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ANALYSIS OF PROFITABILITY OF TRAWL FLEET INVESTMENT IN LIBERIA

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ABSTRACT

Analysis of profitability of trawl fleet investment in Liberia looks at the measurement of financial performance of trawl fleets with special attention drawn to stern freezer trawlers that fish for pelagics and demersal species with sizes ranging from 20 – 50 m in length. Interviews were conducted with managers of trawl fishing companies for the collection of primary data in addition to information provided based on the personal experience of the author who had served on board trawlers for six months as a Fisheries Inspector. Secondary data were gathered from the Bureau of National Fisheries, Monrovia and also by reviewing available printed and elecronic publications. A profitability module developed by Professor Pall Jenson of the University of Iceland was used to calculate profitability, draw up financial statements and calculate financial ratios. Sensitivity analysis with price, sales, equipment and vessel considered as input variables was performed, scenario analysis was conducted looking at best case, worst case and normal case scenarios and a Monte Carlo simulation was carried out to ascertain the probabilities, with data based on assumptions and hypotheses. Gaining strategic position in the industry in Liberia and on a global level was considered. This paper reveals that the net present value (NPV) and internal rate of return (IRR) of both types of trawl investment are acceptable. An adequate cash flow for the investment was indicated.

Key words**:** trawl fleet, Liberia, profitability, investment, strategic position

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ABBREVIATIONS

ARR	Average rate of return
BCRADP	Bong County Rural Agriculture Project
BNF	Bureau of National Fisheries
CCRF	Code of Conduct for Responsible Fisheries
CIA	Central Intelligence Agency
EJF	Environmental Justice Foundation
EU	European Union
FAO	Food and Agriculture Organization
GCF	Gross cash flow
GDP	Gross domestic product
GPS	Global positioning system
GRT	Gross rate tonnage
IHE	Interagency health evaluation
ILO	International Labour Organization
IRIN	Integrated regional information network
IRR	Internal rate of return
IUU	Illegal, unreported and unregulated
LCRADP	Lofa County Rural Agriculture Program
MARR	Marginal average rate on return
MCS	Monitoring control system
MGC	Mesurrado Group of Companies
MOA	Ministry of Agriculture
MSY	Maximum sustainable yield
NCRAD	Nimba County Rural Agriculture Development Program
NPV	Net present value
NRT	Net rate tonnage
ROE	Return on equity
ROI	Return on investment

1 INTRODUCTION

Trawl fleet fishing in Liberia has evolved over seven decades and is known to be the most vibrant of the fisheries sector. Quite recently, the production trend seems to be shifting downwards as the number of landings decreased from 4,493 metric tons in 1999 to 2,894 metric tons in 2006, and the number of registered vessels reduced from 40 in 2006 to 36 in 2008. Furthermore, the trend is now shifting towards import of fish and fishery products as the number of importers increased from five in 2006 to eight in 2008 and the quantity of fish import increased from 9,994 metric tons in 2007 to 13,978 metric tons in 2008. The underlying factors vary and can be viewed from different perspectives. One of the reasons behind this could be attributed to investors who might feel insecure to invest in trawlers. The insecurity could be a derivative of questions like: is the maximum sustainable yield (MSY) of fish stocks large enough to provide economic benefit or high return on investment? Assuming that the fish stocks are large enough, is the portion taken by poachers invading Liberian waters reducing the yield? All other things being equal, is investment in the trawl fleet fisheries profitable considering the fact that investment in the trawl fleet is capital intensive, coupled with the production costs? What could be the return on investment and profit margin based on revenue over a period of time? Which method of trawling is most profitable in Liberia? The questions that led to the selection of this research topic may seem infinite.

The goal of this project is to measure the profitability of trawl fleet investment in Liberia using a designed profitability module with secondary data based on assumptions and hypotheses. A profitability module developed by Professor Pall Jensson of the Economics and Business Department, University of Iceland, was used to perform financial statements and calculate financial ratios; sensitivity analysis, scenario analysis; and Monte Carlo simulations were performed to answer uncertainties. Benefits that could derive from this work include, but are not limited to, *(i)* the module could be used to perform periodic analysis on profitability of trawl fleets*; (ii)* results of such analysis could be used to design policies and make decisions; and *(iii)* the module could be used to perform profitability measurement of other types of fishing vessels. Placed into segments, the topic is arranged as follows: this chapter provides a brief introduction to trawl fleet fishing in Liberia and the present project work including the research questions. Chapter two discusses fisheries in Liberia, chapter three is a literature review, chapter four is on methodology and chapter five looks at trawl fleet fisheries investment in Liberia with specific attention to situational and profitability analyses. Conclusions are outlined in chapter six; discussions in chapter seven and finally there are some recommendations.

To better understand the profitability of trawl fleet investment in Liberia the following intriguing research questions have been put forward:

How profitable is trawl fishing investment in Liberia?
What are the indicators of profitability that will be measured?
What is the average production capacity/landing of the vessel(s) under study?
What is the cost structure of the trawl fishing fleet (s) under study?
What type of technology is involved in trawl fishing in Liberia?
How big is the market of the trawl fishing industry in Liberia and how fast is it growing?
What is the market position of the companies in the industry?

It is noteworthy to mention that some of the data provided herein are not reliable due to limited cooperation from managers of trawl fleet fisheries companies and also understated production as reported by captains of vessels prior to assignment of fisheries inspectors on board fishing vessels in 2007.

2 FISHERIES IN LIBERIA

Liberia, a West African nation located at 6° 30N, 9° 30W with a coastline of about 579 km, borders Guinea to the north, the Atlantic Ocean to the south, Cote d'Ivoire to the east, and Sierra Leone to the west, and has a total area of 111,370 km^2 of which 96,320 km^2 is land and 15,050 km^2 is water. It has a territorial sea of 200 nm.

Figure 1: Map of Liberia. Source: CIA World Fact Book

Liberia's economy relies heavily on the agriculture sector contributing about 12% to the Gross Domestic Product (GDP) and fisheries constitute 3.2% thereof. A 2004 estimate of the GDP (nominal) total is US $2.903 billion and per capita of US $900 (CIA not dated). The currency is the Liberian Dollar with the exchange rate: 1US$ = LRD63[1,] and the population is about 3.3 million.

2.1 Overview of Liberian fisheries industry

The Liberian fisheries are composed of marine fisheries and aquaculture. The marine sub-sector is comprised of the industrial sector and the artisanal sector. The industrial sector is composed of commercial fishing vessels fishing in deep sea for both pelagic and demersal species, using trawlers of different sizes and with different storage methods. The artisanal sector comprises mostly of traditional fishermen who carry out

[1] Foreign Exchange Rate as at 15 January 2009

subsistence fishing along the coast of the country and within 10 - 50 nautical miles (nm). Usually fishing trips are short and inshore and fishing vessels are small.

They target both pelagic and demersal species using line and hook. In the industrial sector, the most common fish preservation method is freezing while the artisanal sector uses drying and salting methods. The majority of the artisanal fish processors are women. The Liberian fisheries are regulated by a management system under the supervision of the Bureau of National Fisheries (BNF) of the Ministry of Agriculture (MOA).

2.1.1 Importance of fisheries to the economy

Fisheries are an important sector of the Liberian economy because it provides an inexpensive source of protein, employment opportunities, generates foreign earnings into the economy and enhances food security. Scientific knowledge has shown that fish is rich in protein and it is a sustainable means of acquiring better health standards which is required of every Liberian as the life expectancy is put at 48 years (IHE Committee n.d.). Most Liberians can easily afford fish as it is relatively cheap compared to meat or other sources of protein. As a result of the unemployment rate in the country (85% in 2005), the majority of the youth, especially those living in the coastal areas see fisheries as a source of livelihood. About 13,000 fishermen and 18,000 fish processors are engaged in fishing activities. Fisheries products are also imported into and exported out of the country, and earnings from both international and local fish trade provide income to the economy. With fisheries contribution to the economy, it was confirmed by the Food and Agriculture Organization (FAO) that Liberia is promoting food security. This fact stems from the National Agricultural Fair in Liberia held in December 2008, when Liberia received through its President, Her Excellency, Madame Ellen Johnson Sirleaf, the *Ceres Medal Award* from the FAO in recognition of its commitment to promoting peace, food security, health and education as a means of achieving a Liberia free of hunger and poverty, as enshrined in the Poverty Reduction Strategy of Liberia (FAO n.d.).

2.1.2 Fisheries production, trade and labour

According to BNF (2006), approximately 7,000 metric tons (mt) of fish was landed at 10 coastal artisanal sites in 2004. The average catch of a canoe per annum was 2.2 tons in 2004 and 1.16 tons in 2005. The reduction in volume of production in 2005 was a result of the resumption of fisheries activities by commercial trawlers as compared to 2004 when the country started recovering from war at which time the trawlers activities were minimised. The major species exploited were the *Sardinella, Barracudas, Croakers, Sharks* and *Ilisha africana*, which make up the major commercially valuable species for the local markets, and constituted 83% and 59% of local fish supply in 2004 and 2005 respectively. The industrial sub-sector which is our focus of study comprises trawl fleets fishing on a large scale, and contributes about 41% to total landings of capture fisheries over an 11 year period (1997-2007) "This sub-sector is mostly relevant in the implementation of the Code of Conduct for Responsible Fisheries (CCRF)" (FAO n.d. a). Other commercially exploited fish species from Liberia waters include *Clupidae (Ethmolosa, Carangidae (Caranx spp.)), Sciaenidae (Pesudolithus elongathus, Pseudolithus senegalensis), Polynemidae (Galeodis), Spanidae (Dentex angolensis), Balistidae* and *Paneid* shrimps.

Statistics from BNF (2008a) show marine production over a period of time as indicated in Table 1 below. According to the table, both fisheries sub-sectors show increase in production from 1997 until 1999. The industrial sector production showed a downward trend between 2000 and 2003 which could be attributed to the third phase of the Liberian civil war. The production in this sub-sector increased in 2004 and 2005 which could be attributed to the relative peace in Liberia following the final seizure of the war in 2003; and finally dropped again in 2006. The sharp increase in industrial (trawl fisheries) production in 2007 could be attributed to the assignment of fisheries inspectors on board fishing vessels to ensure compliance of fisheries rules and regulations by the skippers. On the aggregate, the artisanal sub-sector production surpassed that of the industrial sub-sector during the eleven year period. Though the data from BNF was used, a comparison was carried out with data sourced from FAO Fish stat. With the exception of 2006 (that shows a difference of a little over 2,000), the difference between the two sources of data for 1997-2006 shows a difference of a little over 4,000. Data for 2007 was not provided by Fishstat and the underlying factor responsible for the discrepancy between the two sources could not be identified.

"Aquaculture activities which could be considered to be at their developing stage in Liberia began in the mid 1970s, with fishponds developed at the Central Agriculture Experimental Station in Suakoko, for breeding experiments with common carps, Nile tilapia and catfish varieties. Extension was provided by Peace Corps Volunteers to small-scale farmers. It was promoted by the Bong County Rural Agriculture Development Project (BCRADP), Nimba County Rural Agriculture Development Project (NCRADP) and Lofa County Rural Agriculture Development Project (LCRADP) in Bong, Lofa and Nimba Counties. This development in the aquaculture sector resulted in pre-war production reaching 29 tons in 1989. Post-war production has been boosted by the European Union (EU) supported hatcheries at Klay (Bomi County), Douyee Town (Grand Gedeh County) and Salayea (Lofa County), which supplied the necessary fish fingerlings to farmers. Production rose from 22 tons in 2000 to 38 tons in 2004, with *Oreochromis niloticus, Tilapia zili, Clarias sp.* and *Heterobranchus sp*. as the main culture species. The number of fish farmers rose from 350 in 2000 to 1050 part-time, subsistence farmers in 2004" BNF (2008b), FAOa 2009).

Table 1: Marine fisheries production (artisanal and industrial) 1997 - 2007

MARINE FISHERIES PRODUCTION
FOR ARTISANAL AND INDUSTRIAL FISHERIES SECTOR
FOR THE PERIOD 1997 - 2006

YEAR	ARTISANAL	INDUSTRIAL	TOTAL	% of INDUSTRIAL TO TOTAL	TOTAL (By Fish stat)
1997	2,750	1,579	4,329	36.47%	8,491
1998	3,591	2,700	6,291	42.92%	10,697
1999	5,992	4,493	10,485	42.85%	14,682
2000	4,663	2,425	7,088	34.21%	11,618
2001	4,064	2,239	6,303	35.52%	10,496
2002	4,641	2,201	6,842	32.17%	11,042
2003	4,630	2,020	6,650	30.38%	10,864
2004	7,126	3,191	10,317	30.93%	14,525
2005	5,511	3,584	9,095	39.41%	13,347
2006	5,391	2,894	8,285	34.93%	10,424
2007	5,654	10,500	16,154	65.00%	
TOTAL	54,013	37,826	91,839	41.19%	116,186
%	58.81	41.19	100.00		

Source: Bureau of National Fisheries, Ministry of Agriculture, Monrovia, Liberia; FAO Fishstat

Trade, without which fisheries is incomplete, is the conduit to earnings as relates to the importance of fisheries. The main export markets for Liberian fish and fishery products are Europe, Asia and North America while the main import markets are Spain, Morocco and Mauritania. According to BNF (2006), "84 mt of fish valued at US $702,000.00 was exported, while 3,536 mt valued at US $3,173,000.00 was imported into the country in 2005 respectively. However, information recently gathered revealed that the number of importers of fish and fishery products has risen over the last year from five to eight and the quantity of fish imported into the market stood at 9,983 mt between March and August 2007 (BNF 2008c). Fish landed by artisanal fishermen are sold out-rightly at the beach landing sites and the imported products are distributed to the markets for local consumption. There is very little value addition and a very short value chain in both fisheries sectors."

Labour is a major factor in fisheries production. Statistics from a survey conducted along the fishing communities by the MOA in January and February 2008 indicate a total of 13,000 fishermen and 18,000 fish processors and their families live in 139 coastal communities where they operate 3,500 canoes. Only 8% of those boats are motorised (BNF 2008d, IRIN n.d)

3 LITERATURE REVIEW

Trawl fisheries investment is capital intensive and involves many approaches. This aspect of the work looks at texts, journals, and papers written by fisheries experts at the global and regional levels as well as personal experience. Discussing issues like evolution, characteristics of trawlers, production capacity of trawlers, fisheries management, investment in trawl fleet and market strategy, this section looks at in-depth views of these and other related issues in trawl fleet investment at the international and local levels.

3.1 Trawl, trawler and trawling

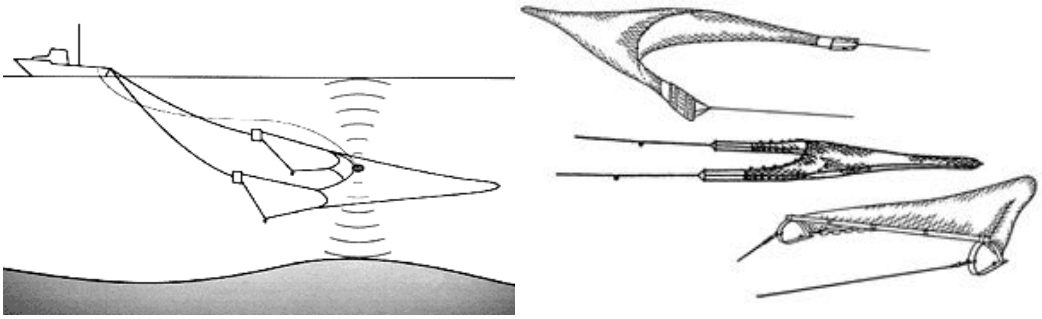
The history of trawlers can be traced to the 17th century, when the British developed the Dogger, an early type of sailing trawler commonly operated in the North Sea. The Dogger takes its name from the Dutch word *dogger*, meaning a fishing vessel which tows a trawl. The town of Brixham, England was where the fishing trawler was improved in the 19th century. Though structured as wooden boats, they were copied all over the world influencing fleets everywhere. Their distinctive sails even inspired the song 'Red Sails in the Sunset' which was written aboard a Brixham sailing trawler called the Torbay Lass known as the "Mother of Deep-Sea Fisheries", its boats sailed all around the coasts and helped established the fishing industries of Hull, Grimsby and Lowestoft (Wikipedia, n.d).

According to Goblirsch and Theberge (2003), "A trawler is a vessel that drags a funnel-shaped net through water to harvest fish or shrimp. The net referred to as trawl, is wide at the mouth and tapers back to a narrow cod end that collects the catch". "Trawlers vary according to the method of towing the net which have a large metal trawl door that is attached to each side, or wing, on the front of the net. The water hits the doors and the pressure of the water passing over the door spreads the net open. The doors are flat, oval, or slightly v-shaped with a steel cable that extends from the door to a winch just behind the pilot house. Trawlers vary in size from small open boats with only 30 hp to large factory trawlers with over 10,000 hp. Trawling is the most important and one of the most efficient fishing methods in the world. Trawling can be carried out by one trawler or by two trawlers fishing cooperatively commonly known as pair trawling." (FAO n.d. b)

There are three main methods of trawling: mid water trawling, bottom trawling and shrimp trawling. A mid water trawl consists of a cone shaped body, normally made of four panels, ending in a cod end with lateral wings extending forward from the opening (Figure 2). It is usually much larger than a bottom trawl and designed and rigged to fish in mid water, including at the surface water. The front parts are sometimes made with very large meshes or ropes, which herd the targeted fish inwards so that they can be overtaken by smaller meshes in the aft trawl sections. The horizontal opening is maintained either by otter boards or by towing the net by two boats (pair trawling). Floats on the headline and weights on the ground line often maintain the vertical opening. Modern large mid water trawls, however, are rigged in such a way that floats are not required, relying on downward forces from weights to keep the vertical opening during fishing (FAO n.d. b). "Mid water trawlers (Figure 2) tow a net off the stern from just above the bottom to just below the surface. They harvest fish travelling in schools, such as pacific whiting. An overhead A-frame, or *gantry*, on the stern holds one or two reels. The net is trawled for a shorter time than shrimp or bottom trawlers and one tow may yield 50 tons of fish" (Goblirsch and Theberge 2003). Mid water trawling is carried out mainly at sea, on the continental shelf, sometimes in deeper waters as well as in some lakes and has no impact on bottom habitats and bottom structures. In most cases it is a single species fishery, as catch rates of other pelagic and demersal species are low. Incidental catch of dolphins and marine mammals may occur in some areas FAO (n.d. b).

As seen in Figure 3 below, a bottom trawl is constructed like a cone-shaped net that is towed (by one or two boats) on the bottom. It consists of a body ending in a cod end,

which retains the catch. Normally the net has two lateral wings extending forward from the opening. The mouth of the trawl is framed by headline and ground rope. It is designed and rigged to catch species living on or near the bottom. Bottom contact with the gear is needed for successful operations. Three categories of bottom trawls can be distinguished based on how their horizontal opening is maintained: beam trawls, bottom otter trawls, and bottom pair trawls. Beam trawls are commonly designed without wings (FAO n.d. b). "The average bottom trawl opening is 40 to 60 feet wide and 8 to 10 feet tall." (Goblirsch and Theberge 2003) "Trawl winches installed on deck control the trawling warps and store them when not in use. Bottom trawls can be operated in a very wide range of depths (from a few meters to 1,500-2,000 m), mainly at sea, but also, in some cases in inland waters and targets both bottom, demersal species and shrimps. Bottom trawls interact physically with the bottom sediment, which might result in removal or damage of sedentary living organisms (including seaweed and corals) and in the case of uneven bottom surface displacement of stones or other larger objects" (FAO n.d. b). Bottom trawls are also used in targeting shrimps and the vessels that use these trawls are called shrimpers.



