel considering purchasing expensive equipment to be able to land high quality tuna for the export business. He will raise his cost by buying the equipment and perhaps staying out for shorter time periods to

deliver better quality (fresher) fish, but his margin will be higher because of the higher market price he will get in return. By contract or vertical integration he can be sure of landing at a time when the raw material is needed and always get export prices, but auction markets may not give him the same assurance. The market's need for special products like high quality at the right time on the right place will not be served by the open markets as well as contracts or vertical integration.

3.3 Strategic Position of Firms within the Value chain

Industries are characterized by trend causing changes affecting their competitive structure and business environment. The forces having most influence on industries changes, affecting their structure and competitive environment are called "*driving forces*" These driving forces need to be identified and the impact they have on the industry analysed. The most common forces are (Thompson & Strickland, 2001);

- increasing globalization
- change in long term industry growth rate
- change in who buys the product and how it is used
- product innovation
- technological changes
- marketing innovation
- entry or exit of major firms
- regulatory influences
- government policy changes
- reduction in uncertainty
- business risk or the opposite

It is also important to consider what the key factors for competitive success are for an industry. Industries differ and the competitive forces highly influence the profitability within them, with a growing industry being more profitable in general than a shrinking one. Structural changes can shift an industry from stagnation to profitability, like new markets opening up in foreign countries or new invention changing the strength of competitive forces influencing the profitability within it (Thompson & Strickland, 2001). Changes in geographic markets of firms, like introduction of foreign markets with export prices can change competitive advantage (Porter, 1985). A firm can also align itself by relocating its position in

the industry using this strategy to change the competitive forces and strengthening its position. Companies cannot do everything for everybody but have to stay focused by making strategic decisions and dedicate themselves to exclusive segments to gain superiority over their rivals in that focused area and capture the value it creates for the customers.

There are two basic types of competitive advantages for firms to create superior value for their customers, to provide a lower price than competitors with same or more benefits or to provide unique benefits exceeding the extra cost of doing so. Porter calls these types of competitive advantage; cost *leadership* and *differentiation,* depending on whether the firm is in low cost and mass production, or if it is focused on high quality product for a selected group of customers (Porter, 1985). It is the question of winning by being cheaper or be being different, which means being perceived by the customer as being better or more relevant. These are fundamental choices for firms when positioning themselves within an industry and taking strategic decisions on to how to exist in a competitive world (Porter).

Competitive advantage is important for a company's profit and so is the industries attractiveness and how firms align themselves to their position against other actors in the industry. One of the basic tools for diagnosing competitive advantage and finding this scope is the concept of the *value chain* (Porter).

3.4 Rents and Finance

The theory of economical rent was first formulated in the eighteenth century by the economist Ricardo (1772-1823). He distinguished between rent as a *"factor income"* (when paid for use of land or other vast resources) and *"economic rent"* (profit from operation). According to Ricardo a *"Rent is that portion of a land's produce which is paid to the landlord for the use of the original and indestructible powers of its fertile soil"* (Ricardo, 1817: 33 cited in Kaplinski, 2000). But Ricardo did not only refer to rent for land because of its fertility but also took into account the scarcity of land and unequal access of people to it. As Freedman (1976) writes: *"…economic rent may arise not just from natural bounty, but also as producer surpluses that are created by purposive action. These augmented rents have become increasingly important since the rise of technological intensity in the mid-nineteenth century"* (cited in Kaplinsky, 2000, p. 123).

Therefore, "*economic rent*" is mostly dynamic in nature as it entails a surplus from differential productivity factors of firms. Firms can turn this rent into consumer surplus and gain competitive advantage relative to their rivals. Schumpeter (1961) showed that scarcity can be created on purpose by firms in order to gain competition advantages (Kaplinski, 2000). The economic rent includes technological capabilities, organizational capabilities, skills and marketing capabilities, often called core or dynamic capabilities in science (Kaplinski & Morris, 2000). Not all rent is economical, but can arise from access of scarce natural resources, like fish stocks, and other are provided by parties external to the value chain, like through government policy or international convention (Kaplinski & Morris).

There is also a need to understand the determinants of the income distribution requiring a focus on rents and barriers to entry. Fierce competition can lower profit but a dynamic capability within the company can strengthen competitive position. This could be gained by endogenous rents or by entry barriers created directly by actors in the value chain itself, or exogenous entry barriers, created from outside the value chain, like government policy or regulations (Kaplinski & Morris, 2000). Good example for such exogenous entry barriers are firms pressuring governments of building infrastructure giving them competitive advantage, and also for lobbying for protection, like trade barriers. If analysis can help to map the income distribution with explanation of the way it is emerging, it can also explain how to make changes to this distribution pattern. It will also help to understand the barriers to entry and how to sustain them to maintain profit in the value chain as well as helping to understand the power relation in the value chain and what behaviour needs to change if a different outcome is required.

Value in competitive terms is considered to be the amount buyers are willing to pay for a firm's input into the value chain and is measured by the total income of the firm (Porter, 1985). If the value exceeds the cost of the firm's activities in producing, the firm will make a profit which is normally the goal of every profit driven company. It is appropriate to use value instead of costs when analyzing the competitiveness of companies since firms often deliberately raise their costs to deliver more value.

Mapping activity and its value creation, using the concept of rent mentioned earlier, can be helpful to understand why some activities in the chain have higher return than others. The most important matter here is the barrier to enter in to the industry, limiting the competitive pressure. When mapping this distribution of income the focus is on profits, with a higher barrier to enter the higher the level of profitability (Kaplinsky & Morris, 2000).

To understand the distributional outcomes phenomenon it is necessary to focus on income at different levels of the value chain, instead of focusing only on profit.

3.5 Value Chain in Fisheries

The value chain in fisheries is distinguished from traditional industry and service in one major aspect which is that the raw material comes from renewable resources. A firm exploiting an oil well can decide if it is more profitable to finish it off in ten years or fifty, but a fishing industry has to exploit its resource, the fish stocks, in a sustainable way. Preferably the exploitation level should be guided by the estimated Maximum Sustainable Yield (MSY) to give maximal rent for a long run but resource management is needed to gain that. There is a threat in an open access system that fish will be overexploited while everybody is trying to maximize their income by fishing more, knowing that everybody else will do the same. Hardin (1968) called this the Tragedy of the Commons where open access and lack of property rights will destroy common resources.

Increasing seafood trade during the last decades, mostly because of the rapid growth of export from developing to developed countries, has lead to concerns about sustainability of fisheries and distribution of value sharing to the upstream sectors in developing countries. Though in general any country engaging in trade will be better off, export can result in increase in prices on local markets with world prices normally being higher than the local prices, affecting domestic consumers. Higher prices often result in increased fishing effort and can cause over-exploitation of fish stocks and collapse in the sector (Gudmundsson, Ashe, & Nielsen, 2006).

Many fisheries around the world are in a crisis due to the failure of governments to manage the resources in a sustainable manner (Anderson, 2003). Declining profitability is due to a decline in catches and the failure to level with sustainable output to satisfy income demand for the fishermen (Tveterås & Kvaløy, 2006).

Despite developing countries enjoying higher prices of seafood as a result of increased fish trade in the world, it does not outweigh the consequences of over fishing. This has led to a demand around the world for internationally accepted standards for environmentally sound fisheries and information dissemination regarding that to the consumers. Formal trade negotiations have been organized by the World Trade Organization to set international regulations and avoid trade barriers between countries.

3.5.1 Market Development

The rationale at the heart of all marketing analysis is the concept of marketing which;

"...in its widest sense, therefore, is any activity which actualizes the potential market relationship between the markers and the users of economic goods and services" (McInnes 1964, cited in Cantillon, *et al*., 2006, p. 194).

The marketing part of the fisheries value chain is heavily influenced by the production part of it, such as the quantity of supply and its uncertainty due to seasonality of fishing. Fish marketing has been traditionally characterized as being one of the most turbulent and dynamic food supply chains in the world, especially in the upstream sector of it. In general, the trend in the seafood business is characterized by globalization and diversification (Tveterås & Kvaløy, 2006). It is a challenge for members of the value chains in fisheries to maximize the margin with higher market value and different product attributes, like quality and delivery time (Tveterås & Kvaløy). Value adding is created by some key actors using communication to deliver customer value to the next customer in the value chain. Free marketing systems where sellers and buyers meet and bargain for the right price, are vital to maximize the margin out of the process.

When considering value chains for foods markets can be characterised as a *"traditional "or "demanding"*; normally with the former in developing counties and the latter in developed countries (Table 2).

Table 2 Characteristics of "traditional" and "demanding" food markets (Tveterås & Kvaløy, 2006).

Characteristics	Traditional Markets	Demanding Markets
Income level	Only a small share of the population has high	Generally high income

	incomes	
Product difference and development	Limited, market dominated by traditional generic products	Consumers and final buyers continuously look for new product varieties
Food processing	- Few value added products - Labour intensive processing technology	-Increasing share of value added and fresh products -High capital intensity in production
Raw material requirements	-Few production process requirements -No formal documentation -Limited testing of raw material	-several production process requirements -Third party certification
Share of food retail outlets in large national and international chains	Most retailers are independent, family-owned	Typically more than 50% large retail chains
Share of modern super-/hypermarkets among retail outlets	Most retail shops are small with a limited product range	High share
Coordination requirements between suppliers and final buyers (planning and information)	Low requirements- final buyers purchase products available at any given time	Higher requirements due to optimization of distribution systems from wholesale to retail level
Investments in promotion	Insignificant or small	Investments by both suppliers and final buyers
Fresh product	Low demand for fresh products, except from regional /local suppliers	Increasing demand for fresh products from foreign suppliers
Share of seafood distributed	Predominantly distributed by traditional	Typically 50 – 80% or

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by food retail chains	fish markets and fish shops	more

This grouping in to *"Traditional markets"* and *"Demanding markets"* can be helpful when examining the value chain for sea food in different markets and to understand the underlying elements in it.

3.5.2 Pricing

If markets are free and fulfil the assumptions of perfect market conditions each market level will receive the price needed to clear the market. This means that everything on the market will be sold for a price accepted by seller and buyer. However, location, infrastructure, lack of information and market power of individual companies at each market level can have an impact on how the value of the final product is distributed through the seafood value chain. As an example, one can think of small scale fishermen in a remote location. They have only one harbour facility to land the catch and there is only one company which buys the seafood. The fishermen do not have access to information from the final consumer and hence might not realize what the potential price for their product is. If these fishermen had access to computerized markets where numerous buyers and sellers participate in the auction, the price would move closer to the market clearing price. That is the right price from the economic viewpoint. However, local structure, agreements between processors and fishermen and the structure of the economy all affect the final price paid to the fishermen. The right economic price might therefore be higher or lower than the current price the fishermen receive. Information flow and transparency between market levels are crucial for an efficient distribution of value throughout the seafood value chain (Gudmundsson *et al.*, 2004). Uncertainty in quality of raw material tends to downgrade products to lower quality markets segments while greater assurance of quality of raw material will give opportunity to target better paying quality demanding markets (Trondsen and Young, 2006).

3.5.3 World market and export

Globalization is defined as the pervasive decline in barriers to the global flow of information, ideas, actors (especially capital and skilled labour), technology and

goods. Globalization can have a high impact on which activities are subject to increasing returns and which will be declining, and influence the nature of return, rent, etc. throughout the various links in the value chain (Kaplinsky and Morris, 2000).

Figure 10 illustrates the possible effect of high world price on local supply. If S is the supply line sloping upwards, where fishermen will fish more if price is higher, and D1 is the demand line, sloping downwards, where consumer will only buy more if the price will go down. Price is denoted by P1 and quantity sold is denoted by Q1. If the world price goes up or transport cost will be lower, the price will shift up to P2 and that would urge the fishermen to supply more fish - the quantity sold will be at Q2. This is considerably outside the demand line and the prices are higher than what the local consumer are ready do pay. So the quantity supplied to the local market will go down to Q3 and the difference (Q1-Q3) will be exported. The fishermen and probably the society as a whole are better off, but local consumers are losing. (Gudmundsson, *et al*., 2006)
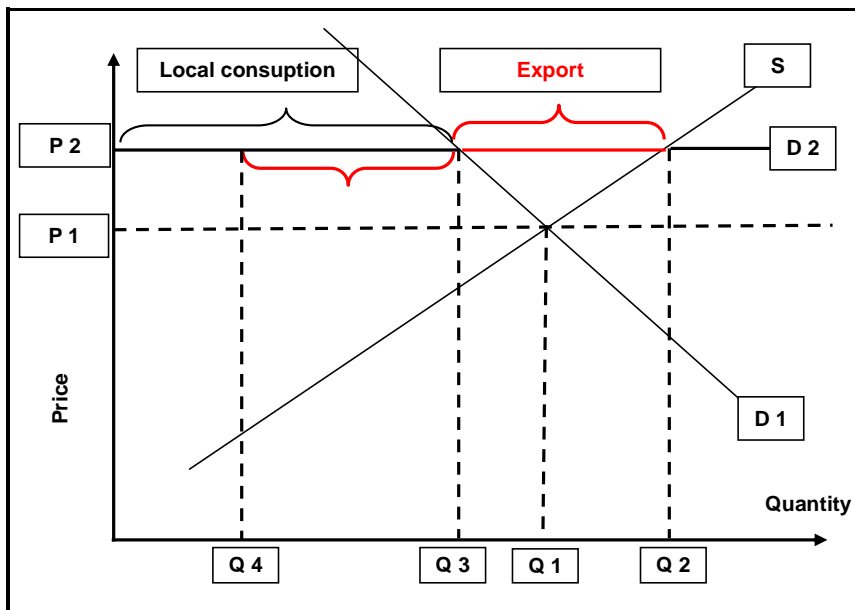
Figure 10 High world market price affects local supply (Gudmundsson. *et al*., 2006)

In this setup it is assumed the resources are well managed and the fishermen can increase the fishing and supply, but if the fisheries resources are fully exploited, there will be no extra supply. The quantity line (Q1) will be a straight vertical line and the supply to the domestic market will move down to Q4, making the local suppliers even worse off. This is a problem associated with modern fishing

technology and the capacity to over harvest. Harvest capacity can only increase to a certain level but then starts to fall due to overexploitation (Gudmundsson, *et al.*, 2006).

The whole value chain of fisheries is illustrated in Figure 11 and the value addition at each level, from fishermen to consumer. Fishermen supply through the auction market, (S1), and the assemblers demand is D1 and the price paid will be P1. Assembler adds value to the fish and it is sold, (S2), through the wholesaler (D2) for a price of P2. Assembler adds value to the fish and channel (S3) it to the retail market (D3) with equilibrium price of P2. The retailer adds value to the product before selling it to the consumer for a price of P4 and equilibrium demand and supply in D4 – D5.
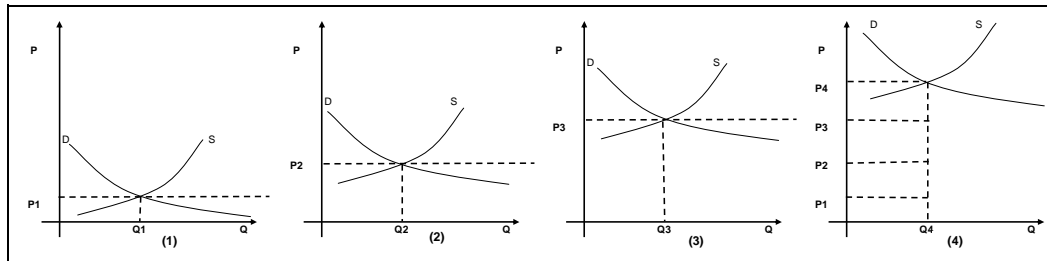
Figure 11 Demand and supply in fisheries value chain (Gudmundsson *et al.*, 2006)

In a perfect market, the equilibrium will be at the level of market clearing, when everything will be sold for a price acceptable to both the buyer and the seller.

The simplest transaction in the fish business would be a processor buying a fish from a vessel. More sophisticated would be a sale from vessel to a primary producer which sells it through wholesaler to a secondary processor making value-added fish fillet breaded and packed especially for the customer, i.e., specially packed for a supermarket. The last transaction will be the customer buying it from a chilled cabin in the supermarket.

