

Research article

Present status of traditional dry fish processing and marketing, and assessment of socio-economic status of dry fish processors in Nazirartek, Cox's Bazar, Bangladesh

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ABSTRACT

The aim of this study was to examine the existing production procedure of traditionally dried marine fish, their marketing system, and estimate the profit margin of different actors involved in the marketing chain along with the socio-economic status of the dried fish producers in Nazirartek, Cox's Bazar, Bangladesh. Data were collected through questionnaire interviews. It was found that 23 marine fish species were used to produce dried fish which continues from in mid-October to the end of mid-February. The wholesale or retail markets prices of those products varied on the basis of species, size and quality of the end product. The retail price per kg dried Chinese pomfret (*Pampus chinensis*), Ribbon fish (*Trichiurus haumela*), Bombay duck (*Harpadon nehereus*) and, Indian threadfin (*Leptomelanosoma indicum*), ranged from BDT 300-500, 350-1400, 400-850 and, 1500-3200, respectively. Maximum (29.41%) gross margin was calculated for dried *Loytta* and, minimum (10%) for dried Indian white shrimp (*Chaga chingri*). Several marketing problems were identified including lack of capital, higher transportation cost, storage problem, lower market demand and higher loan interest rate. Policy level intervention including financing producers was recommended to tackle the non-institutional money lenders.

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1. INTRODUCTION

Drying is one of the oldest and massive methods of fish preservation for the coastal community (Kubra et al., 2020). Fish drying is such a method in which fishes are dried to reduce free water and lowers the water content to 15%-16% (Al Mehedi et al., 2020). Fish from both marine and inland sources are subjected to drying for making "Shutki" (Kubra et al., 2020). The

practice of drying fish in the open air using the wind and the sun to evaporate water content (Al Mehedi et al., 2020) has been since the ancient times (Mehtaj et al., 2018). This is the simplest, cheapest method of preserving fish (Jamila et al., 2009). Almost 20% marine catch in Bangladesh are used for producing dry fish round the year (Ahmed et al., 2007; Shamsuddoha, 2007). It offers great demand in India, Malaysia, UK, USA, UAE, Sri-Lanka, Hong Kong and Singapore (Jamila et al., 2009;

Kubra et al., 2020). Bangladesh has exported 4141.40 metric ton of dry fish during 2019-2020 fiscal year which had a market value of 542.1 millionTK (DoF, 2020).

Dry fish is being produced commercially in large quantities in Nazirartek, Choufaldandi, Khurushkul, Maheshkhali and, Teknaf (Alam et al., 2005; Hossain et al., 2015) in Bangladesh. Dry fish is also being produced in Rajshahi, Thakurgaon, Patuakhali, Sundarbans, Nilphamari, Mymensingh, and Sylhet. These regions of Bangladesh engaged in dry fish production have little or no technical effort and advancement (Mehedi et al., 2020). Insect infestation during drying and storage (Ahmed et al., 1978), soaking of fish into toxicants to bring down infestation (Shamsuddoha, 2007), use of poor-quality raw material (Samad et al., 2009), and least hygienic production conditions have become the reasons of making unsatisfactory quality dry fish. Besides, unscrupulous syndicate of middlemen has made the trading system discouraging to the producers (Ahmed et al., 2007).

Fish Drying Yard, Cox's Bazar is one of the largest production centers for traditionally dried marine fish products. It was estimated that 31250 metric tons of dried fish was produced only in Cox's Bazar in the fiscal year of 2019-20. (DoF, 2020). Several studies conducted by Flowra et al. (2010), Al Mehedi et al. (2020), Amin et al. (2012), Monir et al. (2013), Nayeem et al. (2010), Marine (2014), Reza et al. (2005) and, Paul et al. (2018) on value chain of the dried products reported that there existed a long marketing chain for fresh and dried products. So, the price in each stage of marketing chain increased and finally the consumers bought the product at a higher price.

The aim of the study was to put together various information about dry fish, its nutritional and economic value, drying technology associated with production, health risk and safety aspects, problems faced by the producers along with necessary recommendation for the betterment of both producer and consumer. The present study was therefore designed in Nazirartek, Cox's Bazar to evaluate present status of dry fish production, existing trading system of dried fish and assess livelihood pattern of dried fish processors.

2. MATERIALS AND METHODS

Study area

Nazirartek (Figure 1) is located around 3 km away from Cox's Bazar town coordinating 21.467°N-91.9484°E and built as "Shutki Palli" in 1987 on a 100-acre land along the Bay of Bengal.