Figures 2 and 3: Bottom trawl and mid water otter trawl
Source: FAOb 2009.

According to FAO (n.d. b), "trawlers can be classified into various categories with various characteristics. Trawlers can be categorised as freezer trawlers, wet fish trawlers, factory trawlers and pair trawlers with characteristics like length, power, tonnage, handling and processing mode, and equipment. Also, trawlers can be distinguished according to deck arrangements as side trawlers, stern trawlers (Figure 4) and outrigger trawlers, beam or otter trawlers.

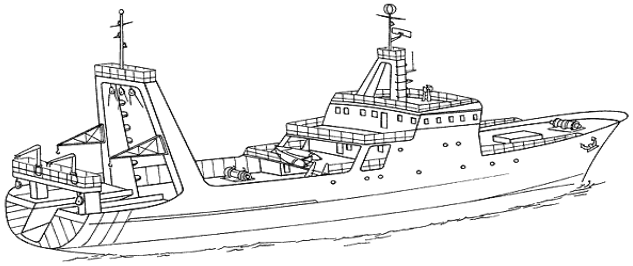


Figure 4: Factory stern trawler
Source: FAOb 2009.

The most common trawlers in Liberia are stern trawlers that target both pelagic and demersal species, and outriggers that target demersal fish and shrimps. There are hardly any fleets specialising in a single species. Most of the fleets have one or two main species but the catches are complemented with other species of commercial interest (Rugueiro *et al.* 2002). Running a trawl fleet in terms of fuel consumption is

quite expensive and this has been the major complaint of fleet managers in Liberia. As mentioned by Parente *et al.* (2008), trawlers are among the most fuel-demanding fishing vessels. This is due to the high towing resistance associated with the gear; the netting drag alone typically accounts for 60% of the total gear resistance. Reducing the netting surface by using larger meshes in the net forepart (wings and square) may significantly reduce net drag without affecting the trawl mouth area and thus the catch efficiency. This is particularly true for those species that display herding behaviour inside the trawl (Fiorentini *et al.* 1987).

3.2 Fisheries management issues

By simple definition, fisheries management is the effort to regulate where, when, and how people fish usually with the aim of protecting fish populations so that people can continue to fish in the future. According to the International Labour Organisation (ILO), "the Code of Conduct for Responsible Fisheries (CCRF) which is voluntary was adopted by an FAO Conference in 1995. The Code provides principles and standards applicable to the conservation, management and development of all fisheries, and also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management." (ILO n.d),

Management issues in fisheries are diverse. As such, there is a need to address these issues which include: sustainability (conservation and preservation); economic (total allowable catch, total value of landing, total operation costs, taxes and subsidies, investment worth, individual transferable quota, labour); social (property rights, health); legislation (policies, rules and regulations, enforcement and compliance); technical measures (input and output control); environment (dynamiting and poisoning, protecting endangered species); and the list goes on.

During the author's services on board pair trawling Chinese vessels (F/V Hong Li 22 & 23), he observed that three out of every 10 fish pans sorted for on board freezing were discarded over board. This high ratio is due to the fishing method and gear selectivity used by these vessels. Based upon constant report from inspectors assigned on board Chinese pair trawlers and consistent report against these vessels by artisanal fishermen as a result of the poor and unsustainable fishing methods applied by the Chinese trawlers, the Government of Liberia (GOL) placed a ban on benthic trawling in Liberian waters in December 2007. According to Madsen *et al.* (2008) discarding of undersized fish is widespread, leading to less than optimal exploitation of the resources. "Improving trawl gear selectivity, often by mesh size regulations, is one way to alleviate these problems and has become a major management tool in many fisheries to prevent juvenile fish from being caught."

The Bureau of National Fisheries (BNF) was created by an Act of the National Legislature under the Natural Resources Laws of 1956 and charged with the responsibility of managing and developing fisheries and aquaculture in Liberia. According to Whitmarsh (2000), "government charged with responsibility for managing marine fisheries have specific information requirements concerning the current state of fisheries and the likely consequences of alternative management strategies. This includes not only biological information on fish stocks and fishing mortality rates but also economic information on the activities of fishermen and the

performance of the fisheries sector". The ability to fully manage the fisheries resources of Liberia by BNF is considerably improving as compared to five to ten years ago. Besides the survey usually conducted by the Norwegian research vessel R/V Dr. Fritdjof Nansen to study the biomass of the Liberian waters, there is no alternative information on the biological and economic resources of Liberian waters. Garza-Gil *et al.* (2008) on the Galician fleet, maintains that "the biological state of these resources is unknown and sufficient information is not available to carry out a satisfactory evaluation". Presently, the control and management mechanisms applied by the BNF consist of minimum regulatory measures relating to the technical characteristics of fishing gear, vessels registrations and licensing systems, mesh size control, fish size limitations, fishing zones, method restrictions and vessel identification marking. These management mechanisms comprise the fisheries management system in place in Liberia. Today, the main inputs to fisheries management are biological assessments of the fish stocks and economic information about profitability in the fisheries (Utne 2008).

Presently, the BNF/MOA is working out modalities to have a closed area method and monitoring, control and surveillance (MCS) system put in place. The BNF is working assiduously to improve its fisheries management systems as it has now developed a fisheries policy (yet to be enacted), and is also working with international and regional bodies as well as international and local NGOs in this direction. As part of its recovery measures, two vessels were arrested early 2008, fishing illegally in Liberian waters. During the Fisheries Conference held in February 2008, Alhaji Jallow, senior Fisheries Officer at the FAO said: "If there's no compliance program on monitoring the illegal poaching, Liberia's vital marine resources will be depleted. There are between 20 and 30 registered vessels licensed to operate in the Liberian waters, but because of the lack of government capacity to patrol its coastline, we have received reports from small scale fishermen that dozens of foreign vessels operate illegally… mostly at night." Jallow told Integrated Regional Information Network (IRIN): "Numerous conflicts between artisanal fishermen and Liberian registered fishing vessels and/or poachers over the damages done to fishing gears and equipments of artisanal fishermen by commercial fishing trawlers have been reported. The BNF had on several occasions imposed fines and penalties on violators of fisheries rules and regulations in an attempt to discourage such conflicts and also to encourage sustainable fisheries as enshrined in the fisheries laws of Liberia. As quoted by IRIN, "according to Environmental Justice Foundation (EJF), Liberia loses $10 million every year to fish pirating." (IRIN n.d.).

A survey conducted by research vessel Dr. Fridtjof Nansen in 2007 revealed that "the coast of Liberia is generally characterised by a narrow shelf that breaks at around 100 m depth. A total of 20 swept-area trawl hauls were carried out. The total swept area biomass for the shelf of four countries (Liberia, Sierra Leone, Guinea and Guinea Bissau) was measured to be around 140,000 tons. Liberia had the lowest measured abundance of about 27,000 tonnes, but not substantially lower than Sierra Leone and Guinea. The exploitation situation in Liberia seemed good, with accumulated stock type length distributions being the norm." (BNF 2007).

3.3 Trawl fleet investment

The high intensity of investment and the significant excess of fishing capacity have not permitted an adequate yield on the investment made in fishing activity, endangering not only the preservation of natural resources but the long term economic and financial viability of the fishing industries. The significant level of state intervention in fishing, the existing institutional framework (especially that which refers to structural fishing aid) really must be considered when analysing the profitability and financial sustainability of the fishing companies (Rugueiro *et al* 2002).

Average rate of return (ARR) is an indicator that is based on the quotient between the annual return, measured by the gross cash flow (GCF), and an estimation of the value of the investment in the fishing industry. Another element to evaluate relates to the outlay the investor has to make when investing in a fishing vessel. It is considered that throughout the service life of a fishing vessel at least two relevant investments exist: the initial one to acquire the vessel and all the equipment necessary to carry out fishing activity and a later one maintenances. The expectation of obtaining a financial profitability from the investment in the fishing fleet increases if we consider the possibility of obtaining a subsidy to renovate the vessel (Rugueiro *et al.* 2002).

Whitmartsh *et al*. (2000), in his paper entitled "The profitability of marine commercial fisheries", stated that most cost and earnings surveys of commercial fisheries are based on a standard accounting framework and aim to collect data on the operating performance of vessels from which various measures of financial and economic surplus can be derived. Data obtained from costs and earnings surveys can therefore provide useful information to policy makers about the current state of fisheries and the levels of financial and economic surplus generated at a given moment in time. The fundamental limitation of such surveys, however, is that in themselves they give no guide to the potential profitability of a fishery.

Utne (2007) in one of her works quoting Trondsen and Vassdal said "the smallest vessels have a higher added value per kg catch than the largest vessels, independent of type of fishery. The reasons are most likely that the smallest vessels have much lesser capital costs and operating costs, shorter operating time, and probably better utilisation of catch. Still, the added value per man labour year is higher for the largest vessels."

To examine the influence of specific factors on the profitability of this sector, we may use costs and earnings data to undertake a sensitivity analysis of the effect of changes in the main parameters on vessel performance. Given a set of assumptions about the form of the revenue and cost function, it is a straightforward matter to derive sensitivity indicators in respect to the factors affecting profitability. The sensitivity indicator measures the percentage change in profitability as a consequence of a percentage change in a given parameter, taking a year as the base. The overall level of profit in the sea fishing industry depends crucially on how well access to the resource is controlled. Economic information on commercial fisheries is essential if an objective assessment is to be made of the performance of the fishing sector and the impact of different policy measures (Whitmarsh 2000).

A simple short-run forecasting model can be developed from costs and earnings data by making a number of assumptions about the stability and behaviour of some of the underlying relationships. The basic identity is:
Gross cash flow = Total revenue - running costs - crew payments - vessel costs assuming that for the individual boat:

(i) price is market-determined and independent of quantity landed,
(ii) running costs vary directly with fishing effort,
(iii) crew payments are based on an agreed share of net revenue,
(iv) vessel costs are fixed.

Accordingly, the profit function may be expressed as:
$II = pQ – cE – w\ (pQ – cE) – F$

Where II is the gross cash flow, p the price, Q the quantity landed, c the direct cost of effort, E the fishing effort, w the crew share, and F = the vessel costs (Whitmarsh 2000).

3.4 Market strategy

Thompson Jr. *et al.* (2005) stated in his book entitled "Crafting and executing strategy", that "companies in the same strategic group can resemble one another in any of several ways: they may have comparable product-line breadth, sell in the same price/quality range, emphasise the same distribution channels, use essentially the same product attributes to appeal to similar types of buyers, depend on identical technological approaches or offer buyers similar services and technical assistance." Trawl fleet fisheries industries in Liberia are in the same strategic group in terms of market position. In order to gain market expansion, these companies need to apply some marketing strategy; some of which may include opening more distribution channels especially outside the capital city; introduce new products into the market that will meet the consumers' taste and probably reduce price of competitive products. "When firms are successful in introducing new ways to market their products, they can spark a burst of buyer interest, widen industry, increase product differentiation, and lower unit costs –any or all of which can alter the competitive positions of rival firms and force strategy revisions."

Thompson Jr. *et al*. (2005) further stated that for a company that decides to expand outside its domestic market and compete internationally or globally, such company needs to apply some strategic options, some of which include:

- Maintain a national production base and export goods to foreign markets;
- License foreign firms to use the company's technology to produce and distribute the company's products;
- Employ a franchising strategy;
- Follow a multi country strategy;
- Use strategic alliances or joint ventures with foreign companies as the primary vehicle for entering foreign markets.

Marketing of fish is an essential element in the measurement of profitability of the trawl fisheries industry. Industrial and competitive analysis is conducted considering the industrial environment and providing answers to strategic marketing questions.

In order for a company to excel in an industrial environment, the external environment of the industry must be evaluated. This is important because there are certain driving forces that exert pressure on companies and have the biggest influence on changes that might take place in the industry. Some of these forces are within and some of them outside the industry. In the Liberian fisheries industry, some of the driving forces are distribution channels, changes in price of substitute goods, changes in buyers' attitude, market innovation and entry of new companies or exit of existing major companies, changes is production costs, changes in production capacity and changes in fisheries regulations by the government. The driving forces may cause demand of fish to increase or decrease, make competition more intense and may increase or reduce profitability in the industry. Evaluating the industry driving forces is a basis of thinking strategically about the future of a company and ability to face the challenges.

It is obligatory on the part of the managers of a company within the fisheries industry to know the market position of the company and where the company is heading. In order to do so, the best technique to apply is the strategic group mapping. This technique is an analytical tool that could be used in comparing the market position of each firm (or by group) within the industry.

4 METHODOLOGY

Many articles, journals and texts on profitability of trawlers have been written by many fisheries experts. Literature review on profitability of trawl fleet investment in Liberia is about references made available in published journals, textbooks and on-line articles as well as the writer's personal knowledge and experience on the subject matter. The methodology used in this work is sequential starting with the preparatory stage, followed by data collection, situational analysis, profitability analysis, risk assessment, and ending with market strategy.

4.1 Project methodology

The preparatory stage involved the review of characteristics of the 36 registered trawlers in the Liberian fisheries industry taking into consideration the size of trawlers, method of fishing and deck arrangement. Data on costs and revenue were also sourced from the fisheries companies and other relevant authorities. Data that was obtained and proved reliable only covered the period from January – June 2008. Two companies were considered for this work: Dong Yong Fisheries Corporation that operates mostly bottom trawlers with eight registered trawlers and Inter Burgo Industrial Fishing Company that operates mostly pelagic trawlers with six registered trawlers during the period mentioned above.

The profitability module developed by Professor Pal Jensson of the Economics and Business Department of the University of Iceland was used in order to estimate profitability in absolute and relative terms with data based on assumptions and hypothesis. Sensitivity analysis was performed to observe the changes in Net Present Value and Internal Rate of Return of trawl investments with changes in input variables. A scenario analysis was performed in order to see the combined effects of changes in the variables, and simulation was made to measure the potential

consequences on profitability of trawl fleet investment. The payback period was considered and financial ratios calculated.

4.2 Data collection

Data collection was carried out using the following method: (i) collection of data on quantity of fish landed, characteristics of vessels from BNF, collection of sales price and sales quantity data from trawl fleet managers in Liberia and other stakeholders (see Appendix 6); (ii) using questionnaires and semi-structured interviews (see Appendices 7and 8) to facilitate the information gathered; (iii) search of available electronic and printed research and text publications (see list of references); (iv) conducting fieldwork at a related trawl fisheries company in Reykjavik, Iceland and (v) from personal experience.

4.3 Situational analysis

Situational analysis looked at analysis on evolution of trawl fleets investment reflecting on the pre-war era [(1989-1997), (1998-2003] to the present (January – June 2008). Characteristics of trawl fleets were analysed from vessels' technical information (Table 2, page 16) provided through data collection, with respect to number, size, age and structure, method of fishing, fishing gears, fishing purpose; operations; engine and speed capacity and labour. Furthermore, current status and trends in trawl fleet investment in Liberia were analysed with respect to production, price sales and market volume with derivative questions on company strategic plans.

4.4 Profitability analysis:

The profitability module that was used in this project encompasses identification of indicators and various calculations of financial statements and ratios such as:

Summary on assumptions and results:

Net present value (NPV) of cash flow on capital and equity is calculated. This is a method of ranking investment proposals using the NPV, which is equal to the present value of future net cash flows discounted at the cost of capital. The assumption shows internal rate of return (IRR) on total capital and equity over investment year period, in this case 10 years. IRR on investment is defined as the discount rate that equates the present value of a project's expected cash inflows to the present value of the project's costs. Applying the IRR to rank investment proposal using the rate of return on an investment, is calculated by finding the discount rate that equates the present value on future cash inflows to the project's cost (Brigham and Houston. 2004). Also, minimum cash account was identified and percentage share on costs was shown in the cost breakdown table. The discount rate, interest rate, and tax rate are used as applicable in Liberia and debtors' charges to turnover and creditors' charges to variable costs were assumed.

Investment:

The value of interest, depreciation of assets, financing, loan repayment period and interest rate on loan were calculated. Investment worth at the end of each financial year was evaluated.

Cash flow:

Cash flow details the cash flow generated by the firm's operations, investments, and financial activities (Bodie *et al.* 2005). It identified the source of funds, allocation of funds, analyses the changes in current assets over liabilities, payback period, and using check line to determine its balance.

Operating statement:

Otherwise known as income statement or profit and loss statement, the operating statement is a financial statement that summarises the firm's revenue and expenses over an accounting period, a year in this case.

Balance sheet:

The balance sheet is a financial statement that shows a firm's financial position at a specific point in time. To ensure the accuracy of the balance sheet, a check line is used to check equality between assets and capital plus liability.

$$A = C + L$$

Where: A = assets,
C = capital and
L = liabilities.

Financial ratios analysis:

Financial statements report both on a firm's position at a point in time and on its operations over some past period. From the investors' standpoint, predicting the future is what financial statement analysis is all about. Financial ratios are designed to help one evaluate a financial statement (Brigham and Houston 2004). This work looks at calculations of the following ratios:

Return on investment (ROI)
Return on equity (ROE)
Turnover ratio
Capital ratio
Net current ratio
Liquid current ratio
Internal value of shares
Debt service coverage

Costs breakdown:

Capital outlay, variable and fixed costs for the operations of the two types of trawlers (bottom and mid water) were assumed. Details of all assumed costs were shown in the breakdown of costs table (Tables 9 and 10).

4.5 Risk

In capital budgeting, firms use various techniques to determine a project's risk and then to decide whether its profit potential is worth the risk. There are three distinct types of risk: stand alone risk, corporate risk and market risk. However, equally important to serve various purposes, it is more worthy to know the reason why a project's stand alone risk is important to anyone. The reasons are:

(i) it is easier to estimate a project's stand alone risk than its corporate risk, and it is far easier to measure stand alone risk than market risk;
(ii) in the vast majority of cases, all three types of risk are highly correlated – if the general economy does well, so will the firm, and if the firm does well, so will most of its projects. Because of this high correlation, stand-alone risk is generally a good proxy for hard-to-measure corporate and market risks.

The three techniques used for assessing a project's stand-alone risks are: sensitivity analysis, scenario analysis and Monte Carlo simulations (Brigham and Houston 2004).

Sensitivity analysis is used to answer "what if" questions; relative to changes in key input variables (unit sales, price, and equipment) using one variable at a time and the resulting changes in NPV. Scenario analysis also answers "what if" questions relative to changes in key input variables using various variables in order to see the combined changes in the variables. Monte Carlo measures sensitivity together with input variables based on probability distributions.

5 5 TRAWL FLEET FISHERIES INVESTMENT IN LIBERIA

In Liberia, trawl fleet investment dates back to 1938 when Woerman, a German company became the first to operate a trawler. This was followed by full scale industrial trawl fisheries in the mid 1950s with the Messurado Group of Companies (MGC) which later became a dominant force in Liberian fisheries when it began operations in the mid 1960s (BNF 2008). During the pre-war era, there were five trawl fleet fisheries companies in Liberia operating a total of six boats per year on average, fishing for demersal species. In 1979-1980, the number increased to eight companies operating 41 vessels out of which there were 12 stern trawlers, 12 twin-rigged trawlers and the rest operated with different deck arrangements. These trawlers had Gross Rate Tonnage (GRT) ranging between 47 mt and 201 mt, Net Rate Tonnage (NRT) of 22 mt – 101 mt; length of 20 m – 50 m and width of 6m – 7m, fishing for both pelagic and demersal species including shrimps (FAO n.d).