It has been argued that the lack of focus on the fish market function as a source for adding value in resource management is affecting profitability in the industry. Free access to the resources along with an ineffective marketing system can encourage fishermen to concentrate more on quantity instead of value. Effective marketing systems can also transmit a signal from the distribution channels as to what are the most economical species to harvest at any given time to maximize the margin out of the exchange process. In general fishermen fish to earn rather than just catch a maximum quantity (Arnarson and Trondsen 1998; Holland and Ginter 2001, cited

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in Trondsen & Young, 2006) but resource management has, at the same time, encouraged fishermen to catch more than increasing unit value. A marketing system is also important for the participants in the value chain for the dissemination of information and knowledge to adapt to changes in different product demands and quality levels (Trondsen & Young). This could improve unit price level and fishers should be able to retain an acceptable income, under a sustainable fishing regime. Auction markets at harbours can be a productive tool for price determination and are characterized as homogenous markets, delivering raw materials with attributes to satisfy the specific demands of a homogeneous market segment. The quality delivered and the right attribute will guide the product into different grades with different prices, motivated by value adding possibilities, targeting different markets (Morven *et al*., 2004).

3.6 Summation of the Value Chain discussion

The structure, actors and activities of a value chain determine the flow of products through the value chain and what the main activities adding value to it are. A real life value chain is a complex phenomenon and there is a need to find a simple, but descriptive pathway through the system, from supplier to processor on and eventually the consumer. The idea is to split up a company's most strategically relevant activities, to cut through the complexity to understand the behaviour of value adding in production.

It is important to identify the key actors within the value chain, those having a large impact on the value addition in the value chain. The most important activities need to be identified and used as milestones through the value chain. These are the strategically most relevant activities were the most value adding will take place, increasing the total margin made in the industry. The paths of activities from supplier through the value chain to the customer and the interaction between the actors on these pathways need to be in focus of such an analysis with information on prices and quantity of the products passed through the chain. It is also necessary to know how the margin of the activities is distributed between the actors throughout the value chain.

The relationship between firms in a value chain is highly important, if they find collaboration appropriate and engage in a *plus-sum game* or use bargaining power

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in their transactions, resulting in a *zero-sum game* to minimize their cost and maximize the margin. The issue here is to estimate whether collaboration between actors and the relationship structure is likely to maximize efficiency and productivity within the value chain or if some changes are needed to improve it. Relationship structure and the degree of collaboration can affect transaction cost and firms have to consider if an open market or a more integrated relationship is appropriate for their business. Part of transaction cost is a wrong quality or product at a wrong place and time of delivery, where nobody gains from the mistake and everybody lose. It can therefore be essential for firms to look at the whole value chain, but not gaze at each firm in isolation from others. A large part of a firm's product value addition is made outside the firm, by its suppliers and customers, who therefore have a large impact on the total cost of the product, influencing the total margin made within the value chain.

The way information and knowledge are distributed through the chain is essential for efficiency and productivity of a value chain and therefore a very important part of actor's relationships and cooperation. Information from upstream actors on product matters needs to flow down the value chain to the market, and from the market to the downstream actors. Information also needs to flow the other way, from the market to the suppliers, for instant specification and information on how to satisfy the customer with unique value.

Information and the ability to learn are essential to capture this knowledge and how it is distributed from the market to the upstream part of the value chain. This distribution of information is crucial within the value chain; with the possibility of one actor misusing information control others in the system. Having information gives power and can be used to manipulate the transactions with personal interest in mind, but everybody will gain more collectively by distributing it with free flow through the value chain.

Power distribution can affect transaction costs between firms. Trust in business can enable efficient transactions with more speed through the value chain, especially if the business is complex with an emphasis on quality and requires delicate interaction between supplier and customer. For a long term cooperation trust and commitment is essential, but power is also important and the way it is distributed through the value chain. Power distribution does not have to be even, as long as all

actors within the chain are benefiting from a *plus-sum game* cooperation. But in a *zero-sum game* where one is gaining at the expense of another using hiss bargaining power without collaboration, can cause uncertainty and distrust in transactions. Transaction cost is cost associated with reaching and enforcing agreements between actors in the value chain, including associated costs like those of planning, adapting and monitoring economic activities. The degree of asset specificity in exchange relationship between seller and buyer can affect the transaction cost. Firms have to decide if a free market situation with suppliers and customers or a close collaboration with them is more appropriate for their business. The complexity of the transaction and the product requirement can affect this situation and have to be carefully considered.

Governance is the power structure within the value chain, between actors within the industry and also with external parties, like the government. The governance in the yellow-fin tuna value chain needs to be analyzed and how important it is for the efficiency of the system and if there is a need for structural changes for the actors to gain higher mutual margins in their transactions. There is a need for the right decisions with in the chain on what is to be produced, and how and when to produce it.

The competitive advantages of firms need to be analyzed to understand the value chain better. First of all the external factors of the firms need to be analyzed, like if the industry is growing or shrinking or if the market situation is supply or demand driven and if there are seasonal impacts on it.

There are many external factors influencing the value chain operation with the government being the most important actor, having a great effect on earnings by legislation, rules, substitutes, tariffs and trade barriers. For an effective government management there is a need to emphasise awards and penalties to force actors to play by the rules of the game. Owners of fishing vessels using illegal fishing gear or if it is caught in the wrong area, will have to have their fishing licences taken from them.

External factors characteristic of fisheries include the fact that the raw material comes from living renewable resources with high seasonal effect and the importance of resource management. Globalization is important for the fish business, especially in developing countries, where market situation changes from

local market paying low prices for products to world market paying high prices. More fish will be captured for the export market; less supply will be on the local market affecting local people. But normally the whole society will be better off, but some may lose, like local consumers. But the most important matter is that without recourse management the danger of over fishing is great.

From this literature study of the value chain a theoretical framework was designed and used as a guideline for the research, to frame the research questions and to structure the outcome of the study. The research questions are:

How efficient and productive is the value chain of yellow-fin tuna in Sri Lanka?

What structural changes can be suggested for improving profits in the value chain?

The framework for the most important issues in the value chain for yellow-fin tuna in Sri Lanka used in this study is:

1. The structure of the value chain and the main actors and activity
    a. The value addition in the value chain
    b. Key actors
    c. Main activity
2. Relationship within the value chain
    a. Collaboration between actors
    b. Flow of information and knowledge
    c. Power and trust
    d. Governance
3. The strategic position within the value chain
    a. Driving forces within the industry
    b. Competitive advantage
4. External forces on the value chain
    a. Value chain in fisheries
    b. Government intervention

The first topic deals with the structure of the value chain and the actors and activities within the system. This could include explaining the capacity, quantity and prices of the product, including the value adding in the value chain. In topic two the relationship within the value chain is the target, how the collaboration between the actors are, if *plus-sum game* or *zero-sum game* is used in their relations. Power and trust is important in this relationship and also to explain the governance of the value chain, who decides what to produce, how and when. Transaction costs need to be analysed and discussed if a free market or more close collaboration is appropriate to lower it.

In topic three the driving forces in the industry are identified and analysed. In the fourth topic the external matters are studied like the uniqueness of the fisheries and the importance of government intervention for the industry.

4. METHODS

When selecting research methods for this project, the nature and the setting of the study led to the decision to use both quantitative and qualitative approaches, with an emphasis on the latter. Quality is defined as the essential character or nature of something, and quantity the amount, the difference being whether anything is to be measured or if the goal is to understand a given phenomenon (Blumberg, Cooper, & Schindler, 2005). Qualitative techniques include for example: a) In-depth interviewing, b) participant observation, c) case studies or d) elite or expert interviewing, e) document analysis and f) experience surveys (Blumberg *et al*., 2005).

Exploratory studies are useful when there is a lack of clear ideas about the problems to be addressed. The goal is then to establish concepts and priorities and develop operational definitions in order to improve future research. Exploratory studies are useful when the area of the investigation is new and results from previous research is vague and important variables are not known or acceptably defined (Blumberg *et al*., 2005). Exploratory studies can be built on both qualitative and quantitative techniques, although exploration relies more on qualitative methods.

In this research the main emphasis was on experience surveys (primary data) but secondary data analysis were also used when available. The lack of reliable secondary data from Sri Lanka fisheries made the use of primary surveys more appropriate.

4.1 Interviewing techniques

Several interviewing techniques were used, based on what was considered the most appropriate for each group of interviewees and would give the most information. The following interviewing techniques were used;

- unstructured interviews
- semi-structured interviews
- structured interviews

4.1.1 Unstructured interviews

To gather preliminary information for building a theoretical framework for the research, the form of unstructured pre-interviews during site visits were used.

Unstructured interviews were also used later on to gather more information on the subject.

Unstructured interviews are similar to normal conversations using no previously prepared list of questions. The interviewer enters into a conversation about a matter or matters relevant to the research in an impromptu setting without a planned sequence of questions. Information for the study is gathered in situations using a free flow of questions. The objective of such an approach is to bring some preliminary issues into the study, giving ideas for further structured interviews later on. This can give a broad picture of the area, but it is also useful to determine the overall scope of the study and areas of specific interest (Sekaran, 2003). The researcher used this pre-study in order to better understand Sri Lanka's yellow-fin value chain before designing more formal questionnaires for further research. Actors throughout the value chain were interviewed. Interviews were taped and later transcribed.

4.1.2 Semi structured interviews

Semi structured interviews/in-depth interviews were used with the interviewer relying on previously decided topics but had the option to go outside the structure when interesting themes emerged that had not been included in the structured interview. This was done in order to get the interviewees' version of things and get in-depth information about a given topic (Bryman, 1989). In-depth interviews can give an advanced view of the subject, openly using the interviewees' own words to express their opinion and where an attempt is made to understand their sense of reality. Participants are met by the interviewer and conversations were face to face with maximum participation of the interviewees in mind. Though participants are typically strangers to the interviewer, who is controlling the pattern of the conversation, their input is normally more effective when there is less structure and more relaxed atmosphere (Blumberg *et al*., 2005). It has to be kept in mind that the interviewees' interest in the process may not be obvious compared with the benefits to the interviewer.

4.1.3 Structured interviews

Structured interviews are used when it is known what information's are needed. The interviewer has a revised list of questions. Questions often built on

unstructured questions and the same questions will be asked for everybody in a homogeneous group (Sekaran, 2003).

4.2 The Interviews

Preliminary data gathering was necessary due to lack of previous studies and knowledge about activities within the value chain. It was considered necessary to start the research by on-site visits to harbours, wholesale markets and retail markets. Also visiting relevant firms and institutions in order to perceive the process and interview knowledgeable people within the value chain. These interviews were conducted by the author from November 2007 to January 2008.

Based on these interviews, a literature study was carried out. Numbered list of participants in the pre-study is given in appendix 1 and reference in text according to these numbers.

Unstructured interviews were carried out alongside the study to gather relevant information from knowledgeable people about the subject. Numbered list of participants in this study is given in appendix 2.

Semi structured interviews, focus group method, was used with five General Managers representing processors and exporters, accompanied by a Quality Control expert from the DFAR, in July 2008. These processors/exporters represent a broad sample of processors and exporters in Sri Lanka. They are General Managers of companies which are both partly owned by foreign customers (wholesalers in Britain) and solely owned by Sri Lankans. Some of the companies are operating their own fishing vessels but others are only in the processing and export business.

This group was thought to be able to give valuable information as the individuals are assumed to have a broad knowledge on tuna fisheries in Sri Lanka. The list of participants is in appendix 3. The author was assisted by a fisheries biologist in the conduct of the in-depth discussion and documentation.

Foreign vessels supply only a small fraction of yellow-fin tuna for the domestic market but their importance for the export market is however not to be underestimated, as they supply up to 50% of the raw material for the processing and export of yellow-fin tuna from Sri Lanka. However, due to the difficulty of reaching these groups it was decided to rely on processors/exporters when gathering information about foreign raw material supply. This method is thought to be reliable and adequate, because of the close collaboration between the foreign

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suppliers and processors/exporters, and broad knowledge base of the latter about the foreign supply of yellow-fin tuna into Sri Lanka.

Structured interviews were used with groups with an adequate number of participants. Detailed information on assemblers, wholesalers and retailers was available from previous studies on the value chain in Sri Lanka (Amaralal, 2008b). A list from that study was used to identify middlemen handling yellow-fin tuna in each of the following groups; a) assemblers, b) export assemblers, c) wholesalers/commission agents and d) retailers. No export assemblers were on this list but twelve were selected after consulting processors/exporters.

The vessel owners and captains were extracted from a list maintained by NARA. This list includes the vessel owners and captains who were willing to participate in the "Satellite Fish Forecasting Project" executed by Icelandic International Development Agency and NARA, which started in 2007 (Appendix 4).

This project has identified over 30 volunteer vessel owners from four large fishing harbours on the west coast of Sri Lanka, Kalpitiya, Chilaw, Negombo and Beruwala, targeting yellow-fin tuna using tuna long line. Twenty one vessel owners and twenty seven captains from this list participated in the present study.

The interviewees selected were participants in the value chain of yellow-fin tuna in Sri Lanka. Included were;

- owners of long-liners targeting yellow-fin tuna
- captains on MDBs
- local assemblers
- export assemblers
- wholesalers/commission agents
- retailers

The vessels owners and captains represent the domestic supply of yellow-fin tuna in Sri Lanka. Vessel owners and captains of MDBs targeting yellow-fin tuna participated in answering a list of questions constructed for this study.

The vessel owners were given the list with 11 closed questions and one open in order to get their views about this important topic (appendix 5). For the captains the version with 8 closed (appendix 6) questions and one open question was used. Captains have less access to information on the markets than vessel owners and therefore the questions for captains did not include marketing issues.

All the interviews were conducted in Singhalese by NARA fisheries researchers who read the questions and marked right answers on a printed question sheet. For important comments made by the vessel owners and captains during the interviews, outside the prepared questionnaire, the interviewers made a comment on the back of the question list.

These questions were mostly administered outside the author's sight and therefore they were kept as simple as possible in order to minimize errors and/or confusion.

Middlemen were asked nine closed questions and one open to capture their opinion on important topics. The lists of questions are in appendixes 7 – 10.

Local assemblers purchase tuna from fishing vessels by pre-arranged agreement or at the auction markets at the harbours. Eleven local assemblers participated in this study.

In the interview with local assemblers, nine closed questions categorized within the theoretical framework and one open question. Two of the busiest harbours in Sri Lanka were chosen for these interviews, Beruwala and Negombo. Both these harbours are important for yellow-fin tuna business and not least for the processing and export market. The research was conducted in July 2008 by interviewing eight local assemblers at the two harbours.

Export assemblers work on the behalf of processor/exporters to purchase export quality fish from local MDBs. They normally work for only one processor/exporter to supply them with export quality fish. Ten export assemblers participated in this study.

Export assemblers were interviewed at Beruwala and Negombo in July 2008

Wholesalers/Commission agents are the middlemen between assemblers and retailers. Eight wholesaler/commission agents participated in this study. In this interview nine closed questions categorized within the theoretical framework and one open question were used to gather participants' views on important issues. This group was reached at SJM and Negombo at normal working hours in July 2008 with eight wholesalers/commission agents responding to the questionnaire for this study.

Retailers purchase fish from wholesalers or commission agents and resell it to consumer. In this interview nine closed questions categorized within the theoretical framework and one open question were used to gather participants' views. Eight retailers participated in this study.

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All of the retailers selected were selling fish from non mobile fixed structure (fixed stall) markets. It is considered that the mobile retailers have only minor effect on the yellow-fin tuna market and are therefore not of interest for this study. Most of these retailers were located in Colombo but some in Beruwala and Negombo. The interviews were conducted in July 2008.

Extra interviews were constructed in September 2008, using list of structured questionnaires for **MDB owners** from Trincomalee and Negombo. Some important information was thought to be missing for the study. Two closed questions were asked and the lists are in appendixes 11 &12.

4.3 Data analysis and presentation of results

An important outcome of the study is to describe how the market transactions are made in the yellow-fin tuna value chain. More specifically how sellers and buyers meet and agree on quality and prices.

All prices used for the study are in US dollars and data in rupees have been converted to dollars (Oanda, 2008). For studies made in 2008 the exchange rate in July 2008 of US dollars against Sri Lankan Rupees are used. For prices in previous years rates on 31st of December was used for the appropriate year.

The framework introduced in the theoretical discussion of this study was used to guide the making of questionnaires used in the study and to structure the presentation of the findings. The framework emerged from the literature review and the original exploratory study, which also lead to the formulation of the two main research questions:

- How efficient and productive is the value chain of yellow-fin tuna in Sri Lanka?

- What structural changes can be suggested for improving profits in the value chain?

