The Supply Chain of Sea Fish from Source to Consumer: Bangladesh Perspective

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Abstract

Supply chain is a burning issue in the new era of global business. Organizations always try to make the supply chain efficient to ensure maximum value to the final consumers. As a riverine country fishes play a vital role in the livelihood and food habit of Bangladesh. But no remarkable research work has been found on the supply chain of sea fishes of Bangladesh.This empirical research based on primary and secondary data depicts the supply chain of sea fishes of Bangladesh. Based on survey research techniques the researchers demonstrate the distribution channel of sea fishes from fishermen to final consumers. In Bangladesh, sea fishes are sold in more informal markets and its supply chains consist of a number or combination of mid-chain players who transform, package, and move product from the point of production to the final sales. But this existing supply chain is quite complex, lengthy and costly. This paper also highlights other underlying hindrances of the supply chain of sea fishes in Bangladesh. Besides, the authors proposed a new model which is free from the influence of intermediary and private parties. The new model incorporates and integrates an information technology based central distribution centre to make the supply chain more effective for all the related parties. But further research is required to find out the effectiveness and challenges of the proposed model.

Key words: Sea fish, Supply chain, fish processing, fisheries, cold storage**.**

Introduction

Fish are the world's major source of wild protein (Nanna Roos,2007). The seafood industry handles around 158 million metric tons of products every year. Approximately, tens of millions of people worldwide who fish for a living collectively harvest thousands of different species; they fish in every ocean on the planet, and range from independent artisanal fishers in emerging economies to months-at-sea workers on factory trawlers. In addition to that

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diversity, certain product characteristics, as well as practices of supply chain actors, make seafood a wholly unique industry (Nanna Roos, 2007).

The fisheries sector in Bangladesh plays an important role in the economy of the country and contributes 60% of the total national demand for animal protein (Fishery statistical yearbook of Bangladesh 2015-2016) Most fishes are sold in the domestic markets and are also exported to different countries. Ethnic communities abroad especially the UK is a good importer of revering and sea fish produced in Bangladesh. Shrimps, known as the white gold of Bangladesh, are exported to markets of UK, Germany, Japan, USA, and Belgium.

Bangladeshi fisheries sector is broadly divided into four sub-sectors- inland capture, inland culture, *mariculture* (artisanal fisheries) and marine industrial fisheries. The marine waters of the Bay of Bengal have great potential for fish production. The fishing trawlers are of two kinds including wooden body and steel hull engaged in fishing in the EEZ of Bangladesh. The distribution system and structure of sea fish from fisherman to consumer involve various chains and the price of sea fish is generally determined by its distribution system. This paper aims at explaining the sea fish distribution system, selling system, supply chain and analyzing how market intermediaries operate along the sea fish supply chain.

Literature review

The supply chain explains the overall activities which are required to bring a product or service from conception, through the various stages of production and delivery to end consumers. The goal is to deliver maximum value with minimum possible total cost and maximize the service quality. Market chain analysis aims to provide information on profitability for the various agents along the supply chain (Monczka, Trent, Handfield, 2011).

Sea fish is a highly consumable commodity and its quality deteriorates very quickly. Production and consumption areas are also extensively separated. Production of sea fish means catching fish can be increased by making best utilization of the existing sea resources through modern technology and scientific method of fishing techniques (Kohls, R.L and Uhl, J.N, 2005). A wide number of different kinds of water bodies both inland and marine have made Bangladesh one of the most suitable countries of the world for freshwater aquaculture as well as sea fish resources. Trawl Fishery in Bangladesh mainly started in 1972, is largely engaged in harvesting demersal fish and shrimp,

but in current years the government is approving new modern mid-water trawlers and long liners to motivate pelagic fishing .The total annual sea fish production is estimated at 599846 metric tons within 9060 km marine territorial area in 2015-16 (Fishery statistical yearbook of Bangladesh 2015-2016). The distribution system and market structure is one of the core issues in sea fish production and it is a complex chain of various sub systems mixed up in distribution of sea fish from fisherman to consumer. Four types such as primary, secondary, intermediary and consumer market of distribution systems are involved in the process of distribution and price of sea fish is also determined by this system. Export of shrimp has been improved in recent years. Fish and fisheries goods are exported from Bangladesh which was worth Taka 32,106 million where frozen fish and shrimp contribute over 90% of the total exports of the fishery products and gained 3.7% of total export income of Bangladesh (Bangladesh Bank, 2011). The total annual fish construction is projected at 2.90 million tons in 2010-11 of which 1.35 million tons (46.62%) are gained from inland aquaculture, 1.02 million tons (35.53%) from inland capture fisheries, and 0.52 million tons (17.85%) from sea fisheries (DOF, 2011).

