Value Chain Analysis in the Dry Fish Production and Marketing of Post Harvest Fishery Products (PHFP) in the Coastal Belt of Bangladesh

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Executive Summary

In Bangladesh about 7.3 million people live in the coastal fishing villages whose livelihood in someway depend on coastal and marine fishing. It is estimated that about 20% of the total marine catch has been dried round the year with the substantial production during October to April and, marketed both in domestic and international markets. In the current marketing system, producers have no influence over marketing and supply chain management, rather they are strongly managed and monopolized by giant traders, brokers, as well as giant super market companies, whose intervention results in price distortion in domestic market and, there by, erodes profitability and preference of primary producers. A study was conducted mainly in Kuakata (and Sundarbans), Chittagong and Cox's Bazar -Teknaf area by three different investigators with associated NGOs during 2005-2006. The study was funded by BFRF and implemented in two coastal areas.

Kuakata and Sundarban area

Fishes are harvested by the coastal fisher communities. After harvesting, fish and fish products reach to the consumers at different level through a series of steps where many people are involved. Generally 8-10 fish species are used for commercial dry fish preparation where 3-5 kg of raw fish is required to produce 1 kg of dry fish. Value added in each and every step (steps of the channels). This study was aimed to identify the channels, steps of the channels, nature and extent of value addition. Study has come up with a set of recommendations to improve the system that would benefit the consumers with price and quality and operators in terms of getting equity. This part of the study was conducted mainly in Kuakata area, Patuakhali. Studies were also done in the Sundarbans, Patharghata, Rangabali, Char Fashion and Manpura and up to Nijhum dwip.

It was found that there were about 15 channels in the value chain and 3-6 steps in each channel in the Kuakata area. Percentage of value addition was found to differ in different steps and also in different channels in the same area. Overall value add situation was from fisher to *paiker* 16%, *paiker* to wholesaler 7%, wholesaler to *khola* 5%, *khola* to dry fish seller 2%, dry fish trader to wholesaler 10%, wholesaler to medium operator 10%, medium operator to retailer 5%, retailer to consumer 15% and wholesaler to exporter 100%. In the channel in many cases many steps are not applicable. Percentage of value addition was high in case of fisher to *paiker* due to *dadan* or money lending system. It was also found that fisher who work in fishing boat had the capacity to over come crisis (threshold) about 3,000-5,000 taka and the boat owners 10,000-15,000 taka, similarly dry fish process labors has the threshold limit of 5,000 taka. A brief comparison of the Kuakata system was also done with that of Rangabali, Char Fashion, Nijhumdwip and Dublarchar. It is strongly recommended to provide easy loan for the operators/fisher to reduce burden and to reduce vale add percentage, introduction of storage facility of raw fish and dry fish, introduction of improved dry fish system will significantly upgrade the system, ensure quality, better price and well being of the ordinary people who are involved in the process.

Cox's Bazar and Teknaf area

In the supply chain management of marine dried fish four intermediary stakeholders viz. dry fish traders, wholesaler, medium operator, retailer etc. were involved between the producers and consumers. In addition to involvement of backward stakeholders identified as fisher, piker, and wholesaler with the primary producer were considerably high resulting in 22% value addition to the raw fish, even before going to be dried. Although a number of stakeholders were identified in the supply chain management but all were not necessarily involved in all the cases. The number of intermediaries and stakeholders was found to vary depending on the extent of market; for localized market supply chain was too short but number of backward stakeholders were virtually the same in all the circumstances. The value addition was found to be the highest (105%) from wholesaler to retailer, followed by 90% from wholesaler to exporter. Theoretically there was a positive correlation between value addition and profitability, the more the value addition, the more the profitability. In case of traditional and long supply chain; profitability was not as high as the value added, because of profit sharing among the multi-stakes and also by the huge transportation cost, high transportation toll particularly in the *Ghats* in river routes. It was found in Mosheskhali that only the *Ghat* charge added 12 to15 percent more value while transporting as a bulk more than 50 kg. In contrary in a short supply chain, managed by private business entrepreneurs, NGOs and super market, both the profit maximization and profit distribution were considerably higher. Supermarket secured as high as 150% profit. Surprisingly, in all cases, primary producers secured considerably less profit, only 5 to 8% whereas their involvement in terms of labor, time etc. was the highest. The major cause of price exploitation to the producers was *dadan* (non institutional money lending) that compelled the producers to go for 'conditional engagement' in the fish drying business. Therefore, these monopolistic and manipulative practices by both the wholesaler and super markets are not curtailed by any counter-veiling power of the producers.

In relation to dry fish export, the increasing non-tariff measures (NTMs) was found to act as critical barrier despite having huge international market demand and prospect. These NTMs has emerged from the Uruguay Round of the Multilateral Trade Negotiations and Agreements on Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) measures. Though the WTO, SPS and TBT agreements imposed a bound obligation to the exporting member countries to improve food quality as per set international standard, but the compliance cost related to SPS obligation is too high, and thus the government is reluctant, otherwise unable to meet the set criteria.

Therefore the study recommends for appropriate policy intervention for financing dry fish producers so that they managed to escape from the vicious chain of non-institutional money lending system and can secure more profit. It is also recommended to strengthen domestic technical regulations or standards to overcome technical barriers to dry fish trading in international market.

Background of the Research

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 little value and make little profit. The reasons for this less value addition at small-scale producer level are presumed to be the poor product quality and lack of market access due to various institutional and non-institutional barriers e.g. high transportation cost/toll/taxation, price exploitative market players between producers and consumers etc.

Most of the fish dryers currently dip the fish in insecticide/pesticide to reduce losses from insect infestation. Residual effects of these pesticides are harmful to human health and thus, this product can not reach widespread consumers particularly those who are health conscious.

To support the small scale marine fish driers for producing quality dry fish a research titled ' Improvement of Food Quality of Traditional Marine Dried Products Using Low Cost Solar Tunnel Drier' has been conducted through collaborative effort of Bangladesh Agriculture University, SUFER project of DFID and COAST Trust. This research initiative has developed user-friendly appropriate technology and allowed fish to be dried without using any pesticide. Still, COAST Trust is supporting the small-scale producers, (particularly the women in its working areas in Moheshkhali and Saint Martin's island) for producing pesticides free dried fish and also expanding its market in urban areas. COAST Trust is trying to develop a producer supportive entrepreneurship through supporting small-scale fish drying and facilitating the direct linkage between producers and consumers, ignoring the price exploitative market players in between producers and consumers.

In fact, entrepreneurship development involves a complex set of interlinked activities related to commercial production of commodities, value addition to the commodities, supply and delivery of inputs, and marketing distribution and trade of the commodities. The main problem of pro poor entrepreneurship development in the country is that effective value chain linkages among the farmers, traders, processors and business service providers are yet to develop. Small-scale producers need to be integrated with domestic as well as international markets. This is especially true for the high valued perishable commodities.

In one hand, development of profitable technology plays an important role in promoting entrepreneurship; on the other hand value addition to the micro level production initiatives is also a priority issue. The government has also provided the agro-entrepreneurship development with various incentive packages including tax exemption, import duty concession, special budgetary allocation and export promotion. But it is necessary to examine how the policy issues supports the marketing of dried fish both in domestic and international markets and what additional policy support is need to make this sector producers sustainable.

High concentration of fish mostly demersal species in some areas of the coastal belt within 25 km from shore has made the depth range of 8 meter to 25 meter suitable for fishing by set bag net (Bhehundi jal) Generally headman of Chittagong are harvesting the fish from deep sea by

Behundi nets and trawlers. But the coastal fishermen have no other alternative but to catch fish within 10-15 meters water depth in the sea because of their small sized nets and boats.

Length related information of the major species of fish used for drying in the coastal belt

Loittya *(Harpadon nehereus)*

Length groups of 5-9 cm, 10-14 cm, 15-19 cm and 20-29 cm were found to be used for drying. The highest percentage belonged to15-19 cm group. Fishes used for drying were generally below the average size.