Interview schedule

A structured questionnaire (closed and open ended) was prepared and, modified to include all type of inquiry. Besides, some unstructured and free flowing questions were asked, lasting for a few minutes to several hours, and were conducted with both individuals and groups of respondents.

Data collection

Primary data was collected through face-to-face interview. Participatory Rural Appraisal (PRA) was intended to gather socio-economics information, focus group discussion (FGD) for qualitative and quantitative data. Secondary data was collected from Statistical Year books of DoF, and published journals etc. Process of drying fish was observed in the drying yard of Nazirartek.

Sampling unit

Total 50 stakeholders (Fishers, Producers etc.) were selected randomly.

Study period

The survey was conducted for a period of 45 days from September- November, 2021.

Data processing and analysis

All the data were summarized, scrutinized, tabulated, edited, coded and transferred into computer at each stage. The data were processed and analyzed using Microsoft Excel program. In order to minimize error, data were collected in local units and later converted into standard units. The gross margin (GM) of the dry fish traders was calculated by the following equation;

$$GM = \frac{[(\text{Buying price} - \text{selling price}) / \text{buying price}] \times 100\%}{\text{Fersoushi et al. 2010}}.$$

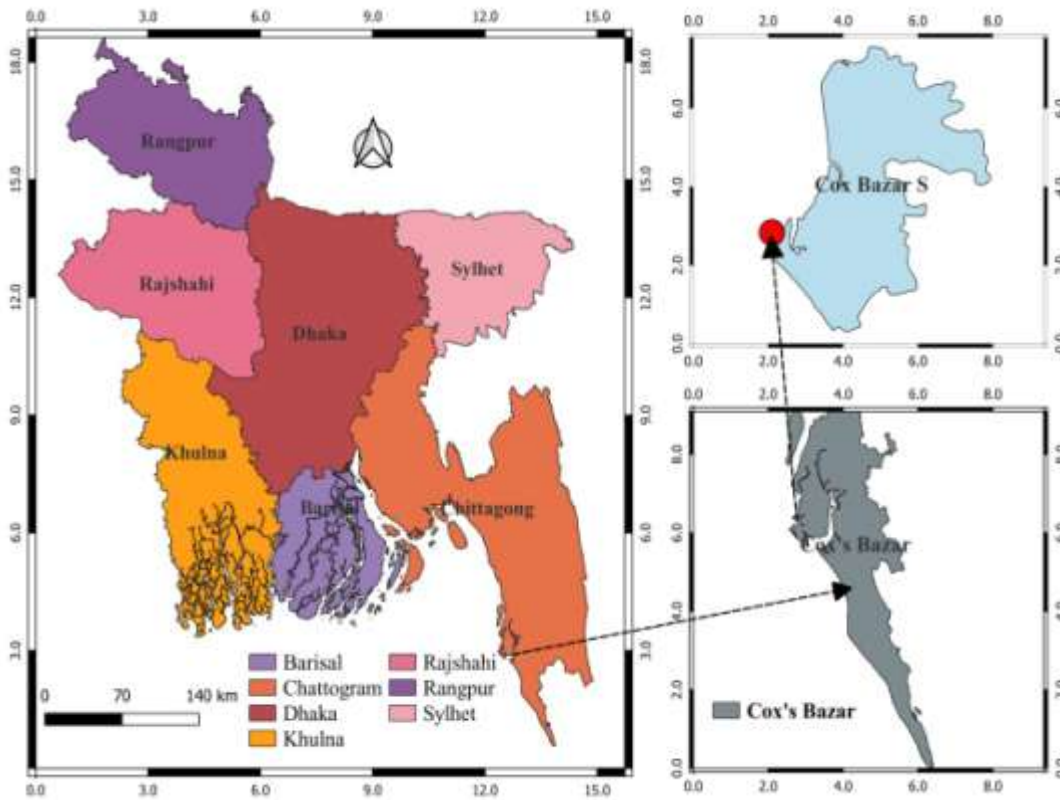


Figure 1. Location of the study area

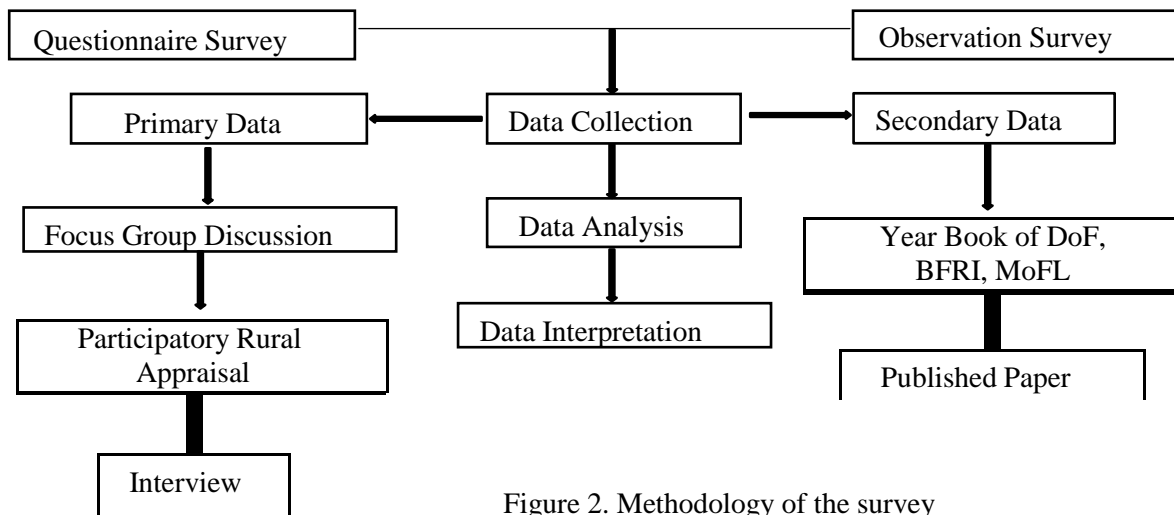


Figure 2. Methodology of the survey

3. RESULTS AND DISCUSSION

Present status of fish drying in Nazirartek Fish Drying Yard

Most of the marine dried fish of Bangladesh are produced in Cox’s Bazar. 80% of which comes from Nazirartek where about 9,000 people were involved in various stages of production, processing as entrepreneurs, workers and investors. The dry fish business is locally known