Though the main economy of Bangladesh is agro-based, the fisheries sector share near about 58% of animal protein to the daily diets of the people, about 3.74% to GDP, 4.04% in export earnings. Since fish production in Bangladesh is increasing over the years, its throwing away pattern is very important as growers, wholesalers, retailers and consumers- all are affected due to value addition in the distribution process. In spite of contributing around 17% of the total fish of Bangladesh, still a lot of information is unknown to people about sea fishes. (DOF, 2011). A number of researches have been carried out on river fish and its supply system. No significant research has been carried out in the field of supply chain of marine fisheries in Bangladesh as per our review. That is why the information on sea fish production and its distribution process is difficult to find out. This study is conducted to determine the supply chain and distribution method and the processing of sea fishes in Bangladesh.

Discussion

The main goal of SCM is to integrate and manage the sourcing, flow and control of materials applying a total systems perspective across different functions and multiple tiers of suppliers (Monczka,Trent, Handfield, 2012).

The functions of distribution may be defined as major specialized activities performed in completing the distribution process of equalization. Distribution system plays an important role by connecting the link between the first stage - fish farmer and the last stage - consumers.

With the help of the channel, members (Local traders, Fishers or fish farmer, Fish party, Whole seller, Distributor and retailer) of the harvested sea fishes transfer from producers to consumers. The channel of fish distribution is managed, supported, financed and controlled with traditional rules and some other intermediaries. These intermediaries engaged in the whole process have no proper education or knowledge to make the best out of the supply chain management. The trawler owners cannot communicate with the market directly or sell to households because the market communication is mainly made by the middlemen and the wholesalers who will not permit this.

Fishing trawlers in Bangladesh

There are various types of vessels engaged in trawl fishing in the Bay of Bengal, grossly categorized into wooden body and steel hull. Wooden trawler catches *hilsha* and general fish like *loitta* and other marine fishes and the industrial trawler catches prawn and white fish. Both types of trawlers are selling marine fish within the country and exporting abroad as well. The wooden trawlers and industrial trawlers have different working conditions. All wooden body trawlers have chilling facilities and almost all steel hull trawlers have freezing facilities for preservation of their caught fish. The industrial fishing fleet has a capacity of gross tonnage ranging from 20 MT to 148 MT for wooden body and 80 MT to 420 MT for steel hull trawlers. The overall length is ranged from 18.5 meters to 26.50 meters for wooden body trawlers and 34 to 54 meters for steel hull trawlers. The engine powers varies from 420-600 BHP (Brake Horse Power) for wooden body and 716-1850 BHP for steel hull, but mostly fall within 500-1000 BHP (www.mechanics.stackexchange.com).

These industrial trawlers are mainly engaged in harvesting *demersal fish and shrimp*, but in recent years mid-water trawlers have been added to the fleet for fishing pelagic species**.** The white fish trawlers use mostly high opening bottom trawls (net) from the stern side with 60 mm mesh size at the cod-end. The head-rope length in the fish trawler fleet varies from 68 meters to 88 meters. Almost all the trawlers are equipped with modern navigations, communication and fish finding equipments. Trawl fishing has

been restricted by ordinance to operate beyond 40 meters depth contour. The smaller wooden trawlers usually sail for 14 days and steel-hull vessels for 30 days in one voyage. They usually complete 5-6 hauls in a day taking 3-5 hours per haul (Suman, 2014). But the number of hauling and fishing days substantially depends on weather, sea worthiness and functioning of trawler itself.

Procedures of Fishing and Processing at Trawler

There are two types of fishing techniques known as bottom-trawling and mid-water trawling. In bottom-trawling method the vessel drags trawl-nets across the sea floor to scoop up fish– stirs up the sediment and all life forms lying on the seabed– wiping out everything. It is regarded as one of the most unsustainable fishing methods and termed as 'bulldozers of the sea', said to be responsible for fish stock decline. Mid-water trawling is regarded as the lesser evil as it does not contact with the sea bed.

Fish processing procedures are most important in fishing vessel as it is a matter of a huge amount of money. After catching, first of all fishes are categorized into several groups depending on their size and then crews wash these fishes with water and they keep 20 kg of fishes in a block (Islam & Habib, 2013). After that, they put these blocks into the freezing room known as fish hold and hold the fishes at the temperature between -20 to -40 degree centigrade. But Shrimp processing procedure are different, basically Shrimp are collected as headless and shell less and plate is used for frizzing.

