

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

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Abstract - Fish drying is fairly widespread throughout the coastal districts of Bangladesh, and dried fish are in high demand both domestically and internationally. The present investigation was performed to observe the scenario of dry fish production and the socio-economic condition along with the existing problems of dry fish processors in Nazirartek, a well-known fish-drying village located in Cox's Bazar, Bangladesh from April to September 2023. Data was gathered through questionnaire interviews and 50 respondents were selected purposively for the study. In the study area, 19 fish species were found to be used for drying and the majority of raw fish was sourced from nearby fish landing centers or directly from fishermen, with transportation provided by non-mechanized vehicles such as vans and rickshaws. Several challenges were noted in dried fish marketing such as a lack of adequate storage facilities, a lack of funding, and the existence of intermediaries. A few processors rarely used chemicals (Sobicron, Nogos) to prevent insect infestations. The majority of the dried fish processors were members of nuclear families, often consisting of below 4 to 4 individuals (74%) and most of them were Muslims (94%). Most of the processors were unschooled (38%) while only a few of the interviewees completed their secondary education (12%). In the study area, all of the families used tube-well for drinking water but most of them used kacha latrines (50%). In addition, 44% of the processors had a monthly income of 31,000-45,000 BDT while a small percentage of them had below 10,000 (4%). During the off-season, few of the dry fish processors engaged in other substitutes agricultural or other occupations (22%) whereas a major part of them remained jobless. From the study, it was observed that the major constraints primarily faced by the communities included inadequate off-season income prospects, reliance on loans owing to poor earnings, exposure to extreme weather, lack of adequate treatment facilities, lack of prior training, and lack of technology infrastructure. The dry fishing industry of Bangladesh may reach its maximum potential with the help of suitable management strategies, alternative income opportunities, improved marketing systems, and collaboration between employment communities, local authorities, and the government.

Keywords: Dried fish; fish processors; socio-economic status; Cox's Bazar.

I. INTRODUCTION

Dry fish has been one of the most popular, tasty, and nutritious food items in Bangladesh since ancient times. One of the most traditional and extensive techniques for preserving fish in the World in both freshwater and for the coastal population is drying (Kubra et al., 2020). Fish drying is a fish preservation technique that reduces free water in fish and lowers the water content to 15%–16% (Al Mehedi et al., 2020). The process of drying begins to protect raw fish from spoilage and in this way, the method of preserving fish for a long time originated from the production process of dry fish. It is considered as the least expensive method of fish preservation. Dried fish products are easily transportable, storable, and marketable. Fish drying, the most widespread fish processing industry in Bangladesh's coastal region, is crucial to livelihoods and nutrition, particularly for underprivileged and marginalized coastal populations (Hossain et al., 2015). Almost 20% of the marine catch in Bangladesh is used for producing dry fish around the year (Ahmed et al., 2007; Shamsuddoha, 2007). Dry fish contains about 60-70 % of body-building nutrients and 7-20% of disease-curing substances. In the fisheries industry, the processing and trading of dried fish is emerging as a lucrative and attractive sector that presents prospects for significant financial gain for fish traders, processors, and other stakeholders. As a result, dried fish has demand both on the national and international markets. A significant amount of dried fish products is exported every year which earns a great amount of foreign exchange. According to the Bangladesh Fisheries Statistics Yearbook (2021–22), in that financial year, the country exported 3301.54 tonnes of dried fish worth USD 4.4 million. Cox's Bazar, situated along the Bay of Bengal, is a major hub for dry fish processing in the South Asian country and involves thousands of coastal populations. Nazirar Tek village under Cox's Bazar district is the largest dried fish-producing village in the country, thousands have made temporary settlements for fish drying under the sun. The first step in analyzing and comprehending livelihood characteristics is to define

livelihood. Livelihood is made up of the capabilities, the resources (natural, physical, human, financial, and social capital), the activities, and access to these resources (via institutions and social connections) that collectively define the standard of living attained by each household (Ali et al., 2017). Dried fish processing is often a major source of income for many people in Cox's Bazar. By studying their socio-economic conditions, we can learn about their jobs, how much money they make, and how they support themselves and their families. Understanding the socio-economic conditions helps us see if dry fish processors have access to basic needs like food, healthcare, and education. If they're struggling, it might indicate problems that need attention. This research helps us understand how the dry fish processing industry affects the community as a whole. It's not just about individual workers, but also about how the industry impacts the town or village where they live. By studying their conditions, we can identify the challenges they face, like low wages, unsafe working conditions, or lack of resources. This can help policymakers and organizations find ways to improve their situation and create more opportunities for them. Therefore, the study was undertaken to evaluate the present status of dry fish production, livelihood pattern, and socio-economic condition of dry fish processors and to identify their existing problems.