as “Chang”. To establish the rights of fish-drying and dried fish business, small entrepreneurs had formed a cooperative society in 1995 named “Nazirartek Fish Traders Multipurpose Cooperative Society”. Starting with 104 members, it had more than a total member of 500. The society was registered in 2000 (Reg. No. 478). In a drying season, one society member can produce 20-25 tons of dry fish (Alam et al. 2005). In each season, 50,000-

60,000 metric ton of different types of dried fish along with fish powder, was produced valuing about 200 crores.

Associated stakeholders

Different stakeholders (Table 1.) were involved in the dry fish supply chain between producer and consumer. Fish drying makes important economic contributions to the livelihoods of large numbers of women, many of whom were highly marginalized Rohingyas displaced from Myanmar.

Sources of raw material

Raw fishes were directly collected from fishermen. Transportation of raw fish from fish landing centers to fish drying point was mainly done by non-mechanized van, rickshaw, and bicycle or by head load or shoulder load of the labors.

Available species for drying in study area

Generally, about 30-35 species of dried fish were found in the study area per drying season. Our study was carried out in mid-September to mid-November and there was a ban season for 4th -25th October. Hence, only a total of 23 dry fish species and 1 shrimp species were found. Marine et al. (2014) found 35 species of dried fish in Sylhet district. Moreover, Flowra et al. (2010) also identified 25 types of fresh and marine water dry fishes in Rajshahi and Thakurgaon districts. Result from the survey of Fersoushi et al. (2010) showed that 15 species of fresh water and 7 species of marine water dried fish (6 full dry and 1 salted dehydrated) were available in Rangpur division. Payra et al. (2016) found 19 species for the production of dry fish, out of which 16 were finfishes and rest of them were shell fishes. Since comparatively poor-quality fishes were being used for making shutki, the price of raw materials was much lower. Some fish were also sold as Hali, hundred, thousand, Maund, Palla.