Some most popular sea fish in Bangladesh

Name of Fish	**Basis**	**Specification**
Cat fish	weight	Large :2 kg above ,medium :1-2 kg
Sardine	weight	Large:1kg(20-25 pcs), medium: 1kg (30-40 pcs) local name: chapia
Silver Pomfret	weight	Large :150gm up , medium:75-150 gm , small: 75 gm bellow
Hilhsa	weight	Large :500gm up , medium :300-500gm ,small:150-300gm
Shrimp	species	Tiger , Lubster, Brown shrimp , white shrimp

Distribution process of Sea Fishes

The Bangladesh fishing industry is one of the major exporters of fish and seafood products worldwide. The fish and seafood are used for a large

variety of products ranging from fishmeal for industrial use to fish products for human consumption. In the diverse fishing industry, fishermen catch and handle huge quantity of fish species in the upstream end of the supply chains whereas fresh and processed fish products are sold to consumers globally in the downstream end. In-between, a varying number of actors handle the process and distribute fish and fish product.

Once the fishes are caught and sold by firsthand, the chain of sea fish supply is performed by several intermediaries. Once fishing trawlers come back from sea, fishes are transferred to the fish party (first hand buyer) or processing plants. Most of the fishing trawlers in Bangladesh are controlled by fish party. They buy tons of fishes from the vessels owners through tenders. On the other hand, there are some processing plants who have their own ships. They collect fishes from trawlers and process the fishes in their own plant for exporting. After purchasing fishes from trawlers, fish party preserve their collection of fishes in the cold storages. The storage duration depends upon the demands of customers. Processing plant mainly processes quality fishes like shrimp, *silver pomfret* etc.

The present Supply chain structures of Sea Fish

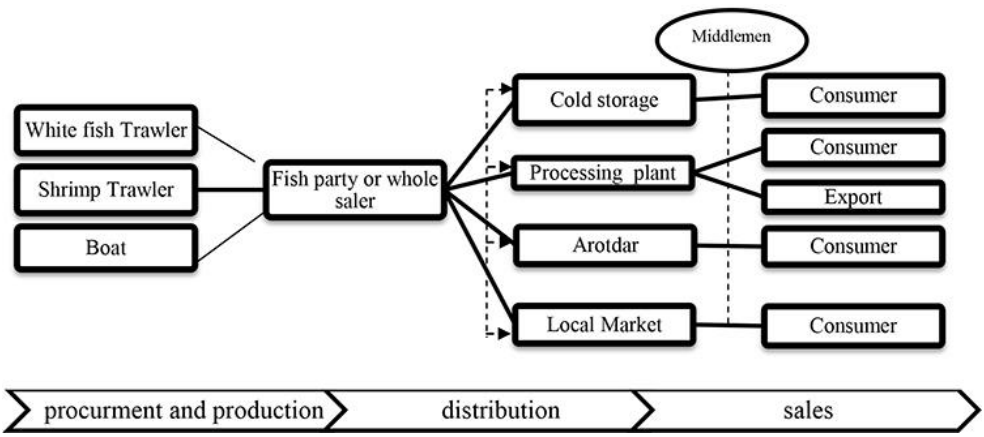

Figure 1: *supply chain and indication of upstream/downstream flows*

The first stage in the sea fish distribution channels or supply chain of fish distribution channel begins from the white fish trawler, shrimp trawlers and boat. At the time of trawling fishes, the crews process the fish immediately after catching and keep them in the fish hold. After the completion of full voyage, trawlers get back to the river side jetty or birth and then owner or agents of trawler draw the attention of first buyer through opening a tender.

Fish party or wholesaler is a middleman who , acting as key player in the whole supply chain, buy sea fishes through these tenders. Fish party store the fishes in cold storage and use this storage as distribution centre. Buyers from different corner of the country accumulate there for purchasing and then send to the local market of the country. Moreover there are some other parties who are involved in export and they buy fish from cold storages and process the fishes through processing plants and later they export to different countries. Processing plant is another type of intermediary in the distribution system that purchases quality fishes from fish party(first intermediary) or directly from trawler and process them for direct export. In some cases, *Arotdar* (second intermediary after fish party) or local market representative take fishes from the cold storage or directly from the fish party. The last intermediaries of fish distribution channel are retailer and they do not have any permanent establishment. However, Retailers have fixed places to sit in the market places or sell fishes with pots on heads travelling from door to door. It is seen that they have no idea about distribution system, modern technology or modern preservation system. However, they have no idea how they could wisely minimize their distribution costs.

Supply chain process of Shrimp

The shrimp supply process is different than other white fish. Most of shrimp caught in fishing trawler are exported to different countries and therefore to maintain the right quality they are processed immediately in trawler after catching. The complete processing is done in trawlers which are required for Shrimp export. When the vessels get back from sea completing the voyage, they unload the processed shrimp and send to the respective port through refer container for export.

Figure 2. *Flow of Shrimp from origin to export*

Findings

The sea fish market of Bangladesh is encountered with a number of problems that severely hinder the smooth supply chain flow of sea fish to the final consumer. But sea fish can play a vital role in eradicating the food

and nutrition deficiency of our country provided we ensure a smooth and modern supply chain of sea fish.