Data processing depended on the interview technique. Unstructured and semi-structured interviews were sorted into the theoretical framework to streamline the conclusions. For the structured questions the theoretical framework was used to categorize the most influential effects on the value chain and try to determine the efficiency with which they add value throughout the chain from raw materials to the end users outlining the importance of each link or person in the process. The

categorizing underlines the most important concepts within the value-chain of Sri Lanka as defined by current theories about value-chains in general.

This is a qualitative research with little emphasis on statistical methods. However with the number of participants in interviews with vessel owners and captains it was thought to be appropriate to use simple calculations, such as frequencies (as) and averages. An Excel spreadsheet was used for this purpose. The research was conducted in April to July 2008, with 21 vessel owners and 27 captains participating

5. THE VALUE CHAIN FOR YELLOW-FIN TUNA IN SRI LANKA

In this study, specific paths within the value chain of the yellow-fin tuna in Sri Lanka are studied and their most important features described. For the domestic market, all the activities from harvesting the tuna until its distribution to the local consumer have been included. For the export market, the pathway chosen is the activities of fishermen, export assemblers, processors and exporters. The wholesale and retail part of the value chain for the export market, undertaken in different countries, is outside the scope of the present study.

5.1 The structure of the value chain and the main actors and activities

In real life, the picture of the value chain is complex with consumers sometimes purchasing directly from producers or assemblers performing the role of a retailer. Because of such real life complexity, it is necessary to simplify the picture and focus on a path through the basic supply chain of yellow-fin tuna in Sri Lanka; fisherman – assembler – wholesaler/commissioner – retailer – consumer. The pathways through the value system are illustrated in Figure 12
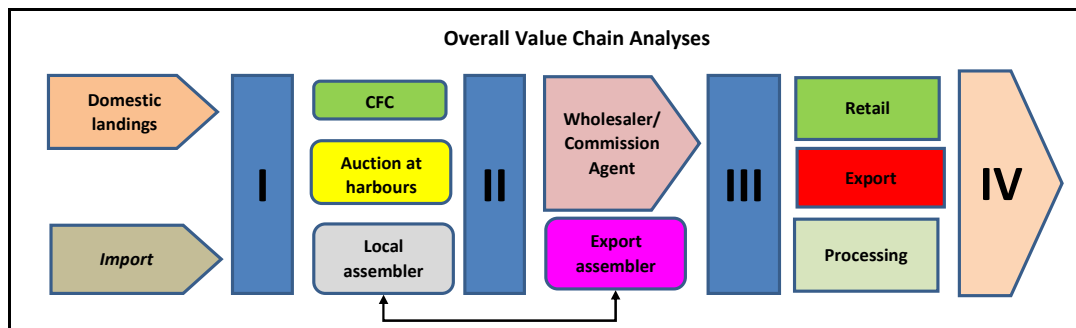
Figure 12 The overall value chain for yellow-fin tuna used in this study.

The four main stages of the value chain are:

I. The combined landings from local vessels and imports, representing the yellow-fin tuna supply to primary intermediaries.

II. The total volume of yellow-fin tuna from primary distributors to secondary intermediaries.

III. The total amount of the product that goes from secondary distribution to the downstream part of the value chain.

IV. The amount going to domestic consumption and export

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In the following chapters, the value chain will be described in greater detail, and the structure, main actors and activities will be analysed for each step in the value chain.

5.1.1 Supply of yellow-fin tuna (I)

Local MDBs and foreign vessels are the major suppliers of yellow-fin tuna in Sri Lanka. There are also some landings from outboard engine powered fibreglass reinforced boats (OFRP vessels) and imports of fresh tuna from the Maldives Islands for processing and re-export to foreign markets. Figure 13 part (I) illustrates the total supply of yellow-fin tuna in Sri Lanka.
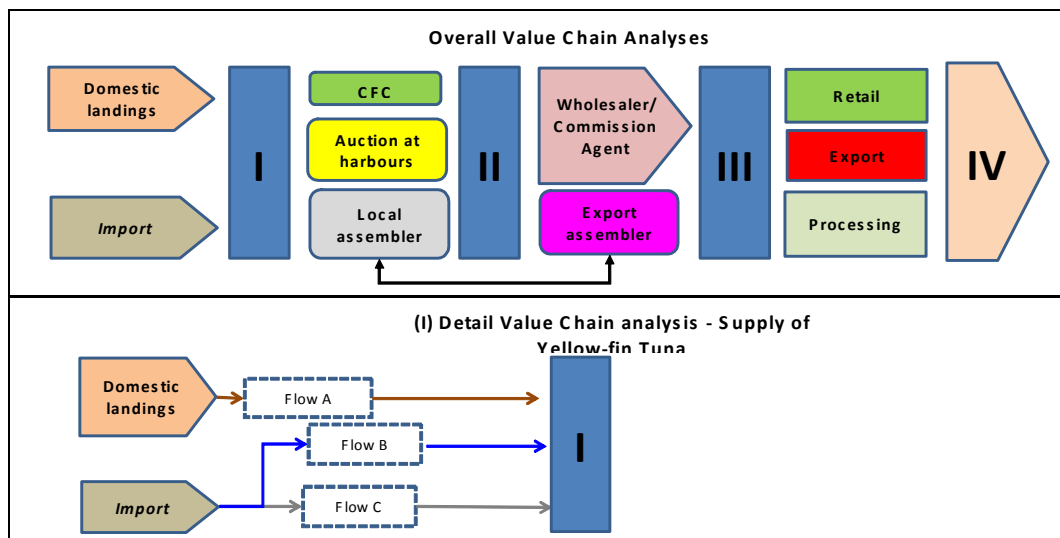
Figure 13 The supply of yellow-fin tuna in Sri Lanka

5.1.1.1 Domestic landings (A)

In June 2008, a total of 1.389 MDBs were registerd by DFAR for fishing with long-lines (DFAR, 2008). Yellow-fin tuna for the export market is caught by long-lines but skip-jack for the domistic market is caught using driftnets. Long liners are therefore the subject of this study.

The total production in 2007 was 39.260 tons in 2007 (Figure 14) and has increasing through the years, except for 2005, due to the devastation caused by the tsunami in December 2004, which destroyed a large number of fishing boats (NARA, 2007).

The numbers of boats fishing for yellow-fin tuna specifically for the export market

Production of yellow-fin tuna

[Bar chart showing production values for years 1983, 1990, 1995, 2000, 2004, 2005, 2006, 2007 with y-axis ranging from - to 45,000 in increments of 5,000]
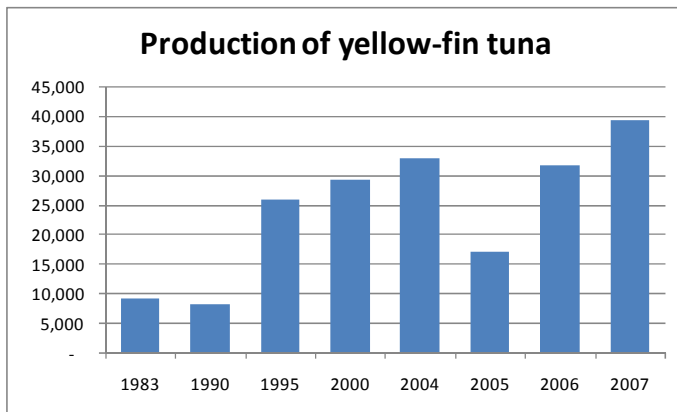
Figure 14 Production of yellow-fin tuna in tons from 1983 - 2007 (MFAR, 2008)

have been increasing during recent years, from few vessels in 2000 to 380 in July 2008 (Dissanayake, 2008). Most of these vessels operate manually hauled long lines with 330-350 hooks while better equipped vessels with powered long-line haulers are capable of handling 750-1000 hooks. With powered line haulers fishing in deeper waters targeting larger adult tuna, more suitable for the foreign market, is also possible. When questioning MDB owners they explained that long liners use small pelagic species or squid for bait, often imported and supplied by processors/exporters. In 2007, thirty three well equipped long liners with powered line haulers and slurry-ice tanks were registered in Sri Lanka (Pannipitiya, 2007). These boats stay out for relatively short periods of time, aiming to land the tuna within 12 days of capture to meet the export quality demands. Most of these vessels are operated by two companies, Thalula in Beruwala and Lihgng Boats Negombo (Dissanayake).

The seasons for yellow-fin tuna are during October to March off the west- and south coasts and in January to August off the east coast. During the seasons the boats target the export market, which gives substantially better prices than the local market, but outside the season the boats target skip-jack tuna for the domestic market (Dissanayake, 2008). More than 800 FRP boats around the island also target tuna using long-lines during the tuna season. These boats are open decked and do not carry ice for preservation but engage only in short fishing trips, from afternoon until early morning. The FRP boats are only capable of catching juvenile (sub-adult) tuna at the surface, not the adults in deeper waters. Any fish larger than 20 kg are offered to the export market but only part of it passes the quality standard required (Dissanayake). There have been proposals to lengthen FRP boats by an extra five to six feet so that an ice box could be taken onboard for preservation of yellow-fin tuna (Perera J., 2008).

According to MDB owners and captains interviewed, a normal fishing trip takes more than two weeks, sometimes exceeding three weeks. For boats that are also targeting skip-jack tuna for the domestic market, a normal trip can last up to six weeks. Many of these multi-geared MDBs catch yellow-fin tuna for the export market during the last ten to fourteen days of a fishing trip.

Yellow-fin tuna landed in Sri Lanka is graded into four different quality categories (NARA 2007);

   I.   grade (I) tuna is exported whole/fresh to Sashimi markets in Japan, giving the best average prices

  II.   grade (II) is sold fresh or frozen, filleted and picketed, mostly to markets in Europe and USA

 III.   grade (III) is the quality for the domestic market in Sri Lanka and to the export "frozen" market

 IV.   grade (IV) which is not suitable for the local fresh fish market is sold to local dry-fish processors

According to processors/exporters, it is essential for those who supply tuna to the export market to have suitable gear for fishing and proper post harvest handling facilities along with a Quality Management System[3] (QMS). The gear necessary for this purpose along with other inevitable equipment are; a) powered line hauler or winch, b) slurry ice tank with a refrigeration system and c) refrigerated fish hold. The QMS system requirements are; a) traceability, b) paralyzing, c) proper killing, d) bleeding, e) gilling, f) gutting and g) instant chilling. One of the main quality problems in yellow-fin tuna is the presence of histamine in the muscle (Fernando, 2008). Histamine is a protein that can cause allergy reactions when consumed (Oxford, 2008). High histamine levels in yellow-fin tuna are caused by insufficient chilling on board the fishing vessels. Considering the fact that presence of histamine is the most common reason for rejection on the export market, this problem is significant, but the right equipment and QMS are the most important

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[3] Authors denomination

initiatives to overcome problems associated with histamine (Fernando, 2008). More than 70% of the owners and captains interviewed were operating vessels of 40 ft in length or less, but according to processors/exporters, a fishing vessel needs to be at least 44 ft in length for carrying necessary equipment and facilities for tuna long line fishing for the export market (Abeyratne *et al*., 2008). More than 80% of the MDB owners interviewed want to modify their boats to increase capacity and facilities to serve the export market, but most of them expect government subsidies to finance the required improvements. None of the owners or captains of MDBs interviewed believe that their vessels are adequately equipped to catch and supply fish for the export market of grade I or II. Only one MDB associated with the interviews was equipped with a powered line hauler and a slurry-ice tank and none were equipped with refrigeration systems.

5.1.1.2 Import (B – C)

Foreign vessels land yellow-fin tuna in Sri Lanka, harvested in international waters in the Indian Ocean. Tuna is also flown in from the Maldives for further processing and re-export.

Foreign landings (B): There are two harbours in Sri Lanka where foreign vessels can land their catches; Galle commercial harbour and the fisheries harbour at Mutwal in Colombo. No statistics are available for Galle for 2007, but with only one company operating there landings are small (Amaralal, 2008c). There were a total of 254 landings from foreign vessels reported from Mutwal in 2007, with a total catch of 7.778 tons (Amaralal). Most of this product went for further processing to factories in Sri Lanka for export to EU markets (Grade II) or was exported as Sashimi product (Grade I) or sold to CFC as Grade III for the domestic market (Amaralal). The foreign vessels are mostly operated by processors/exporters through leasing agreements. Tuna is landed fresh for further processing and export, and therefore giving a tight timeframe to maintain quality and making frequent landings necessary. A vessel operating from Sri Lanka and fishing outside the EEZ takes three days to travel back from the fishing grounds. The tuna has to be brought to the processing plant within 12 days from harvesting, giving only around seven days of fishing (Abeyratne *et al*., 2008).

The sashimi market in Japan requires only whole fish, iced and packed for transport but the EU market buys processed fish, filleted and chilled or frozen before transportation. In Table 3 are details of transhipments of foreign vessels in Sri Lanka to the sashimi- and EU markets, from 2002 to 2007 (Amaralal, 2008c). The EU market is increasing steadily but the sashimi market show more fluctuations.

Table 3 Trans-shipment of yellow-fin tuna (in tons) from foreign long-line vessels (Amaralal, 1999)

Market	2002	2003	2004	2005	2006	2007
Sashimi Market (Grade I)	1.334	3.152	1.989	1.388	3.331	1.837
European Market (Grade II)	372	1.333	766	1.085	3.041	4.909
Total	**1.706**	**4.485**	**2.755**	**2.473**	**6.372**	**6.746**

Imports from the Maldives Islands (C): Whole, fresh yellow-fin tuna is air freighted from the Maldives for primary processing in Sri Lanka. The amount imported in the year 2007 was 858 tons valued at 2.3 million USD (Custom of Sri Lanka, 2008). Strong marketing links and good reputation of Sri Lankan products, as well as good physical connections with the markets give domestic producers advantage over their rivals in the Maldives. The Maldives Islands have not introduced the EU quality standards and are not a member of IOTC, preventing access to the EU market (Abeyratne *et al*., 2008).

5.1.2 *Primary distributors in the value chain (II)*

Primary distributors are categorized in this study as; CFC, auction markets at the harbours and local assemblers (Figure 15).
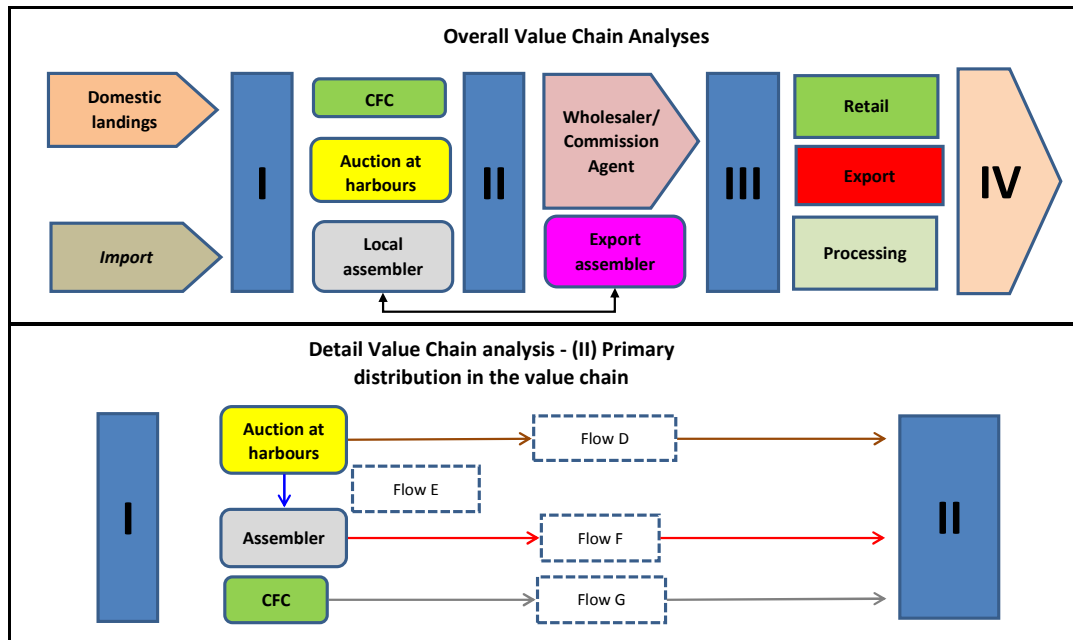
Figure 15 Flow from supply to primary distribution

5.1.2.1 **Auction at harbours (D – E)**

Auction markets are operated at eight major fishing harbours in Sri Lanka, where price determination for sellers and buyers can be obtained. These auction markets have many different market segments and customers with various needs. The costs of those transformations are integrated into the fish prices and are ultimately reflected in the price the consumer is willing to pay (Morven, *et al*., 2004). The auction takes place right after landing of the catch, but in many instances the purchase has been pre-arranged between fishermen and assemblers (Amaralal, 1999). The landing and auction fee is around 1% of the catch value for local vessels registered at the harbour, but around 3% for outsiders (Cooray, 2008).

