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Value Stream Analysis of Dried Fish's Supply Chain in Bangladesh

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Abstract
Drying of marine fish is very common in the entire coastal areas of Bangladesh and these dried fishes have demand both in domestic and international markets though the people involved early in the production chain (fishing and drying) add relatively high value and make little profit. In the current supply chain, producers have no influence over supply chain management, rather they are strongly managed and monopolized by giant traders, brokers, dealers, wholesalers and thereby, erodes profitability and preference of primary producers. We conducted a study mainly in Kuakata and Dhaka to examine the supply chain of dried fish between these two areas. Basically this Kuakata is famous for producing dried fish in Bangladesh. Dhaka is the capital of Bangladesh, as well as center of different business areas. We have used value stream mapping to analyze the supply chain of dried fish in Bangladesh. In our survey we have tried to identify different supply chain intermediaries and surviving problems in dried fish's supply chain. At the final stage of our article we have projected our findings and mentioned some possible solutions.
Keywords: Supply Chain Management, Value Stream Mapping and Value Stream Analysis, Dried fish, Bangladesh

1. Introduction

Southern parts of the Bangladesh are called for river and sea based area. Many of people are directly related to collecting fish related work. In Bangladesh 7.3 million people live in the coastal fishing villages whose livelihood someway depends on marine fishing (Munir , Nazrul & Shamsuddoha, 2006). In the supply chain of marine dried fish, three intermediary stakeholders are involved between fisherman and consumers. They are processor, aratdar and wholesaler/ retailer. In long supply chain profitability is not as high as the value added. In contrary both the profit maximization and profit distribution are considerably higher in a short supply chain than the long supply chain. The wholesaler or retailer in city market secure as high as 40 percent profit. In all cases, primary producers secure less profit, only 10 to 15 percent whereas their involvement in terms of labor, time etc. is the highest. The major cause of price exploitation is dadan (dadan=non institutional money lending) that make producers bound to go for 'conditional engagement' in fish drying business. In relation to dry fish export, the increasing non-tariff measures (NTMs) acts as critical barrier despite having huge international market demand (Munir , Nazrul & Shamsuddoha, 2006). The study recommends appropriate policy intervention for financing dry fish producers and to strengthen domestic technical regulations to overcome barriers in the supply chain of dry fish of Bangladesh.

2. Objectives

We have conducted survey with some specific objectives. The main objective is to prepare value stream analysis of dried fish's produced in Kuakata. Other objectives are as follows:

- To identify problems among the intermediaries of supply chain of dried fish through the helps of Value Stream Mapping and Value Stream Analysis.
- To figure out the cost and price movement in supply chain of dried fish.
- To propose some strategy processes that will be helpful for the fisher men, producer and consumers.

3. Materials and Methods

Primary and secondary data sources are used in this study. Primary data has been collected employing the following techniques:

3.1. Focus Group Discussion

In the group conversation we met some people who are directly involved with the fish collection and processing

in the Kuakata area. Through this conversation we found information related to valuing and value addition on raw fish at different stages, fish drying and marketing apparatus, marketing chain transportation and value addition and finally lending on dried fish business.

3.2. Stakeholders Interview

In the supply chain of dried fisheries products, we identified following stakeholders from kuakata and Dhaka: fishers, dry fish producers, aratdar, commission agents, pikers, whole sellers, super market, entrepreneurs and NGOs. For collecting information from these different types of stakeholders, we developed separate questionnaire by stakeholders. Through questionnaire we collected some information related to finance, supply chain, profit area, value addition, processing, stocking process, time duration, different problem area and transportation. After that we identified the value stream map of dried fish's supply chain and analyzed it.

4. Literature review

4.1. Supply chain management

SCM has been interpreted by various researchers. Based on the relatively recent development of the supply chain literature, it is not surprising that there has been much debate as to a specific SCM definition. (Ganeshan & Harrison 1995) has defined SCM as "a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers". (Lee & Billington 1995) stated that SCM consists of the integration activities taking place among a network of facilities that procure raw material, transform them into intermediate goods and then final products, & deliver products to customers through a distribution system. The overall goal for a supply chain is to fulfill the end customers' needs and expectations in a cost-efficient manner (Jespersen & Skjott 2005). Supply chain always involved to improve the product flow and minimize the cost. It helps producer as well as ultimate consumer through the improvement of upstream/downstream flows of goods and services. There are a number of tools for supply chain analysis. Here we have used Value Stream Mapping/ Value Stream Analysis to describe the supply chain of dried fish in Bangladesh.