Present practices in fish drying activities

The present study revealed that two sun drying techniques were practiced in Nazirartek, Bangladesh. Horizontal drying of small fish which are dried on horizontal wooden racks raised about 1 meter above the ground. The fish

were placed on mats and turned occasionally to prevent sticking to the mat. Mandal et al. (2021) found that about 75-90% of a drying yard was covered by fish drying in a horizontal position. High value fishes were being dried separately, but small sized and low-priced fishes were dried as a mixed lot. Ribbon fish (Churi) and sharks were tied up at the caudal end in pairs, and a pair of Bombay duck (Loytta) was tied together using their extended jaws, before being hung over bamboo bars to dry. Some of the large sized fish like tuna, threadfin, and shark were being gutted before drying. Their bodies were being cut into strips and a round bamboo frame was inserted to ensure that all meat was exposed to the air. Alam et al. (2005) found that the lateral muscles of large fish like four thread tassel fish or Indian mackerel are were split into 8 to 10 strips of equal thickness. One ring encircled the abdominal cavity inside and helped the muscle strips to remain open as it gave a shape of a spindle or rocket shell. Before drying the fish, some organic medicinal ingredients (250 g turmeric powder + 250 g chilli powder + 10L water) were added to the fish. The fishes were immersed in this mixture for 2-3 minutes. Mandal et al. (2021) found that the rate of mixing salt was 1 kg salt for 12 kg of fishes. According to Hossain et al. (2015) the largest quantities of salts were used in high valued, deteriorated and more oily species.

Duration of drying

It took about 2-5 days to make dry fish in natural process. Usually, 1 kg of dried fish was obtained by drying 4 kg of raw material. Small fishes were taken a shorter time (2-3 days) to dry than larger and thicker fishes (4-7 days). Generally, 6-7 drying cycles/ month were run in each season. However, sometimes only 3-4 cycles were completed in a month due to various factors such as sufficient supply of raw fish, high price of supporting materials and bad weather. In winter, when the relative humidity was less in the air (60-65%), 2 days were sufficient for drying small mixed fish. According to Alam et al. (2005) average duration during drying season for different fishes were: jewfish: 2-3 days; ribbonfish: 3-4 days; Bombay duck: 2-3 days and this duration varied if it was rain. Hossain et al. (2015) found that it generally took 2-4 days to dry the fish

based on the size of fish, degree of sunshine and prevailing weather. They observed that the drying duration extremely varied with weather conditions and varied from 3-7 days depending on the size of the raw fishes. Mandal et al. (2021) recorded drying duration to be varied from 2- 6 days depending on the size of the raw fishes.

Use of insecticides

At the beginning of the season, mid- April to mid- June, the owner used more pesticides compared to the rest 6 months. Over the last few years, Morter 48 EC 100 ml plastic bottle by Synokem Agro Ltd. was the most commonly applied chemical in dry fish. It was generally used at a dose of 4-5 drops in a bucket of about 10 L water and fish were soaked for some time. Reza et al. (2005) reported that the use of chemicals and insecticides before drying and during storage of dried fish products in the coastal region of Bangladesh were widespread. Hossain et al. (2015) found that over the last 2-3 years, Shobicron was the most commonly applied chemical in dry fish center of Nazirartek. Payra et al. (2016) indicated that several antibiotics, herbicides, insecticides, were indiscriminately used during the process of dry fish production and their long-term preservation.

Business season

The drying season varied slightly from site to site. However, in Nazirartek, operations run from mid- October until mid-February. Fish drying sites were operated for 8 months from mid-October to mid- June. They mostly stopped drying during the rainy season. However, drying was possible here in remaining four months of the year, although the product was of much lesser quantity. Hossain et al. (2015) found that drying was in operation (Nazirar Tek, Cox's Bazar) for 8 months per year from mid-August until mid-April. Mandal et al. (2021) observed

that peak drying was September- October in coastal belt of Bangladesh. According to Alam et al. (2005), fish was extensively dried from October to March through abruptly reduced in the summer and rainy seasons.

Price of dry fish

Price of the dried fish varied with the size, species, supply and quality of the final product. Flowra et al. (2010) also agreed that the price of dry fish often related to the season. Amin et al. (2012) found that the price of dried marine fish was minimal in winter. During a study in Dublarchar, Hossain et al. (2015) found that the best quality large dried rupchanda can be sold for Tk >3000/kg and very big sized chhuri are worth Tk 1000/kg when dry. Flowra et al. (2010) estimated that the price of dry fishes varies from 215 Tk/ kg to 914 Tk/kg of dry fish depends on species and quality.

Gross margin

Maximum gross margin was found for Baspata (20%-21.74%), Loytta (25%-29.41%) Mishali (12.5- 20%), Surma (11.11-18.75%). Fersoushi et al. (2010) reported that the calculated maximum gross margin was 12.14 Tk/kg for (*Trichiurus lepturus*) Churi dried fish in Rangpur in retail markets.