5.1.2.2 **Local Assemblers (F)**

The assembler is the first middleman in the value chain and can have multiple functions within it (Amaralal, 1999);

- collector of fish from fishermen
- boat owner
- money lender
- supplier of goods and raw materials

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- transporter

Assembler purchases fish directly from fishermen as soon as the fish is landed, at an auction market or by earlier agreement with fishermen (Amaralal, 1999). The latter system often makes the assembler a money lender disturbing the market system and affecting the price to the fishermen. He re-sells the fish to wholesalers in smaller lots or sends to a commission agent to the wholesale market, to act on his behalf and sell to retailers with an 8–10% commission.

An assembler obtains economies of scale by handling large quantities of fish from many fishing vessels, lowering the cost of purchasing and distributing fish to the next level of the value chain. Having much better information of the market than vessel owners, and better contacts with wholesalers and retailers, the assembler is gaining a great advantage over them, including capacity to operate trucks for transporting the fish to the market.

The value addition of an assembler lies therefore in his ability to purchase large quantities of fish and distribute it in smaller lots further down the value system as well as transportation. Retailers are often seen buying smaller lots from an assembler at the auction market in harbours, and immediately to start retailing in small quantities to consumers. This is too small a business to interest the assembler who is using his time and effort to push through large quantities every day. An assembler has many people working for him and can be described as a small enterprise adding complicated and diversified value to the system.

5.1.2.3 Ceylon Fisheries Corporation (G)

The Ceylon Fisheries Corporation (CFC) is a state owned company, over 40 years old with turnover of 1.4 million USD in 2007, paying more than 130.000 USD in salaries every month to over 800 employees (CFC, 2008). The company handled and distributed 3.110 tons of fish in 2006, including tuna from foreign vessels, or around 1,4% of the total production in Sri Lanka (NARA, 2007). The role of Ceylon Fisheries Corporation is to be a price stabilizer for fish, by purchasing it at a low price from fishermen and distributing it throughout the country to consumers at low cost (Fernando J., 2007). The CFC has a monopoly on purchasing fish from foreign vessels landings in Sri Lanka. While the levy they used to charge from foreign boats has been discontinued, the CFC still charges a service and handling

fee. CFC also has the right to purchase 25% of tuna landed by foreign boats at a price determined by the company itself (Abeyratne *et al*., 2008). This has been a controversial issue and has met with strong opposition from importers of yellow-in tuna. The general idea is for the CFC to handle the grade III part of the landings for distribution to the domestic market (Abeyratne *et al*; Fernando, 2008). CFC runs 14 purchasing centres around the island, 12 temperature controlled facilities and 11 ice plants, donated by the Japanese International Cooperation Agency (JICA) (Fernando). The company is operating two 44 ft MDBs, donated by JICA, for raw material supply as well as purchasing tuna from local MDBs. CFC runs a chain of retail outlets for fish, all over the country (eight in Colombo) and also distributes fish to customers using 30 refrigerated trucks, donated by JICA, and 60 three-wheelers donated by JICA and the Rajapaksa foundation (Fernando, ; Amaralal, 2008d). The company has a retail outlet at Colombo fish market in Mutwal, mostly handling yellow-fin tuna from foreign vessels but also purchasing tuna from St. John's Market in Colombo (SJM). The company is processing tuna by freezing it and then slicing before distributing it as IQF[4] to consumers, and using frozen stocks to stabilize the market. The company rents out its factory facility to companies exporting whole fresh yellow-fin tuna for the Tokyo auction market. The fish is iced and packed at these premises, and CFC arranges transport to the international airport, about 30 km from Colombo (Fernando).

True to its mission of lowering prices of fish in the local market, CFC started advertising fixed maximum prices in the local television in August 2007. The company is advertising to create price awareness in the minds of consumers and impose lower prices for fish in the market. The chairman of CFC believes that this will force rivals into lowering their prices to compete with CFC. These prices are based on evaluation of transaction cost in the value chain and the yield on processed fish species in this program (Fernando R, 2007).

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[4] Individual Quick Frozen (IQF)

5.1.3   Secondary distributors in the value chain (III)

Secondary distributors are configured here as wholesalers/commission agents and export assemblers (Figure 16).
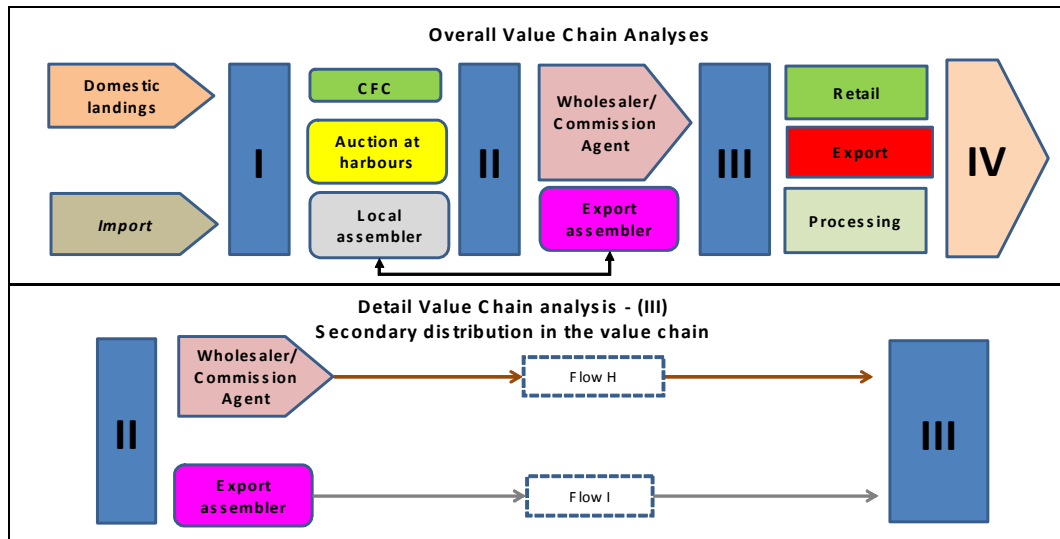
Figure 16 Flow to secondary distribution

5.1.3.1   Wholesalers/Commission Agents (H)

The wholesaler/commission agent acts as an intermediary between the assembler and the retail market. Wholesalers purchase fish from assemblers and re-sell it to retailers. Wholesalers maintain sales outlets and sometimes provide financial assistance to assemblers or fishermen (Amaralal, 2004). In some instances the wholesaler provides supplies to boat owners such as groceries, fuel and nets (Amaralal, 2002). The commission agent sells it on behalf of the assembler for an 8–10% commission and therefore does not take any risks on inventory, sale or spoilage (Amaralal, 2004).

The biggest wholesale market in Sri Lanka is the Saint John´s Market (SJM) owned and operated by the Colombo Municipal Council which rents it out to families ("*stall owners*"), giving them a monopoly right to trade fish at wholesale level in the Colombo area. This is an inherited right, going from father to son/daughter and maintained within families and practiced since the colonial times (Perera, 2007). Almost 90% of wholesalers/commission agents questioned have retailers as customers, 50% have agents working for food services, 50% catering businesses and 25% supermarkets. Wholesalers/commission agents are handling many tons of fish a day, distributing smaller quantities to retailers. Many commission agents on the market act as retailers after early morning wholesale business is over. Around

07:00 hours they turn to retailing, selling the leftover from the wholesale market directly to consumers. Also when supply is limited, commission agents often turn to retail activities by purchasing fish from other commission agents (who may have more supplies on that day) and start retailing from their stands. It is quite common to see retail business going on in the wholesale section of the market (Perera).

Fish is distributed from SJM all around Sri Lanka and the market influences farm-gate and wholesale prices all over the island. Around seven thousand people participate in the market every morning with extreme activity going on with hundreds of bicycle- and motorcycle retailers and lots of vans, "three wheelers[5]" and *pingo* carriers. Fish carriers move fish around in baskets resting on top of their head, in the absence of any type of space for a mechanical system of transportation. The carriers charge 19 Cents US per basket for moving fish within the building and 28 Cents US for taking it outside to the vehicles for transport.

Yellow-fin tuna is visually graded into three quality groups, good, average and bad, with the bad ones sold for lower prices to local dry fish processors (Perera, 2007). Everything is sold fresh on the market and customers appear to be willing to pay for quality. An example of this was observed from a visit to SMJ on the 12th of December 2007 where yellow-fin tuna was sold for 2,3 USD/kg. Later that morning the prices were down to 1,85 USD/kg with the best fish sold first for the highest prices (Perera). On the same morning a processor/exporter sold off cuts and fish failing to meet export market standards because of high histamine contents for 2,8 USD/kg. This was. This price was considerable higher than ordinary price for tuna on the market that morning. The reason is the general belief that anything coming from the export business is of better quality and worth paying more for (Perera).

Agents purchase fish from wholesalers/commission agents for big customers like supermarkets, the army, hospitals and hotels. Price seems to be the main concern in this business which is therefore more cost driven than quality driven. Better

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[5] Three weelers are commonly used in South Asia. A low cost transport vehicle with three weels.

restaurants have their own recourses to assure best quality of fish for their customers and some supermarkets have their own supply chain and are not using the SJM. In the wholesale section, smaller wholesalers purchase fish for other regional or suburban markets, such as the Kandy market. Hotels and restaurants are the first to look for good quality fish but supermarket and food services are less concerned.

5.1.3.2 Export Assembler (I)

The export assemblers purchase export quality tuna from MDBs and resell to processors/exporters. They operate refrigerated trucks and deliver the fish to the factory door.

The value addition of export assemblers is the selection of the right quality tuna for the export market, taking the risk of fish not passing quality requirements and transportation costs to the processors. Most of this value addition is associated with much higher value for export tuna than for the local market. This difference in price for the export and domestic markets is important for the value addition in the yellow-fin tuna fisheries.

The export assembler visually sorts the tuna in to three grades; grades; I – II or III by using his knowledge and experience, checking the skin colour and colour and texture of the muscle. All the export assemblers participating in the questionnaire understood the grading system for quality of export tuna and mainly handle grade II quality but only 10% focus on grade I or grade III quality. When the research team visited Beruwela in July 2008 an assembler buying the whole lot of yellow-fin tuna from a MDB was interviewed. He was well aware of the quality requirements and was planning to re-sell to different quality demand markets. The best fish is sold to exporters, grade I and II and also grade III if quality is right and histamine levels are low, but the rest is sold through SJM.

All the export assemblers participating in the questionnaire identified processors/exporters as their customers but 40% also identified commission agents re-selling rejects from the export market on the SJM. More than 80% of interviewed export assemblers only handle yellow-fin tuna.

5.1.4   Downstream distributors in the value chain (IV)

The downstream distributors in this study are considered the retailers, processors and the exporters (Figure 17).
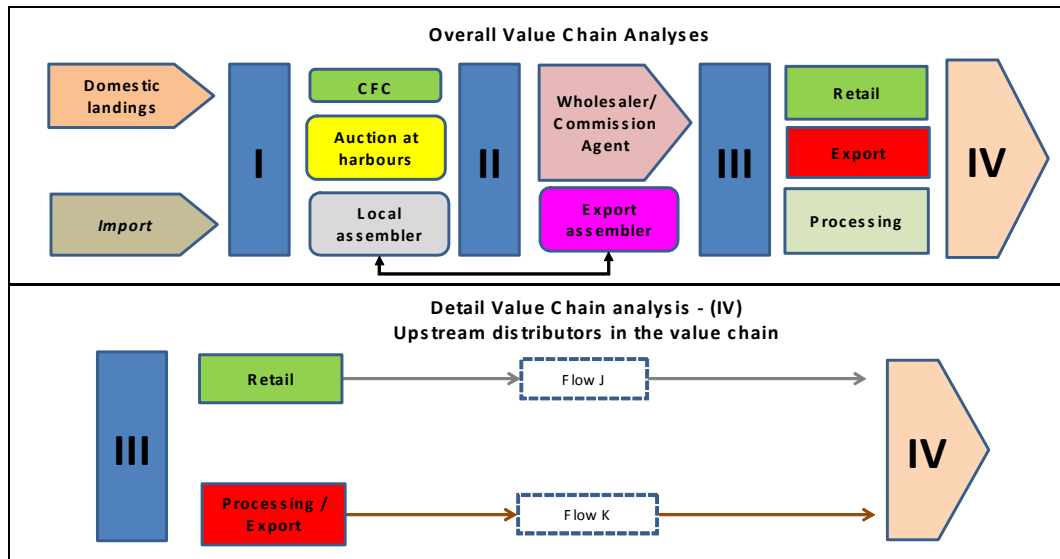
Figure 17 Upstream distributors in the value chain

5.1.4.1   Retailer (J)

Retailers purchase fish from auction markets, assemblers or wholesalers and re-sell to consumers. Their value addition to the system is to purchase large quantities from wholesaler and offer a wide range of variety in small portions for consumer convenience of purchasing small amount for their households. A retailer sometimes brings the fish to residential areas for customer's convenience and often serves customers on a long term basis. Fish is normally sold whole without any processing with the exception of supermarkets selling sliced or filleted fish and CFC selling frozen and sliced fish.

A large number of retailers in the fish trade operate all over the country and can be categorized into five main groups;

- supermarkets
- retail outlets
- motor-bike retailers
- bicycle retailers
- food peddlers

The biggest retail market in Sri Lanka is at SJM, located beside the wholesale market and starts operations around six in the morning and continues until late afternoon. Leftover fish after the day's sale is iced in tubs and sold the following

day. Products running out of time and quality are sold to dry-fish processors (Perera, 2007). Retailers rent stalls from families, "the owners", with the same system as for the wholesaler/commission agent.

Retailers are often financed by a wholesaler/commission agent, but cash payment is the practice in this business (Perera, 2007). Almost 90% of the retailers interviewed named households as their main customers, around 80% were selling to other smaller retailers, 30% were supplying the catering business and 11% sold to agents working for the food service. 78% described their customers as quality oriented and 67% as price oriented. Tuna fish sold in retail outlets around the country is often sold as tuna, but not graded by species, i.e. yellow-fin, skip-jack or big-eye. Only one third of the retailers sort the tuna according to species before selling to local consumers.

Supermarkets sell yellow-fin tuna but the quantities handled are insignificant with price substantially higher than on the market or at CFC retail stores, up to 100%, but supermarkets are handling fish for its customer convenience, being able to get everything at one place (Peries, 2008).

5.1.4.2   Processing and Export (K)

There were 16 processing establishments involved in the fish export business from Sri Lanka, approved by the EU, in January 2008 (Wickramasinghe, 2008). The DFAR have been introducing EU standards with quality certification among processors in Sri Lanka for some years, to boost exports to quality conscious markets (Wickramasinghe). Foreign investment is welcome into the processing business and most of the factories have foreign investors with marketing links or vertical coordination (Fernando R., 2007). Since the tsunami in 2004, the Sri Lankan exporters have been exempt from 18% import duty into the EU. This advantage is giving them a strong position in competition with rivals in other countries (Wickramasinghe).

Total landings of yellow-fin tuna in 2005-2007 are illustrated in Table 4 with subdivision from different sources. These data from Custom of Sri Lanka differ from MFAR data of 31.670 tons in 2006, but are presented here to give an idea of the sources of raw material of yellow-fin tuna. Foreign landings are all going to the export business but domestic landings are going to both local and export markets,

but a breakdown between these two markets were not available. According to information from processors/exporters focus group meeting, around 50% of raw-material for the processing comes from local MDBs. With almost 5.000 tons coming through trans-shipments from foreign vessels in 2007 (Table 3) and 858 tons imported from the Maldives the total foreign raw-material supply for the processing is around 5.800 tons. It can therefore be estimated the total domestic supply is around 6.000 tons which means that more than 30.000 tons, out of 39.260 tons of total landings of yellow-fin tuna, are channelled through the domestic market.