Poa *(Panna microdon)*

The highest percentage belonged to 16-18 cm group and 13-18 cm group was the second highest that were found to be sued for drying. 100% fishes used for drying were below the average size. 16-18 cm group constituted the major proportion in November catch.

Parse *(Liza persia)*

Majority (54.54%) belonged to11-13 cm group in khola. No fishes were above 18 cm. 100% fishes were used for drying were below the average size.

Phasa *(Setipinna phasa*)

Three size groups viz. 6-10 cm, 11-15 cm, 16-20 cm and 21-29 cm were found to be used for drying. The highest percentage belonged to 11-15 cm group while 21-25 cm group was the lowest. 90% of the fishes used for drying were below the average size.

Taposi *(Polynemus paradiseus)*

Four size groups (7-9 cm, 10-12 cm, 13-18 cm and 16-19 cm) were found to be used for drying . The highest percentage belonged to 7-9 cm followed by 10-12 cm size group. 100% of the fishes used for drying were below the average size. A remarkable proportion of the February catch belonged to 7-9 cm size group.

Chhuri *(Lepturacanthus savala)*

Five size groups (10-19 cm, 20-29 cm, 30-39 cm, 41-49 cm and 50-59 cm) were observed to be used for drying during the study. The highest percentage belonged to 30-39 cm size group followed by 40-49 cm group. 100% of the fishes used for drying were below the average size. The highest catch was in October and was dominated by 40-49 cm size group.

Boiragi *(Coilia dussumieri)*

Five size groups (8-10 cm, 11-13 cm, 14-16 cm; 17-19 cm and 20-22 cm) were recorded to be seed for drying. The highest percentage belonged to 8-10 cm and in 11-13 cm size group while

the lowest was 20-22cm size group. 78% of the fishes used for drying were below the average size.

Fatra *(Raconda russeliana)*

Two size groups (10-14 cm and 15-19 cm) were considered for drying. 76.22 % of the fish used for drying belonged to15-19 cm size group. All fishes used for drying were found in below the average size. The mentionable catch was in November and January and was dominated by 15-19 cm size group.

Rupchanda *(Pampus chinensis)*

Two size groups (12-17 cm and 18-22 cm) were considered for drying. 100 % of the fishes used for drying were below the average size. The highest catch was obtained in October and February and was dominated by18-22 cm size group.

Pama *(Otolithes pama)*

Three length groups (10-14 cm, 15-19 cm and 20-24 cm) groups were considered for drying. The highest proportion belonged to 10-14 cm length group. 100% of the fishes used for drying were found to be below the average size. The highest population was found in December.

Fish drying system in the coastal belt

Sun drying is the exclusive method of fish drying. There are two techniques of sun drying :

Horizontal drying : The main bulk of the catch consists of small fish which are dried on horizontal wooden racks raised about one meter above the ground. The fish are placed on mats and turned occasionally to prevent sticking to the mat.

Vertical drying : Big fishes like Loittya, Chhuri, Bol and Indian salmon are typically dried hanging from vertical wooden racks. Some small stingrays are sliced into longitudinal strips which remain attached to the tail base, and the whole ray is hung by the tail from a vertical rack to dry. However, some rays are cut up entirely and the slices are dried on horizontal racks.

A typical drying yard consists of a fenced area with a small house at one end where the fishermen live. One typical yard was paced out by the staff at about 13 m by 35 m, but the dimension of yards vary widely. The fencing is made of *gewa* poles and does double duty as a demarcation line and as vertical drying racks. Certain fish species dry much faster when hung vertically than when dried on horizontal racks. Bombay duck has a high water content. It takes 12 days to dry on a horizontal rack, but only 6 days on a vertical rack. About 75-90% of a drying yard is covered by fish drying in a horizontal position. Typically the fish are dried on mats which are either placed to horizontal racks or directly on the ground.

General marketing system of raw and dry fish in Bangladesh

Much of the catch, particularly from inland waters, is consumed locally or within the same district. However, there are areas where local demand is less than the production resulting in a surplus which can be exported to other areas of the country through development of a marketing system.

The major landing from coastal and marine fishing takes place at Chittagong, Barisal, Khulna, Cox' Bazar and Chandpur, Hilsa constitutes most of the fish shipped from the above landing stations. Dry fish mainly comes from Dublar char,, Kuakata, Nijoomdeep and Sonadia island. Important river points in the interior are Nilkomol, Goalundo, Madaripur, Narshingdi, Munshiganj, Bhairab bazar, Kuliarchar, Bhaggyokul and Aricha. The most important canters for the Syhlet-Mymensingh floodplain (*haors*) include Daberghat and Joikalash (Sunamganj), Azmiriganj, Habiganj, Mohonganj, Netrakona and Kishorganj, Other important areas are the beels of Bonwarinagar-Faridpur, the baors of Jessore and Kushtia, and the Kaptai lake.

Most of northern Bangladesh, Dhaka and all other urban centers form the deficit areas and receive shipments from the surplus areas. It is difficult to determine the proportion of fish which is marketed through the commercial channels and how much is simply consumed locally without passing through the markets.

Marketing channel

Almost all fish traded internally through private channels. The market structure varies from area to area, but in general terms can be summarized based on a description by Ahmed (1983). There are four types of market viz. primary market, secondary market, higher secondary market and final consuming market. The system operates as follows:

The primary market: Here the fishermen sell their catch to a mobile assembler, who may be known as *mahajan/jogandar/faria*. The assembler uses a boat or a truck to collect the fish. When buying in estuaries or rivers, he may buy through a local agent (*dalal* who typically earns a 1-3 % commission for his services.

The secondary market: The assembler sells his accumulated fish in a wholesale market to local retailers (*nickaries*)/local wholesalers (*paikers*)/distributors who transport the fish to other districts. The sale is normally carried out through a commission agent (*aratdar*) who conducts public auctions. In some markets fish is weighed during auctioning but more often it is not so. Hilsa is typically sold by the count of 80 fish, this measure being known as a *pon*. The *aratdar* also extends seasonal advances to his suppliers and short-term credit to the buyers. His basic remuneration is his sales commission, which is charged to sellers at rates normally between 3% and 6%. A rate of 3% is typically charged to sellers who did not borrow any money, while up to 6% is charged where credit is outstanding.

The higher secondary market : Fish consumed at a distance from the secondary market is transported by distributor (*bepari*) to other markets, usually whole sales markets in district towns. Here they sell the fish to local retailers (*nickaries*) and whole sellers (*paikers*) through local *aratdars* who render similar services to the first level *aratdars* referred to above.

Overall objectives of the research

The specific objective of the study was to produce a value chain analysis of the dried fish produced in Kuakata, Chittagong and Cox's Bazar coastal areas and also analyze the existing government policies supportive to the development and promotion of entrepreneurship.

Specific Objectives

- To examine the existing marketing system and estimate the cost, margin and profit of producers and traders involved in the marketing chain.
- To identify the institutional and non-institutional barriers e.g. transportation cost/ toll/ taxation/ illegal extortion to the movement of dried fish and to identify price exploitative market players in between producers and consumers.
- To review the existing government policies for quality control and marketing of dried fish for both domestic and international markets.
- To analyze the role of women, ethnic community people and poor fishing communities in production and marketing of dried fish.
- Review socio economic and livelihood impact of the technology on the small scale dried marine fish producers of Moheshkhali Island, Cox's Bazar and Kuakata area.
- To suggest some policy measures that will be supportive to the small-scale fish drying and facilitating the direct linkage between producers and consumers.

Materials and Methods

The study was conducted in some selected coastal areas of Bangladesh mainly in Kuakata (and Sundarbans), Chittagong and Cox's Bazar -Teknaf areas by three different investigators with associated NGOs during 2005-2006. Specific location of the study area is shown in Fig. 1.