Several trawl fisheries companies sprouted up after MGC and were all known to have been successful. The revolutionary coup of 1980 led to the collapse of MGC and subsequently the 14 year civil war of 1989–2003 led to the extinction of other fisheries entities. Realising the potential of trawl fleet investment in Liberia, some investors regained entrance into the industry seizing opportunity of relative peace that evolved at every phase of the protracted war.

5.1 Situational analysis

The trawl fleet in Liberia is made up of trawlers that fish in the water area of the east and central Gulf of Guinea. The fishing hauls last for a maximum of three hours with a variety of fishing gears and the trawlers mostly spend an average of 45 days at sea in compliance with the fisheries regulation. Fishing is carried out throughout the year but usually record low catches during the rainy season (April – September) as a result of rough weather conditions and biological factors. The trawlers target demersal and

pelagic species with most of the catch landed at the Monrovia fishing harbour. It is widely believed that catch is smuggled out of the country by illegal landings at sea (transhipment), but there is no data available in conformity to the landings at sea.

During the interviews conducted as part of the preparatory stage of this work, information revealed that in January – June 2008, there were four registered trawl fisheries companies in Liberia, engaged in fish catching activities operating 36 vessels with a combined GRT of 542.2 mt with onboard freezing, processing and storage facilities as compared to 40 vessels in the same period of 2007. Only two out of the four active fishing companies (privately owned) operate their own trawlers that target pelagic and demersal fish and they also serve as agents to foreign trawl fleet investors, while the other two only serve as agents and have no trawlers. All these companies import fish in large quantity to supplement supply to the local market due to high demand.

5.1.1 Characteristics of the trawl fleet

Table 2 below lists the characteristics of the 36 vessels engaged in both bottom and mid water trawling, targeting fish and shrimps, belonging to the four trawl fleet fishing companies that fall under the BNF vessel registration system for the first and second quarter of 2008. Vessels have the option of annual, bi-annual and quarterly registration, but the most common is the quarterly and the bi-annual. Out of the 36 vessels, 23 are engaged in bottom trawling belonging to three companies and 13 in mid water trawling belonging to two companies. Only one of these companies engages in both methods of trawling. There are 17 vessels belonging to the four companies that target fish using stern trawlers and 19 vessels belonging to two of the companies that are registered to target shrimps using outriggers otherwise known as shrimpers. Out of the total number of trawlers, there are 33 freezer trawlers and 3 factory trawlers. The company that has the highest number of trawlers under its fleet has 20. The length of these trawlers ranges between 20.41 m and 52.04 m; GRT of 60 m – 349 m, engine power of 220 hp – 1800 hp and speed of 10 knots – 12 knots. The average of the fleet is estimated at 35 years and the average number of crew on board a trawler is 17.

Table 2: Vessels technical information

BUREAU OF NATIONAL FISHERIES
VESSELS TECHNICAL INFORMATION
FOR THE PERIOD JANUARY- JUNE 2008

COMPANY	NO OF TRAWLER	METHOD		PURPOSE		DECK ARRANGEMENT		CATEGORY		SIZE (AVERAGE)			TONNAGE (AVERAGE)		HOLD CAPACITY	AVERAGE AGE OF VESSEL	ENGINE (AVERAGE)		AVERAGE CRE ON BOARD
		Bottom (Demersal)	Midwater (Pelagic)	Fish	Shrimp	Stern	Outrigger	Freezer	Factory	Length(m)	Width (m)	Depth (m)	GRT	NRT	(Ton)	Years	Hp	Knot	
Dong Yong Fishing Corportation	8	8	0	2	6	2	6	8	0	25.10	5.47	2.68	86.82	40.79		15	405.5	10	13
Inter-Burgo Industrial Fishing Co.	6	0	6	6	0	6	0	5	1	30.16	4.1	3.7	143.33	23.67	30	18	1483	12	15
Monrovia Fishing Company	20	13	7	7	13	7	13	20	0				132						
Star Fishing Agency	2	2	0	2	0	2	0	0	2	52.04	35	9.27	180	97.47	45	33	500	10	23
TOTAL	36	23	13	17	19	17	19	33	3	107.30	44.57	15.65	542.15	161.93	75	66	2388.5	32	51

Source: Bureau of National Fisheries, Ministry of Agriculture, Monrovia

5.1.2 Current status and trends

Data from the BNF revealed that the amount of fish landed locally by all trawlers was estimated at 430 mt and 659 mt for the first and second quarters of 2008 respectively. It is, however, believed that the catch is grossly under reported and there is strong suspicion that a number of fishing vessels are engaged in illegal transhipment in high seas which is not reflected in the national statistics. Catch statistics reported by observers assigned on board fishing vessels are also not reliable because of the poor salary paid to the observers and high probability of conniving with the fleet captains to carry out illegal, unreported and unregulated (IUU) fishing. The annual catch landings can be estimated at 2,178 mt and average production per vessel is estimated at 61 mt per annum. There is no data provided on discards and other IUU fishing activities. It is noteworthy to mention here that the landings recorded are for local consumptions. Data on export products are not made available by any of these companies.

5.1.3 Production, price, sales and market volume

Landed fish is packaged into carton or sac, each weighing 20 kg tagged with price according to species; though fish that weighs above 20 kg is considered loose fish and attracts a different price. The price per carton of fish varies (between US $40.00 – US $50.00) among the companies depending on the type of species. The sales volume record for January – June 2008 shows Dong Yong Fisheries Corporation (US $828,155.00), Inter Burgo Industrial Fishing Company (US $1,083,685.00), Monrovia Fishing Company (US $211,866.25) and Star Fishing Agency (US $40,275.00) (See Appendix 6 for details).

Figure 5 shows the market share (sales volume) of the four fisheries companies in Liberia. Inter Burgo Industrial Fishing Company which is majorly involved in pelagic fisheries has 50% of the market share, Dong Yong Fishing Corporation, involved in demersal fisheries has 38%, Monrovia Fishing Company and Star Fishing Agency have 10% and 2% shares of the market volume respectively.

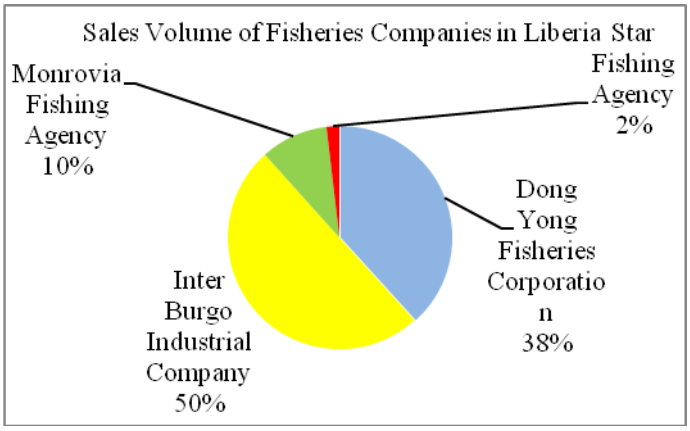


Figure 5: Market share (sales volume) of trawl fleet fisheries companies in Liberia
Source: Dong Yong Fisheries Corporation, Inter Burgo Industrial Fishing Company,

According to Thompson *et al.* (2005), it is necessary to answer the following questions in order to get a better understanding of the external environment and strategic position of the trawl fleet companies in Liberia:

1. What are the industry's dominant economic features?

2. What kind of competitive forces are industry members facing?
3. What factors are driving industry changes and what impacts will they have?
4. What market positions do rivals occupy – who is strongly positioned and who is not?
5. What strategic moves are rivals likely to make next?
6. What are the key factors for future competitive success?
7. Does the outlook for the industry present an attractive opportunity?

Considering the above questions, they will now be looked at one at a time respective to the situation in Liberia.

1. The dominant economic features in the Liberian trawl fleet industry include the market size and growth rate, scope competitive rivalry and number of rivals, buyer needs and requirements, production capacity, capital requirements and ease of entry and exit; product innovation and degree of product differentiation, industry geographical location and economy of scale.

Market size and growth rate:

The market size of the trawl fisheries industry in Liberia is relatively small. Though there was fluctuation in the level of production between 1997 and 2007, it is noteworthy to mention that the production almost doubled in 2007 as compared to 2006. The sharp increase in production in 2007 could be attributed to the presence of fisheries inspectors whose responsibilities include collection of fisheries data and making reports on IUU activities, on board fishing vessels.

The market growth has been fluctuating over the years until 2005 when the industry started experiencing steady growth as depicted in Table 3 below. The data provided for 2007 proves more reliable than the previous years due to the presence of fisheries inspectors on board fishing vessels as of 2007. As shown in Table 4 below, the share of industrial fisheries in total production was 65% in 2007 as compared to previous years which fall between 30% and 42%. Considering 2007 as the base year, the annual growth rate of the trawl fisheries industry is 91% and the percentage change in total industrial production is 90.9; while the percentage of industrial to total marine production is 65%. All these figures are the highest on the table which is enough justification of the reliability of data provided in 2007.

Table 3: Trawl production by fisheries companies in Liberia for January - June 2008

BUREAU OF NATIONAL FISHERIES

TRAWL PRODUCTION BY COMPANIES

JANUARY - JUNE 2008

SPECIES	COMPANY								TOTAL			
	DONG YONG FISHERIES		NTER BURGO IND. FISHIN		MONROVIA FISHING		STAR FISHIHG					
	Production		Production		Production		Production		Production			
	(ton)	(value)US$	(ton)	(value)US$	(ton)	(value)US$	(ton)	(value)US$	(ton)	% to Total	(value)US$	% to Total
PELAGIC	71.48	141,165.00	311.92	513,800.00	24.39	36,146.25	0	0.00	407.79	37.44	691,111.25	31.94
DEMERSA	296.80	682,130.00	271.56	558,215.00	82.06	157,220.00	16.11	40,275.00	666.53	61.19	1,437,840.00	66.44
SHRIMP	1.62	4,860.00	3.89	11,670.00	9.37	18,500.00	0.00	0.00	14.88	1.37	35,044.88	1.62
TOTAL	369.90	828,155.00	587.37	1,083,685.00	115.82	211,866.25	16.11	40,275.00	1,089.20	100.00	2,163,996.13	100.00

Source: Bureau of National Fisheries, Ministry of Agriculture, Monrovia

According to Table 4 below, the percentage change in pelagic production at the end of 2007 shows a 367% increase; demersal shows 180% and shrimp shows 0.88% in the same year. The percentage change in shrimp production in 2007 which is our base year is the lowest in the table. The figure is expected to increase with the presence of fisheries inspectors assigned on board vessels, but as mentioned earlier, the possibility of fisheries inspectors conniving with vessels captains cannot be ruled out due to the poor salaries paid to the inspectors. There is an indication that pelagic production is higher than that of demersal. Comparatively, Inter Burgo Industrial Fishing Company which is majorly involved in pelagic fishing recorded a slight increase in its demersal production over pelagic, however, it gained a market share over other companies as previously stated. Monrovia Fishing Agency, which registered 13 outrigger vessels, recorded the highest shrimp production of 9.57 metric tons valued at US $18,500.

Table 4: Market size of trawl fisheries relative to artisanal and industrial fisheries of demersal , pelagic and shrimps in Liberia

MARKET SIZE OF TRAWL FISHERIES COMPANIES IN LIBERIA

FISHERIES PRODUCTION BY TRAWL (in metric tons)

FOR THE PERIOD 1997-2007

YEAR	SPECIES												TOTAL INDUSTRIAL PRODCTION	% CHANGE IN TOTAL INDUSTRIAL PRODUCTION	ANNUAL PRODUCTION (1997-2007)			
	PELAGIC				DEMERSAL				SHRIMP									
	TOTAL	ARTISANAL	INDUSTRIAL	% Change in Industrial Production	TOTAL	ARTISANAL	INDUSTRIAL	% Change in Industrial Production	TOTAL	ARTISANAL	INDUSTRIAL	% Change in Industrial Production			ARTISANAL	INDUSTRIAL	TOTAL	% of INDUSTRIAL TO TOTAL
1997	2,903	1,844	1,059		1,410	896	514		89	57	32		4,402		2,750	1,579	4,329	36.47%
1998	4,452	2,541	1,911	80.45	1,800	1,027	773	50.21	139	79	60	83.77	6,391	45.18	3,591	2,700	6,291	42.92%
1999	5,948	3,399	2,549	33.40	4,483	2,562	1,921	148.67	306	175	131	119.80	10,737	68.00	5,992	4,493	10,485	42.85%
2000	5,015	3,299	1,716	-32.68	2,037	1,340	697	-63.72	66	43	23	-82.78	7,118	-33.71	4,663	2,425	7,088	34.21%
2001	4,080	2,631	1,449	-15.53	2,180	1,406	774	11.12	67	43	24	5.40	6,327	-11.11	4,064	2,239	6,303	35.52%
2002	4,537	3,077	1,460	0.70	2,255	1,530	725	-6.33	80	54	26	8.13	6,872	8.61	4,641	2,201	6,842	32.17%
2003	4,382	3,051	1,331	-8.80	2,220	1,546	674	-7.04	80	56	24	-5.57	6,682	-2.76	4,630	2,020	6,650	30.38%
2004	5,850	4,041	1,809	35.93	4,438	3,065	1,373	103.55	306	211	95	289.47	10,594	58.55	7,126	3,191	10,317	30.93%
2005	5,615	3,402	2,213	22.29	3,177	1,925	1,252	-8.79	288	175	113	19.91	9,080	-14.29	5,511	3,584	9,095	39.41%
2006	3,395	2,209	1,186	-46.40	4,414	2,872	1,542	23.16	190	124	66	-41.52	7,999	-11.91	5,391	2,894	8,285	34.93%
2007	8,522	2,983	5,539	367.09	6,646	2,326	4,320	180.18	103	36	67	0.88	15,271	90.91	5,654	10,500	16,154	65.00%
TOTAL	54699	32,478	22,221		35,060	20,495	14,565		1,714	1,053	661		91,473		54,013.00	37,826.00	91,839	41.19%

Statistical data for fish exports are mostly obtained from the industrial fisheries sub-sector. The volume of fish exported by local fishermen and individuals is insignificant. According to FISHSTAT, the fisheries database of FAO, the Liberian fisheries export market is relatively small as shown in Table 5 below. The export value for 2007 which is considered our base year is not available, but unofficial data from the BNF show that 38.41 [2]metric tons of fish valued over US $804,000[3] was recorded in 2007. After fluctuation between 1997 and 2004, the export market value has been growing steadily since 2005. Though, there was a drop in percentage change in quantity for 2003 and 2004, but the percentage change in value increased sharply. This sharp increase in value could be attributed to the appreciation of the Liberian dollar against the US dollar at the time. The value of the currency exchange rate at the end of 2003 was LRD 50.50: US $1[4].

[2] Unofficial export quantity from BNF

[3] Unofficial export value from BNF

[4] Source: Central Bank of Liberia

Table 5: Liberia fish export statistical data for 1997-2007

LIBERIA FISH EXPORT				
QUANTITY AND VALUE				
FOR THE PERIOD 1997-2007				
Year	Quantity (metric ton)	% Change in Quantity	Value US$(000)	% Change in Value
1997	19.99		18	
1998	20.01	0.10	11	-38.89
1999	20.07	0.30	64	481.82
2000	20.32	1.25	49	-23.44
2001	20.70	1.87	85	73.47
2002	21.53	4.01	80	-5.88
2003	20.86	-3.11	178	122.50
2004	20.55	-1.49	383	115.17
2005	20.83	1.36	391	2.09
2006	22.42	7.63	639	63.43
2007	38.41	71.32	804	25.82
TOTAL	245.69		2,702	

Source: Fish stat FAO

Scope competitive rivalry and number of rivals:

The trawl fisheries industry in Liberia is composed of four companies that are involved in trawl fisheries activities as earlier mentioned. The two leading companies, Inter Burgo Industrial Fishing Company and Dong Yong Fisheries Company, both Korean owned, have similar operation methods – they own trawlers to themselves, two each and they also import fish to the domestic market. The other two companies, Monrovia Fishing Company (Liberian owned) and Star Fishing Agency (German owned) have somewhat similar operation methods, even though they do not have trawlers to themselves, but only operate as agents and also import fish into the domestic market. All effort to obtain data on the volume of foreign market from these trawl fisheries companies proved futile, and it was revealed that out of the four trawl fisheries companies in Liberia, only Dong Yong Fisheries Corporation imported fish for the period between January and June 2008. It is, however, believed that they earn more profit from foreign trade than is registered in the export figures as they carry out transhipment at sea seizing the opportunity of poor monitoring, control and surveillance (MCS) system in Liberia. These companies have been in business in Liberia for over 15 years and continue to expand their shore based cold room facilities. Table 6 shows importers of fish in Liberia.

Table 6: Fish import quantity by fish importers in Liberia

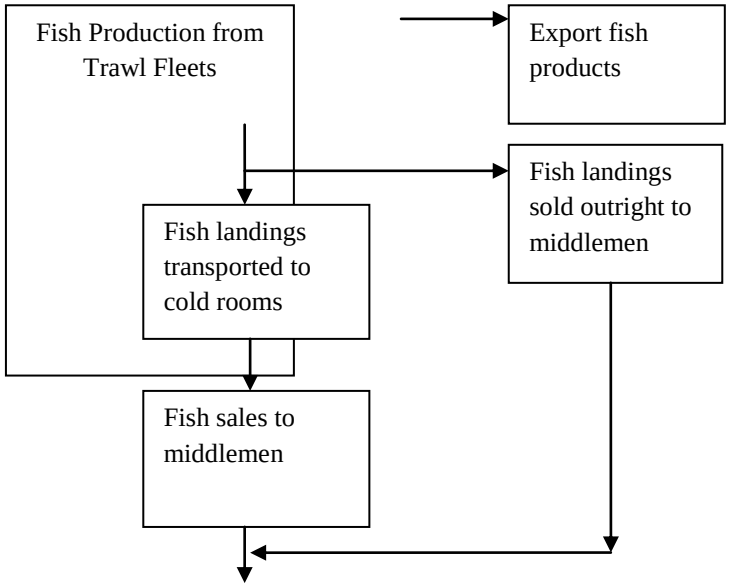
BUREAU OF NATIONAL FISHERIES	
TRAWL FISHERIES AND NON TRAWL FISHERIES COMPANIES	
FISH IMPORT FOR MARCH - AUGUST 2007	
COMPANY	QUANTITY (metric ton)
African Fisheries	180
West Africa Enterprise	3,330.00
Sham Inc.	3,760.06
Cheatou Brother Inc.	1,873
Caroline Frozen Food	400
Dong Yong Fisheries	450
Inter Burgo Industrial Fishing	0
Monrovia Fishing Company	0
Star Fishing Agency	0
TOTAL	9,993

Source: Bureau of National Fisheries, Ministry of Agriculture, Monrovia

However, these companies face challenges from importers of fish and fisheries products who import fish in large quantity to the local market. Statistics from BNF revealed that the number of fish importers rose from 5 to 7 between 2007 and 2008 and the number of trawl fisheries companies[5] remained the same within the same period. Table 6 below shows importers of fish in Liberia.