Table 4 Supply of yellow-fin tuna from domestic catches and imports (S.L. Custom, 2008)

Yellow-fin Tuna Production	2005	2006	2007
Domestic Costal Landings	3.644	11.666	6.628
Domestic Offshore Landings	15.131	14.057	20.388
Foreign landings	2.473	6.372	6.746
Import from Maldives	124	622	858
Total	21.372	32.717	34.620

Processors in Sri Lanka have a relatively good reputation in the export market with well equipped factories and management up to EU standards with approved HACCP[6] and traceability systems (Abeyratne *et al*., 2008).

The best quality yellow-fin tuna is sold whole - fresh to the sashimi[7] market in Japan, giving the highest prices (Table 5) but with the most quality demand. For this market the tuna is exported with minimum processing before being flown to Japan and auctioned on the Tokyo market. Sashimi is consumed as raw-fish delicacy and is sensitive to supply and demand with high fluctuations in prices. The Japanese sashimi supply chain is highly rigid with

Table 5 Average export prices for yellow-fin tuna, USD/kg (Weerasinghe, 2008)

Export prices for Yellow-fin tuna		
FOB Prices	Fresh	Frozen
EU	14.0	6.0
US - Canada	13.0	5.0
Japan	17.5	6.0
Other	10.0	

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[6] Quality System for food product, Hazard Analyzes and Critical Control Point.
[7] Sashimi is Japanese course of fresh fish consumed raw

complexity and many intermediaries. Also it requires unprocessed fish with little value addition in the value chain (Abeyratne *et al*., 2008).

The EU market has been gaining ground against the Japanese market (Figure 18) by accepting processed and even frozen tuna. The frozen tuna for this market is of grade III, same quality as domestic tuna but absent of histamine. This market provides steady prices with short links in its value chain and low transaction costs. (Abeyratne *et al*., 2008).
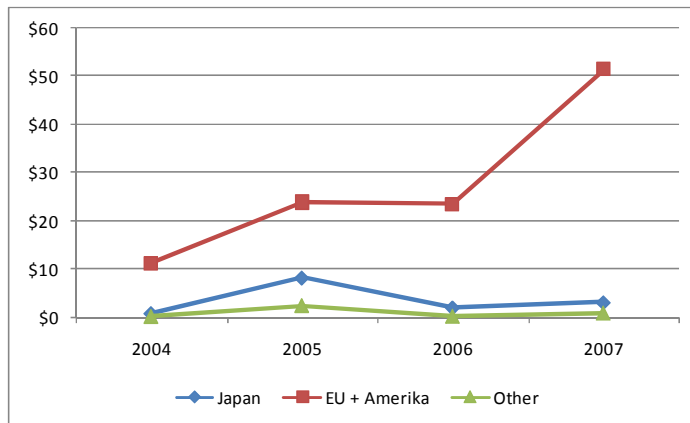
Figure 18 Main markets for yellow-fin tuna and export in millions of USD (MFAR, 2008)

Considering all this in the context of Sri Lanka having little capacity for supplying raw material compared to other countries in the region (due to a poorly equipped local fleet), it needs to go for the markets with more value addition and lower transaction costs to obtain the highest margin to the value chain (Abeyratne *et al*.). Processors consider exporters of whole yellow-fin tuna for the sashimi market as their main rivals in yellow-fin tuna demand. To meet the challenges of lower prices their strategy is to provide more secure and stable prices to compete with exports to Japan (Fernando R., 2007).

Dry Fish Production: During long trips of a typical MDB, the crew process dried tuna onboard from fish caught during the first few days or weeks of the trip. The tuna is filleted and then salted before it is semi-dried for few days on deck before being put on ice in the fishing hold. The price for this product was around 3,7 – 4,2 USD/kg on the auction market in Beruwela harbour during a visit made in June 2008. Interviewing MDB owner in Beruwala harbour in July 2008 he told researcher the yield is around 50% so the wet-fish price is around 1,9 – 2,1 USD/kg Dry fish factories also purchase grade IV tuna on the local market for processing and selling the product for low prices in rural areas in the country side of Sri Lanka. This tuna usually is the end of the line for low quality fish, not acceptable for the fresh fish market (Fernando R., 2007).

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5.1.5   The value addition in the value chain

Value addition for yellow-fin tuna takes the form of market access and processing to get the right type of product, to the right place, at the right time and in the best

possible condition.   In Sri Lanka the local consumer pays for this service around 56% on top of farm gate price[8].   The value addition on the domestic market is more or less by transaction cost, selecting and
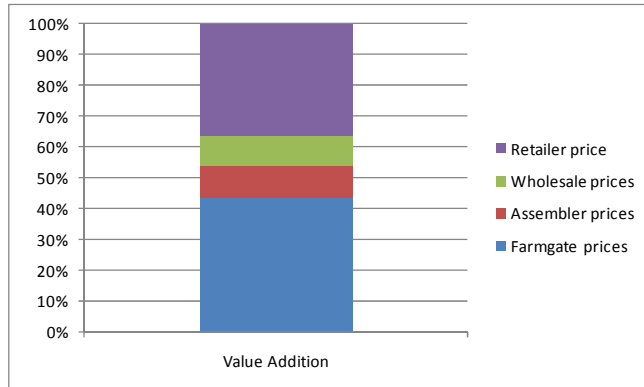
Figure 19 Value addition in the value chain for local markets (MFAR, 2008)

distributing   the   fish, considering there is hardly any

processing done through the value chain. Value addition will depend on the number of links in the chain and the bargaining power each player has and how effective the value chain is. Based on price information collected from SJM in 2007 (Figure 19), the fishing boats are taking almost 44% of the consumer price, an assembler around 10%, the wholesaler also around 10% and the retailer around 36% (MFAR, 2008). Prices may fluctuate but the royalties from each link in the value chain in percentage terms should be similar. This seems to be normal considering the effort and risk taken by the different links in the chain. Cost of harvesting is high and the retailers take the greatest risk in stock and possible spoilage of the product. Retailers also undertake handling of small quantities by selling direct to consumers.

The owner of the SJM, the Colombo Municipal Council, lets out the fish stalls to "*stall owners*" at monthly rent of 46 USD and each retail stall at 14 USD. The "*stall owners*" sub-let the stalls to wholesalers/commission agents for 92 to 278 USD a month and to retailers for 74 USD a month (Perera B., 2008). On top of this the *"stall owners"* require a deposit from leaseholders during agreement time, 92 to

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[8] Price from fishermen (refers to price from a farmer)

278 USD from wholesaler/commission agents and 695 to 930 USD from a retailer. Prices are subject to size and location within the market and some of the largest and best located stalls are rented out to more than one business. During a site visit to SJM in July 2008 three wholesalers sharing one stall said they were paying a monthly rent of a 650 USD.

With all the stalls rented out, and some to more than one business, with average monthly rental price for each wholesale stall of 231 USD and 65 USD for retail stall, the total income, including income from interest on the deposits, for the "*stall owners*" for 87 wholesale stalls and 105 retail stalls would be 380.000 USD a year. Total cost for the "stall owners" paying Colombo municipal rents for the stalls will be 106.000 USD a year with total profit of 274.000 USD. The calculation is illustrated in Table 6 but operational costs like maintenance, water and electricity are not considered.

Table 6 Rental prices on SJM stalls and families income for it (Perera B., 2008).

	Number of stalls	Average monthly rental prices	Yearly rental	Interest from deposit payment (10%)	Total income	Rental to Colombo Municipal Consil	Profit
Retail	105	65	81,667	8,750	90,417	58,333	32,083
Wholesale	87	231	241,667	48,333	290,000	48,333	241,667
					380,417	106,667	**273,750**

It is hard to see any value addition from the "stall owners" and any justification for this traditional custom of family rights for wholesale of fish in the biggest fish market in Sri Lanka. This might increase transaction costs without any value addition, affecting price determination in the country.

Raw materials from foreign vessels have been important for processors of yellow-fin tuna in Sri Lanka. But competition among countries likes Sri Lanka, Malaysia, Thailand, Maldives, Africa, Oman and recently India to lease long liners has increased over the years (Abeyratne *et al*., 2008). This is having a large impact on the industry, forcing local processors to reduce emphasis on foreign raw-material supply and concentrate more on local supply. Sri Lankan companies have been

leasing foreign vessels under wet lease agreements,[9] paying directly for crew salaries, fuel, food and bait. The owners' share is paid after the catch is landed but with deduction of the advances paid for operational costs. The risk is mostly carried by the lessee, if the fishing trip is at a loss as a further advance has to be made for the subsequent trip and there is no way to claim expenditure except through proceeds of the fish catch (Abeyratne *et al.*). The average advanced cost per trip for a vessel is around 25,000 to 30,000 USD of which 30-40% is fuel cost and 30-40% is cost of bait, but the balance of 20-30% is for crew salary, food, water and other costs (Abeyratne *et al.*). The number of foreign vessels operating from Sri Lanka has fluctuated through the years, from up to few hundred down to only a few boats. Soaring fuel cost have been affecting the business and also new regulations imposed by the government forcing importers of foreign tuna to sell 25% of the total catch to CFC. All this will force the processors to concentrate more on the local supply from MDBs in the future (Abeyratne *et al.*).

CFC has monopoly on importing tuna from foreign vessels to Sri Lanka and the right to purchase grade III, estimated to be 25% of this import. Since July 2008, companies have been paying 2 USD/kg for this product but the previous price was 1 USD/kg. (Fernando, 2008). If less than a quarter of the shipment falls into grade III the producers/exporters can purchase tuna on the local market to fill up to the 25 percent quota of CFC at a considerable loss (Fernando). But importers consider this as worthwhile instead of handing export grade tuna over to CFC for 2 USD/kg (Weerasinghe, 2008; Abeyratne *et al*., 2008). Some exporters pay directly around 1,3 USD/kg to CFC in lieu of handing over the quarter of the imports and to escape from this transaction (Abeyratne *et al*.). Exporters are therefore paying for not handing over the 25% to CFC and this explains why only 13% of foreign imports are going to CFC (Table 7; Fernando ; Amaralal, 2008d).

Table 7 Total landings and quantity handled by CFC for the year 2007 (Amaralal, 2004).

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[9] Vessel is leased with out crew and all expences are on the risk of the operator

Year 2007	Total Landing of Foreign vessels Mt	Quantity handled by CFC MT	Percent handled by CFC	Service and Handling Charges in USD
Total	7,777	1,030	13%	838,040

This has been a good business for CFC with substantial earnings and profits, purchasing the yellow-fin tuna for 2 USD (used to be 1 USD) and re-selling it on the local market for 4 USD (MFAR, 2008). It has to be kept in mind that the local market is willing to pay higher prices for foreign product, believing its quality is better (Perera B., 2008).

Local MDB supplies to the export market are becoming more important to the export business. With increasing dependence on the local supply, the exporters are concerned about problems regarding a substandard fishing fleet and fishermen's lack of knowledge in fishing and proper post harvest handling (Abeyratne *et al.* 2008). According to the focus group, the fishing vessels need to be at least 44 feet to be able to carry all necessary equipments for proper fishing and use QMS methods in post-harvest handling. Long fishing trips also cause problems, affecting supply of quality tuna and profitability of the operation (Abeyratne *et al.*).

According to vessel owners targeting the export market, around 80% of the yellow-fin tuna from an average fishing trip is sorted into grade I or II to start with. Around 20% goes directly to grade III and is channelled through the local markets at substantially lower prices. When bargaining the price for the export quality tuna, the export assembler has to take into account the market price on local and export markets and also keeps in mind the risk of histamine as the EU is enforcing a strict limit on the amount of histamine in tuna for its markets. According to MDB owners around 50% of the fish initially selected as grade I and II will contain to high levels of histamine and are subsequently rejected for the export market. This fish is sold locally and the assembler bears the cost of difference in prices on the local market by himself. This means only 40% of the original catch from MDBs targeting the export market meets the quality standards while 60% have to be sold locally.

The total production 2007 was 39.260 tons and with an estimated 6.000 tons being exported. This means that more than 30.000 tons were channelled through the local markets and also keeps in mind the risk of histamine as the EU is enforcing a strict limit on the amount of histamine in tuna for its markets. According to MDB owners

around 50% of the fish initially selected as grade I and II will contain to high levels of histamine and are subsequently rejected for the export market. This fish is sold locally and the assembler bears the cost of difference in prices on the local market by himself. This means only 40% of the original catch from MDBs targeting the

Table 8 Difference of value in million USD from channelling 30.000 tons through the export- and local market

Prices in USD		Grouping in Quality grades	Average Fish Price	Total Value in million USD	Difference in Value - Million USD
Export market					
Grade I	7,14	0,15	4,11	**123.165**	**71.655**
Grade II	3,57	0,85			
Local market					
Grade III	1,80	0,90	1,72	**51.510**	
Grade IV	0,97	0,10			

export market meets the quality standards while 60% have to be sold locally.

The total production 2007 was 39.260 tons and with an estimated 6.000 tons being exported. This means that more than 30.000 tons were channelled through the local market. Let's assume that with better equipped MDBs and improved post-harvest handling that 30.000 tons would all be exported instead of being sold on the domestic market. The fraction between grades is estimated fictions but the ratios in Table 9 are based on information collected during site visits and sows difference of 2,39 USD/kg on farm-gate price for local and export market. Prices in Table 8 are based on own observations and Table 5 The difference in income for the MDBs could be as high as USD 71 million, if they were to sell all their catch for export rather than on the local market.

Let's take another example. Colombo consumer price in 2007 was 4,1 USD/kg (MFAR, 2008) and the average export price was 14,3 USD/kg (Weerasinghe, 2008). Some of the export, Japanese sashimi product, is shipped without processing but the rest is processed with approximately 45% yield. Considering the Japanese export around 15% of the export (Table 4) and cut-offs from production is sold for reasonable prices on the domestic market, the number used for yield loss used here will be 50%. This will constitute to export price of 7,15 giving a difference between the local and export prices of 3 USD/kg. Accordingly, exports of all yellow-fin tuna caught by Sri Lanka could potentially add about 90 million USD to the value

chain, but the cost of production in export and cost of middlemen on the local market, have to be considered in this example. Even so, the two back-of-the-envelope calculations presented above show that large gains can be made from improved harvesting and handling practices in the yellow-fin tuna fishery in Sri Lanka.

5.2 Relationship within the value chain

The relationship between actors within the value chain for yellow-fin tuna need to be analyzed and the effect it can have on productivity and mutual margin in the industry.

5.2.1 Collaboration between actors

The Indian Ocean is vast and finding tuna schools can be difficult, even with information through satellite systems, narrowing down the potential fishing area significantly. Captains of fishing vessels have to consider the spatial distribution as well as the third dimension, the depth of the tuna schools. Collective fishing is used by foreign vessels landing in Sri Lanka, where boats fish in groups with collaboration between captains to improve efficiency in harvesting. The fleet divides the potential fishing ground into grids, each boat fishing one grid at a time as well as checking various depths. Once a vessel finds tuna, the captains will advice his colleagues and the fleet set their long-lines in an organized manner. This gives foreign vessels an advantage over the Sri Lankan fishermen, who normally fish as independent individuals, though there are some exceptions (Abeyratne *et al*., 2008).

The same goes for the assembling process out at sea used by foreign long-liners. To maximize the value of the catch, it is necessary to bring the tuna for processing within twelve days from harvesting. With sailing time up to three days from the fishing ground it will only give the vessel around eight days of fishing. Three days of sailing and one day for unloading and transportation to the factory. This is costly considering fuel costs and a waste of valuable fishing time, but it has to be kept in mind that local MDBs can operate within the EEZ of Sri Lanka, unlike the foreign fishing vessels. But often the tuna is located outside the EEZ and MDBs have to go far beyond Sri Lankan territorial waters for fishing (Abeyratne *et al*., 2008). There are two main systems used for assembling tuna from foreign vessels fishing at the

high sea in the Indian Ocean. One of the fishing vessels may act as an assembling vessel, collecting the catch from the fleet and transporting it to shore. For this transport the cost/kg is approx 20 – 50 Cents US and the assembling vessel is compensated for this cost by the fleet paying for the transportation. After about six days of fishing, a transportation vessel starts assembling tuna from the fleet before sailing back to shore and in another six days the next vessel starts assembling (Abeyratne *et al.*). The other system is to use an assembly vessel (mother vessel) to collect tuna from the fleet and transport it to harbour. A mother vessel can transports up to thousand pieces at a time, each fish weighing around 40 kg, a total around 40 tons per trip (Abeyratne *et al.*).