II. MATERIALS AND METHODS

Study site

The study was conducted at Nazirertek fish drying yard located at the Bhakkhali River's mouth in the Cox's Bazar district (21.467°N-91.9484°E) of Bangladesh (Figure 1). The fish drying village is also known as 'Shutki Polli or Shutki Mahal'.

Study period

The study was carried out for a period of six months from April to September 2023.

Data collection

The study was based on the field survey where primary data were collected from Nazirartek dry fish yard Cox's Bazar of Bangladesh. The information needed for this study was collected from multiple sources. Firstly, extensive secondary data (literature review) was made in this area of Cox's Bazar. Secondary data were collected from various sources viz., various books, Statistical Yearbooks of DoF, BFDC, published journals, etc. Secondly, a structured questionnaire was prepared following the objectives set for the study. Then the questionnaire was pretested and finally used for the collection of data. For the face-to-face questionnaire, interview simple purposive random sampling method was followed for 50 dry fish processors. Then Focus Group Discussion (FGD) was conducted to get an overview of particular issues like existing problems, income, number of employees, etc. After collecting the data through questionnaire interviews and FGD, cross-check interview was conducted with key informants such as the upazila fisheries officer, president and secretary of the dry fish market association, and senior scientific officer of BFRI Cox's Bazar sub-station.

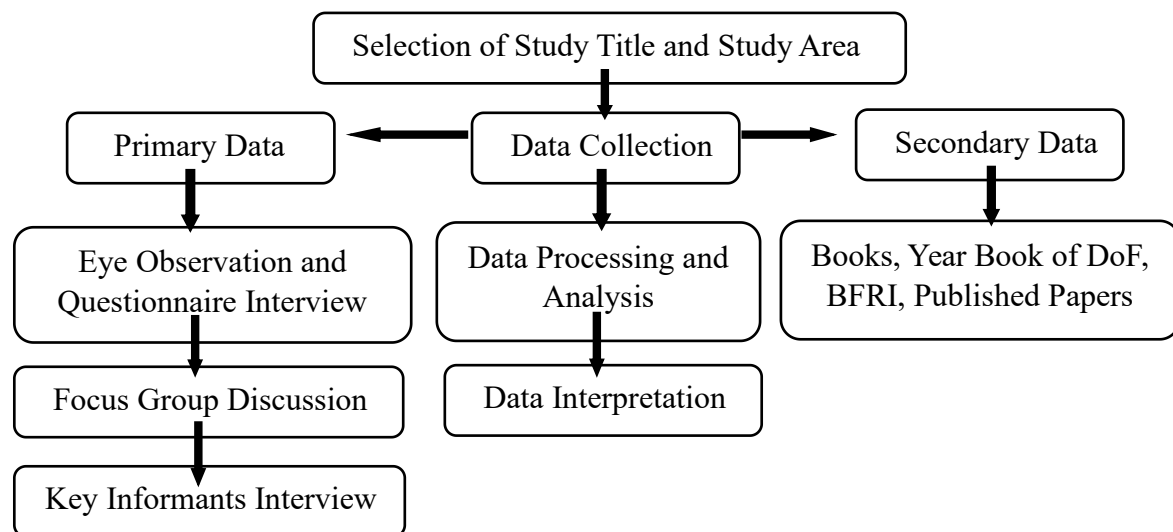


Figure 2: Methodology of the study

Data analysis

After collection the data were compiled, summarized carefully, and transferred to the tabulation sheet. The analysis of collected data was mainly based on the tabular description method. The tabular technique was applied for the analysis of the data by using simple tools like total, average, and percentage. Data were processed and finally analyzed using Microsoft Excel (version 2019).