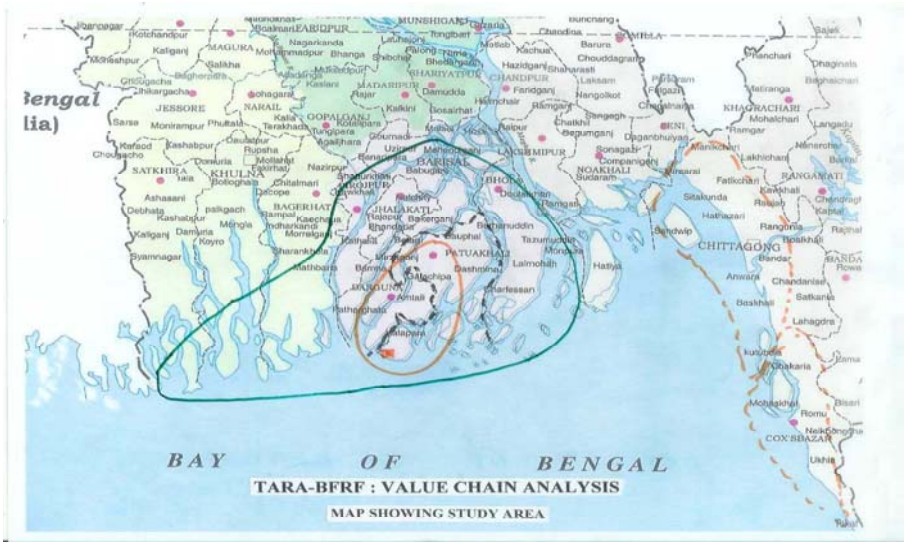

Fig. 1. The study areas in the coastal belt Bangladesh.

Data from both secondary and primary sources were used. Primary data were colleted employing the following techniques;

i) Participatory rural appraisal (PRA)

ii) Focus group discussion (FGD)

iii) Stakeholders interview

Participatory rural appraisal (PRA)

PRA were intended to gather the following socio-economic information primarily from the fisher folk households and dry fish producers :

- Identification of local resources and opportunities for improving the existing income generating activities and identification of the potential alternative ones.
- Ranking of the identified opportunities.
- Assessment of the contribution of dry fish to the livelihood earnings of the coastal people.
- Assessment of the production and marketing nature of dry fish at local markets.

A total of 17 dry fish khola based channel systems were studied in Kuakata area. In addition, study was also conducted in Patharghata/Mathbaria area, Dublarchar and Nijhumdwip.

A total of 12 PRA sessions were conducted in 6 fishing villages (Kutubdia, Moheshkhali, Ghatibhanga, Kutubdia para, Teknaf and Sonadia), 2 in each village. Selection of the fishing villages was done on the suggestion of the partner NGO, COAST Trust, who has been working with those fishing communities for many years.

Focus group discussion (FGD)

In total 18 sessions of focus group discussions were held in the 6 selected fishing villages for collecting qualitative data from Cox's Bazar and Chittagong areas. Similarly, another 17 full FGD sessions were conducted in Kuakata part. The specific aim of those discussions were to collect information on mechanism of raw-fish collection, pricing and value addition on raw fish at different levels, fish drying and marketing mechanisms, pricing and value addition on dried fish at different levels, marketing chain, transportation and value addition, and finally credit system in dry fish business.

Stakeholders interview

The following stakeholders were identified in the supply and marketing chain of marine dried fishery products :

- Fishers
- Dry fish producers
- *Aratdar*
- Commission agents *Paikers*

- Whole sellers/Super market operators
- Entrepreneurs/ NGOs/EPB

Therefore, apart from PRAs and FGDs one-on-one interview sessions were conducted with the associated stakeholders as mentioned above. Separate questionnaires for different stakeholders were developed for the purpose.. All the questionnaires were reviewed by the BFRF executive committee members and then field tested before interviewing.

Major considering factors

Identifying trading partners in dry fish marketing: Value chain analysis is a comprehensive look at the activities of different trading partners, e.g. Raw fish suppliers, dry fish producers, middle men/*aratdars,* wholesalers, retailers, consumers etc.. Understanding the interaction of these trading partners as well as their roles within the supply chain is important in understanding the product and information flow.

Production and distribution channel: The value chain analysis more importantly examines channels. The distribution channels recognize that product flow is identical at the front and back ends of the supply chain, although between the producers and the retailer's store shelves the flows are very different

Considering factors at production level: Production and distribution channel as well as the value addition and the profitability of dried fish business are strongly influenced by the following external factors, which need to be considered and examined properly; the considering factors were:

For domestic marketing

- Sources of finance, NGO/ public financial institutions/local *Mahajans.*
- Inbound transportation cost.
- Quality of fresh raw fish.
- Contractual production system.
- Illegal toll by the local *mastans.*
- Maintenance of minimum moisture level and packing.

For export marketing

- Outbound transportation cost.
- Illegal toll by the local *mastans*/law enforcing agencies.
- Quality certificate.
- Value added tax.
- Import market liberalization.
- Safety and quality matters; GATT agreement on the Sanitary and Phytosanitary Measures (WTO Article 3).
- Tariff and non-Tariff barriers.
- Export subsidy.

Results and Discussion

Kuakata areas

Fisher communities living in the coastal areas were found to harvest fish from the sea and transported to many places for marketing in the remote markets in Bangladesh and in the international markets in Singapore, Thailand and Hong Kong. A considerable quantity of the catch were used for making dry fish. The fishers of the coastal areas were found to be very poor and vulnerable to a number of issues. Many of them used to go the coastal areas and even in the relatively deep sea for fishing and became victim of natural disasters like storm. They also become victim of the miscreants who often snatch the fisher's nets, harvested fish, valuable belongings and even toll their lives. Many of the fishing boats do not have proper communication/SOS system and do not have adequate fish preservation and storage facilities. In the lean time a number of fishers become unemployed and thus their livelihoods become vulnerable. The labors that support fishing, fish drying, processing or marketing, everywhere in the system of the chain work under the key people. The labors and key people were found to work under an agreement where there is every possibility of depriving the labors, as a result, the major benefit will naturally go to the richer partners. The situation not only affected the labors but also the consumers as the system added undesired costing on the real value of the product.

The harvested fish and fish products were found to reach the consumers through a chain of steps where many people were found to be involved. Different category of stake holders and their activities were found to make the chain complete. Value added in each and every step (steps of the channel). Generally 8-10 types of fish were found to be used for commercial dry fish preparation where 3-5 kg of raw fish produce 1 kg of dry fish.

It was found that there were about 15 channels of the value chain in Kuakata area (based in 17 *kholas*) and 3-6 steps in each channel. Some channels are shown in Figs. 2, 3 and 4. Data also revealed that mainly 2 channels and 3-4 steps in each channel in Dubla Island. The percentage of value addition was found to differ in different steps and also very in different channels of the same area. Overall value add situation in case of fisher to *paiker* was 16%, *paiker* to whole sale 7%, wholesale to *khola* 5%, *khola* to dry fish seller 2%, dry fish trader to wholesaler 10%, whole seller to medium operator 10%, medium to retailer 5%, retailer to consumer 15% and whole seller to exporter 100% in the channel in many cases many steps are not applicable. Percentage of value addition was high in case of fisher to *paiker* due to *dadan* or money lending system. Salient features/results are shown in Tables 1 and 2. It was also found that fishers who work in fishing boat had a capacity to over come crisis (threshold) of about 3,200-5,000 Tk and boat owners 10,000-15,000 Tk. while labors involved in fish drying had a threshold limit of 5,000 Tk. A brief comparison of the Kuakata system was also done with that of Rangabali, Char Fashion, Nijhumdwip and Dublarchar. It is strongly recommended to provide easy loan for the operators/fishers to reduce burden and to reduce value percentage. Introduction of storage facility of raw fish and dry fish, introduction of improved fish drying system will significantly upgrade the system, ensure quality, better price and well being of the people involved in the process.