Both these approaches give opportunity for a 3-5 week long trips for a vessel, while ensuring that the oldest fish brought into processing is never more than twelve days old (Fernando, 2008; Abeyratne *et al.*, 2008). The foreign fishermen have adopted a traceability system with tags on every fish including vessel name, time and location of catch. This is mandatory for the export to EU markets with no exceptions and the information is kept in processors quality system files, if traceability will be demanded later from a customer (Abeyratne *et al.*).

The local MDB owners interviewed didn't show much interest in closer cooperation with their customers, nor did they feel an urgent need to increase flow of information and knowledge between seller and buyer. Their general attitude is that they already know all about the quality requirement of the export market but in reality only few of them have considered the customers need or the quality standards for this market. With this communication problem in mind vessel owners were asked if they had tried to maintain direct contact with processors/exporters to improve mutual margin for seller and buyer for a *plus-sum game*. Most of the vessel owners do not believe in cooperation with exporters nor do they feel that dissemination of knowledge would give them higher prices and increase their profits. Only two of the interviewed MDB owners (out of 21) at Beruwela harbour in July 2008, had direct contacts with processors, the rest communicated with export assembler. These two using processing contracts with processors/exporters were paid 4,6 USD/kg for yellow-fin tuna, a substantially higher price than the average export market price at the harbour this day. The average price on that morning was around 2,3 – 3,2 USD/kg, taking into account that most of the catch

was going to the local market. When the research team interviewed vessel owners at Negombo harbour on 4th March 2008, they noticed a boat unloading yellow-fin tuna in an unusual way compared with the general method adopted by other boats. The fish was taken directly from the boat and covered by ice and taken straight to a truck waiting at the harbour side, with the fish only exposed to the sun and the heat for a very short time. This vessel owner had a production contract with a large processor; Tropical Frozen Food and everything seemed to be done by the book regarding quality handling. All this indicates that there are connections between quality and price, with quality being an important variable for prices in the value chain. But to increase quality there is a need for a flow of information and knowledge between the seller and buyer. Knowledge and collaboration in fishing and post harvest handling seem to be crucial for better prices and minimise quality waste in the yellow-fin tuna business.

Mr. Weerasinghe (2008) a General Manager for the tuna processor, Am As Euro Holdings Pvt. Ltd, looks at the local MDBs as the main suppliers of yellow-fin tuna in the future and sees it as an opportunity to increase the quality concern among the fishermen and future development of the fishing fleet to manage the supply of quality tuna. He believes the only way to reach to the MDB owners for improving quality is through better prices for quality fish. But the message is hard to get through and it is difficult to convince them of the inter-dependency between quality and prices (Weerasinghe). According to processors, they consider themselves as marketing people and not having time or opportunity to communicate with numerous MDB owners and therefore rely on export assemblers as intermediaries for distributing knowledge and information from processors to fishermen. At the focus group meeting with processors, there was a remark from one of them that it is expected from fishermen wanting to be in this business to seek information necessary to operate within the export business (Abeyratne *et al*., 2008). It was the opinion of the exporters that the quality problems of the local MDBs are their biggest threat to future supply. Awareness creation among fishermen would be their main strategy for improving the quality of the local supply and as one commented at the focus group: *"If fishermen believe that better handling will give higher prices and the right quality will pay off they will change their way of handling the fish"* (Abeyratne *et al*.). Processors believe that fishermen need to

understand this connection between quality and price and one commented; *"If fishermen would understand and know that quality fish would give them higher prices they would supply quality fish"* (Abeyratne *et al.*). This raises the question as to how processors can convince fishermen that quality and prices are connected, with the current lack of communication and using export assemblers as intermediaries. Changing attitudes and mindset of fishermen is a long term process where communication is an essential tool to achieve results, and it is also important is to have a clear strategy on how to achieve the expected objectives and to be careful of not disperse confusion or sending a wrong message through this process. Gummersson (2002) points out the importance of close cooperation between actors in the value system with actors working together as partners to increase their mutual value, or what is called a *plus-sum game*, with the opposite system being where bargaining power is used to gain as much as possible for themselves or *zero-sum game* (cited in Pitta, *et al.*, 2004). The use of bargaining power without coordination with suppliers can exclude opportunities of increasing mutual value between actors. An export assembler (15) interviewed at Negombo harbour on 12th of July 2008 had a contract with large processor/exporter in the area. He claimed that fishermen are not interested in quality matters, and there is little sense in providing quality training to them. He admitted he would not pay more to fishermen for better quality fish, but would buy fish for as low a price as possible for the export market. He said fishermen have no interest in adopting the QMS, claiming the fish will only lose weight if it is gilled and gutted. This export assembler (15) is not willing to pay fishermen extra for adopting QMS, despite getting better quality product. He believes that the system is working fine as it is and there is no need to change the conventional procedures. The exporter assembler (15) attitude indicates that export assemblers look at their information as a bargaining tool for strengthening their personal position. This is an example of a *zero-sum game* where export assemblers are using strong bargaining power without coordination with their suppliers, losing the opportunities to exploit the supplier's capacity to increase total value in the chain.

Another example for lack of coordination came from the export assembler (12), who claimed that there is a long way to go for tying quality and prices in fishermen minds. He mentioned the confusion for fishermen during yellow-fin tuna season,

with high supply the quality demand from buyers is also high. But outside the season and with shortages in the market, the quality demand will be considerable lower. He claims that high supply is normally associated with high rejects, and low supply is associated with little rejects, believing the quality and supply is highly correlated. Supporting export assembler (12) presumption is the interview with export assembler (15) when supplying yellow-fin tuna to a processing plant, in the presence of the quality manager. He said prices had sky-rocketed during the previous few days, with high demand and low supply caused by shortages during the off season. Not only had the price of yellow-fin tuna for the export market gone up to 8,3 USD/kg, but the quality demand had also been lowered. He said it was normal to lower quality standards when demand was high and supply limited. Yellow-fin tuna up to 20 days old was accepted with pink reddish colour in the muscle, but normally a red colour is demanded. Such a supply and demand related quality requirements can be confusing for fishermen and is not likely to build up quality awareness among them. Processors have to consider these matters seriously if they want to reach their goal of connecting quality and prices in fishermen's mindset, to secure their raw material from MDBs in the future. In general, processors believe they need to cooperate with the local suppliers of yellow-fin tuna in the future, finding it much more convenient to purchase fish from local vessels, where they can visually examine it for quality before purchase and can reject if it isn't up to the standard. Local MDBs are also fishing within the EEZ, giving them an advantage over the foreign vessels by way of shorter fishing trip and fresher fish when tuna is available there (Abeyratne *et al.*).

Most middlemen in the value chain maintain good cooperation with both seller and buyer and their relationships are built on trust. An assembler may purchase fish from other assemblers at a time of supply shortage. Same goes for the retailers having good relationships with their colleagues, suppliers and customers. Processors and exporters are working closely together in areas of mutual interest like in dealing with the government, policy formulation for the industry and along with DFAR in promoting quality awareness among fishermen.

All the local assemblers questioned in this study have a wholesaler/commission agent as a customer. More than 90% of them sell directly to retailers and half of them are selling some amount to exporters. More than half of the assemblers

questioned regularly meet or communicate with their customers. Over 90% of the customers are looking for good quality, but more than 50% said that low price is also a concern.

5.2.2 Information and learning

Only 20% of the MDB owners interviewed in this study monitored the prices at SMJ, but the market has substantial influence on local prices of yellow-fin tuna in Sri Lanka and affects farm-gate prices all over the country. Monitoring these prices would give them valuable information on the market, making it more likely for them to get fair prices for their catch. None of the MDB owners interviewed knew about the 18% tax break for Sri Lankan export to the EU and the fact that it may expire in 2009, causing a large impact on export prices. This lack of knowledge and information among fishermen seriously affects their bargaining power and makes them ineffective in price marking their product.

The NJ Fishing Company in Negambo owns four tuna vessels, all larger than 44 ft and equipped with powered line winches and ice slurry tanks, and therefore capable of practicing QSM on board. Export assembler (12), interviewed at Negombo in July 2008, is a 50% owner of the company and is assembling yellow-fin tuna for processing, working with some 150 owners of local MDBs to supply raw material for the factory. His emphasis is on training and education for crew members to maximize quality of the yellow-fin tuna and he is paying these vessels an extra, fixed 0,93 USD/kg, on top of the export market price in Negombo. He strongly believes in training and educating fishermen and is using processor contacts to build up trust and knowledge to create free flow of information to improve quality and lowering transaction costs.

Knowledge about hygiene is unsatisfactory in Sri Lanka. Part of this problem could be their culture of cooking the fish for at least half an hour and then using strong spices to mask bad taste from spoiled fish (Fernando R., 2007).

Most fishermen wash the tuna using harbour water before displaying the fish up on the harbour side so the assembler can visually sort the catch into quality grades. Fishermen interviewed believed that the fish appearance would be much better after washing and ranking the fish, increasing possibility of selling it to the export market. Almost 90% of the vessel owners and all the captains said they were

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washing fish with harbour water when landing the tuna. The sea water in Sri Lankan harbours is contaminated with dangerous bacteria like E-coli (*Escherichia coli*) and even salmonella (*Salmonella enterica*). Samples taken of landed fish have shown contamination of bacteria increasing substantially after washing the fish with harbour seawater (Marteinsson & Sigurðsson, 2007). After washing the fish it is often left to lie on the harbour side in 30°C and sunshine for hours, before being put in refrigerated trucks and iced. Considering the yellow-fin tuna business, especially the sashimi market of raw fish, this is a totally inappropriate way of handling this product. The ignorance on hygiene and quality is obvious and can be seen at any fishing harbour in Sri Lanka. People interviewed at Beruwela and Negombo in May 2008 had the general view that leaving fish for a long time at the harbour, exposed to the sun, did not matter for the quality because the fish would be iced before transportation and would have long enough time to cool down again. Icing and chilling just before handover at the processing plant was believed to be adequate. Another example of this is Mr. Weerasinghe argument explaining that one of exporter's requirements is to keep the fish temperature below 4 °C throughout the process. Often fishermen are not using adequate ice on board the boats, chilling down the fish just before handing it over at the processing plant. This fish will be contaminated with histamine because of mishandling and will not meet with the export quality requirements (Abeyratne *et al*., 2008).

None of the local assemblers questioned measured the temperature in fish but 90% inspected quality visually. Most of them claim long experience in fish handling as their qualification for quality inspection.

Awareness of quality is believed to be growing among fishermen, but it is a slow process (Abeyratne *et al*., 2008). Neither owners nor the captains interviewed have been provided with any sort of training in post harvest handling. None of the interviewees knew the quality procedure for the export market or understood the problems associated with histamine. None of them were aware of requirements for traceability for the yellow-fin tuna, nor understood the necessity for recording every single fish with adequate data in the fishing log book for tractability. There is definitely a need for organized procedure to rectify this ignorance so widespread among fishermen.

It is not the shortage of information causing quality problems for MDBs to serve the export market but rather fishermen unwillingness to understand this market and lack of capability of reconstructing their vessels. For the former the key word is communication between sellers and buyers to reach the point of mutual understanding of each other's needs. This is also about changing fishermen mindset which is complicated and time consuming. Information and knowledge need to flow between actors and be shared for mutual benefits for both partners in the export business to gain a *plus-sum game*. Sellers and buyers need to interact with each other as partners and cooperate to provide beneficial value for both parties to gain competitive advantage. The value chain should be like a network of actors transforming raw material into finished goods fulfilling consumer's expectation (Pitta, *et al.*, 2004). This flow of information is crucial for maximizing mutual margins and creating superior value for the customer (Frunert, *et al.*, 2002). Important matters regarding this are trust between seller and buyer to establish collaboration and avoid misuse of bargaining power. Such misuse of bargaining power occurs when actors in the value chain use information as a power tool to gain as much for themselves at the cost of others.

5.2.3   Power and trust

The landings of foreign vessels in Sri Lanka are controversial and many fishermen want the government to ban these landings. *"What we are pleading with the government, is to dismantle this mafia that has pushed away the local fishermen and are buying up catch from foreign vessels for exports"* said an angry fisherman in an interview with the newspaper, "Daily News" on February 18th 2008. Fishermen interviewed in this article believed they were getting low prices from processors/exporters because of landings from foreign vessels. The president of the Chilaw Fisheries Co-operative Society explained in the same interview how processors/exporters purchased fish from the foreign vessels at low prices, regardless of quality. These foreign vessels are overwhelming the local MDBs, with up to fifty times the capacity in fishing. In the same article is an interview with the Deputy Minister of Fisheries announcing the government intention to introduce a standard price for yellow-fin tuna to ensure that local fishermen are given fair prices. In the same paper is a short statement from Mr. Roshan Fernando,

President of Sea Food Exporters Association, explaining the reasons why sea food exporters purchase fish from foreign vessels.

> *"This issue of local fishermen having an excess stock occurs only in the mid December to February season, when the hand-line fish catch is higher. However there is a larger potential for lactic acid formation within the fish caught using this method. When you cut such fish the insides are already cooked. There is also a pertinent danger of histamine forming in them. There are stringent quality standards enforced by the Fisheries Ministry that have to be met for the export market. If any trace of histamine is found the EU might stop exports from the entire country and definitely ban the exporting company"*

He also noted*;*

> *"It is important to note the seasonal nature of this problem. Hand-line fishing is only possible when the fish come closer to the shore. In the other months, the local fishermen who use long-line fishing fetch 30–40% higher prices when compared to the foreign vessels. This is because the local vessels have a lower turnaround time of a maximum of 7 days while their foreign counterparts store fish up to 10–12 days before landing, which reduces the quality. Therefore, exporting firms prefer purchasing the local catch when it is available in the right quality"*

Many vessel owners interviewed declared that the export assemblers use their overwhelming bargaining power by neglecting them for days to give them a poor price offer. Sometimes the tuna was left unsold in the fish-hold for days with limited ice, spoiling the quality and their hope for good prices (Perera B., 2008). The export assemblers (12) for NJ Fishing Company in Negambo believe the export assemblers are cooperating to gain monopoly on the market, collaborating and manipulating the market affecting the possibility of connecting quality and prices. The export assemblers are using monopoly for gaining bargaining power to control the market and maintain low prices to the fishermen. Only eight to ten assemblers can monopolize the market in area like Negombo said the export assembler and his further comment was: *"The auction system at the harbour site and the facility*

itself, dos not encourage free market were prices are constructed by two equal parties, seller and buyer"

Roshan Fernando, the General Manager of the large processing and export company, Tropical Frozen Food, believes that the lack of trust between fishermen and processors is the biggest problem in the value chain of yellow-fin tuna (Fernando, 2008). One of the reasons is that the export assemblers are not willing to disseminate knowledge and information, looking at information at this part of the chain as valuable recourses and keeping it for themselves. Instead of spreading this information among fishermen, the export assembler earns extra profit through his position (Fernando). This bottleneck in the flow of information between seller and buyer with export assembler working as gatekeeper for knowledge could be the threshold for quality development in the export business (Fernando). For the wholesalers participating in responding to the questionnaire associated with this study, trust is the most important in dealing with customers and suppliers. Few also mentioned long term relationships to describe this collaboration. An overwhelming number of middlemen in the value chain claimed trust as a characteristic for their relationship with both suppliers and customers. Only a few view suspicion as characteristic of the relationships. Export assemblers reported that their relationship with customers and processors was built on trust and long term relationships.

5.3 The strategic position within the value system

The competitive forces driving changes in the yellow-fin tuna industry need to be detected for analyzing the current position and which of these will be influencing changes in the future. The business environment and the competitive forces within the industry influencing company's rivalry need also be analyzed.