III. RESULT AND DISCUSSION

Available dried fish species in the study area

Most of the marine dried fish of Bangladesh are produced in Cox's Bazar. In every drying season, roughly 30 to 35 different species of dried fish were found in the study area. In the investigation area, 19 different finfish species and 1 shrimp species were found to be used for drying purposes (Table 1). Shuchi et al. (2022) stated that a total of 23 dry fish species and 1 shrimp species were found in Nazirartek shutki polli/. Seventeen fish species were identified in Kuakata and Barisal (Kubra et al., 2020). Additionally, in the districts of Rajshahi and Thakurgaon, Flowra et al. (2010) detected 25 different species of fresh and marine water dry fishes. 15 species of freshwater and 7 species of marine water-dried fish (6 whole dry and 1 salted dehydrated) were found in the Rangpur division, according to the findings of the Fersoushi et al. (2010) survey. Saha et al., (2022) found 19 species of dried fish species in the Noakhali coastal region.

Table 1: Fish species used for drying in the study area

Species	Scientific Name	Selling Price (taka/kg)
Chaga chingri	<i>Peneaeus indicus</i>	300-700
Chapila	<i>Gudusia chapra</i>	200-300
Churi	<i>Trichiurus haumela</i>	800-1000
Faissa	<i>Setipinna phasa</i>	200-250
Hilsha	<i>Tenualosa ilisha</i>	1500-2000
Kachki	<i>Sicamugil cascasia</i>	200-300
Kali Chanda	<i>Parastomateus niger</i>	400-600
Kamila	<i>Congresox talabon</i>	200-250
Kata	<i>Pseudosciades sona</i>	350-500
Koral	<i>Lates calcarifer</i>	1200-1500
Lal Poa	<i>Johnius argenteus</i>	150-200
Loitta	<i>Harpadon nehereus</i>	200-250
Mola	<i>Amblypharyngodon mola</i>	250-300
Olua	<i>Coilia dussumieri</i>	150-200
Potka	<i>Lagocephalus lagocephalus</i>	80-100
Rup Chanda	<i>Stromateus chinensis</i>	500-700
Shapla Pata	<i>Himantura bleekeri</i>	200-300
Surma	<i>Scomberomorus guttatus</i>	300-400
Tailla	<i>Eleutheronema tetradactylum</i>	500-600
Tuna	<i>Thunnus albacare</i>	300-600

Sources of fish

In the case of raw fish source, 38% received raw fish from the landing center, 12% received from Chattra gram, and another 50% received from both the landing center and Chattra gram. Raw fish were primarily transported by non-mechanized vans, rickshaws, bicycles, or by the head or shoulder load of workers from fish landing centers to fish drying points (Table-1).

Present practices

Most of the fish drying spots have demarcated areas that are surrounded by bamboo fencing and have raised bamboo racks, poles, and bars where the fish is dried, according to observations. The bamboo-marked territory is called "Khola". The drying method varied with the type and size of fish to be dried. In most cases, small fishes are dried on horizontal bamboo or wooden racks placed about 1 meter above the ground. The fish were put on mats and rotated periodically to keep them from adhering to the mat. According to Mandal et al., (2021),

fish drying horizontally occupied between 75 and 90 percent of a drying yard. In some cases, fishes were spread on the mat directly on earth. High-value fish were dried separately, but small-sized and low-priced fish were dried as a mixed lot. Ribbon fish and sharks are tied up in pairs at the caudal end, while two Bombay ducks are joined with their jaws outstretched and suspended from bamboo bars. Before drying, several larger species, such as tassel fish and Indian mackerel, undergo pretreatments such as lateral muscle breaking and gutting.

Duration of drying and drying place

Small fish arranged in a thin layer on the raised racks typically dry faster. Fish that are thicker and larger take longer. It took about 2-5 days to make dry fish in a natural process. In winter, when the air's relative humidity was lower (between 60 and 65 percent), two days were enough to dry small mixed fish. In the study area 50% processor used bamboo rack, 30% used bamboo bar and 20% processors are used to dry fish on beach by spreading (Table-2). Alam et al. (2005) found that the average drying season duration for several fishes was as follows: jellyfish: 2-3 days; ribbonfish: 3-4 days; and Bombay duck: 2-3 days. Hossain et al. (2015) reported that generally drying of fish takes 2-4 days based on the size of fish and weather conditions.