Buyer needs and requirements:

At present, there is no fish production plant in Liberia. The trawl fisheries companies in Liberia are majorly involved in sales of frozen un-gutted fish. The flow channel is - from the trawlers to the cold room, then to the middlemen who later sell on retail to consumers in the local market as can be seen in the distribution channels flow chart below (Figure 6). Buyers (middlemen) look for products with longer shelf life and species that are demand driven. Another attribute that causes buyers to choose one company over the other is price and distance from point of sale. The number of buyers (middlemen) cannot be estimated as a survey is yet to be conducted in that regard.



[5] Highlighted in grey colour in Table 6

Figure 6: Distribution channels flow chart

Production capacity:

Production varies among the trawl fisheries companies. The monthly catch landings (Table 7) for the four trawl fisheries companies in Liberia revealed that in the first quarter, a total catch landing of 429.9 metric tons was recorded with the highest figures in March (49.2%), followed by February (28.7%) and January (22.1%). Dong Yong Fisheries Corporation alone landed 56% of the total. On the aggregate, a total of 1,088.8 metric tons was recorded by all the companies for the two quarters with Dong Yong Fisheries Corporation 34.0%, Inter Burgo Industrial Fishing Company 54.0%, Monrovia Fishing Company 10.6% and Star Fishing Agency 1.5%. Below is a table showing the monthly catch of the trawl fleet fisheries in Liberia.

Table 7: Monthly catch landed by trawl fisheries companies in Liberia (January-June 2008)

BUREAU OF NATIONAL FISHERIES
FISHERIES COMPANIES IN LIBRIA
MONTHLY CATCH LANDED FOR JANUARY - JUNE 2007 (in metric tons)

	1ST QUARTER				2ND QUARTER				TOTAL PRODUCTIO	%
COMPANY	JANUARY	FEBRUARY	MARCH	TOTAL	APRIL	MAY	JUNE	TOTAL		
Dong Yong Fisheries Corporation	0.00	0.00	0.00	0.00	54.10	303.42	12.38	369.90	369.90	33.97
Inter Burgo Industrial Fishing Company	94.90	59.94	211.51	366.35	158.57	39.80	22.65	221.02	587.37	53.95
Monrovia Fishing Company	0.00	47.50	0.00	47.50	45.50	10.12	12.30	67.92	115.42	10.60
Star Fishing Agency	0.00	16.11	0.00	16.11	0.00	0.00	0.00	0.00	16.11	1.48
TOTAL	94.90	123.55	211.51	429.96	258.17	353.34	47.33	658.84	1,088.80	100.00
%	22.07	28.74	49.19	100.00	39.19	53.63	7.18	100.00		

Source: Bureau of National Fisheries, Ministry of Agriculture, Monrovia

Capital requirements and ease of entry and exit:

The trawl fleet investment in Liberia is capital intensive. The low number of trawlers owned by the companies themselves is an indication of the huge capital that is required to enter into the industry. The two companies that own vessels themselves have two vessels each and the rest of the vessels in the industry's fleet are owned by foreign investors for whom the Liberian companies serve as agents. The survey indicated that only the above mentioned four trawl fisheries companies have gained control of the industry for the past 10 years. Another company, Continental Fishing Agency, (Liberian-German owned) which was operating along with the four had long ceased operations as far back as two years ago. An interview with the management of the company revealed that the company is still legally registered in Liberia and hopes to resume operations as soon as possible. Propensity to exit the industry is as high as to gain entry. This opinion stems from the physical evidence of cold store room and facilities of companies that had folded operations and some which are now solely engaged in fish import activities. Examples of such companies are Messurado Group of Companies, Italian Liberian Fisheries Enterprise, West African Fisheries and Liberia Katopas Fishing Company.

Production innovation and differentiation:
Production output varies among the trawl fisheries companies in Liberia. Production and services of rival companies are essentially identical and as such have no effect on price. Virtually, the operation methods, distribution channels, methods of sales are more or less the same.

Industry geographical location:
All the trawl fisheries companies compete in the same local area serving a nation of about 3.3 million people with major market concentration in the capital city of Monrovia which has a population of about 1 million people. The companies are all located within the same geographical environment (around the fishing harbour) within a 5 mile radius. These companies do have foreign markets which contribute to their long term competitive success. The transportation of products to cold rooms is dissimilar for the companies as the distance of each company from the harbour to the company site varies. Inter Burgo located farthest from the harbour has a disadvantage when it comes to transporting landed fish from harbour to cold room, while Dong Yong Fisheries on the other hand is located nearest to the harbour, an so has an advantage. Inter Burgo has bigger shore based facilities and is also involved in other business activities like entertainment, sales of Freon and hiring of trucks.

Scale economies:
The economy of scale in the industry is low.

2. The competitive forces in the trawl fisheries industry are intra and inter. As earlier mentioned, the intra forces are limited to rivalry among four companies whose operations methods are identical, while the inter forces include large scale importers of raw fish and fisheries products, canned fish products, meat and poultry products and other sources of protein. According to the BNF (2007) report, 9,994 metric tons were imported into the country between March and August 2007. Resistance to the potential entry of new competitors into the industry which can be considered another competitive force is high, due to the intensive capital required to invest in trawlers.

A fall in price of substitute commodities can cause consumers to reduce the demand for fish, thus causing a downward shift in demand curve of fish. In Liberia, the price of substitute commodities is high compared to the price of fish. From all indications, Liberians consume fish more than any other source of animal protein because fish is relatively affordable and readily available. Equally, on the other hand, any attempt by any of these fisheries companies to increase price will automatically lead rival companies and other competitors to gain market volume.

Buyer-seller or seller-buyer competitive pressures are not imminent in the fisheries industry in Liberia as they are both inter-dependent relative to the forces of demand and supply principles of economics.

According to Porter's five forces mode of competition as stated in the work of Thompson *et al.* (2005), it holds that the state of competition in an industry is a composite of competitive pressures operating in five areas of the overall market as shown in the model below (Figure 7).

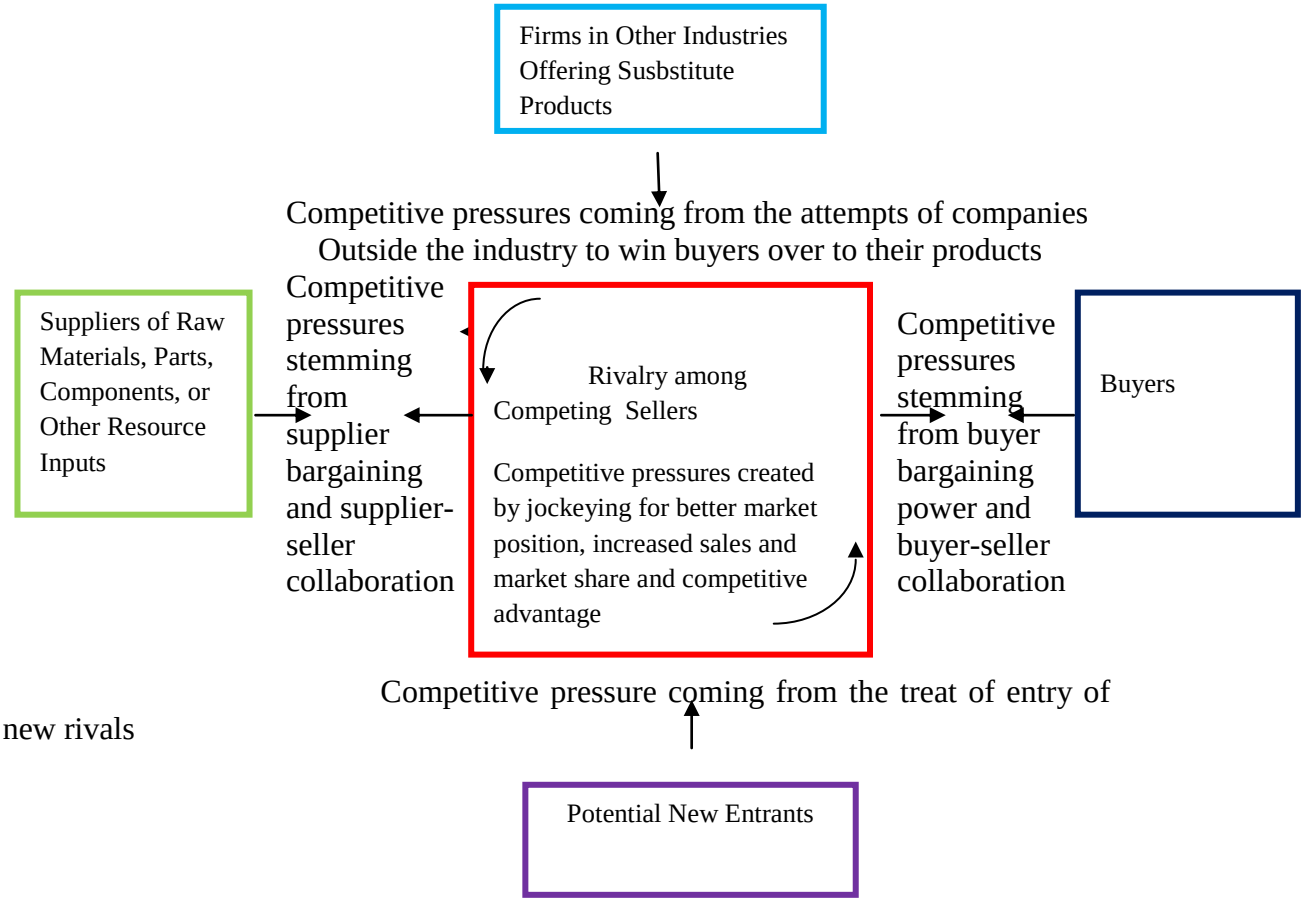


Figure 7: Michael E. Porter's Five Forces Model of Competition
Source: Thompson *et al.* (2005)

From the Liberian scenario, the sellers control the industry in terms of production and price. Though these companies are strong, when there is overproduction which sometimes occurs as a result of co-incidental landings by trawlers of each of the companies, the suppliers are forced to reduce price in order to increase demand. Firms in other industries offering substitute products, such as suppliers of poultry products, are strong. A fall in price of substitute goods by these suppliers will lead to a fall in demand for fish; thus reducing the revenue intake of fisheries companies. Suppliers of raw materials and other resource inputs include suppliers of package boxes, fishing gears and other accessories (foreign companies) while buyers are majorly fish mongers who sell to the consumers at retail price. Though there is no barrier to entry, threat of new entry into the industry is minimal as the industry is capital intensive. Rivalry among competing sellers is not visible as they all have similar modes of operation with each of the companies providing customer services in order to gain a wide market. Buyers' competitive pressure in this industry is weak as buyers are few and do not form themselves into a unified body; thus allowing the sellers to dominate them.

3. The trawl fleet industry in Liberia is relatively small as there are only four companies engaged in trawl fleet with a total number of 36 vessels and no growth over the years, for comparison, the number of registered vessels was 40 in the year 2007. Recently, during the preparation phase of this work, the writer gathered data on

the domestic market value of fish produced by the trawl fisheries industry. According to the information, the value of the domestic market for the first and second quarter of 2008 is US $2,163,981.00. Export market value can hardly be determined as these companies engage in transhipment, i.e. selling of products to factory vessels on the high seas; thus underreporting the export market value, if reported at all. However, according to BNF (2006) report, the export value recorded in 2005 stood at US $702,000 for 84 metric tons.

4. The trawl fisheries industry in Liberia competes with importers of fish and fisheries products. The industry also engages in import activities to maintain customers and increase profit. Production capacity of estimated 2,178 metric tons per year is relatively low (and grossly under estimated) but as such, these trawl fisheries companies along with other importers of fish and fisheries products import fish in large quantity to supplement demand. According to BNF (2008), 9,994 metric tons were imported into the country between March and August 2007. Buyers (middlemen) only choose species that attract high revenue and sometimes opt for imported fish and fisheries products depending on demand and price. These companies have shore-based facilities; majorly cold store rooms in which they keep landed fish for future sales. They use similar fishing gear technology and need strong technological capabilities in order to meet demand.

5. Looking at the market positions of the rival companies, the next question that might be likely to come to mind could be what strategic moves are rivals likely to make? Obviously, these companies know each others indifference operational methods, yet any of these companies that would want to stand out needs to conduct competitive intelligence on the rivals' latest moves, strengths and weaknesses. Already, the two leading trawl fisheries companies in Liberia have applied strategic moves like lowering costs compared to rivals and efficient transportation systems. Notwithstanding, these companies need to apply strategic moves like efficient production, sales, marketing, promotion and distribution strategies, scope of geographic coverage and better product design and quality management as all these strategies are lacking in the trawl fisheries industry in Liberia..

6. Thompson *et al.* (2005) stated "that industry's key success factors are those competitive factors that most affect industry members' ability to prosper in the marketplace – the particular strategy elements, product attributes, resources, competitive capabilities and market achievements." The key successive factors for the two leading trawl fisheries companies in Liberia is that Dong Yong Fisheries Corporation is known for producing demersal species that have high value and is closer to the fish harbour where middlemen purchase their products at a cheaper rate while Inter Burgo Industrial Fishing Company is noted for producing pelagic species and has a fleet of refrigerator vans that are used in transporting landed products to cold rooms and at the same time they rent out these vans to rival companies when required. The key success factors are manufacturing related in that they have high utilisation of fixed assets as they have large cold rooms and large administrative buildings, low-cost plant locations due to their nearness to the fishing harbour, access to adequate supply of skilled labour, good customer care services, quality products and low cost of production as they bear majorly, cost for fuel, feeding of crew, crew salary and maintenance in the course of operations. They have also distribution related success factors in that they have low distribution costs as they only sell to middlemen

that call at their cold room and are majorly responsible for distribution to local consumers.

7. Though sales of export products and other financial information are not made available by these companies, but from the data on the industry's growth rate, market volume (local and export) provided herein and also from the author's personal analytical point of view, the present outlook of these companies shows an attractive opportunity. The level of competition provides profitability and possibilities exist that competitors could become stronger. However, there are degrees of risk and uncertainty in the industry which include failure of GOL to carry out constant surveillance of the coastal waters of the country, new entrants into the industry and registration of more companies that engage in fish import may lead to the industry's unprofitability in the long run. Though presently the industry's profitability is above average, continuous persistence of problems like high costs of production, unprotected resources availability and production inefficiency could make the industry unprofitable. There are prospects for the industry's profitability if these companies could get involved in production diversification and/or expansion by producing canned fish products, fish and animal feeds and other fisheries products.

5.2 Profitability analysis

5.2.1 Production, sales revenue and costs

In order to calculate the profitability of trawl fleet investment in Liberia using the profitability module developed by Professor Pall Jensson, a closer look at the production, sales revenue and costs of the two common types of trawl fleets in Liberia (bottom and mid-water trawl) is necessary. Table 8 below shows the average production and sales revenue from trawl vessels of both the Dong Yong Fisheries Company, a company involved majorly in bottom trawl and Inter Burgo Industrial Fishing Company, a company involved majorly in mid-water trawl. Table 8 shows the average calculation of sales and catch by trawl fisheries companies in Liberia on annual total production (based on the projection of data provided for January – June 2008).

Table 8: Average sales and catch by trawl fleet fisheries companies for January-June 2008

AVERAGE CALCULATION
SALES AND CATCH ANALYSIS BY COMPANY
FOR JANUARY - JUNE 2008
COMPANIES: DONG YONG FISHERIES INC. & INTER BURGO INDUSTRIAL FISHING CO

ITEM	COMPANY	
	DONG YONG FISHERIES INC.	INTER BURGO IND. FISHING CO.
Yearly Production (in metric ton)	739.80	1,174.74
Quanatity of Landing/Trip (in metric ton)	91.21	144.83
Revenue of Landing/Year (in US$)	1,664,550	2,349,480
Revenue/Landing per Trip (in US$)	205,218	289,662
Price/Carton (in US$)	45.00	40.00
Number of Days/Trip (in days)	45	45
Number of Trip/Yr (in trip)	8	8
Carton/Ton (in quantity)	50	50
Price/Ton (in US$)	2,250	2,000
Kg/Ctn (in kg weight)	20	20

Source: Dong Yong Fisheries Incorporated and Inter Burgo Industrial Fishing Company

5.2.2 Profit maximisation

Breakdown of costs:

Profit maximisation is the goal of every investment. In order to determine the profitability of trawl fleet investment in Liberia, a closer look at the breakdown of costs is needed. Tables 9 and 10 below show the cost breakdown of a mid water trawler and a bottom trawler, using information from both the Dong Yong Fisheries Company and the Inter Burgo Industrial Fishing Company.

For this profitability analysis it is assumed that the capital outlay for bottom trawl investment (demersal) including equipment is US $7,500,000. Estimation for a fairly used trawler found on the internet at a ship broking firm (maritimesales.com n.d) revealed that a similar trawler as shown below (Figure 8) is priced at a US $6 million and has a length of 40 m, breadth of 10 m and draft of 4 m. The speed is 13.5 knots, fishing range of 55 days per trip. Constructed in 1991, the trawler has a GRT of 516 and NRT of 212. The trawler's engine is 1,470 hp, a 265 KVA generator with fuel capacity of 160 tons and water capacity of 50 tons. The refrigeration on board has a capacity of 12 tons/24hr, fuel consumption rate of 3.5 tons/24hr. The trawler has navigational equipments like echo sounder, radio, GPS plotter and other radar equipment. The trawler shown below is similar to the trawlers used in Liberia.

Figure 8: Pictorial view of a trawler that is used for both demersal and pelagic fishing
Source: Maritime Sales, Inc.

Table 9 shows that the variable cost for the first year of operations is put at US $1,532,500 for an estimated catch of 740 tons that year, or a cost of US $2,071 per ton. The fixed cost is estimated at US $1,435,000 per year; thus making a total cost of operations for the first year of US $2,967,500. The capital outlay is valued at US $5,500,000 plus an additional US $2,000,000 for equipment, making a total of US $7,500,000 for initial investment. This is an indication that the investment is lucrative and also an evidence that the catch is grossly underreported as earlier mentioned.

Table 9: Cost breakdown of demersal trawl fleet investment in Liberia

DONG YONG FISHERIES INCORPORATED					
DEMERSAL TRAWL FLEET INVESTMENT, VARIABLE AND FIXED COST					
(in US$)					
INITIAL INVESTMENT		VARIABLE COST		FIXED COST	
Vessel	5,500,000.00	Fuel	1,140,000	Salary	1,088,000
Gear & Equipment	2,000,000.00	Engine Oil	161,000	Administration	40,000
Other		Feeding	72,000	Insurance	180,000
Total	7,500,000.00	Ice	108,000	License	100,000
		Harbor Dues	20,000	Maintenance	16,000
		Shore Labor	20,000	Repairs	3,000
		Commission	2,000	Gear Expenses	5,000
		Crew Travel	5,000	Equipment Hire	3,000
		Boxes	2,000	Other Fleet Costs	0
		Store	1,000	Total	1,435,000
		Subscription	500		
		Other Expenses	1,000		
		Total	1,532,500		
		Total Catch (in metric ton)	740		
		Cost Price/ton (in US$/ton	2,071		

For investment in a mid water trawler (Table 10), on the other hand, capital outlay is valued at US $5, 500,000 plus US $3,000,000 for equipment, thus making a total of US $8,500,000 initial investment. The variable cost is US $1,543,500 calculated at US $1,314 per ton. The fixed cost is assumed to be US $1,931,000 per year. The total operational cost is valued at US $3,474,500 per year. This table also shows that the investment is capital intensive.