Hygiene and sanitation

The bamboo mats or racks were often very dirty and not cleaned after one cycle of drying, before drying the next batch. The water in which the fresh fish was washed in before and after sorting was not very clean. All the fresh fish and dry fish were handled with bare hands. The drainage system was almost non-existent, as were proper bathroom and toilet facilities. Washing hand and faces with clean water before and after working was not a common practice.

Table 1. Stakeholders Involved in Fish Drying Activities

Fishing	Boat owners, Gear suppliers, fishermen, fishing labors (net mending, repairing, lifting), Boatmen
Processing	Permanent, semi-permanent workers (men, women, children), pesticide sellers
Marketing	Wholesaler, Aratdar, Retailer, Bepari, Exporter, Entrepreneur
Others	Dadan, Consumer, NGO and GO, Researchers

Table 2. Marine fish species used for drying in the study area

Local Name	English Name	Scientific Name	Price (BDT /kg)
Chaga chingri	Indian white shrimp	<i>Peneaeus indicus</i>	200-600
Chapila	Indian River shad	<i>Gudusia chapra</i>	120
Churi	Ribbon fish	<i>Trichiurus haumela</i>	150-170
Faissa	Gangetic hairfin anchovy	<i>Setipinna phasa</i>	100-120
Hangor	Shark	<i>Scoliodon sorrakowah</i>	150
Kachki	Yellowtail mullet	<i>Sicamugil cascasia</i>	100
Kalo Chanda	Black Pomfret	<i>Parastomateus niger</i>	350-400
Kamila	Yellow pike conger	<i>Congresox talabon</i>	100
Koral	Sea bass	<i>Lates calcarifer</i>	350-400
Lal Poa	Silver jewfish	<i>Johnius argenteus</i>	180-200
Loitta	Bombay duck	<i>Harpadon nehereus</i>	70-80
Mishali Chingri	Mixed shrimp	-	80-300
Tuna	Yellowfin tuna	<i>Thunnus albacares</i>	150-500
Olua	Goldspotted anchovy	<i>Coilia dussumieri</i>	140-150
Potka	Puffer fish	<i>Tetraodon sp.</i>	30
Rita	Rita	<i>Rita rita</i>	200-400
Rupchanda	Chinese pomfret	<i>Stromateus chinensis</i>	300-500
Shapla pata	Pale edged stingray	<i>Himantura bleekeri</i>	100-120
Surma	Spotted sea fish	<i>Scomberomorus guttatus</i>	200-300
Tailla	Four thread tassel fish	<i>Eleutheronema tetradactylum</i>	450-500