Business season and Yard status

Generally, fish drying starts in July and ends in January. The drying season varies slightly between sites. Peak drying is observed from mid-October until mid-February in the study area. 40% drying yard is own and 60% yard is leased for drying fish. Most (42%) of the yard area is above 35 decimals (Table-2). According to Hossain et al. (2015), drying occurs at Nazirartek in Cox's Bazar for 8 months per year, from mid-August to mid-April. Mandal et al., (2021) found that the peak drying period was September-October in the coastal belt of Bangladesh.

Used water for washing fish

In the study area most (70%) dry fish processors used sea water and 39% processors used freshwater (Table-2). In the coastal area sea water is available than freshwater. So, most of the dry fish processor use sea water.

Hygiene and sanitation

The hygiene and sanitary conditions at the fish drying areas were deplorable. There is no system in place to protect the flies because the semi-dried fish are prone to blowfly larval attacks. The bamboo mats or racks were typically unclean and not cleaned after each drying cycle before the following batch. The water used to wash and sort fresh fish was not clean. All fresh and dried fish were handled with bare hands. There was a lack of drainage and adequate toilet and bathroom facilities.

Use of insecticides

The current study revealed that the fish processors applied more pesticides during the early part of the drying season, from mid-April to mid-June in comparison to the other six months. The most widely used chemical in dry fish throughout the past few years was Morter 48 EC 100 ml plastic container by Synokem Agro Limited at a rate of 4-5 drops in 10L water. Only a small portion of the community has reported dousing the dried fish with pesticides (Sobicon, Nogos) to lessen pest attacks during cloudy and rainy days. In the study, it was observed that most of the processors were careless about the adverse effects of using pesticides. According to Payra et al. (2016), several antibiotics, herbicides, and insecticides were used carelessly when producing dried fish and preserving them for an extended period. Reza et al. (2005) documented the extensive use of pesticides and insecticides in Bangladesh's coastal region both before and after the drying process and also during the storage of dried fish products.

Table 2: Features related to drying place, yards, and drying activities

Parameters	Patterns	Respondents	Percentage (%)
Source of fish	Landing center	19	38
	Chattragram	6	12
	Landing center and Chattragram	25	50
Drying place	Bamboo rack	25	50
	Bamboo bar	15	30
	Spread on beach	10	20
Yard status	Own	20	40

	Leased	30	60
Area of yard	Below 5 decimals	3	6
	6-15	11	22
	16-25	10	20
	26-35	5	10
	Above 35	21	42
Pre-drying activities	Yes	20	40
	No	40	60
Used water for washing	Freshwater	15	30
	Sea water	35	70
Use of insecticides	Yes	5	10
	No	45	90
Selling area	Locally	2	4
	Chattagram	19	38
	Locally and Chattagram	27	54
	Others	2	4

Packaging, storage, and marketing

After drying of fish, packaging was done with plastic and jute-made bags. Sometimes bamboo baskets were also used for this purpose. In the investigated area, it was found that the majority of processors (80%) exposed dried fish to sunlight for prolonged storage, whereas 10% used chemicals and 10% did nothing. More or less similar results were reported by (Monir et al., 2013) that 70% of processors used sunlight for extended storage, whereas 20% did nothing. The dried fish marketing chain involves several middlemen, including beparis, wholesalers, aratdars, and retailers in the study area. Shamsuddoha (2007) and Reza et al. (2005) found intermediaries like wholesalers, Aratdars, and retailers in Cox's Bazar. In the study area 54% processors sold their product locally and also send to Chattagram, 38% send to only Chattagram and 4% sold locally and others way. Chattagram is the near big city of Cox'sbazar and also a sea port. So, the Processors like to send their processed product at Chattagram.