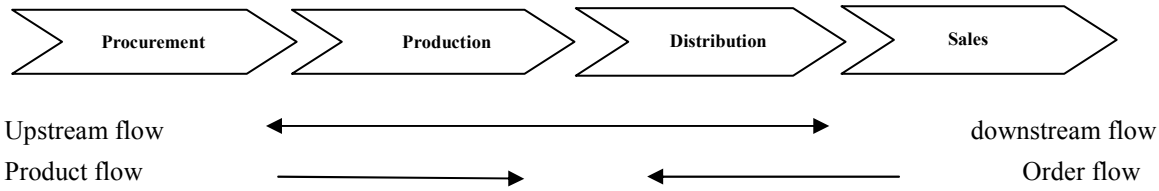


Figure 1. Simple supply chain and indication of upstream/downstream flows

***Source:Toke K. Jensen, Jette Nielsen, Erling P. Larsen, Jens Clausen (2009), A report on The fishing industry – toward supply chain modeling*

4.2. Value Stream Mapping and Value Stream Analysis

A value stream map is typically created as a one-page flow chart depicting the current production path or design path of a product from the customer's request to delivery. Value stream mapping, a lean manufacturing tool, which originated from the Toyota Production System (TPS), is known as "material and information flow mapping". In the 1980's, it was introduced by Toyota's Chief Engineer Taiichi Ohno and Shigeo Shingo (http://en.wikipedia.org/wiki/Value_stream_mapping) . This mapping tool uses the techniques of lean manufacturing to analyze and evaluate certain work processes in a manufacturing operation (Wolfgang A., Jia Y. Li and Vanessa W.2007). Value stream mapping is one of the best tools for identifying and planning opportunities for a process. Value stream mapping and Value Stream Analysis is one of the most popular supply chain analysis techniques focusing on the flow of materials and information required to deliver a product to a consumer (Ramingwon, Wattanutchariya and Laosiritaworn , 2011). Value Stream Mapping is a method of visually mapping the flow of materials product and information from one channel to other channel. Form the producer to ultimate customers. A value stream map includes: Cycle times, uptimes, change-over times, in-process inventories, information flow paths, total lead time, number of people and material moves. (http://www.managementsupport.com/nl/tvsmap.htm)

Value Stream Mapping (VSM) is the technique used to visually define the process path of activity. This process defines the activities from three viewpoints i.e. Value-Added Activities (VA), Non-Value Added Activities (NVA) and Necessary-Non-Value Added Activities (NNVA). Many of specialist used value stream analysis. Ramingwon, Wattanutchariya and Laosiritaworn had studied about parboiled rice's supply chain of Thailand through the helps of Value stream mapping and Value stream analysis.

5. Dried fish in Bangladesh

Dried Fishes edible and preserved through removal of moisture. Fish drying as a means of preservation has been practiced since time immemorial in this region, and dry fish is considered as a delicacy in the menu of many people of Bangladesh (www.banglapedia.org). The basic principle of fish drying is that the activity of the muscle enzyme and microorganism is reduced to a minimum through drawing out the water content of the fish by sun drying in a traditional way. Munir , Nazrul & Shamsuddoha, 2006 conducted an important research on Value Chain Analysis in the dry fish production and marketing of Post-Harvest Fishery Products (PHFP) in the coastal belt of Bangladesh. Where they mentioned some important spots: Dublar Char of SUNDARBANS, ST MARTIN'S ISLAND, Rangabali, Sonadia Island, Moheshkhali, Cox's Bazar, Kuakata. These are all coastal areas where modern preservation facilities and good infrastructure for transportation are vague.

The important marine and freshwater species that are dried are Loitya (Harpodonneherius), Poa (Panna microdon), Parse (Liza persia), Phasa (Setipinna phasa), Taposi (Polynemus paradiseus), Boiragi (Coilia dussumieri), Fatra (Raconda russeliana), Pama (Otolithes pama), Chhuri (Lepturacanthussavala), Punti (Puntiussarana, P. stigma), chapila (Gadusiachapra), Lakhua (Polynemusindicus), Rupchanda (Pampuschinensis), and shrimps (Metapenaeus species and Penaeus species) identified by (Munir , Nazrul & Shamsuddoha, 2006).

6. Major channel in supply chain of dried fish

In the supply chain of dried fish's we have identified some major channel of that sector. We can define them as the intermediaries in supply chain. Firstly fisherman collects the fish form sea. Sometimes the fisherman himself involves in dried fish processing. Who are not directly involved with the dried fish processing, they send their fish to the processor or the dried fish maker, then follow some steps to process the fresh fish to the dried fish.
Finally the processor sell dried fish a third party like the aratdar (local wholesaler) etc. Then the supply chain depends on the number of intermediaries. It may go through a huge no. of intermediaries or a few no of intermediaries to the ultimate customers. Here we have identified a traditional and most common supply chain of dried fish's which encompass 4/5 intermediaries from fisherman to ultimate customers. Here we have included a supply chain of dried fish which we have made on the basis of survey information conducted in Kuakata and Dhaka. But this chain is more or less same for the other part of the country.