5.3.1 Driving Forces within the industry

To understand a trend in industry it is necessary to have data over long period of time. Such data for yellow-fin tuna export were not available; hens the data for the fish export as whole were obtainable. With yellow-fin tuna the most important fish exported this should be a good yardstick for this export (Figure 20). The export as whole has been increasing though the years

Export Value in millions of USD
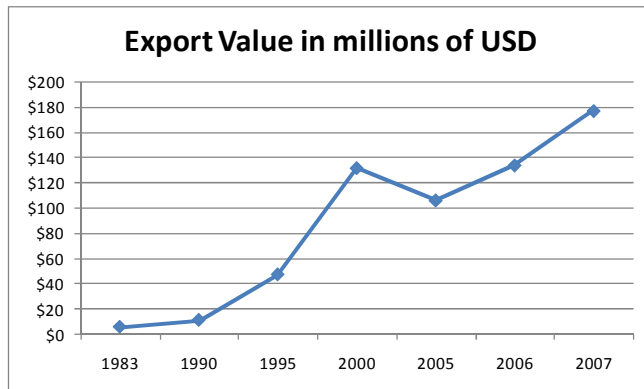
Figure 20 Value of fish exports from Sri Lanka in millions of USD 1983 - 2006 (MFAR, 2008)

with a world price introduced to the fisheries. This emerging export industry is catching the attention of local fishermen who see an opportunity to increase their incomes and living standards. This has caused a tension between local and export suppliers which is characteristic of the Sri Lankan yellow-fin tuna industry today. This division into local and export markets with different quality requirements and prices are the driving force for changes emerging within the value chain. Sri Lankan fishermen are struggling with serving this interesting market but for many reasons they have mostly failed to do so. Sri Lanka will need to focus on the problems hindering the flourishing of the export market, especially the substandard supply sector. These problems derive from the lack of recourse management. Knowledge, cooperation and collaboration within the industry will be the most important matters for the yellow-fin tuna value chain in the future.

5.4 External effects on the value chain

The substandard nature of the MDB fleet in Sri Lanka has been discussed before in this study. The minimum length for MDB fishing for the export market is considered to be 44 feet. Currently, 86 vessels in Sri Lanka fall into that category but length information of 87 vessels is missing (Table 9). The government policy is to expand the MDB fleet for offshore fishing, with better equipped and larger vessels targeting large pelagic in the high seas (GoSL, 2006). The intention is to enlarge the fleet with 100 new, well equipped boats capable of serving the export market, with powered long-line winches, adequate fuel and water capacity and with refrigerated storage holds. These vessels will also have navigation and communication equipment and facilities for crew members in accordance with international regulations. This will increase Sri Lanka's share in the valuable tuna fishing in the Indian Ocean outside their EEZ (GoSL). It is claimed by the government that this will be very important for Sri Lankan fisheries as quota setting of tuna in the Indian Ocean is possible in the future. Today, fish landed by foreign vessels for processing and export in Sri Lanka are not considered as local landings, and would not be part of the country's quota if and when such quotas are set in the future in the Indian Ocean, based on historical landings (IOTC, 1998).

Table 9 MDBs classified in sizes (DFAR, 2008)

Length Class	Total
≤ 29	59
29-34	999
34-39	1,132
39-44	738
44-49	65
>49	21
n.a.	87
Total	3,101

Two 150 ft long vessels, donated by China, entered the fishing fleet in October 2008. The original plan was to equip these two vessels for tuna fishing for the export market but later the government decided to use them as an assembling vessels (mother ships) for the local MDBs (Amaralal , 2008b). The idea is to find a local entrepreneur interested in operating these two boats in a joint venture with CFC. The government through CFC will contribute the vessels, valued at around 1,6 million USD, but the private entrepreneur will meet the financial costs for operations and management. The tuna will be purchased from fishing vessels at open sea with cash payment. The oldest fish accepted from fishing vessels will be six days old, and the oldest fish delivered to shore will be less than 10 days old, ideal for the export market (Amaralal, 2008a).

As mentioned earlier government regulations force importers of tuna from foreign vessels to sell 25% of the catch to CFC (Abeyratne *et al*., 2008). Many vessel owners, in common with processors/exporters, are of the opinion that CFC should not interfere in this business, but should rather get into production and distribution of bait for the long-liners in Sri Lanka (Fernando, 2008). There is a clear government policy to encourage the use of long-lines instead of driftnets in Sri Lanka (GoSL, 2006). One of the main problems in promoting tuna long line fisheries is the seasonality of bait availability. To have a regular supply there is a need for freezing capacity and cold storage in areas were long-lining is practiced. The bait used by the deep see tuna fisheries is imported and supplied by processors/exporters.

The marketing system in Sri Lankan fisheries does not justify the existence of the CFC in the business. With all the indirect subsidies through the government like the monopoly on import of tuna from foreign vessels, with dozens of ice-plants and a large fleet of refrigerated trucks and three-wheelers donated by foreign countries and the Sri Lankan government, it is not operating at free market level and could pose a threat to other players in the value chain. With its mission of lowering prices on the market CFC could be a threat to fishermen's income, who try to get as high prices as possible. But the fact that CFC is only handling a little more than 1% of the domestic production implies the company's impotence on the market.

Many MDB owners believe the government should subsidize them for modifying their vessels to a standard required to supply the export market. Their opinion is that the government should subsidize the introduction of the required technology, like power-winch, refrigeration system and navigational equipment. Government training programmes to promote improved quality and post harvest handling are also believed to be essential for the local fishery. The government has had the opportunity to lead the way of boat designing and building but have failed to do so with regard to the need of the export market.

More than 90% of all vessel owners and captains interviewed were of the opinion that the government should introduce a minimum price for yellow-fin tuna landed by the local boats for the export market. A minimum price on tuna however would be the worst thing the government could do for the industry. With minimum price the incentive for better quality would disappear completely. On the contrary there

is a need to link quality and price in fishermen mindsets, but absolutely not take away the best tool to encourage better quality, the price.

According to MDB owners interviewed, they want the government to subsidize the MDBs to compensate for high fuel prices. But there is no need for the government to subsidize fuel for the MDB fleet, and there are other ways for the owners to respond high fuel costs. More collaboration between the fishermen, like using collective fishing method could save considerable amount of fuel spent in long-line fishing for yellow-fin tuna. Also to use a transportation system from the fleet to shore, giving the MDBs up to three weeks fishing instead of only one week. Better equipped fishing vessels with powered line-haulers have much more capacity than one using hand-line, not only by using much more hooks but also catching larger adult tuna from deeper waters.

It is generally accepted that Sri Lanka lacks the required technology to enter high seas tuna long line fishing. There are no regulations governing boat construction and many of the vessels are unsafe and unfit for the high-seas. The MDBs sail long distances in search of large pelagic fish and even operate close to EEZs of other countries (Creech & Subasinghe, 2001).

According to processors/exporters, the most important initiative the Government of Sri Lanka should undertake is to introduce sensible legislation for the fisheries in the country, with necessary surveillance to make sure that the fishermen will follow the rules of the game to maximize the outcome from the resources (Weerasinghe, 2008). From the sentiments expressed during the study, majority of the stakeholders are expecting the government to take the initiative in the development of the fisheries of Sri Lanka. Government is responsible for resources management and can have a large impact on the industry through implementation of rules and regulations. The government can influence the development of the fishing fleet through finance and setting rules for minimum size of MDBs, with safety and capacity in mind. The government is responsible for liaison with IOTC and management of the common yellow-fin tuna stocks in the Indian Ocean and possible quota setting in the future. But direct government involvement in the value chain, like through CFC is questionable.

The domestic market in Sri Lanka can be characterized as a "*traditional market*", a norm for developing countries with a small share of the population with high

incomes, limited markets dominated by traditional generic products, few value added products and with many small retail outlets for fisheries products. (Tveterås and Kvaløy, 2006) There are large supermarkets in Sri Lanka but according to interviews with manager of the biggest one, Arpico, the fish business is only a small fraction of their sale. Tuna is considerable more expensive in supermarkets compare with fish markets. At the same time when tuna was sold at CFC retail outlets at 4,2 USD/kg and at SJM for 3,5 USD/kg the price in Arpico was 6,9 USD/kg. Sri Lankan fish consumers are in general purchasing from fish markets, CFC outlets or from a mobile retailers. According to Tveterås and Kvaløy, the food retail chains shares of seafood distribution in traditional markets are small but seafood is predominantly distributed by traditional fish markets and fish shops.

Lack of fisheries management is of a great concern in Sri Lanka. Open access system where anyone with money can buy or build a fishing vessel and start fishing is hindering sustainable development in the industry. Overexploited fisheries resources will lead to reduced income for vessel owners and fishermen. It can also hinder development in the fisheries with too little investment and substandard fishing fleet. Although the MDB fleet appears to be responding to these challenges, majority of vessels are too small to carry necessary equipment for appropriate fishing and to adopt QMS in post harvest practice to adequately supply the export market for yellow-fin tuna in Sri Lanka. Sri Lanka can expect international pressure because of lack of management both from governments and customers/consumers around the world. There is an international demand for internationally accepted standards for environmentally sound fisheries and information dissemination regarding that to the consumers. Important markets are becoming more and more conservation conscious, demanding sustainable fishing practice from its suppliers.

6. CONCLUSION

There are two main sub value chains of Yellow fin tuna in Sri Lanka. There is a domestic market where everything is sold fresh with little or no processing, flowing mainly through fishermen, assemblers, wholesalers/commission agents and retailers to consumers. Then there is an export market with domestic- and foreign supply of raw material. The flow through the value chain for local supply to the export is from fishermen to export assemblers, processors and exporters. The foreign supply is from foreign vessels, to CFC, processors and exporters. The export market has three different pathways; whole fish exported to the sashimi market in Japan, fresh and filleted tuna exported mainly to Europe and America for the steak market and filleted and frozen tuna for same markets.

6.1 Efficiency and Productivity of the Yellow fin Tuna Value chain

The local value chain is rather rigid with three middlemen from harvesting to consumer, adding value of more than 60% to the farm-gate price, without any processing. This value addition is mainly due to selection, transport and sale. Price determination is mostly built on a free marketing system in auction markets but with some exceptions.

Colombo Municipal Council lets facilities at the SJM, the most important fish market in Sri Lanka, to "stall owners". This arrangement is based on nepotism and inherited rights of families for wholesale business of fish in Colombo, dating back to colonial times. It is an unnecessary authority intervention on the market. Renting fish-stalls to "stall owners" does not add any observable value to the value chain. About 30% of the fish supply in Sri Lanka goes through the SMJ. The municipality thus interferes with price determination, not only in Colombo, but in the whole country.

None of the families "*stall owners*" run a real fish business but are acting like middlemen between the Colombo Municipal Council and the wholesalers/retailers. These families are adding a yearly cost, without a visible value, of about 275.000 USD, only for re-renting out the stalls to fishmongers. This extra cost of doing business in SJM will either increase cost to consumers or lower margin within the value chain.

But it is not the direct transaction cost in the value chain for the domestic market that affects efficiency the most, but rather the deterioration of quality throughout the

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value chain. Fishermen stay out at sea too long with limited amount of ice to preserve the catch and fish are often spoiled before being brought to shore. When landing the fish, fishermen wash the tuna with contaminated harbour sea-water before displaying it on the dock side in 30°C and sunshine, sometimes for hours before being iced and transported to the market. This lack of quality awareness and hygiene causes a lot of waste in the value chain, lowering the value of the product. Some of this tuna is sold to local fish-dryers at low prices.

The total value addition through the export market is considerably higher than through the domestic market, estimated in this study to be 4,1 USD/kg (MFAR, 2008) for the local retail price but 14,5 USD/kg (Weerasinghe, pers. comm. Feb 28th 2008) for FOB[10] for the export market. The export market pays much higher prices for raw material than the local market, up to 7,5 USD/kg for the sashimi market and 4,6 USD/kg to the EU market compared to an average farm-gate price for the local market is around 1,8 USD pr/kg and dry-fish processors are paying less than 1 USD/kg. If 30.000 tons of Yellow-fin tuna were to be channelled through export instead of the local market, the economic gains could be around 90 million USD a year. This is a considerable amount of money but cost of production has not been taken in to account but this increase in export of yellow-fin tuna would create foreign currency and valuable jobs.

If the gain of the MDBs is only taken in to account with 30.000 tons going to export instead of local market it would be extra revenue of 33 million USD according to prediction in the study. The cost of renovating the fleet has not been taken in to account but it looks like this extra revenue could produce extra margin within the value chain of yellow-fin tuna.

One of the biggest problems to gain extra value by channelling fish currently going to the local market to the export market is the lack of quality awareness and hygiene among the actors of the chain. To gain efficiency and productivity, fishermen need to understand the demands of the export market and how to meet them through

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[10] Free On Board, before airfreight and insurance cost

changing practices in fishing and post harvest handling of fish. Passing this knowledge from the market up the value chain to fishermen is fundamental to increasing efficiency and minimizing waste within the value chain of yellow-fin tuna in Sri Lanka. Free flow of information running up and down the value chain, from fishermen to the market and from the market to fishermen is essential for positive result. Processors argue that the most important incentive for improving quality of local MDBs targeting the export business is linking quality and prices in fishermen mindset and use it as motivation to improve quality.

In the last few years supply for the export market has been around half from foreign vessels and the other half from local MDBs. The processors/exporters have been using production contracts with foreign vessels owners, with most of the risk taken by the lessee. But these vessels have been successful in fishing and supplying good quality tuna for the export business. Competition has been escalating in the Indian Ocean on contracting these vessels and if the 18% tax-break for Sri Lankan exporters for importing to EU will not continue after mid-2009, Sri Lankan competiveness for these vessels will weaken. The local MDBs will than become even more important to the processing and export than previously. Processors believe the local MDBs will be their main supply of raw material in the near future. Some processors are vertically integrated in fishing, owning their own fishing vessels and some are using processing contracts.

But the main supply has been through the open market, were seller and buyer use an auction for price determination. The main problem with using the auction system seems to be lack of communication and cooperation between buyers and sellers with insufficient collaboration between them. Processors/exporters are using export assemblers as intermediaries between them and the fishermen, which are not likely to improve the biggest problem in this business, lack of quality and hygiene.

First and foremost there is a conflict of interest for the export assembler using information as a tool to gain bargaining power and defending his position within the value chain. The export assembler prefers his own interest over the interest of the value chain as a whole. This is a clear example of a *zero-sum game* where an actor in the chain uses his bargaining power without considering the possibility of a *plus-sum game* were everybody in the value chain can benefit from collaboration. This bottleneck in communication is causing many problems and hindering necessary

development in the business and is a clear draw-back of efficiency in the export value chain and blocking free flow of much needed information between seller and buyer.

In general the quality awareness in Sri Lankan fisheries is unsatisfactory with lack of hygiene and knowledge in post harvest handling. It seems quite obvious to anybody walking the fishing harbours watching fish being handled in the auction markets with fishermen unloading fish from their boats, throwing the fish onto the harbour deck in 30°C and leaving it there for a long time through transaction activity until finally iced before transported to the fish markets. This seems to be one of most serious problems for quality and prices of tuna, whether or not it is channelled through the export- or the local market. Experiencing totally different working procedure by vessels with processing contracts with processors indicates that using contracts instead of free market system could improve quality and quantity of the export supply.

But the lack of quality is not the only issue affecting efficiency in the Sri Lankan yellow-fin tuna fishery. MDBs targeting the export market need to adopt a different fishing method with higher capital investment and different post-harvest handling using QMS methods demanding considerable knowledge for such an operation. Sri Lankan fishermen need to adopt collective fishing like their foreign colleagues. Collective fishing is more efficient and productive with less time spent on finding good fishing ground. Such collaboration in fishing will lead to increased efficiency and productivity in harvesting and producing more value for the whole value chain.

There is also government interference interrupting the value chain of the export market. The extra cost for processors of yellow-fin tuna by CFC monopoly increases transaction cost in the export value chain, weakening their competitiveness against their rivals around the Indian Ocean. The foreign tuna import has been extremely important for the processors, being the back bone of the supply through the years. The extra cost for the transaction could reduce this important raw material supply affecting earnings in this industry and adding cost to the value chain without any value addition to the consumer. There is strong evidence for connection between quality and price on the local markets. On SJM the best fish is sold first for the highest price. Also the rejects from the export markets are sold for considerable better prices the average local supply.

With the local markets only handling the overflow from the export market and taking what is not suitable for exporting, there is still a need to improve efficiency and productivity by lowering cost and increase rent to the society.

6.2 Recommendation

The most important structural changes to increase profit in the value chain of yellow-fin tuna in Sri Lanka is to improve MDB capabilities and fishermen knowledge in fishing and post-harvest handling. It is necessary to involve the government in to a plan of reconstruct the fleet and also in educating fishermen in fishing and quality concern matters and hygiene. This is a collective need for the industry to improve total margin within the value chain, with benefit for all actors in the industry and for the society as whole.

Processors/exporters need to renegotiate their cooperation with fishermen supplying yellow-fin tuna in to the export market. Direct communication with then is essential with free flow of information building up common knowledge to serve this delicate market. Production agreements between buyers and sellers may in the current situation be more appropriate than a free market as it is practiced today. The export markets for yellow-fin tuna are demanding, making improved collaboration and therefore closer relationship between actors necessary. Supplier and customer should be working together to lower waste and maximise mutual margin in the value chain engaging in a *plus-sum game*.