Table 10: Cost breakdown of pelagic trawl fleet investment in Liberia

INTER BURGO INDUSGTRIAL FISHING COMPANY					
PELAGIC TRAWL FLEET INVESTMENT, VARIABLE & FIXED COST					
(in US$)					
INVESTMENT		VARIABLE COST		FIXED COST	
Vessel	5,500,000.00	Fuel	1,140,000	Salary	1,496,000
Gear & Equipment	3,000,000.00	Engine Oil	161,000	Administration	64,000
Other		Feeding	72,000	Insurance	216,000
Total	8,500,000.00	Ice	108,000	License	120,000
		Harbor Dues	20,000	Maintenance	24,000
		Shore Labor	25,000	Repairs	3,000
		Commission	2,000	Gear Expenses	5,000
		Crew Travel	7,500	Equipment Hire	3,000
		Boxes	3,000	Other Fleet Costs	0
		Store	2,000	Total	1,931,000
		Subscription	1,000		
		Other Expenses	2,000		
		Total	1,543,500		
		Total Catch (in metric ton)	1,174.74		
		Cost Price/ton (in US$/ton)	1,314		

For both the demersal and pelagic trawlers (Table 11), it is assumed that the discount rate is set at 25%, loans are 40% of project's financing and the loan repayment period is 10 years with an interest rate of 14%. The average accounts receivable are assumed to be 20% of revenue and accounts payable are assumed to be 10% of variable costs. Dividends to shareholders are expected to be 30% of profit after income tax which is 12% in Liberia. Charge and management fee for new loans is set at 2%. Depreciation on vessel and equipment is assumed to be 5% and 10% respectively. Though the same assumption is used for the mid water trawler, the investment cost is quite different (Appendix 1).

Table 11:Assumptions and results module for demersal trawl fleet

		Assumptions and Results											
		2009		Discounting Rate		15%							
Investment:		MUSD		Planning Horizon		10	years						
Vessel		5,500,000											
Equipment	100%	2,000,000				Total Cap.	Equity						
Other		-		NPV of Cash Flow		16,167,744	15,350,074						
Total		7,500,000		Internal Rate of Return		15%	15%						
Financing:													
Working Capital		1,500,000		Capital/Equity		1.0							
Total Financing		9,000,000		after 10 years									
Equity		60%											
Loan Repayments		10	years	Minimum Cash Account		0							
Loan Interest		14%											
Operations:			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Sales Quantity	100%		740	925	1,110	1,295	1,480	1,665	1,850	2,034	2,219	2,404	ton/year
Sales Price	100%		2,250	2,813	3,375	3,938	4,500	5,063	5,625	6,188	6,750	7,313	KUSD/ton
Variable Cost		2,072	KUSD/ton										
Fixed Cost		1,435,000	KUSD/year										
Inventory Build-up			500	KUSD			Breakdownof Costs:						
Debtors	20%	of turnover					Variable Cost	32,565,625	40%				
Creditors	10%	of variable cost					Fixed Cost	14,350,000	17%				
Dividend	30%	of profit					Paid Taxes	2,231,672	3%				
Depreciation Vessel	5%						Finacial Costs	2,844,000	3%				
Depreciation Equipm.	10%	down to a rest value of 0%					Loan Repayment	3,600,000	4%				
Depreciation Other	0%						Paid Dividend	4,931,277	6%				
Loan Managem. Fees	2%						Cash Account	21,706,299	26%				
Income Tax	12%						Total	82,228,873	100%				

Profitability module:

The profitability module measures the performance of a trawl fleet looking at the investment worth, loan and interest rate, IRR, NPV, and payback period. Risk analysis was also performed to measure uncertainty with respect to changes in input variables from the assumptions and results module shown in Table 11.

As earlier mentioned, risk analysis involves the application of analytical tools (sensitivity analysis, scenario analysis and Monte Carlo simulation) to estimate uncertainty accompanied with changes in inputs variables. For the purpose of this work, sales, price and equipment are the major inputs which we can alter at any moment to see the effect of the changes with the application of the analytical tools. Shown below are analytical tools used to perform some tests from the data provided on the assumptions and results table.

Sensitivity analysis:

The sensitivity analysis (impact analysis) looked at the impact of changes in input variables one at a time. Considering a case for demersal trawl as in Table 12 and Figure 9 below, a reduction in the price of equipment or vessel by a lower repayment

percentage on loans, will automatically shift the equipment or vessel curve. On the other hand, an increase in the sales price and production quantity will also automatically shift the price and production curve.

Table 12: Impact analysis table with respect to IRR of equity (bottom trawl)

					WACC = Weighted Average Cost of Capital				
					WACC= Interest of Equity = RateEq*(E/(E+D)+RateDe*(D/D+E)*(1-Tax Rate)				
					WACC= 15%*60%+14%*40%*(1-14%)				
Impact Analysis					14.0%				
	% change	Sales Price	% change	Production		Equipment	% change	Vessel	
		15%		15%		15%		15%	
-50%	50%	0%	50%	0%	50%	17%	50%	20%	
-40%	60%	0%	60%	2%	60%	17%	60%	19%	
-30%	70%	0%	70%	6%	70%	16%	70%	18%	
-20%	80%	5%	80%	10%	80%	16%	80%	17%	
-10%	90%	10%	90%	13%	90%	15%	90%	16%	
0%	100%	15%	100%	15%	100%	15%	100%	15%	
10%	110%	20%	110%	18%	110%	15%	110%	14%	
20%	120%	24%	120%	20%	120%	15%	120%	13%	
30%	130%	27%	130%	22%	130%	14%	130%	13%	
40%	140%	31%	140%	24%	140%	14%	140%	12%	
50%	150%	34%	150%	26%	150%	14%	150%	11%	

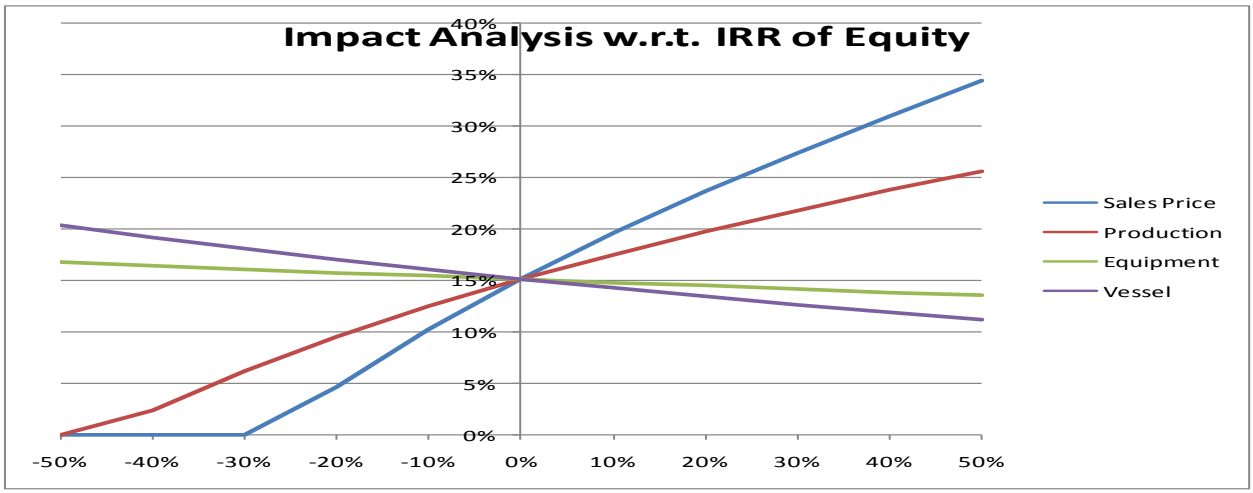


Figure 9: Impact analysis for IRR of equity of demersal trawl fleet investment

Monte Carlo simulation:

A Monte Carlo simulation measures sensitivity to changes in input variables (Appendix 2)

Scenario analysis:

The scenario analysis looked at the impact of changes in input of more than one variable at the same time looking at the worst, best and normal cases. Figure 10 below shows worst, best and normal case scenarios of a demersal trawl fleet investment.

Scenario Summary	Current Values:	Worst Case	Best Case	Glasgow Case
Changing Cells:				
Equipment	100%	80%	100%	90%
Production	100%	85%	105%	95%
Price	100%	90%	110%	100%
Result Cells:				
NPV of Equity	14,705,260	10,198,528	18,233,420	13,823,410
IRR_of_Equity	15%	6%	21%	14%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

Figure 10: Scenario analysis showing the best case, worst case and normal case scenarios

6 CONCLUSION

From the profitability module shown below (Table 13), the NPV of total cash flow for bottom trawl is US $16,167,744 with the IRR of total cash flow as 15%. NPV of net cash flow for this investment is US $15,350,074 and IRR of net cash flow is 15%. The payback period is eight years, which is an indication that, though the investment is capital intensive, it is believed that the investment will be profitable. The ROI is 51% and ROE is 56% at the end of the tenth year of operation. Turnover ratio is 84% and capital ratio is 84%. The net current ratio and liquidity ratio is 5.5, internal value of share is 4.3, debt service ratio is 3.0 and acceptable criteria of 1.5.

The breakdown of costs for bottom trawl shows 40% for variable costs, 17% for fixed costs, 3% for taxes and 3% for financial costs, 4% for loan repayment, 6% for paid dividend and 26% for cash account. On the other hand, the breakdown of costs for mid water trawl shows 29% for variable costs, 17% for fixed costs, 5% for paid taxes, 2% for financial costs, 3% for loan repayment, 9% for paid dividend and 35% for cash account.

The profitability module for a mid water trawler (Table 14) shows that the NPV of total cash flow is US $25,367,919 and IRR of total cash flow is 23%. NPV of net cash flow for mid water trawl investment is US $24,686,527 and the IRR is 25%. Unlike the bottom trawl investment, the payback period for this investment is seven years which is also an indication that, though the investment is capital intensive, it is also believed that the investment will be profitable. The ROI is 45% and ROE is 47% at the end of the tenth year of operation. The turnover ratio is 65% and capital ratio is 83%. The net current ratio and liquidity ratio is 6.1, internal value of share is 6.0, debt service ratio is 44.0 which is far higher compared to bottom trawl and an acceptable criteria of 1.5.

The weighted average cost of capital for the bottom trawl shows 14.0%. An increment of 20% will increase the sales price from 15% to 35%, and production quantity from 15% to 34% and equipment from 15% to 24% respectively. Any change in the input variables will automatically result in change in IRR of equity and total capital as well as NPV of cash flow of equity and total capital. The impact of changes in a variable using one variable at a time is reflected in the impact analysis.

The scenario analysis of bottom trawl investment shows that at the current values, the IRR of equity is 15% and NPV of equity is US $14,705,720; the best case, IRR of equity is 21% and NPV of equity of US $18,233,420; the worst case shows 6% of IRR of equity and NPV of equity of US $10,198,528; while the normal case shows IRR of equity of 14% and NPV of equity of US $13,823,410.

Results from the modules indicate that the investments in trawl fisheries are likely to be profitable and much alike in both types of trawl fisheries and yield almost the same returns, though the mid water trawl fleet investment shows higher profitability with a shorter payback period. Both modules indicate that the investment will not realise profit until after the fourth year of operation.

The market position of the trawl fisheries companies shows that the market growth is 91% as of 2007 which is considered the base year; indicating a high growth. Export products are under reported and the export quantity and value was low during 2007 (base year), at which time the quantity and value is expected to be high due to the presence of fisheries inspectors assigned on board fishing vessels. However, the presence of fisheries inspectors on board fishing vessels played a significant role in reporting much higher landings for local consumption.

Table 13: Profitability module for bottom trawler

		Profitability											
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Profitability Measurements													
NPV and IRR of Total Cash Flow													
Cash Flow after Taxes		0	-1,483,110	-898,715	-179,076	748,633	1,884,409	3,228,255	4,780,169	6,070,709	7,750,694	9,679,607	31,581,576
Loans		-3,600,000											-3,600,000
Equity		-5,400,000											-5,400,000
Total Cash Flow & Capital		-9,000,000	-1,483,110	-898,715	-179,076	748,633	1,884,409	3,228,255	4,780,169	6,070,709	7,750,694	9,679,607	22,581,576
NPV Total Cash Flow	15%	-9,000,000	-10,289,661	-2,264,601	-1,054,433	471,909	2,387,249	4,691,588	7,384,924	10,059,047	12,810,443	16,167,744	
IRR Total Cash Flow							-9%	-12%	-1%	6%	11%	15%	
NPV and IRR of Net Cash Flow													
Net (Free) Cash Flow		- 72,000	- 2,347,110	- 1,712,315	- 942,276	35,832	1,222,009	2,616,255	4,218,569	5,559,509	7,289,894	9,269,207	25,137,576
Equity		- 5,400,000											-5,400,000
Net Cash Flow & Equity		- 5,472,000	- 2,347,110	- 1,712,315	- 942,276	35,832	1,222,009	2,616,255	4,218,569	5,559,509	7,289,894	9,269,207	19,737,576
NPV Net Cash Flow	15%	-5,472,000	-7,512,965	-3,836,080	-2,531,685	-911,117	1,098,449	3,497,014	6,284,576	9,052,925	11,898,548	15,350,074	
IRR Net Cash Flow							-1%	-3%	-5%	4%	11%	15%	
Financial Ratios													
(ROI) Profit+Interest/Debt+Capital			-20%	-19%	-9%	11%	37%	55%	61%	59%	56%	51%	
(ROE) Profit/Shared. Capital			-43%	-45%	-34%	8%	67%	93%	80%	71%	63%	56%	
(Turnover Ratio)Revenue/Debt+Capital (Asset Turnover)			19%	40%	73%	115%	147%	152%	136%	115%	98%	84%	
(Capital Ratio) Capital/Debt+Capital (Equity Raatio)			58%	50%	44%	45%	55%	66%	71%	77%	81%	84%	
Net Current Ratio (Current Asset/Current Liabilities)			3.4	-29.7	-5.0	-1.6	0.4	1.9	2.8	3.6	4.4	5.5	
Liquid Current Ratio (Currents Asset - Inventory/Current Liabilities)			3.4	-29.7	-5.0	-1.6	0.4	1.9	2.8	3.6	4.4	5.5	
(Internal Value of Shares) Total Capital/Equity			0.7	0.5	0.4	0.4	0.6	0.9	1.4	2.2	3.1	4.3	
Debt Service Coverage (Cash Flow after Tax/Interest + Repayment) (Price Earning Ratio)			-1.8	-1.2	-0.3	1.1	3.1	5.7	9.4	13.2	18.9	3.0	
Acceptible Criteria			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	

Table 14: Profitability module for mid water trawler

		Profitability											
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Profitability Measurements													
NPV and IRR of Total Cash Flow													
Cash Flow after Taxes		0	-1,481,215	-461,827	694,144	2,143,801	3,887,142	5,636,633	7,456,128	9,738,066	12,272,572	15,059,648	54,945,092
Loans		-3,000,000											-3,000,000
Equity		-7,000,000											-7,000,000
Total Cash Flow & Capital		-10,000,000	-1,481,215	-461,827	694,144	2,143,801	3,887,142	5,636,633	7,456,128	9,738,066	12,272,572	15,059,648	44,945,092
NPV Total Cash Flow	15%	-10,000,000	-11,288,013	-1,882,804	141,777	2,558,319	5,523,924	8,788,562	12,120,222	15,924,011	20,409,868	25,367,919	
IRR Total Cash Flow							-13%	1%	9%	16%	20%	23%	
NPV and IRR of Net Cash Flow													
Net (Free) Cash Flow		- 60,000	- 2,201,215	- 1,139,827	58,144	1,549,801	3,335,142	5,126,633	6,988,128	9,312,066	11,888,572	14,717,648	49,575,092
Equity		- 7,000,000											-7,000,000
Net Cash Flow & Equity		- 7,060,000	- 2,201,215	- 1,139,827	58,144	1,549,801	3,335,142	5,126,633	6,988,128	9,312,066	11,888,572	14,717,648	42,575,092
NPV Net Cash Flow	15%	-7,060,000	-8,974,100	-3,192,369	-1,089,267	1,405,797	4,449,924	7,793,083	11,203,266	15,085,576	19,649,955	24,686,527	
IRR Net Cash Flow							-16%	-1%	9%	16%	21%	25%	
Financial Ratios													
(ROI) Profit+Interest/Debt+Capital			-17%	-10%	7%	27%	44%	52%	53%	52%	49%	45%	
(ROE) Profit/Shared. Capital			-31%	-21%	3%	36%	55%	60%	60%	57%	52%	47%	
(Turnover Ratio)Revenue/Debt+Capital (Asset Turnover)			24%	47%	75%	99%	109%	104%	94%	83%	74%	65%	
(Capital Ratio) Capital/Debt+Capital (Equity Raatio)			70%	70%	66%	66%	69%	72%	74%	78%	81%	83%	
Net Current Ratio (Current Asset/Current Liabilities)			1.7	-1.4	0.7	2.0	2.9	3.4	4.1	4.7	5.3	6.1	
Liquid Current Ratio (Currents Asset - Inventory/Current Liabilities)			1.7	-1.4	0.7	2.0	2.9	3.4	4.1	4.7	5.3	6.1	
(Internal Value of Shares) Total Capital/Equity			0.8	0.7	0.7	0.8	1.2	1.7	2.4	3.3	4.5	6.0	
Debt Service Coverage (Cash Flow after Tax/Interest + Repayment) (Price Earning Ratio)			-2.1	-0.7	1.1	3.6	7.0	11.1	15.9	22.9	32.0	44.0	
Acceptible Criteria			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	

Concluding furthermore, Figure 11 below shows a graphical representation of accumulated NPV (net present value of total cash flow and net cash flow) of a demersal trawler. According to the graph both NPVs are parallel meaning there is not much difference even if considering a discount rate of 15% which is considered a marginal average rate on return (MARR).

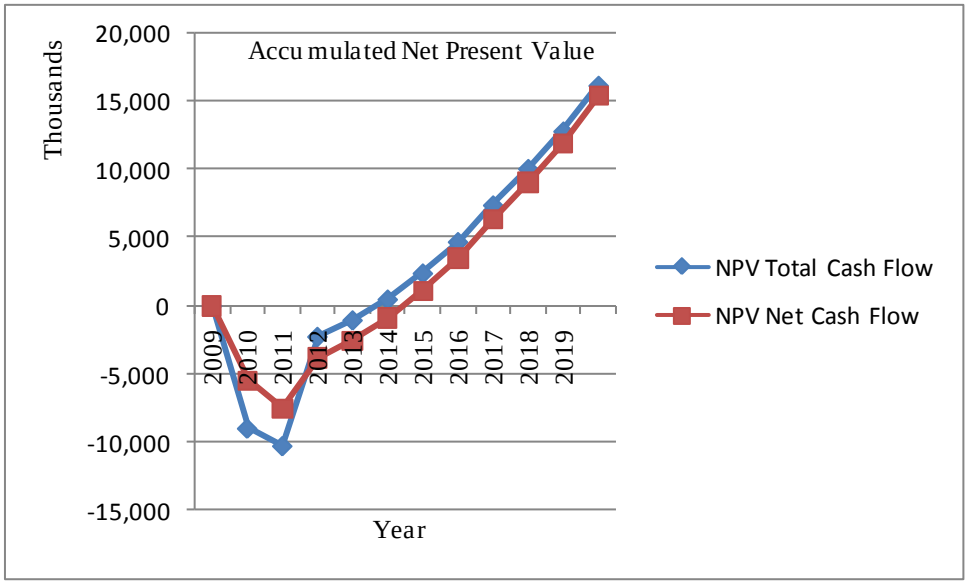


Figure 11: Accumulated net present value (NPV total cash flow and NPV net cash flow)

The IRR (total cash flow and net cash flow) graph below (Figure 12 shows a slight difference (2%) between the total and net cash flow, indicating a good return on investment.