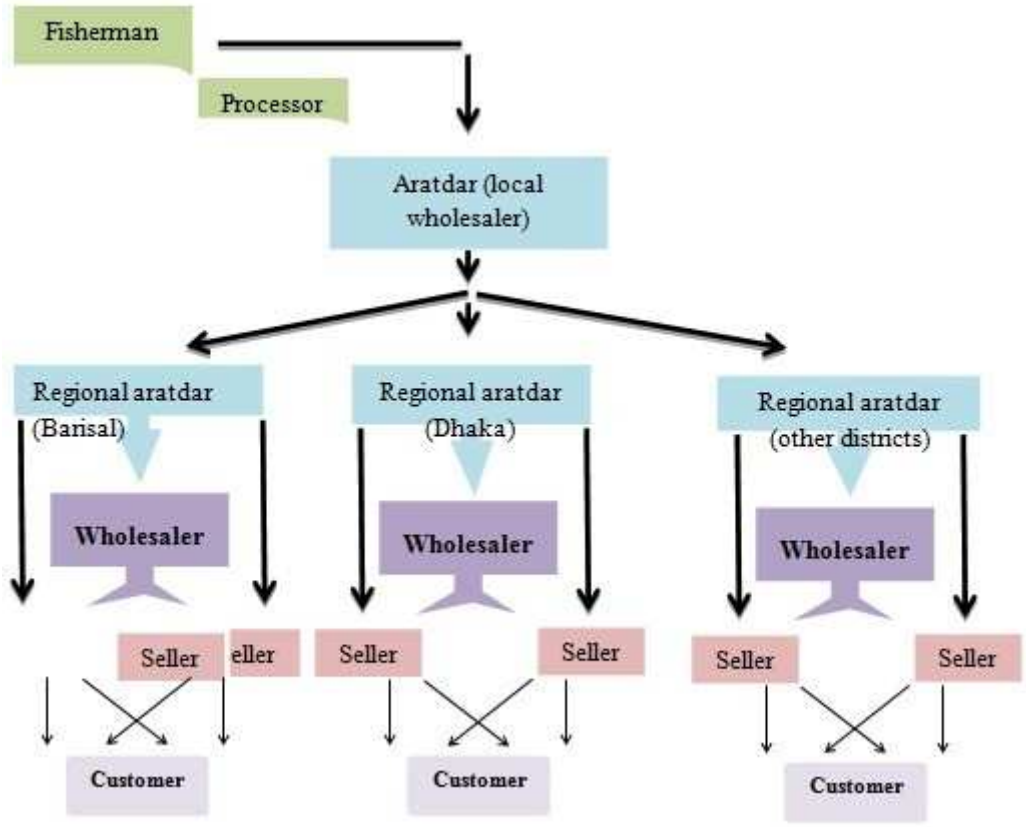


Figure 2. Physical flow of dried fish's in Bangladesh

7. Value stream mapping and analysis

To projecting the supply chain of dried fish here we have used value stream analysis. In Value stream mapping activities are divided into three types. These are Necessary-Non-Value Added Activities (NNVA), Non-Value Added Activities (NVA), and Value-Added Activities (VA). Non-Value Added Activities (NVA) is the stocking of the dried fish in various middle man warehouses. Like processor, local arotdar, regional arotdar, wholesaler, sealer etc. hold it as their inventory which ultimately adds no value to the dried fish. Value-Added Activities (VA) are those which are directly involved with the production activities like cutting, mixing, drying etc. Without this value added functions it's can't be dried fish. Again some of the activities are involved with movement of dried fish. It may be the transportation, receiving and storing fish by the various intermediaries. These are called necessary-Non-Value Added Activities (NNVA).

Here the value stream of dried fish which we have identified mainly presented and discussed from the two different viewpoints.

- One is when fisherman is also the processor of dried fish
- Another is when Fisherman and processor of dried fish are different persons

Basically when fisherman is the processor of dried fish then there is a reduction in time and intermediaries. Again it may reduce the additional cost which arises due to hand transfer. Now in the following section we will analysis the value stream mapping from these two different viewpoints.