CFC monopoly on importing yellow-fin tuna should be abolished immediately. This would increase profit of the processing sector and strengthen its competitive advantage over foreign competitors in purchasing this important raw material. It will also lower transaction costs, increasing profit and productivity of the value chain.

It has been suggested that CFC could play an important and constructive role for the future development of the industry if it were to engage in the production and distribution of bait in Sri Lanka. Somehow the free market has not taken care of this important service to the fisheries. Lack of bait is an expensive problem hindering the GoSL objective of increasing long-line fishing in the country. Using long line is a prerequisite for the export market and produces better quality tuna than driftnets. It is a government policy to expand the long line fleet in the future.

Resources management is essential for the fisheries efficiency and productivity affecting the total margin of the industry. The open access system with lack of fishermen property right of the recourses can cause rent drainage as a consequence of "tragedy of the common". Sri Lanka has to decide if it wants to run its fisheries as an economic activity or to generate employment. Open access will generate excessive fishing fleets and effort causing poor profitability and low income for fishermen. Also and more importantly it will contribute little or nothing to the country's GDP as well as threatening the biological sustainability of the fish stocks. Fisheries management connected to vested interests of fishermen, industry and the nation is desperately needed. Including adequate surveillance program to secure the players are following the rules of the game.

The main finding of this study is the discovery of the two sub-value chains of yellow-fin tuna in Sri Lanka; the export value chain and the domestic value chain. And the large difference of those two in producing value for the value chain. Local supply is critical for the future expansion of the export business but there are many obstacles to be overcome. Most MDBs are still substandard and there is lack of knowledge among fishermen in fishing and post-harvest handling. There is a need to further studying these matters before setting strategy for solving the problems. A baseline study of the situation on knowledge on quality awareness of fishermen would be helpful to estimate the situation and what is needed for correction.

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8. APPENDIX

1. Pre-study interviews

2. Unstructured interviews

3. Participants at Focus Group Meeting 21st of July

4. Accepted list of vessel owners for interviews

5. Owners of MDBs

6. Captains on MDBs

7. Local assemblers

8. Wholesalers/Commission agents

9. Retailers

10. Export assemblers

11. MDB owner's questionnaire in Negombo September 2008

12. MDB owner's questionnaire in Trincomalee September 2008

Appendix 1: Pre-study Interviews

1	Interviewer	Company	Name	Participant in the value chain
2	G.T.	Tropic Fishery (Pvt) Ltd	R. Fernando	Processor/exporter
3	G.T.	NARA	Amaralal	Socio-Economic research
4	G.T.	AmAsEuro Holdings Pvt. Ltd	Parakrama Weerasinghe	General Manager – Processor/exporter
5	G.T.	CFC	Eng. Jude Fernando	Fishing, raw material import, retail, production.
6	G.T.	President of the wholesale association	Basil Roshan Perera	Wholesaler
7	G.T.	IOTC	Miguel Herrera	Resource management
8	G.T.	ICEIDA	Leslie Joseph	Fisheries Expert
9	G.T.	Tropical Frozen Food	Fernando R.	General Manager

Appendix 2: Unstructured Interviews

Number	Interviewer	Company	Name	Participant in the value chain
1	G.T.	Ceylon Fisheries Corporation	Fernando, Jude	Foreign vessels, retail
2	G.T.	Tropic Fishery (Pvt) Ltd	R. Fernando	Processor/exporter
3	G.T.	NARA	D.C.T. Dissanayake	Research Biologist
4	G.T.	NARA	Amaralal	Director of Socio-Economic research
5	G.T.	AmAsEuro Holdings Pvt. Ltd	Parakrama Weerasinghe	General Manager – Processor/exporter
6	G.T.	CFC	Eng. Jude Fernando	Fishing, raw material import, retail, production.
7	G.T.	President of the wholesale association	Basil Roshan Perera	Wholesaler
8	G.T.	IOTC	Miguel Herrera	Resource management
9	G.T.	ICEIDA	Leslie Joseph	Fisheries Expert

10	G.T.	MDB Owner Association Negombo	Jude Perera	Vessel Owner
11	G.T.	Arpico Supermarket	Peries	Manager Purchasing
12	G.T.	Nj Fishing Company Limited	Cooray S.	Export Assembler
13	G.T.	National Fisheries Statistics Center	Pannipitiya S.	Project Leader
14	G.T.	DFAR Quality Control	Wickramasinghe S.	Deputy Director
15	G.T.	Export Assembler	Mr. Kthsíri's	Export Assembler
16	G.T.	Export Assembler	Mr. Kíthsíri	Export Assembler

Appendix 3: Participants at Focus Group Meeting 21st of July

1. Roshan Fernando	CEO / Tropic Fishing Pvt. Ltd.
2. Indika Abeyratne	Director / Apollo Marine Intl. Ltd.
3. Channa Weeratunga	GM / Global Fishing (Pvt) Ltd.
4. Prasanna Weerasinghe	GM / Global Sea Foods
5. Sepalika Wickremasinghe	Actg. Deputy Director/ Quality Control, DFAR

Appendix 4: Accepted list of vessel ovners for interviews

Awareness programmes conducted to Boat Owners and agreed for trial fishing

1. Negombo (3-4 March 2008) and
2. Chillaw (7 March 2008)

Survey team:

1. Mr. Gunnar Thordarson (ICEIDA)
2. Mr. Leslie Joseph (ICEIDA)
3. Mr. JK Rajapaksha (NARA)
4. Ms. DCT Dissanayake (NARA)

	Owner	Address	Telephone	Boat Name	IMUL-A
1.	WAT Emanual	5A, Deewara Niwasa, Mankuliya, Negombo	0602315996	Erosh-1	0226 NBO
2.	WA Jude Kumara	793, Mada Pitipana, Church Road, Negombo	0602315776	Vijitha-2	0226 NBO
3.	-do-	do-	do-	Vijitha-3	0040 NBO
4.	LMAP Silva	120, Basiyawatta, Negombo	0714247443	Samanali	0225 NBO
5.	Milroy Peris	24/3, St. Martin road, Munnakkaraya, Negombo	0722914751	Kaushini Duwa-1	0045 PTM
6.	-do-	-do-	-do-	Kaushini Duwa-2	
7.	Sunil Shamel Fernando	84/2, Aluth Kuruwa, Negombo	0312236178	Roshanthi-1	0016 NBO
8.	-do-	-do-	-do-	Roshanthi-2	0019 NBO
9.	P.D.N. Ruwanthi Fernando	241/12, St. Joseph's Street, Negombo	0777689035	Holy Cross 01	0303 NBO
10.	P.D.N. Ruwanthi Fernando	241/12, St. Joseph's Street, Negombo	-do-	Holy Cross 02	0304 NBO
11.	Aruni Trishalika Sarani	241/12, St. Joseph's Street, Negombo	-do-	Holy Cross 03	0462 NBO
12.	Champika Fernando	9/10, Nimala Mariya Mawatha, Negombo		Holy Cross 04	
13.	M. Masariyus Roshan Fernando	7th Lane, Thalduwa, Negombo		Holy Cross 05	
14.	L.A.D.A. Appuhamy	1/197, Padaripeye Mw, Negombo		Holy Cross 06	0489 NBO
15.	M.F.K. Fernando	1/197, Thalduwa, Negombo		Holy Cross 07	0501 NBO
16.	K. Pradeep Mahinda Silva	51, Mankuliya Deevara Niwasaya, Mankuliya	0773774371	Amal Putha 01	
17.	-do-	-do-	-do-	Amal Putha 02	
18.	-do-	-do-	-do	Amal Putha 03	
19.	-do-	-do-	-do	Amal Putha 04	
20.	-do-	-do-	-do	Amal Putha 05	
21.	Milton Christoper	2/260, Duwa, Negombo	0312239779	Sudu Putha	0457 NBO

Appendix 5: Owners of MDBs

Date and place:_____

Name of boat:_____

Topics for interviews with Owners of MDB – Regarding Tuna fishing and marketing

What is the length of your boat (in feet) and number of crew?

Lenghth	Crew
30-35	
36-40	
41-45	
46-50	
50+	

What kind of fishing gear are you using?

Gillnet	
Hand-hauled long-line	
Powered long-line	
Other	

What species of tuna are you mainly aiming for?

yellow-fin	
skip-jack	
Big-eye	

What is a average length of fishing trip?

Less than week	
1 week	
2 weeks	
3 weeks	
4 weeks+	

Do you prepare dry fish on board the boat?

Share of catch %		Kg.
Yellow-fin		
Skip-jack		

How do you sell your catch?

Auction market at the harbour	
To Assembler	
To export assembler	
To CFC	
Other?	

What markets are you aiming for yellow-fin ?

Share of catch %	
Local	
Foreign	

Are you concerned on Quality Matters?

Do you mesure Temp:	
In fihs holde?	
In fish?	
Is your fish checked for Histamin?	
Do you have traicability for fish?	
Do you wash fish at harbor site?	
Do you train your crew:	
Killing/bleading/gutting?	

What is the expected range of sales-price for your tuna catch?

	From	To
Auction market		
Assembler		
Export assembler		
Exporter		
Other?		

Do you know what the average selling price at St. Johns market?

Yes	
No	

Are you planning to modify your boat?

Yes	
No	

Do you get financial assistance from your Assembler?

Yes	
No	

What is the most important government intervention expected in fisheries?_____

Appendix 6: Captains on MDB's

Date and place:_____

Topics for interviews with Crews of MDB – Regarding Tuna fishing

What is the length of your boat (in feet) and number of crew?

Lenghth	Crew
30-35	
36-40	
41-45	
46-50	
50+	

What kind of fishing gear are you using?

Gillnet	
Hand-hauled long-line	
Powered long-line	
Other	

What species of tuna are you mainly aiming for?

yellow-fin	
skip-jack	
Big-eye	

What is a average length of fishing trip?

Less than week	
1 week	
2 weeks	
3 weeks	
4 weeks+	

Do you prepare dry fish on board the boat?

Share of catch %		Kg.
Yellow-fin		
Skip-jack		

How is the catch sold?

Auction market at the harbour	
To Assembler	
To export assembler	
To CFC	
Other?	

Are your crew trained in Quality matters?

Do you mesure Temp:	
In fihs holde?	
In fish?	
Is your fish checked for Histamin?	
Do you have traicability for fish?	
Do you wash fish at harbor site?	
Do you train your crew:	
Killing/bleading/gutting?	

Have you ever attained in a Quality Training Course?

Yes	
No	

What is the most important government intervention expected in fisheries?_____

Appendix 7 List of questions: Local Assemblers

Trust and Confidence	Government interference	Intelligence and Knowledge	Dissemination and Responsiveness	Bargaining power and Power Distribution
Describe your relationship with your customers (Wholesaler) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	Are there any government quality regulations on fish handling to your knowledge? Yes [ ] No [ ]	Do you? Measure temp. in fish [ ] Do you check quality of fish [ ] If yes , how}	Do you give your fishermen quality demand for fish? Use of ice [ ] Wash fish at landing side [ ] Maximum days at sea [ ]	Describe your customers? Customers looking for low prices [ ] Customers looking for good quality [ ]
Describe your relationship with your supplier (fishermen) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	What do you think is the most important intervention the government should do for the fish industry?	Do you recommend washing fish at harbor site? Yes [ ] No [ ]	Do you regularly meet your suppliers? Wholesalers [ ] Retailers [ ] Fishermen [ ] Exporters [ ] Other [ ]	Who are your customers? Retailers [ ] Wholesalers [ ] Exporters [ ] Producers [ ] Other [ ]

Appendix 8 List of questions: Wholesalers

Trust and Confidence	Government interference	Intelligence and Knowledge	Dissemination and Responsiveness	Bargaining power and Power Distribution
Describe your relationship with your customers (retailer) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	Are there any government regulations on fish quality on handling to your knowledge? Yes [ ] No [ ]	Do you? Measure temp. in fish [ ] Do you check quality of fish [ ] If yes , how}	Do you give your supplier quality demand for fish? Use of ice [ ] Washing fish at landing side [ ] Maximum age of fish, days since harvest [ ]	Describe your customers? Customers looking for low prices [ ] Customers looking for good quality [ ]
Describe your relationship with your supplier (Assembler) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	What do you think is the most important intervention the government should do for the fish industry?	Do you regularly check: Temp. in fish [ ] Use of ice of your suppliers [ ] Age of fish [ ] If fish is washed at landing side [ ] If yes, how?	Do you regularly meet your suppliers? Assemblers [ ] Agents [ ] Other [ ]	Who are your customers? Retailers [ ] Agents [ ] Supermarkets [ ] Food service (hospitals, army ect.) [ ] Catering [ ]

Appendix 9 List of questions: Retailers

Trust and Confidence	Government interference	Intelligence and Knowledge	Dissemination and Responsiveness	Bargaining power and Power Distribution
Describe your relationship with your customers Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	Are there any government regulations on fish quality on handling to your knowledge? Yes [ ] No [ ]	Do you? Measure temp. in fish [ ] Do you check quality of fish [ ] If yes , how}	Do you pass requirements on quality to your suppliers? Use of ice [ ] Do you categories the tuna sold, in to species? [ ] Maximum time from harvesting to delivery [ ]	Describe your customers? Customers looking for low prices [ ] Customers looking for good quality [ ]
Describe your relationship with your supplier (wholesalers) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	What do you think is the most important intervention the government should do for the fish industry?	Do you regularly check: Temp. in fish [ ] Use of ice of your suppliers [ ] Age of fish [ ] If fish is washed at landing side [ ] If yes, how?	Do you regularly meet your suppliers? Assemblers [ ] Agents [ ] Fishermen [ ] Other [ ]	Who are your customers? Households [ ] Agents [ ] Supermarkets [ ] Other retailers [ ] Catering [ ]

Appendix 10 List of questions: Export Assemblers

Trust and Confidence	Government interference	Intelligence and Knowledge	Dissemination and Responsiveness	Bargaining power and Power Distribution
Describe your relationship with your customers (Wholesaler) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	Are there any government quality regulations on fish handling to your knowledge? Yes [ ] No [ ]	Do you know grading system for quality of fish? Grade I [ ] Grade II [ ] Grade III [ ] In witch grade do you mostly handle with?	Do you educate fishermen and suppliers regarding quality standard before harvesting? Yes [ ] No [ ] Sometimes [ ]	What proportion of total catch from a vessel do you normally purchase? [ ] %
Describe your relationship with your supplier (fishermen) Build on trust [ ] Build on suspicious [ ] Long term relation [ ] Price and quality relation [ ] Short term relation [ ]	What do you think is the most important intervention the government should do for the fish industry?	Do you recommend washing fish at harbor site? Yes [ ] No [ ]	Do you regularly meet your suppliers? Yes [ ] No [ ]	Who are your customers? Export company [ ] Agent [ ] Assembler [ ] Other [ ]

Negombo 22/09/2008

IMULA		Regarding quality and prices for yellow-fin tuna for the export market; do you comunicate with:			How is cooperation with buyers of export tuna?				
		Export Assembler	Direct with Processor/ exporter		Build on trust	Build on suspicious	Long term relation	Short term relation	Price and quality relation
0012NBO	1	✓							✓
0559NBO	2	✓					✓		
0469CHW	3	✓					✓		
0249NBO	4		✓		✓				
—	5	✓			✓				
0576NBO	6	✓					✓		
Sankalpa-1	7	✓							✓
Ishani	8	✓			✓				
0876CHW	9	✓			ᵼᵼᵼ		✓		
1205 NBO	10	✓			✓				
	11								
	12								
	13								
	14								
	15								
	16								
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	19								
	20								
	21								
	22								
	23								
	24								

Appendix 12: MDB owner's questionnaire in Tricomalee September 2008

Trincomalee 22, 23 / 09 / 2008

IMULA

		Regarding quality and prices for yellow-fin tuna for the export market; do you comunicate with:			How is cooperation with buyers of export tuna?				
		Export Assembler	Direct with Processor/ exporter		Build on trust	Build on suspicious	Long term relation	Short term relation	Price and quality relation
3657 MTR	1	✓			✓				
Delis-6	2	✓							
447 CHW	3	✓			✓				
0076 CHW	4	✓					✓		
2517 NBO	5	✓							✓
0252 CHW	6	✓							✓
00246 CHW	7	✓							✓
1452 NBO	8	✓			✓				
0342 CHW	9	✓							✓
2643 NBO	10	✓							✓
	11								
	12								
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