Table 1 Average value addition scenario

Serial no	Steps of the channel	Percentage
1.	Fisher to paiker	16%
2.	Paiker to whole seller	7%
3.	Whole seller to khola	5%
4.	Khola to dry fish seller	2%
5.	Dry fish traders to whole seller	10%
6.	Whole seller to medium operator	10%
7.	Medium operator to retailers	5%
8.	Retailers to consumers	15%
9.	Whole seller to exporter	!00%

Table 2 Value addition for of different fish types at different steps

Species	Fisher to processor	Processor to Retailer	Retailer to Consumer
Loittya	92.5	7.3	99.8
Churi	44.3	18.4	62.7
Faisha	20.6	6.7	27.3
Average	52.5	10.8	63.25

Sundarbans areas

Mid October to end of February was found to be the peak season for fish drying in this area. However, dry fish production continues sometime up to April. Most of the products (about 75%) goes to Chittagong, 10% to Syedpur, 5% to Teesta, 5% to Sylhet and 5% to Dhaka.

Dry fish traders (*Bahadders*) of Chittagong area were found to dominate dry fish business and catching raw fishes for the production of dry fish. They come to the area and engage 20-30 fishing boat for catching fish from distant places. Two to three transport boats carry fishes to Khulna. Dry fish traders from Satkhira, Bagerhat, Pirojpur also come to this area. Meher Ali, Alor kol, office kella and Shellar char are the important points in this area for dry fish. There were about 640 *Basa (khola*) in Alor kol, 500-600 in office kella, 100 in Meher Ali and 50 Chaprar char. About 100 *paikers (Bepari)* were reported to buy dry fish.

Each khola operator usually had 1 to 2 fishing boats with about 8-16 people. They spend about 11,000 taka per season and build one *Basa*, stags for fishing drying, dig a had tube well for water, make one small toilet and one ice box. Dry fish operators bring labors from their own area however many operators arrange labor from other areas as well but usually they are selected in terms of salary. Involvement of child labor was estimated to be about 3% in Alor kol. Some support service like shops, medical facilities etc were also found to be developed in the area. Fisher society and also supply basic requirements like food, vegetables etc. They were found to use insecticide if the fish start rottening usually in April when wind comes from the sea direction. Dry fish sellers also sell some valuable part of some fishes like air bladder at the rate of Tk. 250-300 taka per prices and fins at the rate of Tk.700-800/kg.

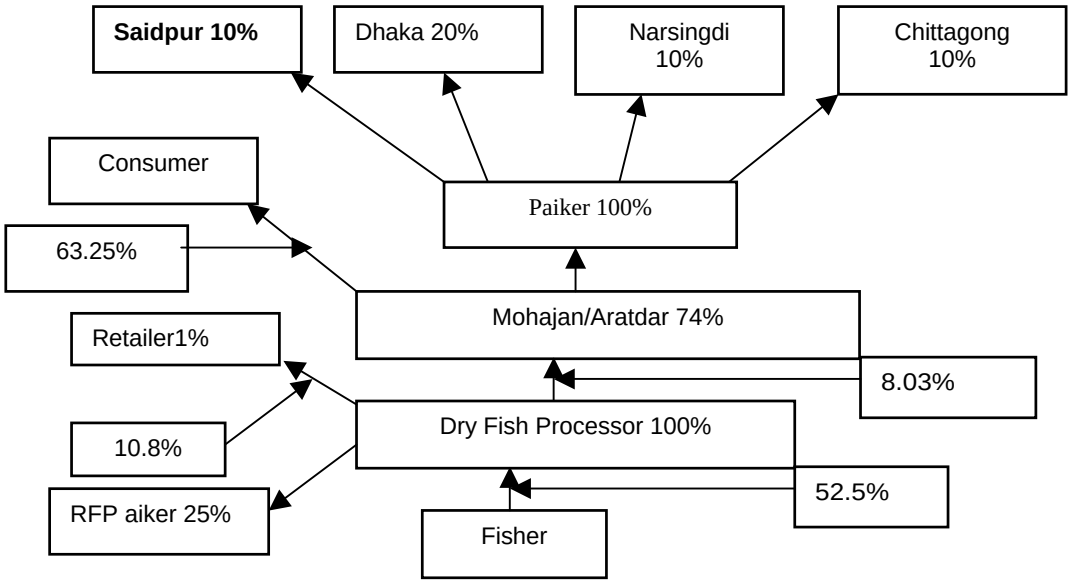

Fig. 2. A general channel based value chain.

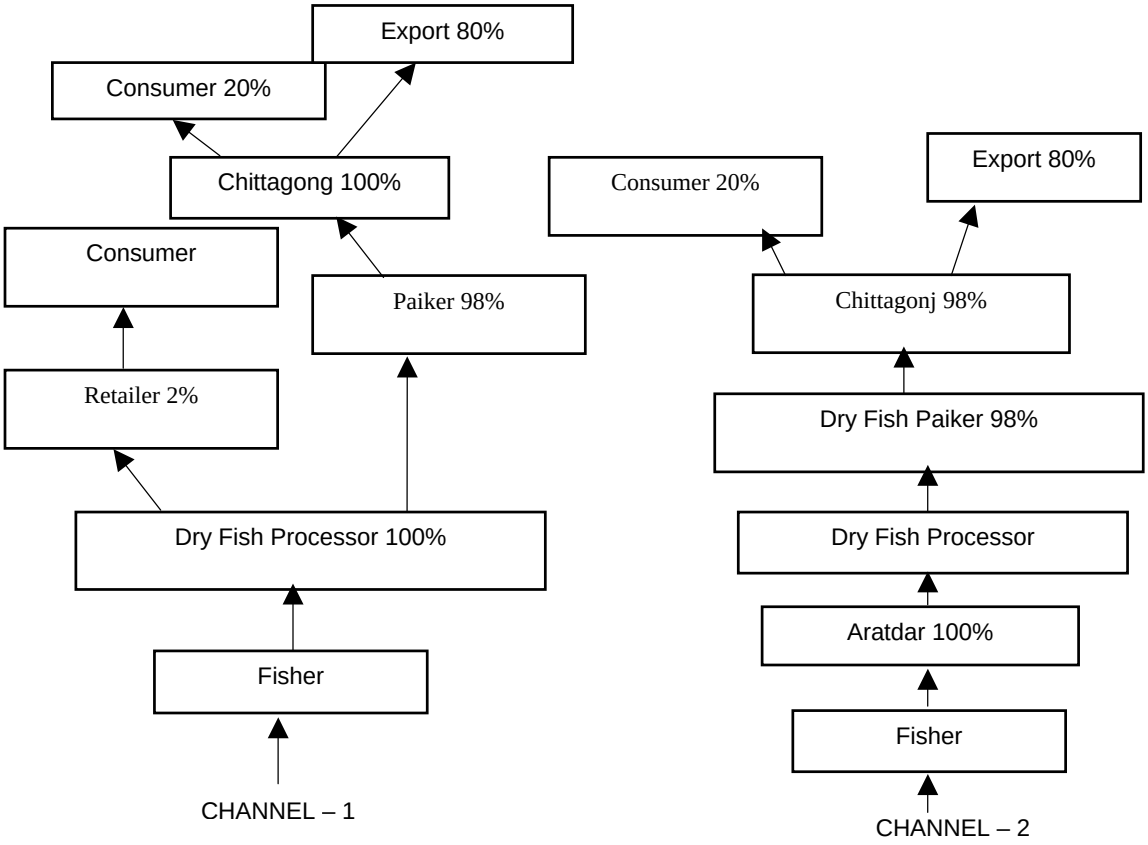

Fig. 3. A channel based value chain in Kuakata.