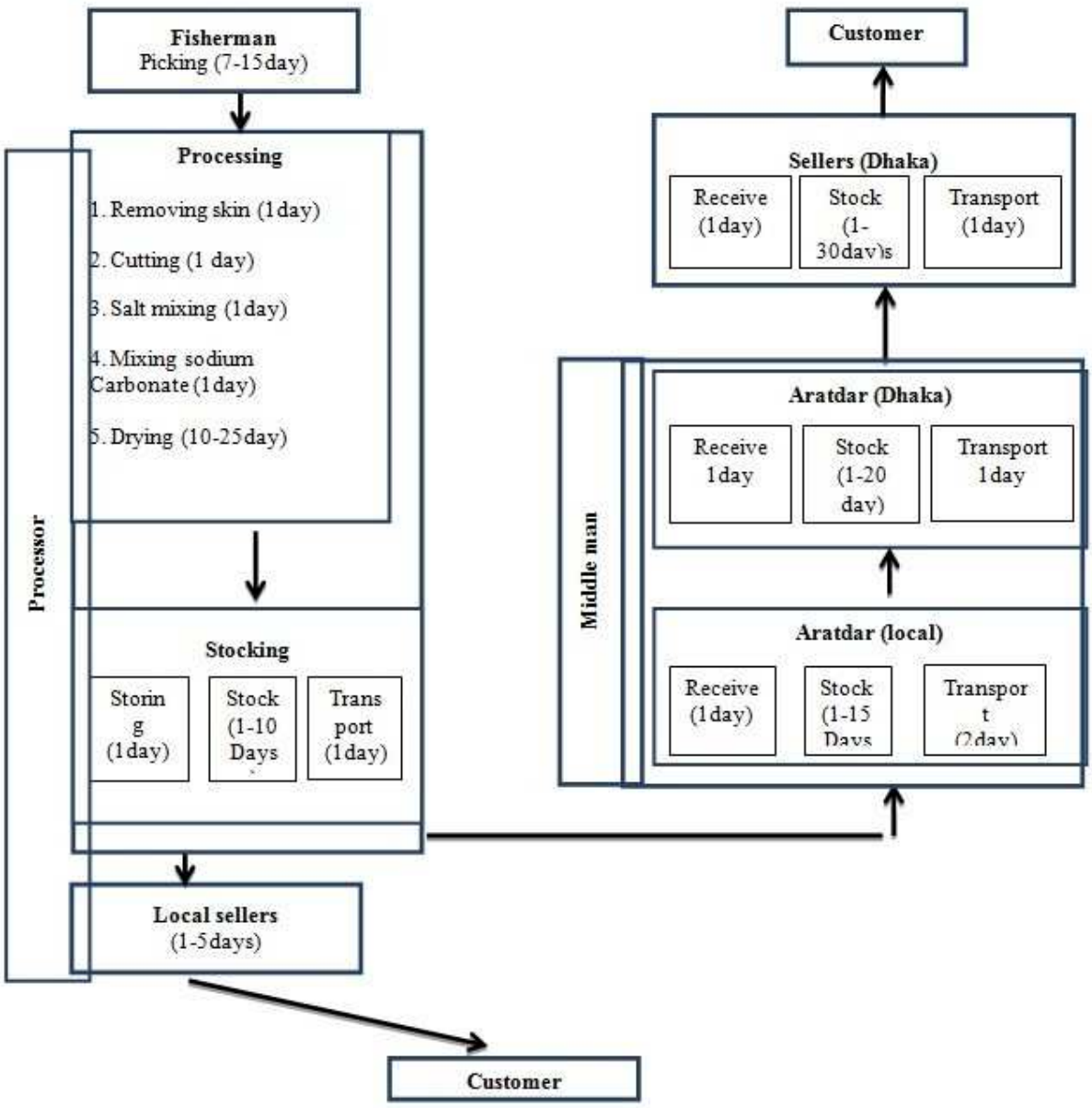


Figure 3. Value stream analysis (when Fisherman and Dried fish's producer is different person)

Analysis

From the above value stream we see that total no of activities are 18. From this no. of activities we can see than Value-Added Activities (VA) are 6. They are Picking, Removing skin, Cutting, Salt mixing, mixing sodium Carbonate and Drying. 7-15 days is for picking, 1 day for removing skin, 1 day for Cutting, 1 day for Salt mixing, 1 day for Mixing sodium Carbonate and 10-25 days for Drying.

Again Non-Value Added Activities (NVA) is 4. Mainly these activities are indicated only the stocking in different hand like producer, aratdar, wholesaler, seller etc. This Non-Value Added Activities (NVA) consumes a large no of days which is 75. And these are activities increase the cost of product and creates high price for the ultimate consumer.