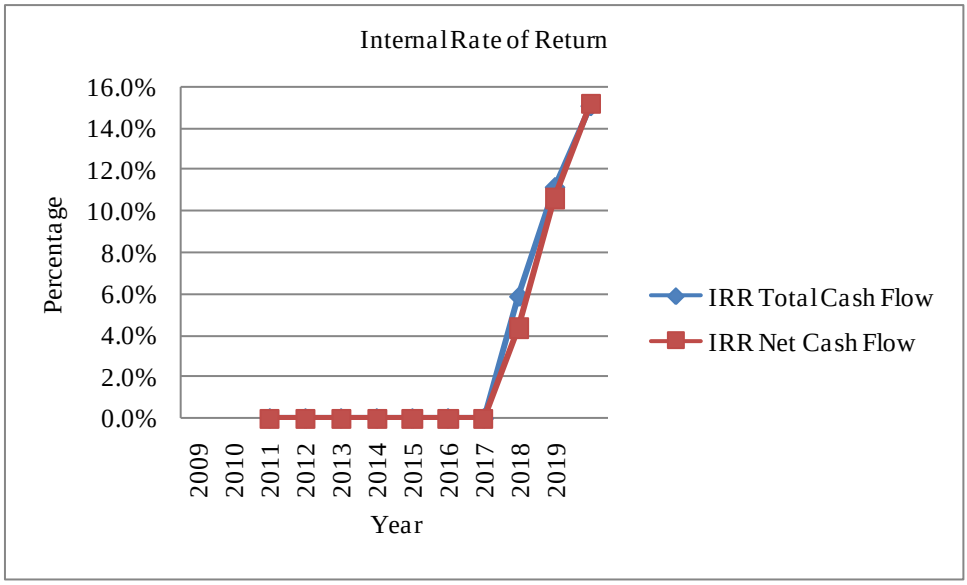


Figure 12: Internal rate of return (IRR) of total cash flow and net cash flow

As can be seen from the calculations of financial ratios in the profitability module, the return on investment (ROI starts with a negative value, but grows steadily up to 41% in the middle of the investment period, reached its peak of 52% at the end of the seventh year and then decline to 45% at the end of the tenth year period (Figure 13).

The return of equity (ROE) shows a similar trend and ended up with 47% at the tenth year. These indicate profitability on investment (capital and equity).

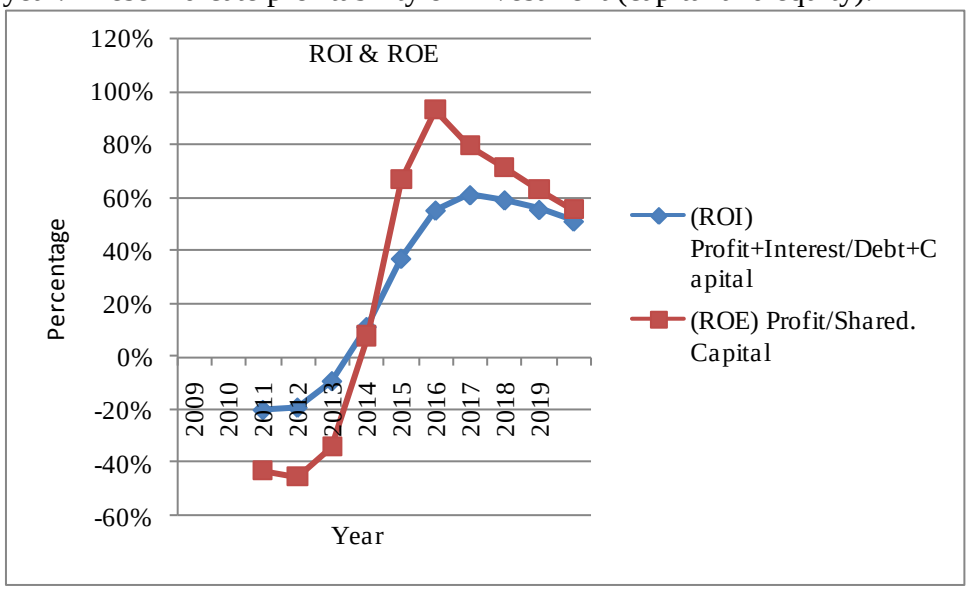


Figure 13: Return on investment (ROI) and return on equity (ROE)

Current ratios which show the value of the company's assets over its liabilities (net current ratio) and the ability of the company to settle its liabilities (liquidity current ratio) is shown in the graph below (Figure 14). The trend according to the graph below indicates that the company is solvent.

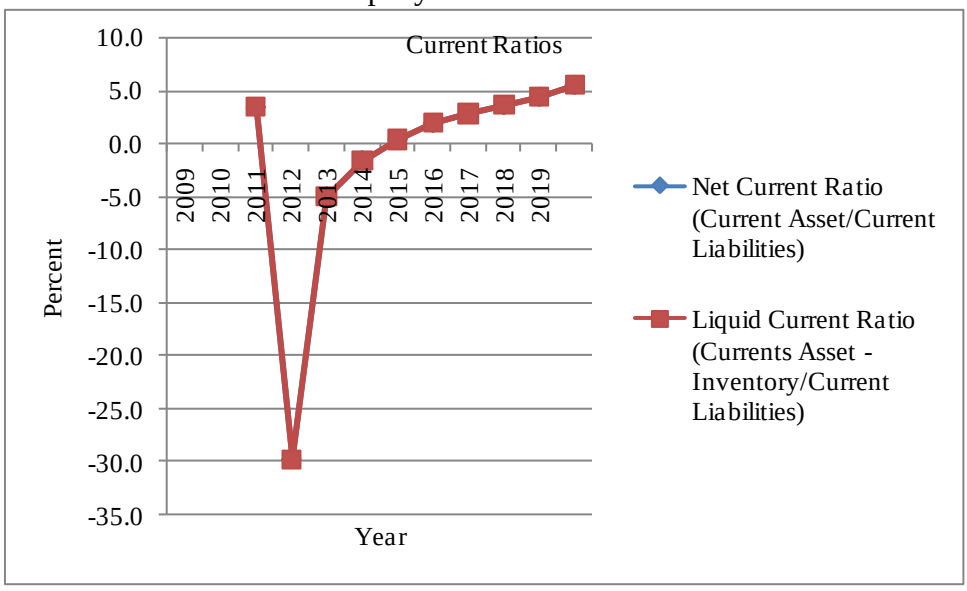


Figure 14: Net current ratio and liquid current ratio

Graphical representation of the turnover ratio, capital ratio, internal breakdown of costs, and value of shares and debt service coverage for the bottom trawl fleet investment can be seen in Appendix 3. Also the graphical representations of accumulated net present value, internal rate of return (IRR), return on investment (ROI) and return on equity (ROE), current ratios, turnover ratio, capital ratio, internal value of shares and debt service coverage for the bottom trawl fleet investment can be seen in Appendices 4 and 5.

7 DISCUSSION

Analysing profitability of trawl fleet investment has never been performed in Liberia. This work looks at the measurement of financial performance of the trawl fleet with the application of the profitability module. This module is considered a vital instrument in executing such financial tasks. The profitability module used in this study (made by Professor Pall Jensson of the University of Iceland) can be used by fisheries management in Liberia and the world over to evaluate the performance of trawl fleet investment in a particular country.

During the preparation and execution stages of this work, numerous problems were encountered relative to gathering financial data from managers of fisheries companies in Liberia

The investment is capital intensive. From the profitability module, equity is assumed to be 60% and loan is assumed to be 40% of total financing for both the bottom and mid water trawl investment. The vessels categorised are evaluated, though they are not fully investigated. It is, however, known that stern trawler and out-rigger are the two types of trawl fleets common in Liberia fishing for pelagic, demersal and shrimps. The assumed price of trawlers could be right in place based on the information gathered from shipbrokers. According to information gathered from the management of Katla Seafood, Reykjavik, Iceland, a new factory trawler under its fleet operating in Morocco, Mauritania and the coast of West Africa, costs about US $50 million. The vessels in Liberia are quite old, but yet their capital outlay for investing in a trawler is assumed to be US $7 million and US $8.5 million (vessel and equipment) for bottom and mid water trawlers respectively. Appendix 9 shows a price list of fairly used fishing vessels from a reputable shipbroker company based in the Unites States of America.

Sales are calculated at 100% of initial production per year and price calculated at 100% of price per ton annually. Sales and price are projected at .25 cumulative increase every year for the purpose of calculating annual revenue. The depreciation rate was assumed to be 5% for the trawler and 10% for equipment (this assumption is based on experience and information gathered from field reports) and was calculated at a fixed rate and the inflation rate was not considered.

The interest rate of 14% which is used in the module is what is charged by most commercial banks in Liberia. Though with the payback period of the investment showing a reasonable time period, the module shows that the investment is profitable. High interest rate reduces the present value of future cash flows, thereby reducing the attractiveness of investment opportunities (Bodie *et al.* 2005). The interest rate applied in the module is prime rate that is commonly used among banks in Liberia as a means of attracting investors. “Capital is allocated among borrowers by interest rates. Firms with the most profitable investment opportunities are willing and able to pay the most for capital, so they tend to attract it away from inefficient firms or from those whose products are not in demand.”(Brigham and Houston 2004)

Data for January – June 2008 was used because data on production by individual trawl fisheries companies over a considerable period of time was difficult to gather from both the BNF and the fisheries companies. Moreover, 2007 was considered the

base year because of the increased reliability of data provided with the presence of fisheries inspectors on board fishing vessels.

The capital outlay is mainly the acquisition of a trawler, fishing gears and equipment; and the operational costs are primarily the variable and fixed costs. The profitability module shows that the investment is profitable - 15% and 23% IRR of net cash flow for demersal and pelagic trawls and long payback periods of eight years and seven years respectively.

The profit varies from year to year for the two types of trawl fisheries investment under study. "The reasons may be varying external conditions, overcapacity, increasing fuel prices, and unfavourable fish prices (Utne 2007). The financial records of the trawl fisheries companies could not be accessed, however, assumptions made based on available data and personal experience as well as research from related publications was applied in the calculation of trawl fleet investment profitability.

The results of the analytical module used here are based on several assumptions, some of which may be questioned, such as that the catch will increase from 740 to 2400 tons from 2010 to 2019 (Table 11). Also, because of restricted access to some information (exports), and wrongly reported information on other data (catches), some of the inputs may be inaccurately estimated. In spite of this, the present approach is the closest one can get to the actual scenarios and the exercise is a large step forward in understanding the profitability of trawl fleet investments in Liberia.

Gaining entrance into the industry has proven difficult because of the high initial capital outlay involved. The four companies dominated the industry for about a 10 year period. The Government of Liberia (GOL) could help newcomers by making loans available to would-be local investors or subsidise the industry in terms of fuel and equipment costs in order to ease entrance into the industry.

The licensing scheme can be described as an access right to the fishery (Arland and Bjorndal 2002). Trawl fleet investment in Liberia is regulated by the licensing system and the entry into the industry is open provided the investor is able to meet with the requirements. Presently the GOL provides no subsidy for the industry.

8 RECOMMENDATIONS

Having applied the profitability module to the Liberian scenario and having realised its usefulness, I would like to make the following recommendations:

- That the GOL should ensure the gathering of reliable data on catches, local sales, exports, both in quantity and value.
- That costs and earnings data forms should be developed to enable field officers of the Bureau of National Fisheries to use data gathered relative to the measurement of financial performance of trawl fleets of fisheries companies in Liberia.
- That the Bureau of National Fisheries create an Economic, Social and Environmental Division to handle all data relative to economic, social and environmental issues as such data could be beneficial to the bureau, politicians and the public.
- That the present work should be extended further in order to produce a real picture of the situation on the ground in order to make concrete recommendations to the fisheries management in Liberia.
- That the managers of trawl fleet companies and fisheries officers alike should be trained in how to use the profitability module herein to measure the performance of the trawl fleet operations in the respective trawl fisheries companies in particular and for the BNF in general.

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I am also thankful to the management of the four trawl fisheries companies in Liberia for granting me the maximum cooperation during the preparation stage and also to Katla Seafood, Reykjavik, Iceland for according me all necessary assistance during my field trip and to the Government of Iceland through the Marine Research Institute (MRI) for its warm reception and hospitability. My appreciation goes to the Government of Liberia, particularly the Bureau of National Fisheries, Ministry of Agriculture for allowing me to undertake this very important training programme on Management of Fisheries Companies and Marketing.

Finally, I would like to extend my thanks to my family, both immediate and extended, for their patience and endurance during my absence from home. I thank you all and God bless you.

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APPENDICES

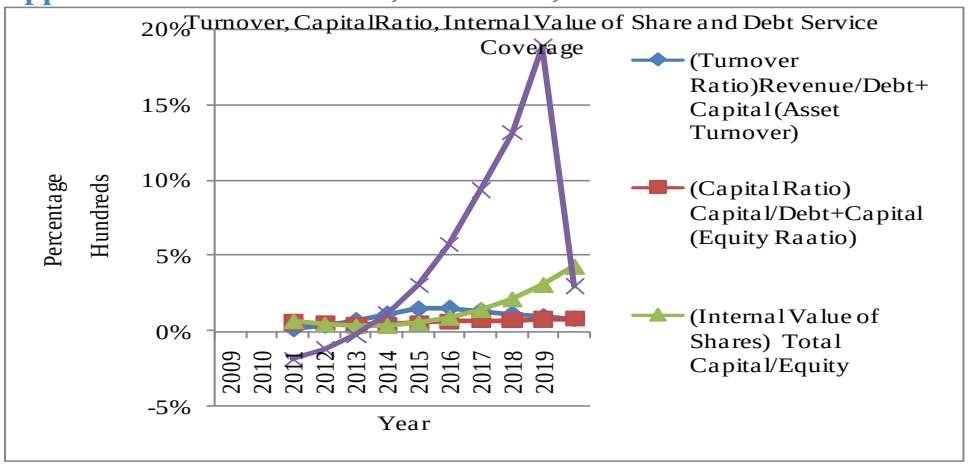
Appendix 1: Assumption module for pelagic trawler

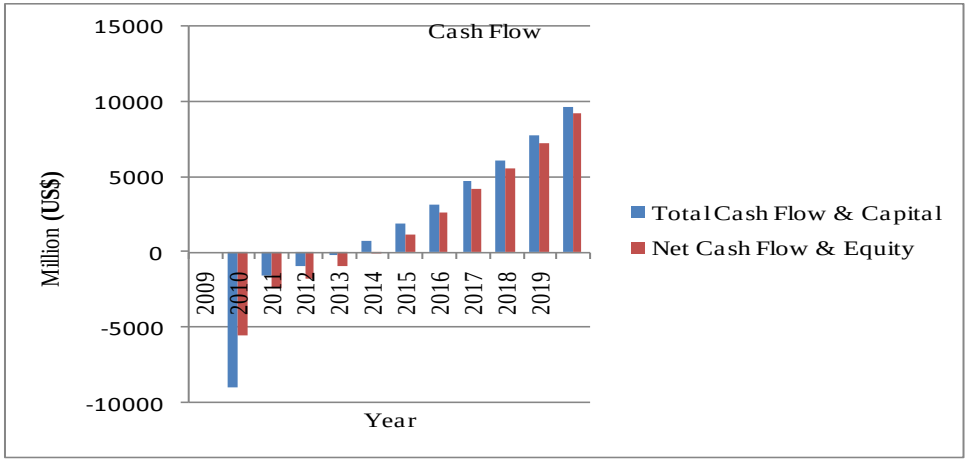
		Assumptions and Results											
		2009		Discounting Rate		15%	(MARR)						
Investment:		MUSD		Planning Horizon		10	years						
Vessel		5,500,000											
Equipment	100%	3,000,000				Total Cap.	Equity						
Other		-		NPV of Cash Flow		25,367,919	24,686,527						
Total		8,500,000		Internal Rate of Return		23%	25%						
Financing:													
Working Capital		1,500,000		Capital/Equity (IVS)		1.0							
Total Financing		10,000,000		after 10 years									
Equity		60%											
Loan Repayments		10	years	Minimum Cash Account		0							
Loan Interest		14%											
Operations:			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Sales Quantity	100%		1,175	1,468	1,762	2,056	2,349	2,643	2,937	3,231	3,524	3,818	ton/year
Sales Price	100%		2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	KUSD/ton
Variable Cost		1,314	KUSD/ton										
Fixed Cost		1,931,000	KUSD/year										
Inventory Build-up			350	KUSD			Breakdownof Costs:						
Debtors	20%	of turnover					Variable Cost	32,799,375	29%				
Creditors	10%	of variable cost					Fixed Cost	19,310,000	17%				
Dividend	30%	of profit					Paid Taxes	5,701,756	5%				
Depreciation Vessel	5%						Finacial Costs	2,370,000	2%				
Depreciation Equipm.	10%	down to a rest value of 0%					Loan Repaymen	3,000,000	3%				
Depreciation Other	0%						Paid Dividend	10,525,522	9%				
Loan Managem. Fees	2%						Cash Account	40,549,570	35%				
Income Tax	14%						Total	114,256,223	100%				

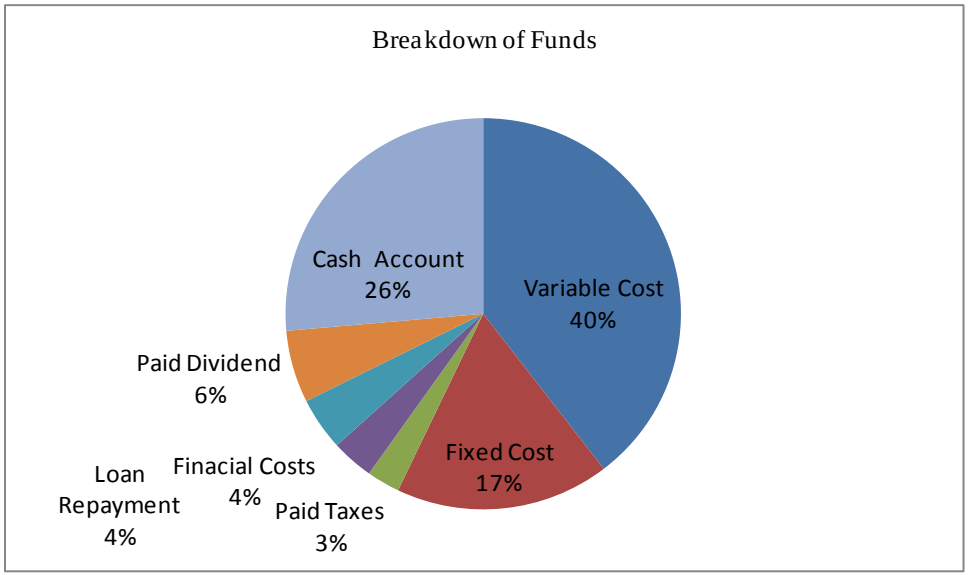
Appendix 2: Monte Carlo simulation for demersal trawler