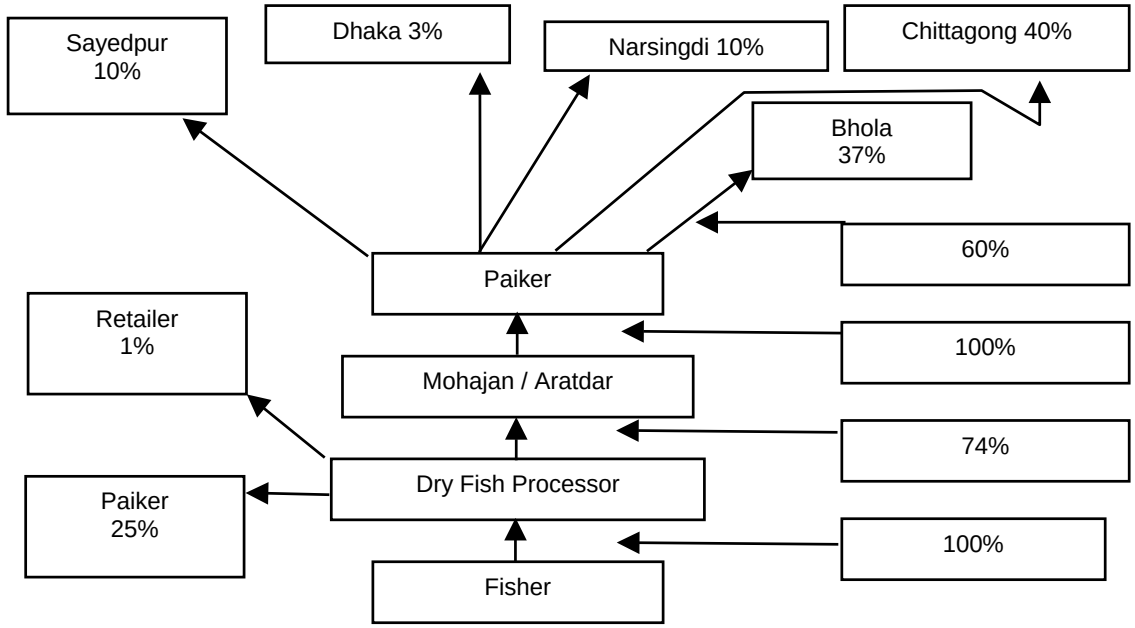

Fig. 3. A channel based value chain in Gangamati.

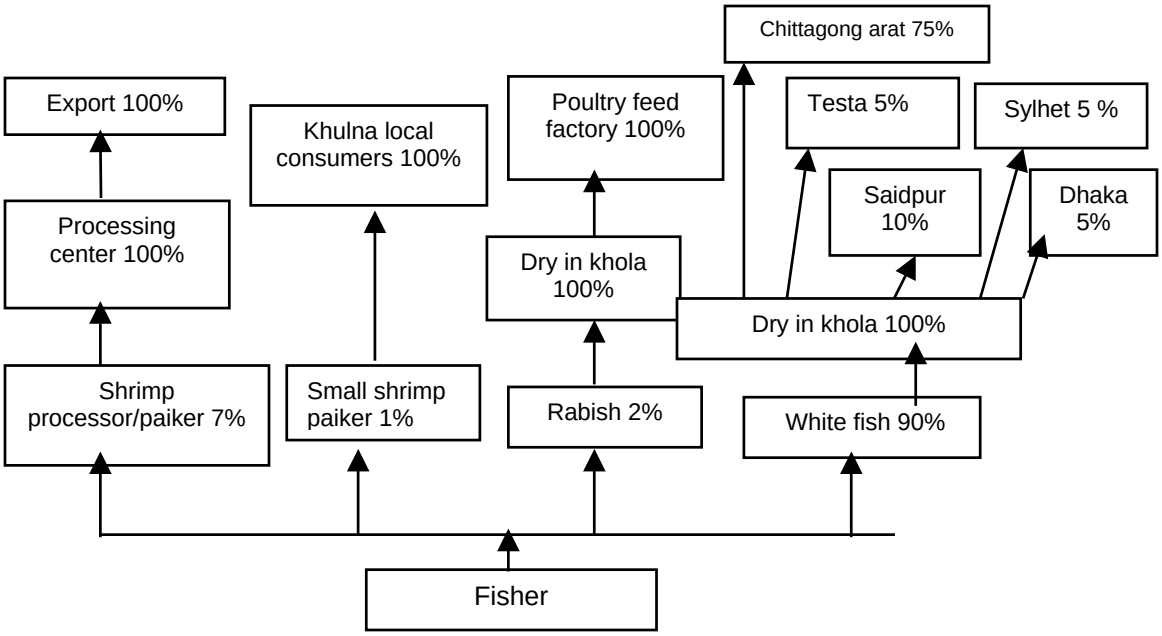

Fig. 4. A channel based value chain in Dublarchar area (Alor Kol)

Dry fish production was the highest in November but less in December. About 20 to 23 types of fish were used for dry fish production in the Sundarbans. Unlike Kuakata and other places sharks and rays were less used for drying. The price and percent contribution of different types of dry fish. channel of Dublar Char area is shown in Figure 5 and some percentage and price information of dry fish in the Sundarbans is shown in Table 3.

In case of dry chingri (shrimp) , 10% was bagda, 60% tiger shrimp, 20% chali and 10% chaka. Low grade mixed small dry fishes was found to contain small crabs also and termed as ' Rabish' about 30% of this category was found to go to Dhaka and 50% to khulna area. Usually on an average 30% value was added, a little percent to *paikar*s of Chitagong and other areas. Usually some fishing groups were found to be interested in dry fish production but entry of *paikers* from Chittagong, Syedpur, Teesta and Rampal to the steps of the channel is very limited in this area.

Table 3 Value addition percentage and price information of dry fish in Sunderbans

SL	Species name	Fishermen to *paiker* in %	Sale rate at khola
1.	Loittya	30	92
2.	Telo	15	100
3.	Churi	10	125
4.	Ana fish	10	67
5.	Tapsi	10	100
6.	Jew fish	10	30
7.	Other, small fishes	5	20

Cox's Bazar and Teknaf areas

Supply chain of marine dried fish: Generally the supply chain of marine dried fish was comprised of several stakeholders like producers, wholesalers, *aratdars*, middlemen, retailers and finally at the top, the consumers. But in the supply chain analysis the number of intermediaries and stakeholders were found to vary depending on the extent of market; the supply chain was too short for localized market. Four intermediary stakeholders e.g., dry fish traders, wholesalers, medium operators and retailers were found to exist generally between the producers and the consumers in a standard marketing chain in the country's domestic marketing pattern (Fig. 6). Aside with this a number of backward stakeholders e.g. fishers, *piker*s, and wholesalers were identified. The number of backward stakeholders was similar both in long and short supply chain.

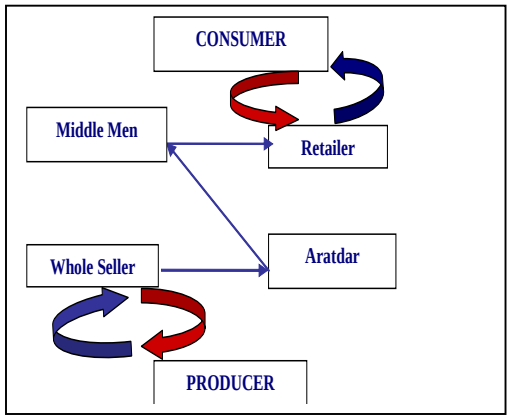

Fig. 6. A typical supply and marketing chain of marine dried products

About 20% of the total marine catch was found to be used for drying round the year with the substantial production during October to April. Interestingly two types of *paikers* viz. land based *pikers* and *pinnya paiker* were found to be involved in the marketing of raw fish at the very initial stages of fish harvesting while the three categories of producers involved in dry fish production were:

- Low income/poor of indebted producers
- Middle income group
- Private NGO entrepreneurs

Majority of the dry fish producers were from low income group and their supply chain was comparatively longer than that of the remaining two category of producers. The producers belonging to the first category were found to be highly indebted, majority of them were women and was found to work either as contract labor or contract producer who had to sell their product before hand against taking loan during the lean period.