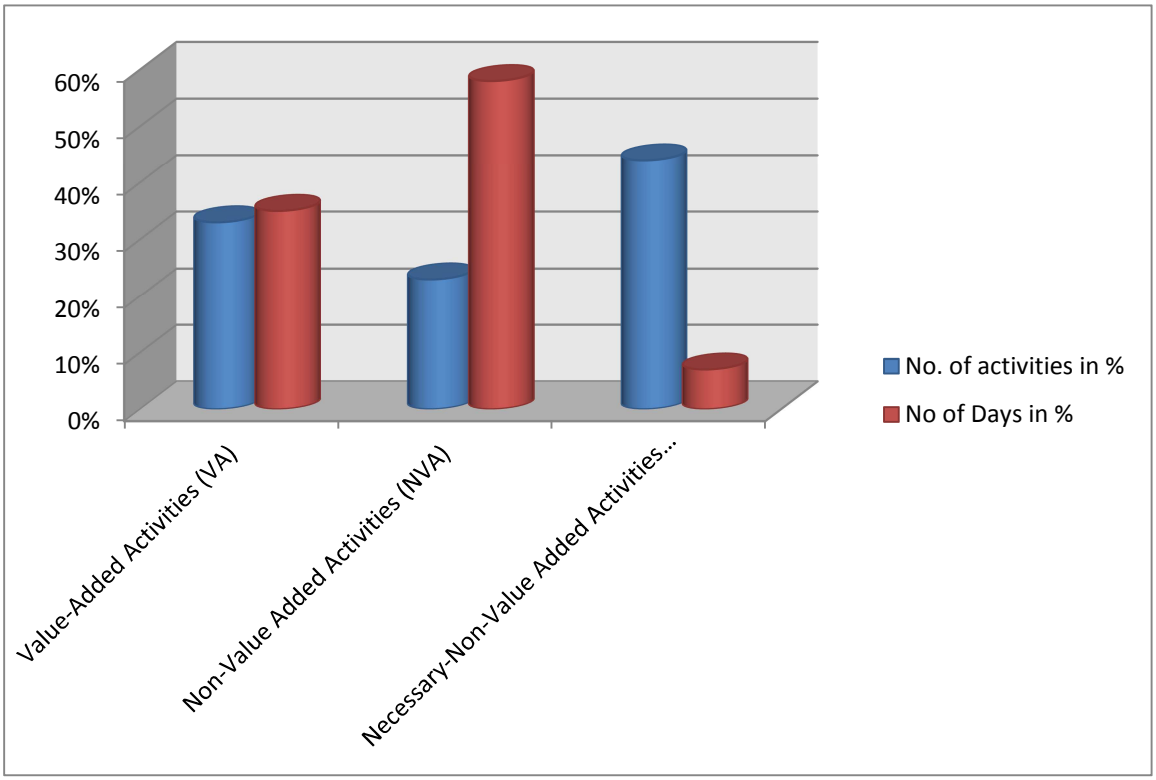
And the final category is Necessary-Non-Value Added Activities (NNVA) and the no. of activities in this category are 8. They are the related to receiving and transportation in different intermediaries.

But it is necessary to note that when the dried fishes are sold in local market then there is large reduction in the no. of activities which arise from different intermediaries. A reduction is also in the no. of days taken. But our main focus is on the chain with some usual intermediaries when dried fishes are sold outside the local market. Basically here we consider in country market of Bangladesh. The outcomes from this value stream mapping are summarized below:

Table-1: results of value stream mapping

	Activities		**Times**	
	No. of activities	%	Days	%
Value-Added Activities (VA)	6	33%	44	35%
Non-Value Added Activities (NVA)	4	23%	75	58%
Necessary-Non-Value Added Activities (NNVA)	8	44%	9	07%
Total	18	100%	128	100%

Chart-1: No. of activities and time in VA, NVA, NNVA



From these graph one thing is important to be noted that most of days are consumed in non-value added activities; i.e.75 days which ultimately lengthen the no. of total days. But in value added activities it is only 44 days.