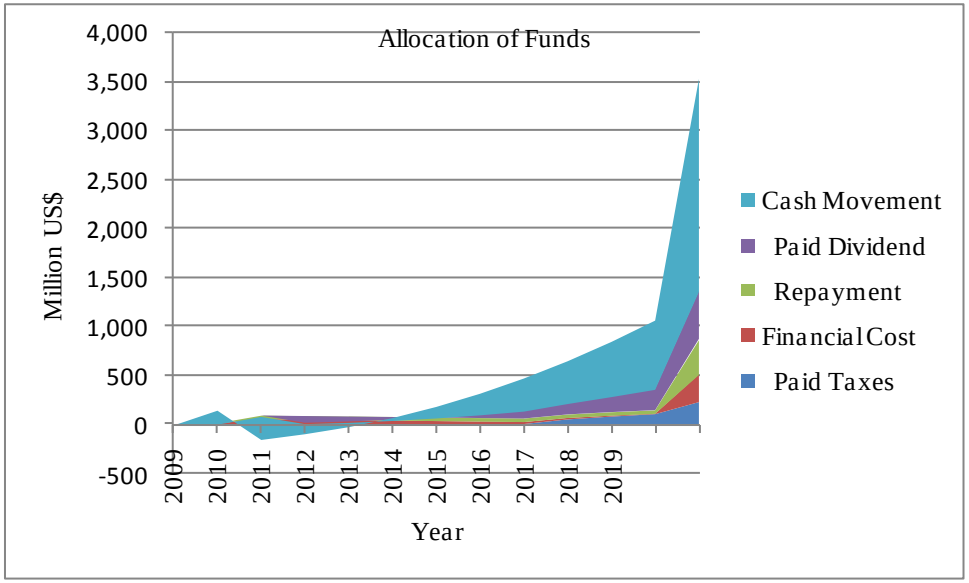
	Monte Carlo Simulation		
		Adding	
	Random	0.5	IRR of Equity
Cases	Number		15%
1	0.9398157	1.4398157	46%
2	0.8845809	1.3845809	56%
3	0.9420116	1.4420116	6%
4	0.6111147	1.1111147	34%
5	0.0677855	0.5677855	36%
6	0.970386	1.470386	37%
7	0.7696838	1.2696838	19%
8	0.2234306	0.7234306	43%
9	0.1326485	0.6326485	37%
10	0.9420446	1.4420446	51%
11	0.6999476	1.1999476	14%
12	0.3908329	0.8908329	37%
13	0.1061016	0.6061016	48%
14	0.3211382	0.8211382	54%
15	0.1498317	0.6498317	32%
16	0.7395577	1.2395577	38%
17	0.0167656	0.5167656	33%
18	0.7695543	1.2695543	42%
19	0.0128917	0.5128917	7%
20	0.4252509	0.9252509	54%
21	0.7832124	1.2832124	30%
22	0.3242104	0.8242104	27%
23	0.7312655	1.2312655	11%
24	0.1211603	0.6211603	58%
25	0.3784707	0.8784707	26%
26	0.3962841	0.8962841	53%
27	0.4350778	0.9350778	3%
28	0.4109912	0.9109912	55%
29	0.3239286	0.8239286	43%
30	0.9868159	1.4868159	22%
31	0.890777	1.390777	33%
32	0.3878921	0.8878921	20%
33	0.9521438	1.4521438	49%
34	0.2450542	0.7450542	14%
35	0.8948282	1.3948282	54%
36	0.6083723	1.1083723	2%
37	0.9890535	1.4890535	42%
38	0.6421324	1.1421324	60%
39	0.2785736	0.7785736	57%
40	0.6799648	1.1799648	46%
41	0.291649	0.791649	33%
42	0.3312781	0.8312781	2%
43	0.762512	1.262512	37%
44	0.0778345	0.5778345	16%
45	0.1034695	0.6034695	20%
46	0.6842723	1.1842723	19%
47	0.8905078	1.3905078	51%
48	0.1335868	0.6335868	59%
49	0.720434	1.220434	50%
50	0.8895014	1.3895014	46%
51	0.8981856	1.3981856	26%
52	0.0039269	0.5039269	47%
53	0.0826666	0.5826666	4%
54	0.4253119	0.9253119	41%
55	0.6326345	1.1326345	4%
56	0.4257214	0.9257214	46%
57	0.4623848	0.9623848	29%
58	0.411922	0.911922	60%
59	0.7524702	1.2524702	42%
60	0.0311958	0.5311958	59%
61	0.9521183	1.4521183	10%
62	0.9678956	1.4678956	16%
63	0.6570892	1.1570892	55%
64	0.2366181	0.7366181	35%
65	0.3813326	0.8813326	36%
66	0.6032233	1.1032233	18%
67	0.3582702	0.8582702	56%
68	0.4234837	0.9234837	38%
69	0.435472	0.935472	-1%
70	0.0014281	0.5014281	17%
71	0.4813434	0.9813434	2%
72	0.4077939	0.9077939	25%
73	0.5987957	1.0987957	46%
74	0.7836595	1.2836595	59%
75	0.0238085	0.5238085	57%
76	0.2511153	0.7511153	9%
77	0.1082212	0.6082212	44%
78	0.6206887	1.1206887	18%
79	0.5116918	1.0116918	45%
80	0.2461155	0.7461155	0%
81	0.5371909	1.0371909	61%
82	0.4824198	0.9824198	51%
83	0.2680806	0.7680806	32%
84	0.3809681	0.8809681	49%
85	0.5935068	1.0935068	61%
86	0.0496309	0.5496309	2%
87	0.2020434	0.7020434	59%
88	0.4670076	0.9670076	16%
89	0.6662049	1.1662049	34%
90	0.5246929	1.0246929	33%
91	0.7394824	1.2394824	41%
92	0.206339	0.706339	60%
93	0.6795892	1.1795892	53%
94	0.9578895	1.4578895	12%
95	0.5601366	1.0601366	24%
96	0.9165218	1.4165218	37%
97	0.8466195	1.3466195	36%
98	0.6222263	1.1222263	46%
99	0.6666726	1.1666726	15%
100	0.5424771	1.0424771	29%
Average	0.5054691	1.0054691	35%

Appendix 3: Turnover Ratio, Cash Flow, Breakdown of Funds and Allocation of Funds Charts for bottom trawler:

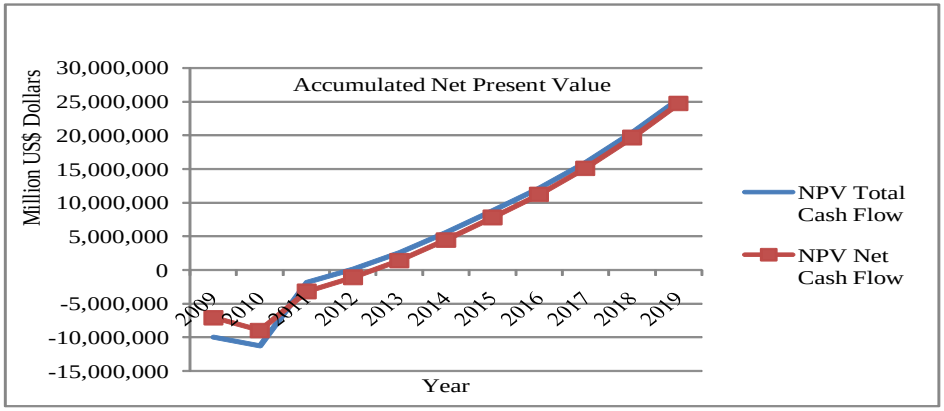


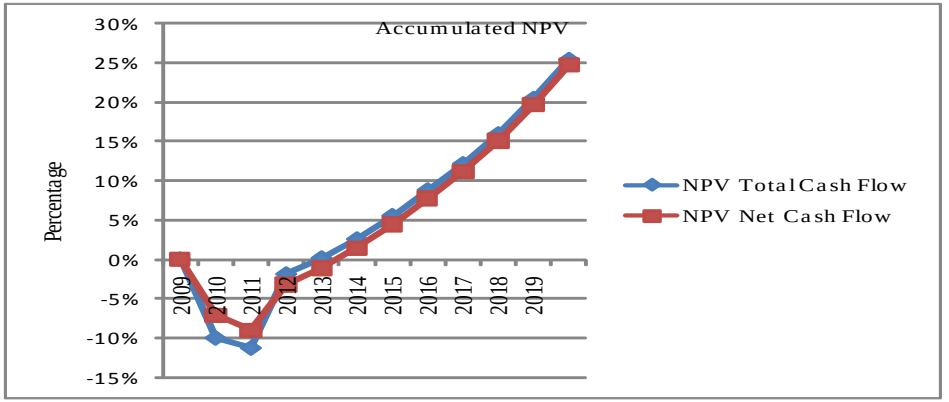


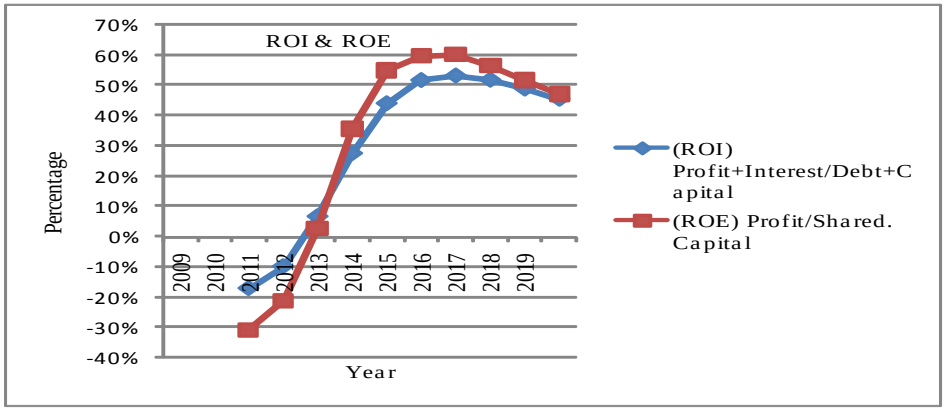

Breakdown of Funds
Cash Account 26%
Variable Cost 40%
Paid Dividend 6%
Fixed Cost 17%
Loan Repayment 4%
Finacial Costs 4%
Paid Taxes 3%

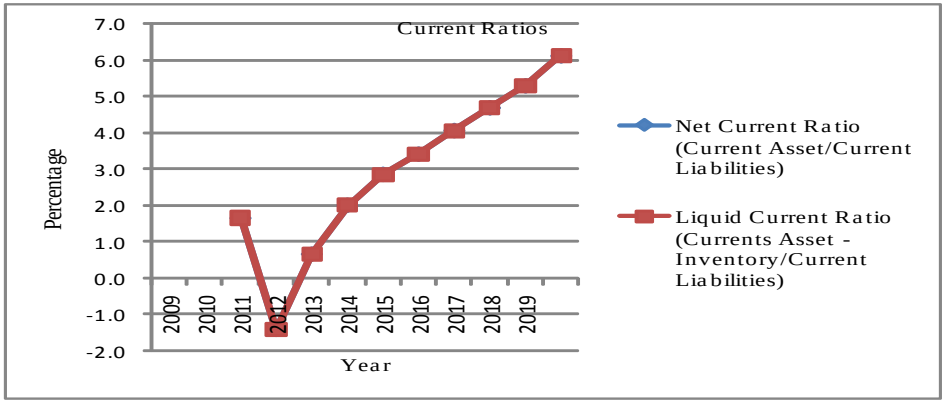

Allocation of Funds
Million US$
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
-500
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year
Cash Movement
Paid Dividend
Repayment
Financial Cost
Paid Taxes

Appendix 4: Accumulated Net Present Value (NPV), Internal Rate of Return (IRR), Return on Investment & Return on Equity (ROI & ROE) and Current Ratio Charts module for mid water trawler

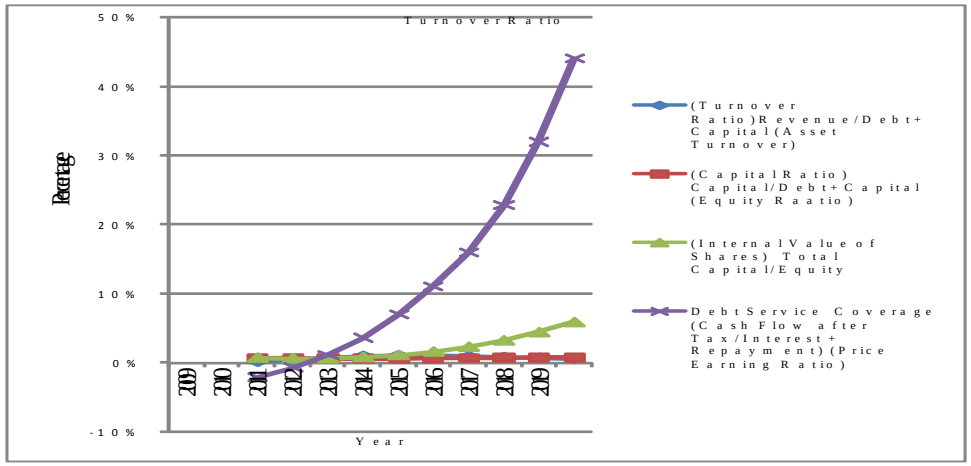


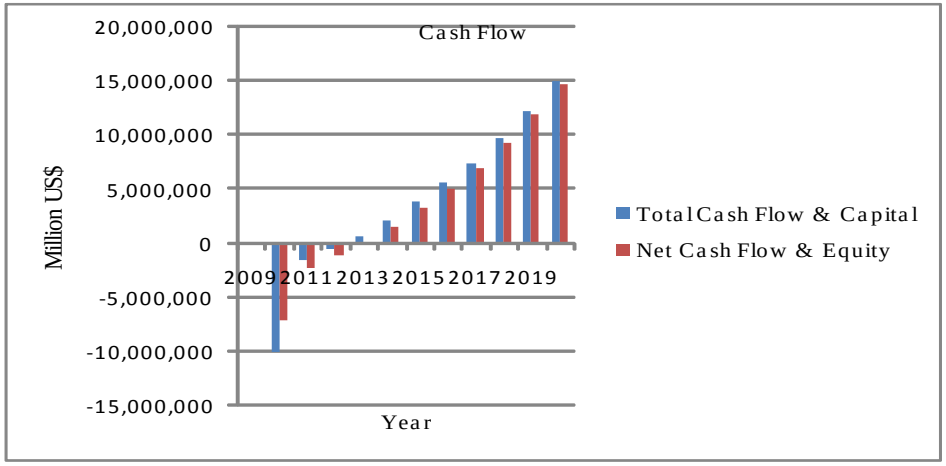


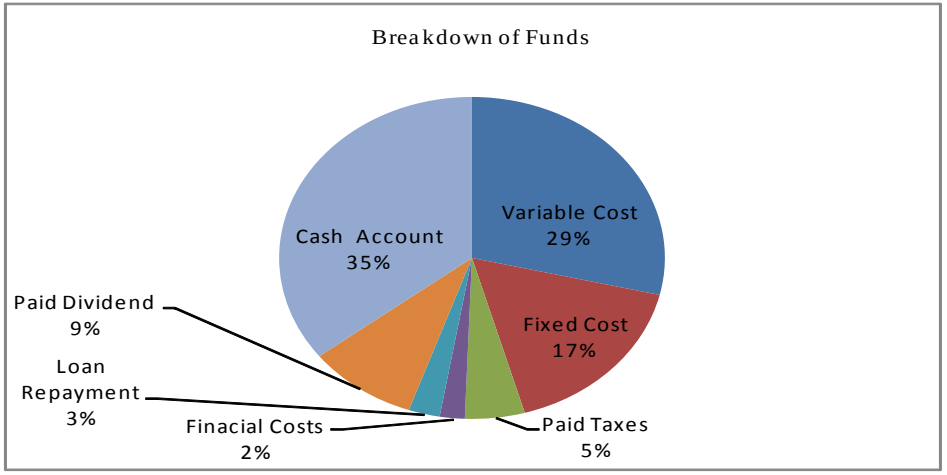


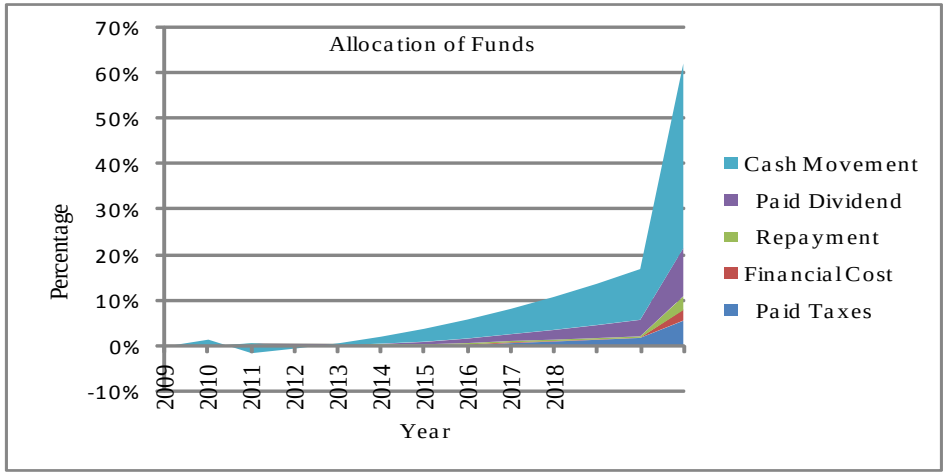


Appendix 5: Turnover Ratio, Cash Flow, Breakdown of Funds and Allocation of Funds Charts for mid water trawler


Turnover Ratio
50%
40%
30%
20%
10%
0%
-10%
Year
(Turnover Ratio)Revenue/Debt+Capital(Asset Turnover)
(Capital Ratio) Capital/Debt+Capital (Equity Raatio)
(Internal Value of Shares) Total Capital/Equity
Debt Service Coverage (Cash Flow after Tax/Interest+Repayment)(Price Earning Ratio)


Cash Flow
20,000,000
15,000,000
10,000,000
5,000,000
0
-5,000,000
-10,000,000
-15,000,000
Million US$
2009 2011 2013 2015 2017 2019
Year
Total Cash Flow & Capital
Net Cash Flow & Equity


Breakdown of Funds
Variable Cost 29%
Fixed Cost 17%
Paid Taxes 5%
Finacial Costs 2%
Loan Repayment 3%
Paid Dividend 9%
Cash Account 35%


Allocation of Funds
70%
60%
50%
40%
30%
20%
10%
0%
-10%
Percentage
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Year
Cash Movement
Paid Dividend
Repayment
Financial Cost
Paid Taxes

Appendix 6: Catch and sales summary of fisheries companies in Liberia for January - June 2008

SUMMARYT OF CATCH AND SALES ANALYSIS
FOR THE PERIOD ENDED 1ST & 2ND QUARTER ENDED 2008
COMPANIES: DONG YONG, INTER BURGO, MONROVIA FISHING & STAR FISHING