The private sector controls the sea fish distribution system in Bangladesh. Presences of some unnecessary parties just add a cost to the consumer and a loss to the party engaged in the distribution chain. This additional involvement of intermediaries keeps fishermen and markets separated not allowing them to be market responsive.

Moreover, there are no specific road networks, transports and landing points and due to the absence of landing centers and planned transport network the quality of the fish is affected severely. It has also created an opportunity for the intermediary to make money which is a complete loss for the fisherman and it increases the price for the final consumer.

Absence of modern technology or modern preservation system impacts the supply and quality of sea fish. The hygiene quality of the existing cold storage is required to improve. Still the loading and unloading system of the cold storage is manual that consume time. In addition to that there is lack information flow along the supply chain as the fisherman, whole seller, Arotdar and consumer communicate manually or over phone.

The existing distribution system is time consuming. It takes huge amount of time to supply the sea fish to end users. It almost takes 5-7 days to store all the fish from fishing trawler to cold storage. This happens because of the syndicate of around eight to ten fish parties (whole sellers/ first intermediary) who control the whole-sale market of sea fish in Chittagong. These fish parties purchase the fish from the fishing trawler owners through tender which consume much time as the tender begins after the arrival of the fishing trawler in the shore at their specific buoy or jetty. After the tender, the concern fish party unload the fish from the fishing trawler in small amount with *sampan* (small boat) and bring the fish to the cold storage that actually enlarge the lag time. For each day a vessel has to face the average loss of tk. 1,00,000/- in the form of maintenance cost as the compression must be on until all the fishes are unloaded.

Recommendations

This paper has proposed a new model for fish distribution. It demonstrates how the sea fish supply chain becomes more effective and efficient. In this system there will be a common landing and distribution centre with cold

storage and transportation facilities, where all the intermediaries (Fish party, Wholesaler, Fish processing agents) can meet together in a point. As a result, everybody will collect fish from that common center and this will minimize the time and cost. This arrangement can make the distribution channel shorter as they can make a deal with a landing center and thus reduce the number of intermediaries and cost. With the application of information technology (IT), this distribution centre will enable us to conduct a centralized fish tendering which would certainly minimize time and cost. The application of information technology (IT) system will also enhance the transparency of fish tendering as all the parties will have the access to market information. Fishes will be immediately stored in the central cold storage just after the arrival of the fishing vessels that will ensure the quality of the fishes. As this paper aims at exploring the existing supply chain system of sea fish, it is a matter of further research that how this distribution centre will adapt various information technology (IT).

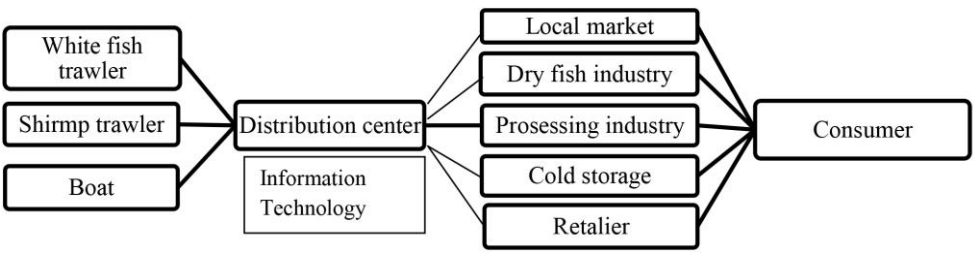

Figure 3. *The proposed sea fish supply chain process with IT integration*

So, specific suggestions which are needed to establish to improve the distribution system are as follows:

a. Installation of modern information technology ((e.g. Bar-code system) to reduce the information gap and the lag time along the supply chain.
b. Online selling system should be introduced to keep updated all the intermediaries in between the supply chain. This will also reduce the number of middle men and ensure the minimum price for the final consumer.
c. Establishment of proper cold-storage and preservation facilities to another parts of the country is necessary to ensure best quality and distribution.

d. Using insulated and refrigerated fish vans and fish carriers to maintain right temperature during the transportation within the country and outside as well.
e. Existing fish market structure should be improved to reduce the cost of supply.
f. Improvement of fish transport and handling facilities.
g. Establishment of modern wholesaling facilities.
h. Establish hygienic condition, drainage and washing facilities in the market.
i. Using of mechanical weighing equipment which will enable to weigh large amount of fishes at a time.
j. As fish is one of the vital food items for Bangladeshi people, the price and other regulatory issues of fish market are required to come under the close observation of the Government.

Conclusion

Sea fish distribution in Bangladesh is overwhelmed with a number of unresolved issues. To improve fish distribution environment in the country, a new supply chain is required. There is no change in the distribution system, it is going on same as like as past years but the structure should be changed with the help of integration of modern technology and proper management of supply chain. By the proper use of information system it is possible to make the supply faster and efficient. The above proposed model can certainly minimize the mentioned problems in the sea fish supply chain in Bangladesh.

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