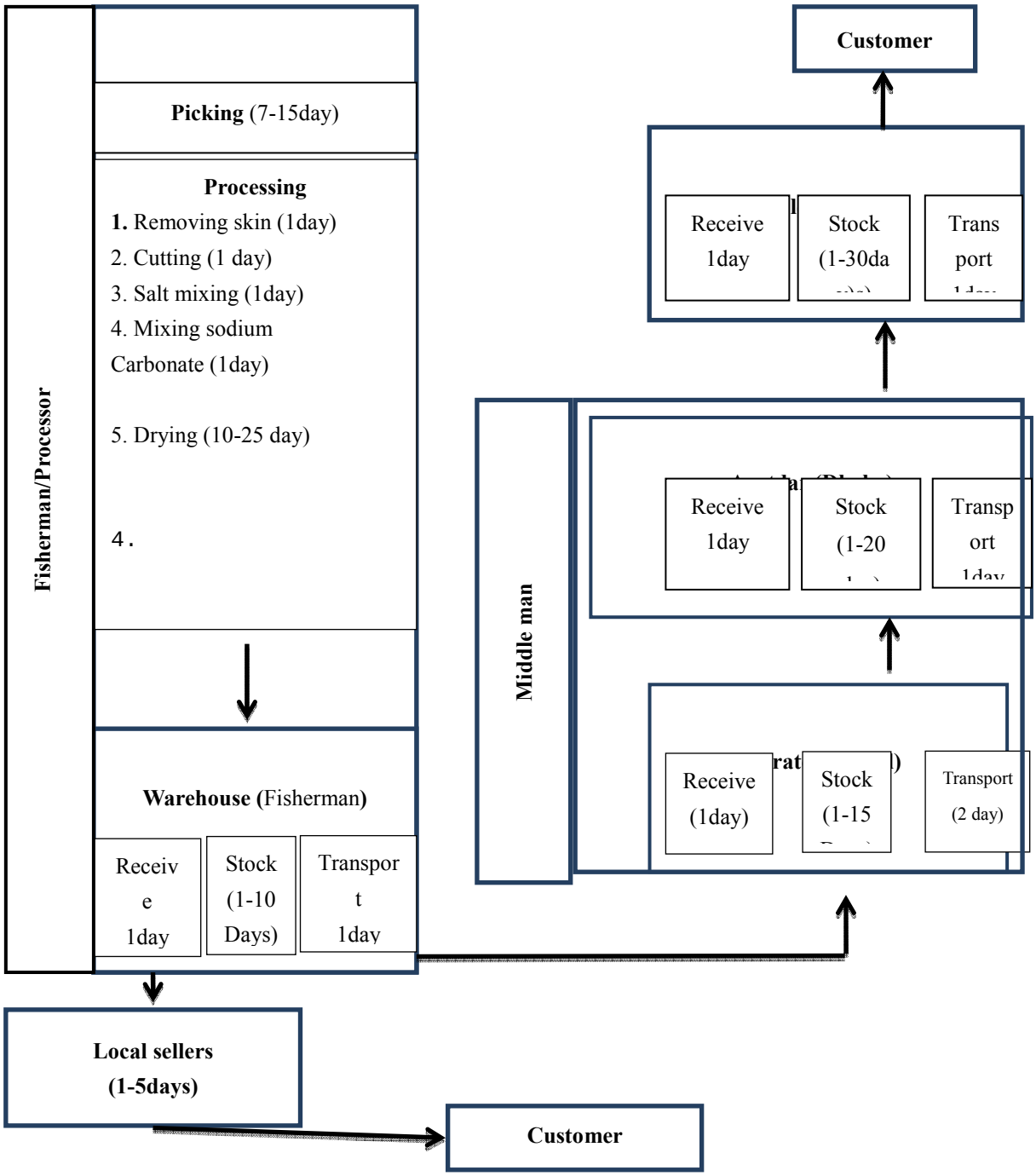


Figure 4 Value stream analysis (when fisherman is the producer of dried fish)

In this case all are same as we have presented when fisherman is not the producer. Only there is reduction of another person as a producer. **Value addition blocks in supply channels:**
Supply chain is closely related with value addition because in every channel in value chain some value is added. Here we have projected the value addition scenario.

Table-2: Average value addition scenario

Steps of the channel		Percentage	
Fisher to processor			15%
Processor to Retailer	Removing skin (1day)	5%	75%
	Cutting (1 day)	5%	
	Salt mixing (1day)	15%	
	Mixing sodium Carbonate (1day)	10%	
	Drying (1 day)	40%	
Retailer to Consumer			10%
Total			100%