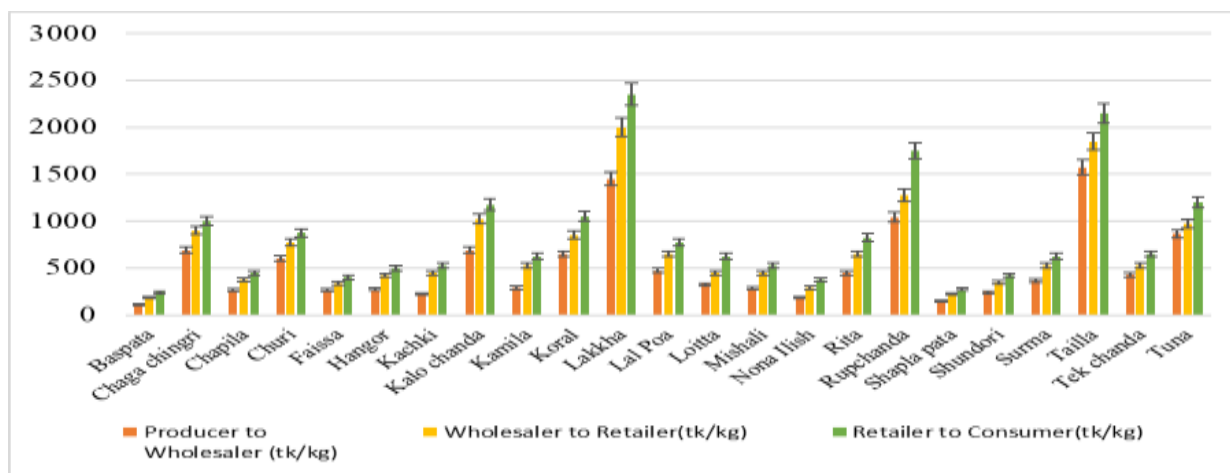


Figure 3. Average Price (tk/kg) of Dry Fish During Study Period

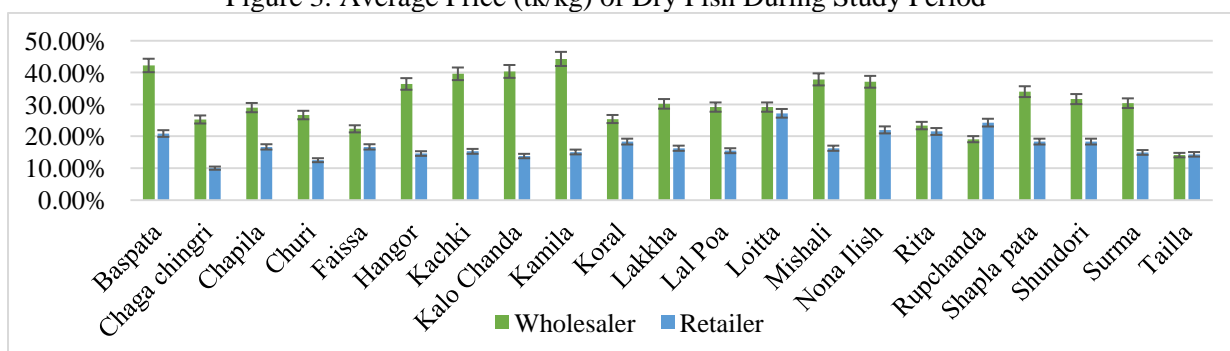


Figure 4. Gross Margin of Stakeholders in Dry Fish Business

Preservation, packaging and storage

Processors mostly used chemicals to prevent insect infestation. But in some places, they used salts. Reza et al. (2005) studied about some commercially important marine dried fishes of Bangladesh where they asserted that the raw fishes were soaked in various kinds of insecticides including DDT and Nogos before drying. Approximately 70% of the respondents were found to use jute made bags for storage purpose which contradicts the findings of Monir et al. (2013) where they found only 20% and a maximum of the dried fish were seen to be stored in cement floor without any packaging. Marine et al. (2014) also found more or less similar result. They used to keep the jute bag full of dry fish in the storeroom which was very poor and un-hygienic. About 85% of the respondents took the measure by exposing the dried fish into sunlight for longer storage, 10% dry fish sellers used some chemicals and 5% did nothing for longer storage. Most of them had an idea about the production technique of modern sun drying, while the rest had no idea about the production procedure. Marine et al. (2014) found that 70% processors used sunlight for longer storage and 20% of them did nothing for longer storage.

Consumer preference

Dry fishes were highly relished for its flavor and taste by the people of Cox's Bazar, Chattogram. Higher- and middle-class consumers were the main customers of dried fishes. Moreover, shidal (a semi-fermented fish products) was very popular in north Bengal and "Chepa" was traditional food in Mymensingh-Netrokona. But the food loving Bengalis didn't have dried shark in their menu. This special breed of shutki was quite popular with the hill tribes. Among the other dried fishes that the author came across after visiting the market, dried ray was also famous to the people who lived in the hill region.

Marketing channel

Dried fishes were carried out by Aratdars of Asadganj, Khatunganj, Chaktai dry fish markets of Chattogram from Nazirartek, Cox's Bazar. Amin et al. (2012) found that the producers carried 70% of their dried fish to Asadganj dry

fish market. Besides, some dried fishes were also exported to our neighbor countries. The marketing system comprised a set of intermediaries. They took part to form a chain between producers and consumers. However, it included producers, aratdars, wholesalers and retailers.

The author found 5 marketing channels, all of which the above intermediaries were involved in dried fish marketing which matches the findings of Marine et al. (2014). More or less similar findings were also found by Flowra et al. (2010) and Samad et al. (2009). Monir et al. (2013) observed 4 dry fish marketing channels in Nilphamari district of Bangladesh. Shamsuddoha (2007) and Reza et al. (2005) found intermediaries like wholesalers, Aratdars, middlemen and retailers in Cox's Bazar. Amin et al. (2012) noted 6 marketing channels in the survey while studying about marketing channels of dried marine fish in the south-eastern coastal belt of Bangladesh. The following value chains were identified in case of dry fish marketing:

Drying yard >Local retailer> Local Consumer
Drying yard >Supplier> Exporter> Foreign Market