In contrary, production managed by middle income group and entrepreneurs poses short supply chain and their share in dry fish production is less only 4 percent out of 20.

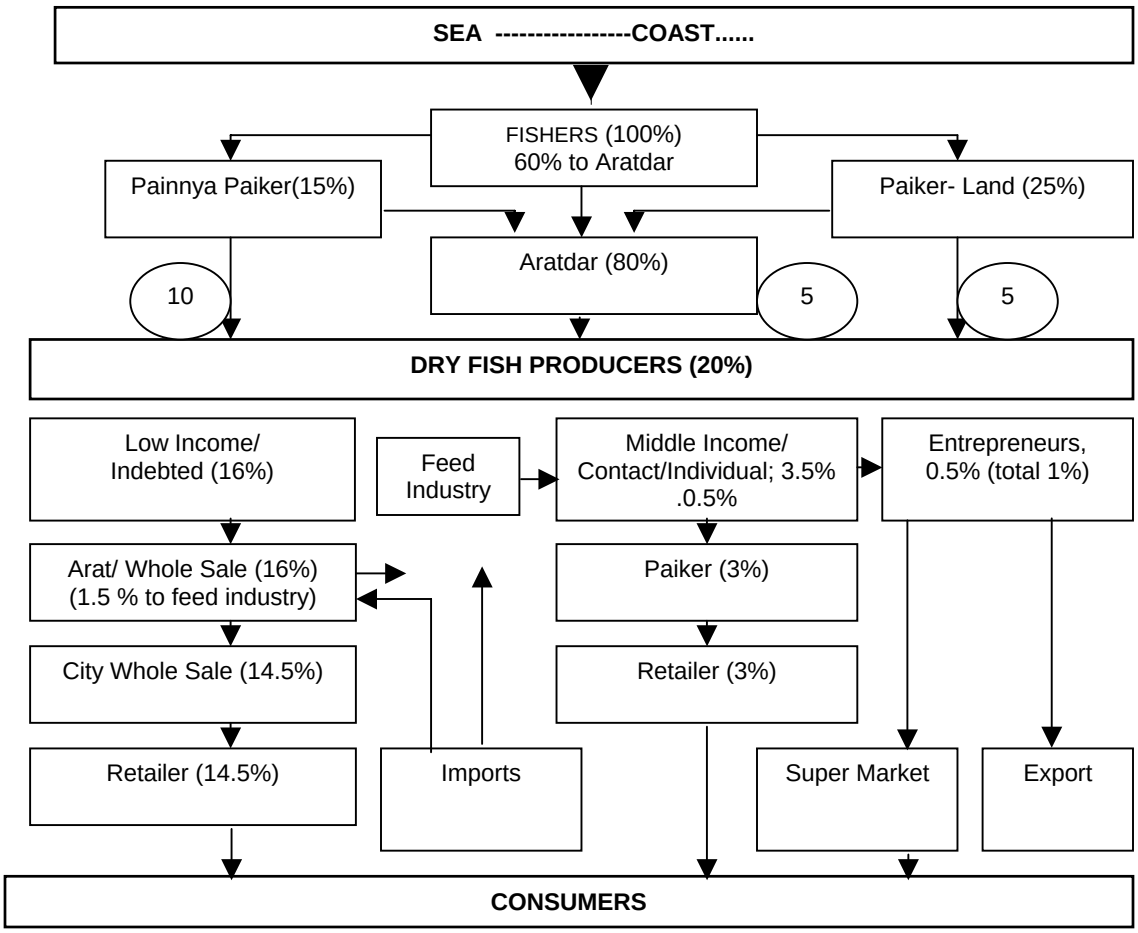

Fig 5. Supply and product flow of marine dried fish in the domestic market.

Value addition in the marketing chain: Value addition was found to start from the very fist dealing of raw fish from its harvesting point. Around 60% of total catch was found to go directly to the land-based *aratdars*, majority of whom had their own fishing vessels or made advance payment for the fishes to be caught while the remaining 40% goes to the *paikers* or commission agents.

The fishers' were found to sell-out the catch as mixed composition to the commission agents. Most of the *paikers* were appointed by the *aratdars*, so the maximum catch by any means finds it's destination to *arat*, and thus poor people had no access to direct purchasing of raw fish. If someone wants to purchase raw fish from *paikers*, s/he must have to purchase a mixed composition of fish.

People of low income group were usually found to purchase raw fish from the local market, on the other hand contract producers got supplies from the entrepreneurs or local *mahajans*, who directly collect the required fishes from the *arats* or from the commission agents. The commission agent in *arat* is particularly useful because he deals with the local dialect speaking fishermen as well as with the raw fish suppliers. Therefore the involvement of several stakeholders in fish handling contributed 22 percent value addition to the raw fish, even before going to be dried. The value addition was found to be the highest (105%) from wholesalers to retailers, followed by 90% from wholesalers to exporters.

Value addition and profitability: Theoretically there is a positive correlation between value addition and profitability, the more the value addition, the more the profitability. In case of traditional and long supply chain; profitability is not as high as the value added, because of profit sharing among the multi-stakes. On the other hand operational cost of doing business is considerably high, which erodes preference and profitability. Profit erosion mainly occurred due to huge transportation cost, high transportation toll particularly in the *ghats* of river routes. Only the *Ghat* charge added 12 to15 percent more value while transporting as a bulk more than 50 kgs in Mosheskhali.

In contrary in a short supply chain, managed by private business entrepreneurs, NGOs and super markets, both the profit maximization and profit distribution were considerably high. Supermarkets secured as high as 150% profit. Surprisingly, in all cases, primary producers secured considerably less profit, only 5 to 8% whereas their involvement in terms of labor, time etc. was the highest. Therefore, these monopolistic and manipulative practices by both the wholesalers and the super markets could not be curtailed by any counter-veiling power of the producers

Non institutional credit system: The major cause of price exploitation to the producers was *dadan* (non institutional money lending) that compelled the producers to go for 'conditional engagement' in the fish drying business. *Mohajons* and their money lending system were a common phenomenon in all the coastal areas. In absence of sufficient collateral and due to lapses of the government financial agencies, local *mohajons* flourished. In all the fishing villages of study area, it was observed that other than *dadon* (lending for specific income sources), general loans were also available through out the year. Such loans were offered for a short

period of time. The conditions for lending were found to vary from area to area. Mainly three types of loans were seen in the surveyed villages. They were: a) cash to cash, b) kind to cash and kind, and c) kind to cash. The rate of interest was found to be higher in case of kind to cash loan. Despite higher rates of interest, villagers were found to accept such kinds of loans socially, as they had no access to formal institutions and the loans were available through out the year. Village wise terms and conditions for getting loan are shown in Table 5.

Table 4 Credit information

Thana	Village	Pattern of dealing		Remarks
		Pattern	Rate of interest in Tk.	
Cox'sbazar	Kutubdia para	Cash to Cash Cash to Kind	48 – 60 120	Gold kept as collateral amounting about two times higher than borrowed money.
Kutubdia	Dhurang Boroghop	Cash to Cash	120	Only interest has to be paid monthly, without considering whenever principal to be returned.
Moheskhali	Jelepara Ghatibhanga	Cash to Cash	100	Basically repayment period is six month – commensurate with fish and paddy season.
Tenkaf	Khonkarpara Kachubunia	Cash to Cash	60 - 120	Time – not fixed, interest calculated monthly.

But the types of non-institutional credit in fishing or fish drying were different from the traditional social credit system. The two types of informal credit lending system were found in fishing and dry fish trading system were:

Commission system: Fishers having their own fishing vessels and other required fishing efforts were usually found to take money from the local *aratdar* or depot owner on commission basis to meet their running expenses for a fishing trip. On an average the cost of a fishing trip of approximately ten to fifteen days was around taka 70,000 to 80,000. The condition of commission system loaning was to give a share of the catch varying from 10 to 12%, as commission or repayment of the loan taken. The price of fish was fixed beforehand and was found to remain unchanged throughout the fishing period.