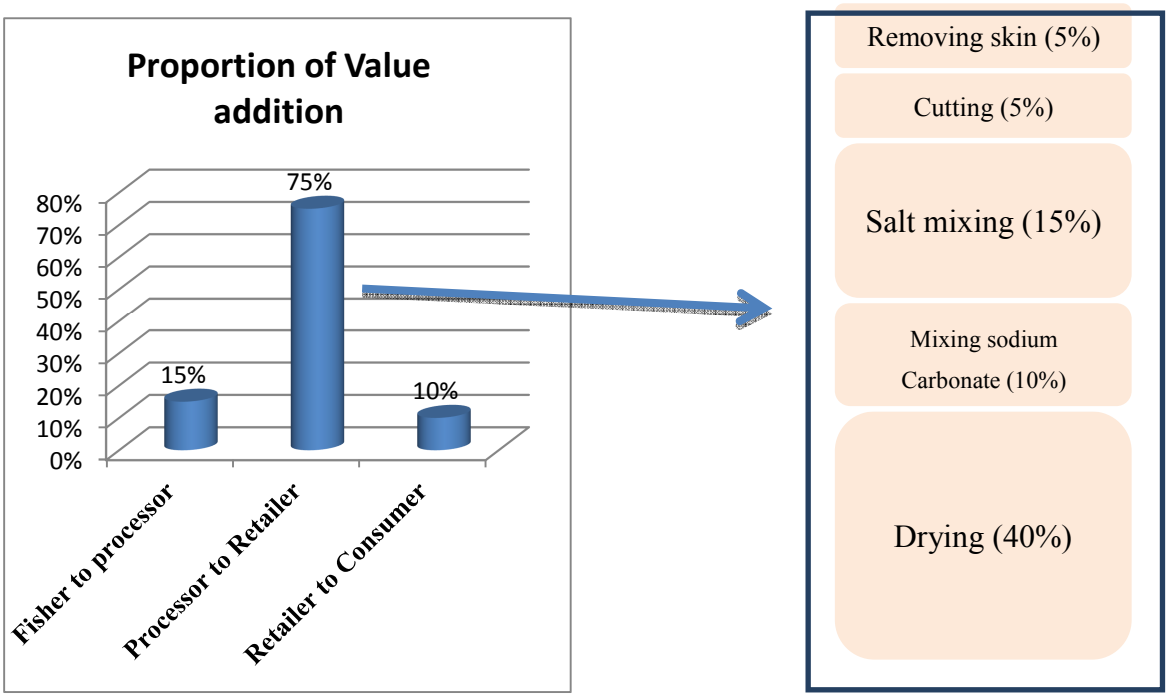


Chart-2: Value addition scenario in supply chain

From this chart we see that large amount of value addition are in the production. After that there is a small amount of value addition though it contains a number of intermediaries.

8. Cost and price movement in supply chain channels

In all channels of supply chain cost is added with the product. So price is also increasing step by step. Firstly, fish is passing from fisher man to processor. Cost is involved with fisherman activities. Fisherman passes it to the processor in a price which is higher than his cost. Due to variation in types and times this price addition are may be different. So ignoring the types of fish and amount of fish we will present our survey result on the basis of percentage. If we consider about the shrimp then price 1kg of shrimpfish is tk. 150.Fisher man sell it to processor at taka 150-160.There is a large cost involvement in the processor activities so when processor sell it to another party the price goes up to tk 350 /kg. Usually processor sells it higher than its cost. Then price increase in every time when it transfer from one middle man to another middle man. Because in every step it involves some cost. In local market 1kg shrimp is sold at taka 400-450. In Dhaka this 1 kg shrimp is sold at tk. 500-550/kg.