Drying Yard>Aratdar>Exporter>Foreign Market

Drying Yard>Aratdar>Intra-District

Wholesaler>Retailer>Consumer

Drying Yard>Aratdar>Intra-District

Wholesaler>Entrepreneurs>Consumer

Drying Yard>Aratdar>Inter-District

Wholesaler>Retailer>Consumer

Drying Yard>Aratdar>Inter-District

Wholesaler>Entrepreneurs>Consumer

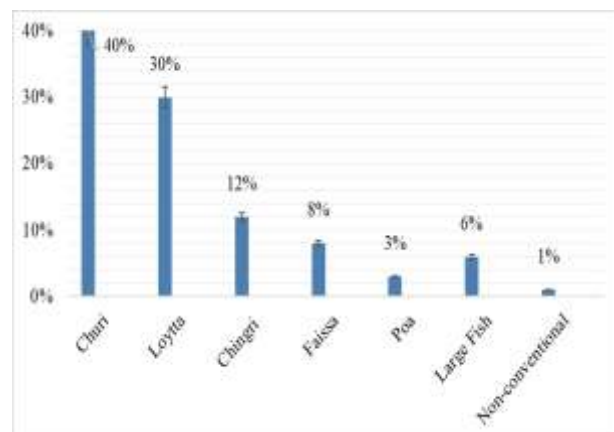


Figure 5. Dry fish preference of consumers

Livelihood pattern

Age group

Highest group (37%) of associated stakeholders were found in the age between 30-45 years and lowest were found under 18% years old. Amin et al. (2010) observed that 60% of producers/processors were in the age category of 18- 35 years, 26% were 36-50 years and 13% above 50 years. Nayeem et al. (2010) found that in his study, the highest percentage 14% was found in 40-50 years age and the lowest percentage 9% was found in 50-60 years.

Religion and economic aspect

Most of the respondents were Muslim (80%) and rest belonged to Hindu and Buddhist. Nayeem et al. (2010) revealed that 63% respondents were Muslim and the rest belonged to Hindu religion. Most of the people belonged to the lower class in terms of livelihood and economic aspects. However, lower middle-class families were also seen. The only way for them to make a living was to make dried fish or sell it by catching fish from the sea.

Educational status

A considerable number of respondents had completed their primary education (45%) and few of them had higher secondary (8%) education. Most of the women had no schooling.

Shamsuddoha (2007) reported that most of the coastal belt people involved in fishing related activities and 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. These occur because the economic. Faruque et al. (2012) reported two types of reported that about 20% of respondent have no schooling at all. Nayeem et al. (2010) found that 25% of respondent had acceptable level of formal education. So, they can at least read and write and solve simple mathematical equation also. He also reported that 18% of respondent had education up to secondary school level.

Housing status

It was found that 25% households of the producers were in tin shed with bamboo, 60% households were in shed with tin wall and, 15%

households were respectively. Kubra et al. (2020) reported that most of the dried fish producers in Barisal and Kuakata region were in tin shed house whereas, Barisal contained 53.33% and 41.67% in Kuakata region.

Daily income

Among 9,000 workers, 3,000 were women and 1,000 were child labors. The owners hire women and children to work for less money. Occasionally if the quantity of fish was very high, they may increase their labor demand.

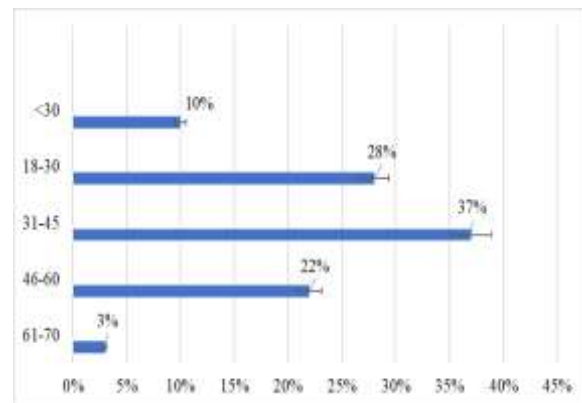


Figure 6. Age group of respondents

Hossain et al. (2015) found that women were paid Tk 150/day (children Tk. 100) who worked from early morning until 6 to 7 pm. Sometimes, it was increased up to Tk 200-220/day. There were no wages for female processing labor in Gular Char (Hossain et al., 2015).

Off farm and non-farm activities

75% households earned their livelihoods from non-farm activities, 4% from off farm activities especially on large-scale fishing from the adjacent sea and rivers, 21% from off farm wage labor i.e., fishing labor.