Contract system: Contract system was found to be the widely practiced informal money lending system both in case of fishing and fish drying business. Usually the influential and rich fishing

vessel owners provide fishing permits and loans to fishermen and pay them for their catch, without giving them any other benefit. In contract system fishers act simply as fishing laborer. People who are highly indebted and belong to low income group take loan from *aratdar* or *mahajan* under contract system, in contrary, middle income group take loan either from NGOs or from entrepreneurs.

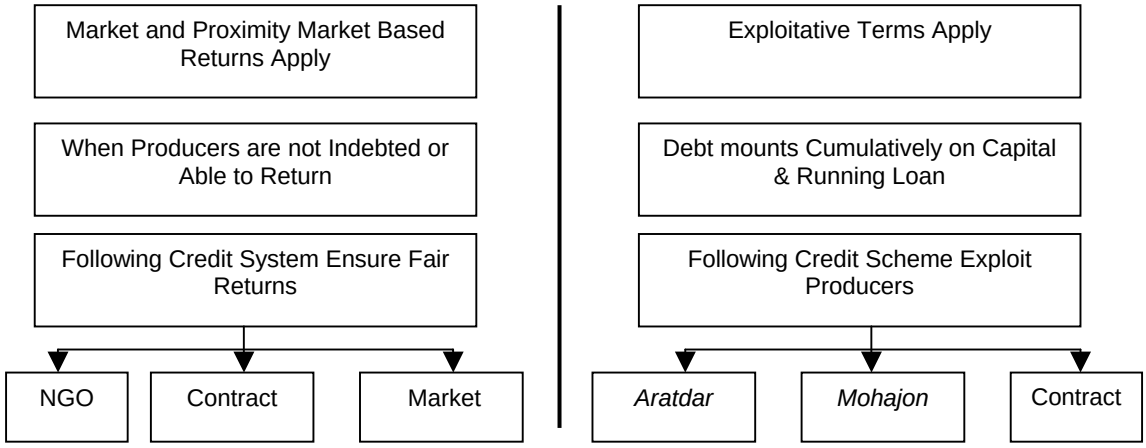

Fig 7. Debt- return linkage

Debt-return linkage : The debt-return linkage as found to exist in case of fishing, production of dry fish, and trading of fish and fishery products in the coastal areas is shown in Fig. 7.

Diversity in livelihoods in the coastal fishing villages

Livelihood condition of the people is found to depend largely on what resources are available at the household level in terms of ownership and access. Based on household assets (ownership and access) members perform diverse activities to earn their livings. Choices are conditioned by the extent of the respective asset base. Therefore, certain activities are common everywhere and some are exclusively attributed to the coastal zone while some others are relevant to the coastal districts to a greater extent than the other areas. These activities observed are:

Natural resource based activities

- Salt production
- Fishing from estuarine and marine waters
- Fishing labor
- Fish processing (drying and salting)
- Shrimp fry collection
- Extraction of forest products (fuel wood, honey, *golpata*, wax collection)
- Crab and oyster collection
- Coastal aquaculture (mainly shrimp culture)

Human resource based activities

- Livestock and poultry rearing
- Boat making (carpentry)
- Net mending
- Kantha stitching
- Embroidery
- Small trading (fish, vegetables, clothes etc.)
- Handicrafts making

Livelihood diversity refers to the existence, at a point in time, of many different income sources, thus also typically requiring diverse social relations to underpin them. In fact livelihood is diversified by a number of social, cultural, environmental and policy, even, this diversity varies from community to community.

Kuakata and Sundarbans areas

Head fishermen

Two types of head fisherman were found in the coastal belt in Bangladesh, those who came from Chittagong and Cox's Bazar are called *Bhahardar* especially they are involved in drying of big fish and are only found in office kella, Mezerkella and Mehar Ali char at Dubla. The other category of the coastal belt fishermen are called headman. They are the fishermen who are involved in harvesting, drying, marketing and exporting of fish. They are liable for making house, depot, trawler and also face any kind of unexpected situation. The highest number of headman is observed in Alor koll and Mazerkella Island.

Fishermen

During the study period a large number of fishermen are observed in different drying yards/*khola* in the coastal belt. These fishermen were recruited by the head fishermen/*bhahadar*. They are directly involved in fishing, fish transportation and sometimes only a few are involved for drying purposes. The skilled fisherman who was appointed by each headman is the key person for harvesting, selection of site and construction of khola. He advise the other fishermen to operate the net in the sea. He stays in the fishing site for a long time even whole of fishing season for better harvesting. The monthly salary of *mazi* was Tk. 8-10 thousand and that of general fishermen was Tk. 1,100- 2,400.

Labor/kids

Huge employment opportunities exists in fish drying yard/khola for fish drying, transportation, packing and storage purposes. Sometimes they form a group (10-20 kids) and work under one headman with 5% sharing of the harvested fish. They maintain their life at *char* by selling their share of fish to the headman. Headman generally supply some money in advance to those who come from headman's village or his basis and food is always free and monthly salary is from Tk. 700 - 900.

House

Before harvesting the fish, mainly the headman makes a house in *char* for staying the whole season and storage of the dried fish. The highest number of house was found in Alor koll, Big

size houses were observed in Mazer Kella, Mehar Ali char and Office kella and small size occurred in Kauar char, Babla tola and Dhulishor etc. Cost of the house was Tk. 6000 – 40,000.00 (Big size).

Education

Most of the coastal belt people involved in fishing related activities do not know how to write. Some of the people can put their signature only. A few S.S.C and H.S.C holders were found in different chars. They were found to work as clerk under big headman.

Loan system in Kuakata and Sundarbans areas

Credit plays a vital role in the harvesting, drying, transportation and marketing of fish. A lot of head fishermen collect money from different NGO's, money lenders, *dadonders*, financial institutions etc. for primary investment i.e. for net making, purchasing, food for labors, boat repairing or purchasing and for other related works (Table 5). The highest percentage of headmen had collected the loan from the *dadonders* and only a few collected loan from the Bank. A mentionable number of head fishermen collected the loan from money lenders and NGO's

Table 5 Source of credit

Locatin	Loan from
Seller char	*Danander*, Bank and NGO
Office Kella	Bank, Money lender and *Danander*
Narikel Baria	NGO and *Dananderr*
Meher Alir Char	*Danander* and Money lender
Mazer Kella	*Danander*
Manik Khali	*Danander*
Kokil Moni	*Danander*
Kabor Khali	*Danander* and Money lender
Choto Umbaria	*Danandar*
Chapra Khalir Char	*Danander*
Alor Koll	*Danandar,* Bank and NGO
Kauarchar	*Danandar* and Money lender
Gangamati	*Danander*
Bablatola	*Danander* and Money lender
Nutunpara	*Danander* and Money lender
Khajura	*Danander*
Kuakata Khola	*Danander* and Money lender

Thresh hold capacity

The thresh hold capacity of the different stakeholders regarding their coping capacity in an emergency need was found to be as follows :

Fishers working in fishing boats Tk. 3,000-5,000

Boat operators/owners Tk.10,000-15,000

Dry fish labors Tk. 5,000

Average market price of dry fish at different chars in the coastal belt

The average price of fish was found to vary with season, market demand and locality, price was the minimum during the peak fishing season while the maximum during the off peak season (Table 6)

Table 6 Variation in market price of the important fishes in the coastal areas

Name of fish	Tk./kg	Name of fish	Tk./kg
Churi	60-80	Fatra	50-60
Phasa	50-60	Tular dandi	40-50
Rupchanda	300-350	Gura chingri	15-20
Poa	40-50	Hangar	40-55
Tengra	30-45	Kukur jib	45-60
Shaplapata	30-40	Gura (Miscellaneous)	40-50
Taposi	70-80	Chaka chingri (Fresh)	50-60
Lakhua	200-250	Chali chingri (Fresh)	30-40
Loitta	60-70		