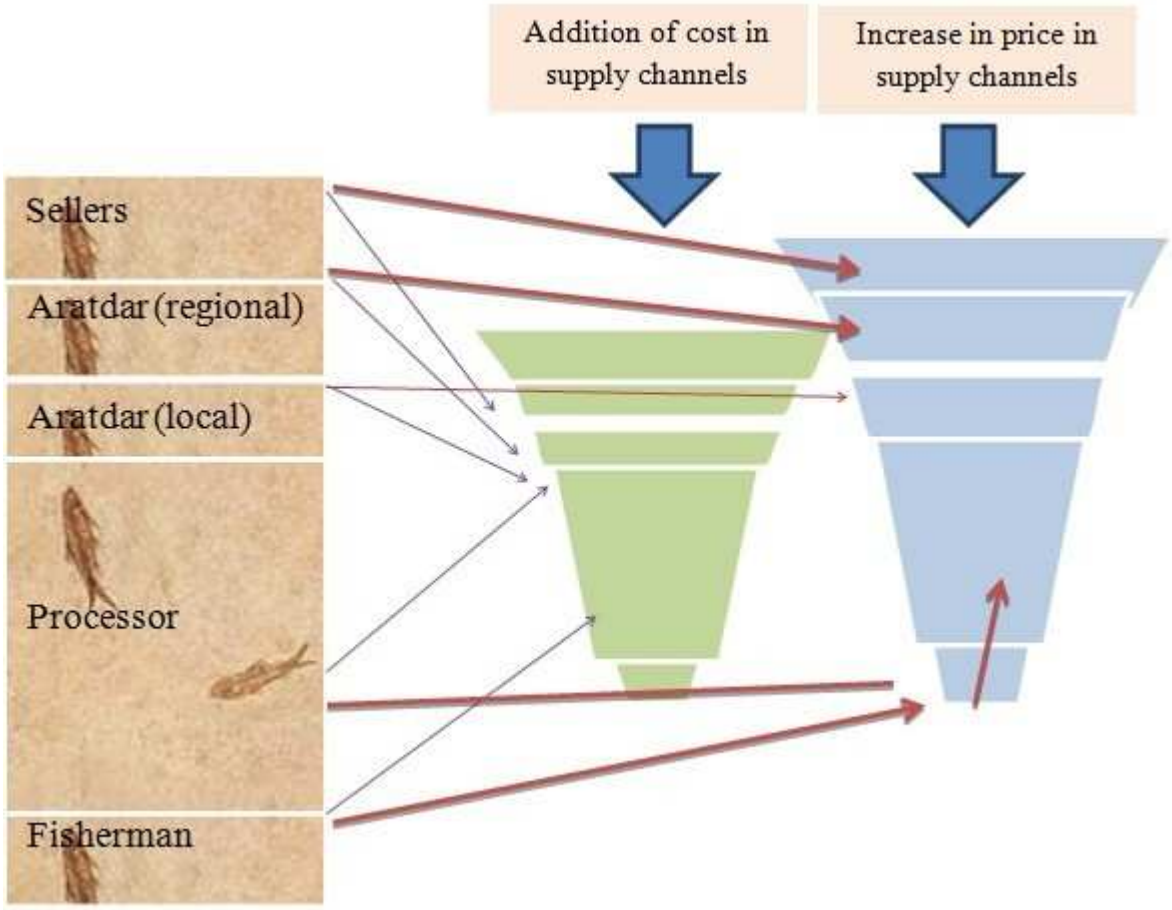


Figure 4. Cost vs. price in various steps

When dried fish move from Kuakata to Dhaka then there is a huge cost involvement because of transportation cost. The transportation cost from Kuakata to Dhaka is tk. 8-10/kg. Still we are talking about the forward price movement in supply chain. But sometimes backward movement of price may occur. Frequently market demand is low and that's time aratdar (Dhaka cities) takes the position to fixing the price of dried fishes. Processor, middle man and other gets the price of the product according to aratdar's fixation. This situation hampered the fisherman and local aratdar's financial condition, because they losses their capital and profit.

9. Findings

- Through our survey we found that most of the people who are directly involved with the collecting of fishes they are poor. Their livelihood is so terrible. Fishermen are facing different types of problem in their practical field. In the deep sea some time they face storm; sometime robbery occurred in their board by some robber. One of other thing is that, in their fishing boat there is no proper communication system. Most of the cases fisher men collect their necessary money from local dadan (non-institutional money lending) system. Fishers have barely any choice to sell fish as per their choice but they are bound to sell to that particular person. They are deprived and they are bound to obey the lender. That's why its effect exists in supply chain of dried fish's in this area. The situation not only affect the labors but also the consumers as the system added undesired costing on the real value of the product
- In the supply chain we have examined, large no. of days consumed in stocking activities than the production activities. It indicates that it is possible to shorten the total no of days by minimizing the stocking time.
- Backward pricing system sometimes causes a great loss to the producer or fisherman because it only ensures the benefit of rich intermediaries in the supply chain.
- There is an imbalanced profit margin ratio scenario in the supply chain intermediaries. Basically aratdar takes the most portion of the profit. And customer deprived by the aratdar for a long supply chain process.
- The producers most of the time faces difficulty because of lack of capital. Sometimes it leads them to stop their activity. They didn't get any governmental support to continue their business.

- From Kuakata to Dhaka distance is only 265 kilometers. But communication system is so problematic. Roads are very much narrow and spoiled. In that way there is 5 ferries systems exist. This creates a lengthy process of transportation in dried fish supply chain and also added ultimate cost.
- Natural disaster causes a great loss to their finished goods as well as goods which are in processing.

10. Recommendations

At last we are in a place to recommend some solution to reduce the existing problems in supply chain of dried fish as well as in the industry. Mainly we will recommend on the basis of our findings. Our recommendations are as follows:

- It is necessary to reduce the no. of intermediaries in supply chain. If concerned authority, government takes initiative to help the fishers through developing a direct selling system of dried fish or fish ignoring the all aratdars and dealers.
- To shorten the total times. Warehousing time should be reduced, so that finished goods can reach to the ultimate customer as early as possible.
- Improve quickest transportation facilities for fish collection and supporting supply chain.
- Modern credit system should be introduced in this area.
- Safeguard of the producers is very much needed; Coast guard should provide more watchful services.
- A secured place has to be ensured for the producer of dried fish to expand their business like as special zone.
- Government should take necessary steps to expand export of the dried fish to the foreign country.
- Various NGOs provide loan for the helps of fisherman. In the coastal area, NGO's should reduce their interest rate. It will increase the financial solvency of the fisherman as well as the producer.
- Need to prohibit use of insecticide/pesticide in dry fish production.
- Backward pricing should be avoided; it causes losses of capital and profits of the producer of dried fish's.

11. Conclusion

Bangladesh has great opportunity to become one of the prevalent dried fish's producers in all over the world. Because it has many of rivers, long sea shore area, efficient fishermen, competent dried fish's producer, better weather. But certain supply chain problems which we have found exist in this area. Numerous stakeholders like producers, wholesalers, aratdars, middlemen, retailers and finally at the top, the consumers are in the supply chain. But there are selected financial difficulties and avoidable activities which increase ultimate product price. If government take necessary steps to solve financial complications through different government support, then fishermen feel safe. Transport conveniences are very much significant for the further development of this sector. As of our value stream analysis we can realize that utmost of cost increases by some of redundant activities. The redundant activities lessening can change Bangladesh's future dried fish's future.

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