Ahmed et al. (2007) mentioned 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, 4% from livestock keeping, 13% from farm activities especially small-scale aquaculture, share cropping and salt production, and 14 % from off farm wage labor in the fishing communities of Kutubdia Island and Cox's Bazar.

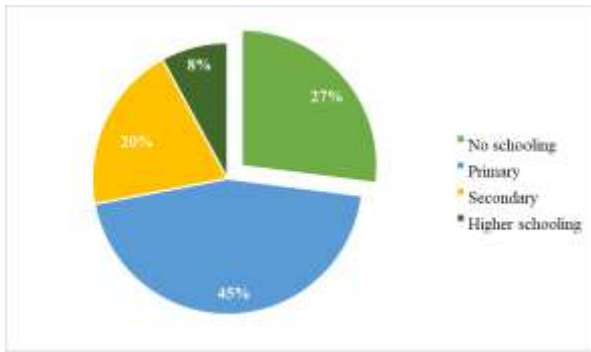


Figure 7. Educational status of stakeholders

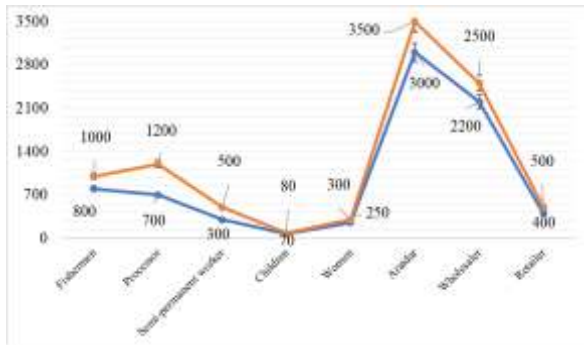


Figure 8. Daily income of stakeholders

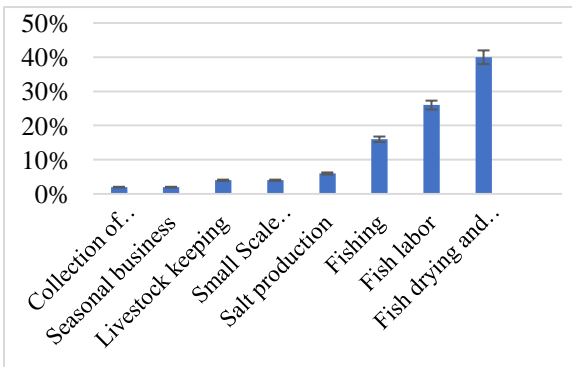


Figure 9. Off farm and non-farm activities of stakeholders

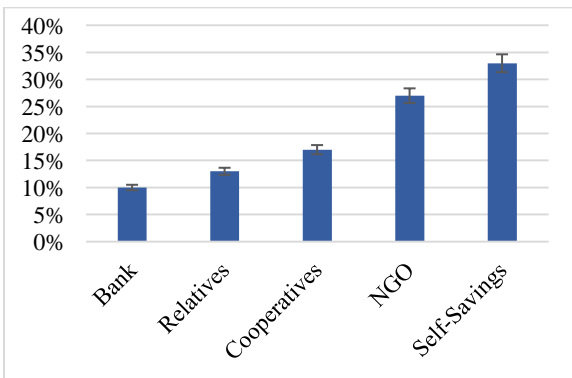


Figure 10. Sources of credits of stakeholders

Sources of credit

One of the most important sources of funding for farmers were co-operative credit facilitates credit which facilitated small- and medium-scale farmers. The fishing families of those villages jointly formed the “Nazirartek Shutki Cooperative Society” in 2001. The poor families were given an annual loan of Tk 2000-5000 from the cooperative society. Some families also saved some of their weekly income as savings.

4. CONCLUSION

Marketing of dried fish plays an important role in our national economy through increasing production, earning foreign currency and providing employment opportunities. The business has made a strong position in the economy as it has its appearance both on local and international markets. But there are selected financial difficulties and avoidable activities which increase ultimate product price. However, evidence suggests that real prices of dried fish are increasing, resulting in declining consumption among the poor. Bangladesh’s food and nutrition security may be negatively impacted as a result. Besides, there is a scope of increased competition in marketing particularly at the assembly phase, where the level of bargaining between fishermen and middlemen is often unequal due to financial dependency and poor access to the existing marketing system. It is therefore necessary to provide institutional and organizational support, government support, extension services and more research along with knowledge of dried fish marketing. 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.

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