Revenue rate for fish, fishery products and fishing in the Sundarbans

It was found that the Department of Forestry, Government of the People's Republic of Bangladesh for fish, fishery products and fishing in the Sunderbans (Table 7)

Table 7 Revenue rate for fish, fishery products and fishing in the Sunderbans

	Tk/Mound(38 kg)		
Ilish (Fresh)	200	Harvesting fishermen	2/day/fisherman
Big shrimp (Fresh)	600	Trawler	40/week
Gura chingri (Fresh)	60	Crap	80/ Mound (38 kg)
Dry fish	195	Over stay (fishermen)	0.25/day/fisherman
Crab	80	Overnight stay (trawler)	5/day
Shark	500		
Miscellaneous fish	80		
Dust head of fishes	25		
Dry waste fishes	25		

Source: Department of Forestry

Off farm activities in Cox's bazar and Teknaf areas

In the fishing communities of Kutubdia Island and Cox'sBazar, it was found that 51% households earned their livelihoods from off farm activities especially on fishing from the adjacent Bay and rivers, 18% earn from non farm activities (15% from fish drying and trading, 2% from seasonal business, 1% as community female teacher serving in NGO supported NFPE schools), 4% from livestock keeping, 13% from farm activities especially small scale aquaculture, share cropping and salt production, and 14 % from off farm wage labor i.e. fishing labor (Table 8 a and 8 b).

Table 8 Off farm activities in Cox's bazaar and Teknaf areas

Activities	Type	Percentage
Fishing	off farm	49
Collection of firewood, honey, crab, shrimp fry etc.	off farm	2
Fish drying and trading	non farm	15
Seasonal business (miru selling, kantha stitching)	non farm	2
Teacher of NFPE school	non farm wage	1
Livestock keeping		4
Small scale aquaculture	farm income	4
Share cropper	farm income	3
Salt production	farm income	6
Fishing labor	off farm wage labor	14

Therefore, in a semi-urban coastal area of Cox's Bazar district (*Kutubdia prara*) it was found that 76% households earned their livelihoods from non-farm activities (65% from fish drying and trading, 11% from seasonal business), 3 % from off farm activities especially on large-scale fishing from the adjacent bay and rivers, 21% from off farm wage labor i.e. fishing labor

b) Livelihood diversity in Kutubdia para, Cox'sbazar

Activities	Type	Percentage
Fish drying and trading	non farm	65
Seasonal business	non farm	11
Large scale fishing	off farm	3
Fishing labor	off farm wage labor	21

Fish and fishery product marketing system in the coastal belt

There was no fish-landing center in any villages at chars in the Sundarban coastal regions. Every *bahardar*/dry fish processor were found to construct temporary residential huts having enough space to be used as fish drying yards. Fish were found to be landed near the fish drying yard on the bank of the *khal*. But during the low tide fishing boat or transportation boat cannot reach the bank of char. Then the harvested fish are unloaded from fishing/carrier boat on head to the drying yard from a distance. All most all fishes of the harvested fishes are dried in their drying yards. Sun drying is hampered if bad whether continues for a longer time resulting in the deterioration/decomposition of the landed catch and fishermen has to incur heavy loss. Fishermen often fall victims of diarrhea diseases or cholera due to bad environment but there is no information about the death of fishermen.

The varieties of fresh fish and shrimp, which have demand both in local and international markets, are sold through existing marketing channel. The shrimp traders live in boats and sometimes in depots in the char areas and buy shrimp from *bahardars*/headmen. They carry ice and insulated boxes with them, the collected shrimps from the *bahardar* were kept in icebox after deheading and then send to Khulna. Sometimes whole shrimps of ice remains in good condition for a longer duration than de-headed ones but the traders prefer de-headed shrimp as it save space and ice. In many cases, the shrimp traders provides *bahardars* and fishermen with mechanized boat or motor-cycle on the condition that the entire catch of exportable shrimp has to be sold to them at a prefixed price.

Operational costs of such boats are borne by bahardar/fishermen. The farias collect shrimp from the bahardars, after deheading deliver the product to the traders boat and receive commission for this work at a fixed rate bulk of the harvested catch of behandi net, consists of fish, small shrimp, crabs and molluscs is sun dried and then put into sacks and then dried product are sent to Chittagonj, Khulna & Syedpur. by motorized boats, lorry & rail for sale. But poor quality products mostly juvenile fish, shrimps are used as a raw materials by the fishmeal factories at Khulna, Dhaka for production of fish feed/ poultry feed

Credit access

- Only the fishery industrialists, the educated and new entrepreneurs have access to bank loans but the poor and illiterate fishermen and the small traders have no access to bank loans, because
- He has nothing to offer as collateral.
- He is a floating person. Hence, bank officials are not interested in giving him loans because of insecurity in recovering the loans.
- He dose not get a bank loan when he really needs it.
- There is a lack of business relationship and faith between him the bank officials.
- Fishers are of the opinion that the interest rates are high in the banks.

Probably due to these reasons the fishermen and the small fish trader approach the middleman-usually a rich fish trader (*aratder*)- for loans. The fishermen, small fish trader or retailer prefer to take loans from the *aratdars* because :

- He has a long-standing business relationship with the *aratdar*.
- He gets long-term and short-term advances from the *aratdar* as and when required by him.
- He does not have to pay any interest to the *aratdar* but has only to bind himself by faith to sell the fish only through/from the *aratdar*.
- The *aratdar* helps to rehabilitate him quickly, in the case of any loss or damage to his inputs, like boats, nets etc.

The poor fishermen or the retailers think that they were benefited, but it is the *aratdar* who is the greater beneficiary. Apparently he does not charge any interest directly, but he makes the double profit from both the seller and the buyer which is unknown to them.

The *aratdar* carries on his business as a fish trader and as a financier as well. He is much more efficient because of his human relationship with his clients. He also benefits due to the failure of cooperative societies to help its members with credits. It seems to be almost impossible to eliminate the *aratders*.

Recommendations

There is widespread belief that the middlemen are only exploiting the fishermen and that they should be 'eliminated' from the marketing system. However it is found that the profits of fish traders are not extraordinarily high considering the perishable nature of the product. At the same time it does not appear that the existing co-operative system of the country can provide the same services at a lower cost.

Not with standing this general comment, there is scope for increased competition in marketing particularly at the assembly phase, where the bargaining position between fishermen and middlemen is often unequal due to financial dependency, poor communications with market.

The study recommends for appropriate policy intervention for financing dry fish producers so that they can manage to tackle the vicious chain of non-institutional money lenders and can secure more profit. This is also recommended to strengthen domestic technical regulations or standards to overcome technical barriers to dry fish trading in international market.

In view of the above, the following recommendations are put forward :

- Introduce quick transportation facilities between different chars and the near by towns/ habituations.
- Introduce supervisory credit system through loan guarantee fund scheme.
- Establish portable fish drying units to avoid the deforestation.
- Introduce health care facilities in the coastal belt specially in the Sundarban areas.

- Processors do not get proper price when they sell their products in Chittagong whole sale market, moreover costs related to travel, transportation and *aratdar*'s commission etc. ate high, it is need to reduce the costs and ensure more bargaining power of the producers in the wholesale market.
- Need alternate transportation system (more land based) and ensure safety of the producers, Coast guard should provide more vigilant services.
- When processor and *Mohajons* work jointly, *Mahajon* takes 50% profit directly. It is logical to reduce the existing high share of the *mohajons.*.
- Producers have hardly any choice to sell fish as per their choice but they are bound to sell to a particular person. It is needed to widen the market net work and create a scope to sell fish else where also.
- Need to prohibit use of insecticide/pesticide in dry fish production..

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