S/N	SPECIES	SPECIES TYPE	SCIENTIFIC NAME	COMPANY				COMPANY				COMPANY				COMPANY				TOTAL SALES	TOTAL			
				DONG YONG				INTER BURGO				MONROVIA FISHING				STAR FISHING AGENCY								
				TOTAL TON	TOTAL CTN	UNIT PRICE	AMOUNT	TOTAL TON	TOTAL CTN	UNIT PRICE	AMOUNT	TOTAL TON	TOTAL CTN	UNIT PRICE	AMOUNT	TOTAL TON	TOTAL CTN	UNIT PRICE	AMOUNT		TOTAL TON	TOTAL CTN	UNIT PRICE	AMOUNT
						US$	US$			US$	US$			US$	US$			US$	US$	US$			US$	US$
						(Average)				(Average)				(Average)				(Average)					(Average)	
1	Barracuda	Dermersal	Sphyraena spp.	0.00	0	0.00	0.00	0.06	3	50.00	150.00	0.00	0	0.00	0.00	16.11	806	50.00	40,275.00	40,425.00	16.17	809	25	20,212.50
2	Black Grouper	Dermersal	Lutjanus johnii	0.00	0	0.00	0.00	0.07	4	50.00	175.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	175.00	0.07	4	12.5	43.75
3	Blue Fin Tuna	Pelagic	Thunnus albacares	0.00	0	0.00	0.00	0.00	0	0.00	0.00	5.00	250	44.50	11,125.00	0.00	0	0.00	0.00	11,125.00	5.00	250	11.125	2,781.25
4	Bonny	Pelagic	Sardinella melanura	0.00	0	0.00	0.00	17.00	850	40.00	34,000.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	34,000.00	17.00	850	10	8,500.00
5	Butter Nose	Dermersal	Stromateus faitola	51.64	2,582	40.00	103,280.00	43.08	2,154	40.00	86,160.00	11.50	575	28.00	16,100.00	0.00	0	0.00	0.00	205,540.00	106.22	5,311	27	143,397.00
6	Cassava Fish (L/N)	Dermersal	Pseudotolithus elo	45.64	2,282	45.00	102,690.00	9.92	496	50.00	24,800.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	127,490.00	55.56	2,778	23.75	65,977.50
7	Cassava Fish (S/N)	Dermersal	Pseudotolithus seneg	0.00	0	0.00	0.00	0.00	0	0.00	0.00	31.30	1,565	40.00	62,600.00	0.00	0	0.00	0.00	62,600.00	31.30	1,565	10	15,650.00
8	Cat Fish	Dermersal	Aridae	0.00	0	0.00	0.00	21.00	1,050	50.00	52,500.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	52,500.00	21.00	1,050	12.5	13,125.00
9	Crab	Pelagic	Brachyura	0.36	18	50.00	900.00	0.00	0	0.00	0.00	0.20	10	25.00	250.00	0.00	0	0.00	0.00	1,150.00	0.56	28	18.75	525.00
10	Grunter	Dermersal	Pomadasys jubelini	35.00	1,750	40.00	70,000.00	24.70	1,235	40.00	49,400.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	119,400.00	59.70	2,985	20	59,700.00
11	Ink Fish	Pelagic	Seplidae/Sepiolidae	0.08	4	40.00	160.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	160.00	0.08	4	10	40.00
12	Jacob Fish	Pelagic	Brotula barbata	0.00	0	0.00	0.00	26.86	1,343	40.00	53,720.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	53,720.00	26.86	1,343	10	13,430.00
13	Jurel	Pelagic		0.00	0	0.00	0.00	46.30	2,315	40.00	92,600.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	92,600.00	46.30	2,315	10	23,150.00
14	Lobster	Dermersal	Palinurus spp.	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.48	24	30.00	720.00	0.00	0	0.00	0.00	720.00	0.48	24	7.5	180.00
15	Mackerel	Dermersal	Scomber japenicus	60.00	3,000	50.00	150,000.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	150,000.00	60.00	3,000	12.5	37,500.00
16	Mixed Fish	Pelagic	Osteichithyes	61.54	3,077	40.00	123,080.00	85.28	4,264	30.00	127,920.00	11.16	558	30.00	16,740.00	0.00	0	0.00	0.00	267,740.00	157.98	7,899	25	197,475.00
17	Octopus	Pelagic	Octopodidae	0.08	4	50.00	200.00	0.04	2	40.00	80.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	280.00	0.12	6	22.5	135.00
18	Porgy	Dermersal	Drepane africana	0.00	0	0.00	0.00	0.50	25	30.00	750.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	750.00	0.50	25	7.5	187.50
19	Porjo	Pelagic	Clupeoidei	8.06	403	35.00	14,105.00	102.88	5,144	30.00	154,320.00	2.42	121	20.00	2,420.00	0.00	0	0.00	0.00	170,845.00	113.36	5,668	21.25	120,445.00
20	Rock Fish	Dermersal	Epinephelus	0.08	4	40.00	160.00	0.06	3	30.00	90.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	250.00	0.14	7	17.5	122.50
21	Sharks	Pelagic	Elasmobranchii	0.00	0	0.00	0.00	0.12	6	40.00	240.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	240.00	0.12	6	10	60.00
22	Shrimps	Dermersal	Nantantia	1.62	81	60.00	4,860.00	3.89	195	60.00	11,670.00	8.89	445	40.00	17,780.00	0.00	0	0.00	0.00	34,310.00	14.40	720	40	28,800.00
23	Small Mixed Fish	Pelagic		1.36	68	40.00	2,720.00	31.92	1,596	30.00	47,880.00	5.60	280	20.00	5,600.00	0.00	0	0.00	0.00	56,200.00	38.88	1,944	22.5	43,740.00
24	Snake Fish	Dermersal	Congridae	19.18	959	45.00	43,155.00	0.30	15	30.00	450.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	43,605.00	19.48	974	18.75	18,262.50
25	Snapper	Dermersal	Lutjanus spp.	80.82	4,041	50.00	202,050.00	110.28	5,514	40.00	220,560.00	15.60	780	40.00	31,200.00	0.00	0	0.00	0.00	453,810.00	206.70	10,335	32.5	335,887.50
26	Sole Fish	Dermersal	Soleidae	3.22	161	50.00	8,050.00	61.34	3,067	40.00	122,680.00	23.66	1,183	40.00	47,320.00	0.00	0	0.00	0.00	178,050.00	88.22	4,411	32.5	143,357.50
26	Stinger	Dermersal	Rajiformes	1.22	61	45.00	2,745.00	0.25	13	40.00	500.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	3,245.00	1.47	74	21.25	1,561.88
27	Tempond	Pelagic	Albula vulpes	0.00	0	0.00	0.00	1.40	70	40.00	2,800.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	2,800.00	1.40	70	10	700.00
28	Trigger Fish	Pelagic	Balistidae	0.00	0	0.00	0.00	0.12	6	40.00	240.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	240.00	0.12	6	10	60.00
29	Yellow Fin Tuna	Pelagic	Thussus obesus	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.01	0	45.00	11.25	0.00	0	0.00	0.00	11.25	0.01	0	11.25	2.81
	TOTAL			369.90	18,495		828,155.00	587.37	29,369		1,083,685.00	115.82	5,791		211,866.25	16.11	805.50		40,275.00	2,163,981.25	1,089.20	54,460		1,295,009.19
	AVERAGE																				37.56	1,877.92	18.04	982,388.16

Source: Dong Yong Fisheries Corporation, Inter Burgo Industrial Fishing Company, Monrovia Fishing Company and Star Fishing Agency, Monrovia

Appendix 7: Survey questionnaire

Analysis of Profitability of Trawl Fisheries Investment In Liberia

Survey Questionnaire

Date: _____

Company's Status:

Name of Company: _____

Address of Company: _____

_____

Phone #: _____ GSM #: _____

E-mail: _____ Fax: _____

Year established in Liberia: _____

Type of Company: O Public O Private

What business your company engages in? O Fisheries only O Fisheries and other activities

Company's activities: O Import O Export O Fish Trawling O Processing

O Agent/Representative Plant (canning)

Ownership: O Sole Proprietorship O Partnership O Limited Company O Corporation

Operation:

Offshore (Fishing Vessels)

Does the company operate fish trawlers? O Yes O No

If yes, how many fish trawlers does the company have under her operation? _____

Out of these fish trawlers, how many belong to: The Company itself _____ Other Investors ____

What type of fish trawlers does the company operate? Back Trawling ____ Double Rigged ____

Purse Seiner _____ Pole and Line _____ Other: _____

What type of cold storage system do your vessels have? O Freezer O Ice

Vessels Size: Minimum _____Maximum _____

Type of gears common on board fish trawlers: _____

On which fishing ground do your vessels operate? _____

What is the average number of days your vessels go fishing before landing their catches? _____

Onshore

Does your company have cold room? O Yes O No
If yes, what is the capacity? _____
Does the company have a warehouse? O Yes O No
If yes, what is the capacity? _____
What is the average production capacity of your company on a monthly basis?
_____

Marketing:

What is the average size, quantity and species of fish your company markets on a monthly basis?

Species	Wt	Size	Price	Quantity

What percentage of your product is on the market: Locally _____ Internationally _____
Which country (ies) is/are your products marketed?_____
_____
What is the quantity of products exported?
What is the quantity of products imported?
What is the quantity of products transshipped?
What are the needs of your customers?
_____
_____
_____

Finance:

What is the capital investment of the company? Minimum _____ Maximum _____
What is the average monthly operational cost of your company?
Minimum _____ Maximum _____
What is the average revenue generation of your company on a monthly basis?
Minimum _____ Maximum:
_____
What is the average profit margin of your company on a monthly basis?
Minimum _____ Maximum _____
How much does your company pay for vessel registration?
_____
How much does your company pay for vessel license
_____
How much does the company pay on import duty?
_____

How much does the company pay on export duty?
_____
Is the tariff on import fishery products high or low? O High O Low
Is the tariff on import fishery products high or low? O High O Low
What is the average monthly sale? _____

Labor:
How many persons are in the employ of your company? _____
How may persons are in your company in the:
Senior Management Level _____
Middle Management Level _____
Junior Management Level _____
How many Liberians are in the employ of your Company? _____
How many Aliens/Foreigners are in the employ of your company? ____
What is the salary structure of your company: O Minimum O Maximum

General Question:
Is fish trawling business profitable in Liberia? O Yes O No
Is importing and exporting business profitable in Liberia? O Yes O No
Is business atmosphere in Liberia conducive? O Yes O No O I don't know

Fish Mongers: (Only for fish sellers)
How much do you pay for a crate/carton/sac of fish

Species	Weight/Carton	Amount

How much do you sell a crate/carton/sac of fish

Species	Weight/Carton	Amount

What is your overall cost per market cycle? _____
Is the fish business profitable? O Yes O No O I don't know
Which of the species consumers buy mostly/ _____
Which of the fishing companies do you buy your fish from?
_____
Why do you buy your fish from this company?
_____
_____
_____

_____
_____
How far is the company to your selling point? _____
Which of the company(ies) do you consider the best in terms of quality product/service?
_____
_____
Which of the company(ies) do you think is financially strong than the others?
_____
_____
Why do you think the above-mentioned company is financially stronger than the others?

Captains: (Only for Vessel Captain)

Name of Captain:
_____
Nationality:
_____
Are you licensed? Yes _____ No _____
If Yes, License Number: _____
How many years of experience do you have? _____
What is the name of your fishing vessel?
_____
What type of fishing vessel do you operate presently?
_____
What is the size of your fishing vessel: Length: _____ Breadth: _____ Width: _____
What is your vessel's: GRT _____ NRT: _____
How old is your vessel? _____
What is the engine capacity of your vessel?
_____
What is the hold capacity of your vessel?
_____
What is the refrigerant capacity of your vessel?
_____
What is the purchase price of your vessel?
_____
When was the vessel constructed?
_____
What is your vessel's current status? Active_____ Non-active_____ Under Repair _____
What type of fishing operation are you engaged in? Fish only _____ Shrimp only _____
Lobster only _____ Crab only _____
Do you fish for: Local consumption? Yes _____ No _____

Internation

al market? Yes _____ No _____
Do you carry out export/transshipment at sea? Yes _____ No _____

How long do you trawl per haul? _____ hrs
Which area do you carry out your fishing activities? _____
How many crew members on board your vessel? _____
Liberians: _____ Other Africans _____ Europeans/Non-Africans _____
Is the vessel owned by an individual or a company? _____
Name of individual/company:
_____
Is the vessel owned by a Liberian/Liberian company? Yes _____ No _____
If Yes, what is the individual Liberian/Liberian company:
_____
Do you carry out processing on board vessel? : Yes _____
No_____
What is the fuel consumption rate of your vessel? _____
What is the average operational cost per fishing trip of your vessel?
_____

Appendix 8: Semi structured interview form

SEMI- STRUCTURED INTERVIEW:

Company Status:
Name & Location:
Year Established:
Type of Company:
Industry's Activities:
Ownership:
Operations:
Number of Vessel(s):
Type of Vessel:
Target Species
Fishing Method
Size of Vessel (Minimum & Maximum):
Cooling/Freezing Method
Fishing Area
Fishing Duration/Trip
Trip/Day
Type of Fishing Gears
Number of days at Sea
Minimum No of days at harbour
Fuel Consumption per trip
Food consumption per day
Vessel Capacity
Average Catch per trip
Average size of fish per catch
Types of Species catch per trip:
Pelagic:
Demersal:

Sales Marketing, Finance & Investment:

Packaging Method
Weight per Package
Price per Package:
Pelagic:
Demersal:
Percentage of Product Market:
Local:
International:
Product Market:
Countries:
Average Off shore sales (if any transhipment):
Average sales per trip/landing/month:
Investment worth:
Price of Vessel:
Price of other Equipment
Depreciation Rate:
On Vessel:
On Equipment:

Loan Amount:
Equity:
Interest Rate:
Discount Rate:
Loan Repayment:
Loan Management Fee:
Dividend per year:
Tax rate:
ITQ:
Average operational cost per month:
Average revenue generated per month:
Variable Cost:
Fuel
Engine Oil
Feeding
Ice
Harbour Cost
Fixed Costs:
Salary
Administration
Insurance
Licenses
Maintenance
Contingency
Inventory:
Number of Persons on board Vessel:
Salary structure:
Is trawler investment profitable?

Management Strategy:
How do you see the company now?
What is your goal or what do you want to become?
How do you achieve your goal or how do you achieve what you want to become?
Some highlight on management strategy to be applied in terms of expanding market and increasing profitability.
What is your goal or what do you want to become?
How do you achieve your goal or how do you achieve what you want to become?
Some highlight on management strategy to be applied in terms of expanding market and increasing profitability.

Appendix 9: Price List of Used Fishing Vessels/Trawlers

MORE DETAILS CLICK BELOW	Type	Length Feet/Meters	Breadth Feet/Meters	Draft Feet/Meters		Asking Price U.S. $	Approximate Location	Flag
UM10	Fishing Vessel	168 Feet 51.5 Meters	32.8 F 10M		447 DWT	2,200,000 Price Reduced	Thailand	Thailand
NAD10	Tuna Purse Seiner	166.1 F 50.65 M	46.9 F 14.3 M	12.5 F 3.8 M	300 Tons	4,250,000 Price Reduced	Turkey	Turkish
MTL10	Trawler/Fish Factory	164 F 50.26 M	32.14 F 9.8M	15.84 F 4.83 M		670,000	Ukraine	Ukraine
JFG10	Fishing Vessel	157 F 47.86M	27 F 8.2 M	12 F 3.66 M		1,200,000 Price Reduced	Montevideo	Vanuatu
RBE10	Trawler	150.84 F 45.99 M	28.07 F 8.56 M	17.97 F 5.48 M		750,000	Peru	Panama
ERA10	Stern Trawler	146 F 44.5 M	31.2 F 9.5 M	17 F 5.2 M		1,500,000	Nambia	Nambia
EU10	Fishing Vessel	141 F 43 M	42.6 F 13 M			3,300,000 EUROS	Turkey	Turkey
LEX11	Trawler	127.1 F 38.75 M	26.2 F 8M	14.4 F 4.4 M		800,000	South Africa	
VDD10	2-Purse Seiner (Nearly New)	117 F 35.66 M	34.7 F 10.6 M	7.7 F 2.35 M		2,700,000 EUROS	Italy	Italy
SUL10	Long Liner Trawler	111.5 Feet 34 Meters	27.5 F 8.4 M	F M		2,000,000	Argentina	Portuguese
PAZ10	Trawler/Processor	105 Feet 32 Meters	30 F 9 M	F M		3,025,000	Spain	Spain
ATC10	2 -Sister Trawlers	97 Feet 29.5 Meters	27.6 F 7.33 M	11.5 F 3.5 M		900,000	Portugal	Portuguese
BN10	Long Liner Fishing Vessel	95.3 F 29.07 M	24.3 F 7.42 M	F M		1,200,000	Namibia	Namibian
ROL10	Trawlers De-Listed	97 Feet 29.5 Meters	26.4 F 8.0 M			700,000	New Zealand	New Zealand

PH10	Trawler De-Listed	**131 F** **40 M**	32.9 F 10.04M	13.12F 4M		6,000,000	Greece	Greek
LP10	Trawler De-Listed	**83.4 F** **25.45 M**	22.3 F 6.8 M	10.8 F 3		480,000	Latvia	Latvia
WP10	Shrimp Vessel De-Listed	**66 F** **20.12 M**	F M	F M		60,000	South Carolina	US
KAN10	Shrimp Trawler De-Listed	**68 Feet** **20.7 Meters**	20 F 6 M	6 F 1.8 M		92,000	Northwest Florida	US
RE10	5-Shrimp Trawler De-listed	**75-63 Feet** **19-22 Meters**	F M	F M		120,000-140,000	El Salvador	El Salvador
LG10	Trawler De-Listed	**87.5 Feet** **26.6 Meters**	F M	9.24 F 2.8 M		300,000	Cyprus	None
NN11	Trawler Incomplete New Hull De-Listed	**94 F** **28.6 M**	24 F 7.3 M	14 F 4.2 M		115,000	Washington State	US
NN10	Trawler De-Listed	**86 F** **26.2 M**	22.4 F 6.8 M	11.1 F 2.38 M		170,000	Washington State	US
TGC10	Shrimp Boat Sorry, Sold	**50 F** **M**	18F M	4.5 F M		55,000	Mississippi	US
MBH10	Shrimp Trawler Sold	**85 F** **25.9 M**	22 F 6.7 M	11 F 3.35 M Depth		175,000	Gulf of Mexico	US
KW11	Fishing Vessel De-Listed	**89 F** **27 M**	23 F 7 M	10 F 3M		525,000 FIRM	Eastern Canada	Canada
RY10	2 - Freezer Trawlers De-Listed	**88.5 Feet** **27 Meters**	24.6 F 7.5 M	11.5 F 3.5 M		240,000 Each	India	India

Source: Maritime Sales Inc. (maritimesales.com)

Appendix 10: List of Interviewees:

1. Mr. Hixenbaugh K. Darbeh, Manager, Inter Burgo Industrial Fishing Company, Monrovia, Liberia.
2. Mr. James F. Sackie, Manager, Dong Yong Fisheries Corporation, Monrovia, Liberia.
3. Mr. Lawrence M. Doe, Jr., Manager, Monrovia Fishing Company, Monrovia, Liberia.
4. #Mr. Morris B. Lackett, Manager, Star Fishing Agency, Monrovia, Liberia.
5. Mr. Adalsteinn Helgson, Managing Director, Katla Seafood, Reykjavik, Iceland.
6. Mr. Baldvin Thorsteinsson, Junior Executive, Katla Seafood, Reykjavik, Iceland.