Livelihood pattern of dried fish producers

Age group

The dry fish processors were classified into five age groups based on their age limit. In the study, it was found that the highest percentage (34%) was in the 21-30 years age group and the lowest percentage (8%) was in below 20 years (Table-3, Fig. 3). Kamal et al., (2023) found that 60% of dry fishers were young (<35 years), whereas 30% and 10% of fishers were middle and old-aged, respectively. The highest group (37%) of associated stakeholders were found to be aged between 30-45 years and the 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% were above 50 years. Shuchi et al. (2022) reported that the largest group of associated stakeholders was aged 30-45 years, comprising 37%, with the lowest percentage being those under 18 years old, which aligns closely with my findings.

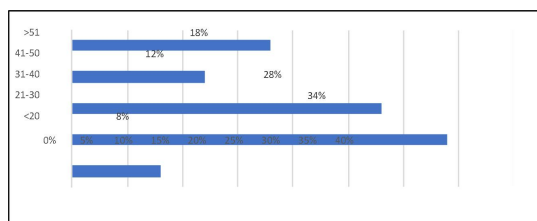


Figure 3: Age group of dry fish processors

Educational status

It was observed in the present investigation that few of the respondents had completed their primary school (22%) while a sizable portion (12%) had secondary education. The majority of the processors were unschooled (38%)(Table-2, Fig. 4). Shuchi et al. (2022) reported that a considerable number of respondents had completed their primary education (45%) and a few of them had higher secondary (8%) education which is almost the same. The majority of people in the coastal area who work in jobs related to fishing are illiterate; others can only sign their names (Shamsuddoha, 2007). A few S.S.C. and H.S.C. holders were found in different charts. These results significantly coincide with the current investigation. According to Nayeem et al. (2010), 25% of respondents have completed a satisfactory level of formal education and 18% of respondents have completed SSC-level education which is more or less similar to the findings of the current study.

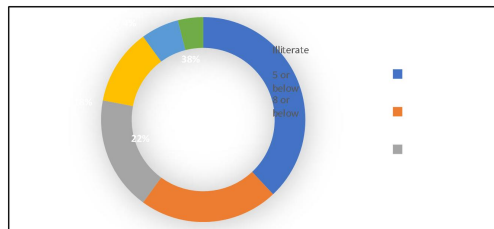


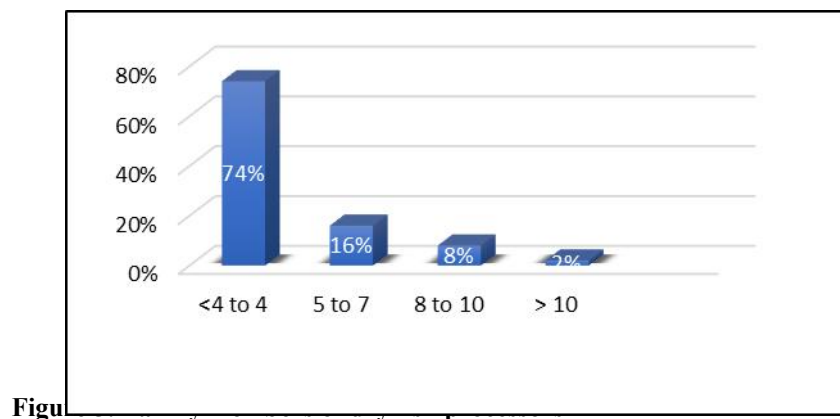
Figure 4: Educational status of dry fish processors

Religious status

There are two main groups of fish processors in the study area based on their religious status: Muslims and Hindus. The majority of dried fish producers in the study area were Muslims (94%), with the remaining 6% being Hindus (Table-2). According to Shuchi et al. (2022), the majority of fish processors (80%) were Muslims, with the other ones being Hindu and Buddhist. More or less similar results were also found by Kubra et al. (2020) that 86.67% of dry fish processors were Muslim in Kuakata and 75% in Barisal.

Family members and earning members

It was found that most of the dry fish processors lived in nuclear families and had below 4 to 4 members (74%) to the highest above 10 members (2%). And the number of earning members of their family was very poor. 56% of processors have one or two earning members in their family (Table-2, Fig. 5).



School going person

In this study, it was observed that 76% family have 1-3 School going person, 14% have 4-above and 10% have no school going person (Table-3). Most of the family are going to be educated.

Housing condition

In the study area, 50% houses of the dry fish producers were found to be in a tin shed with bamboo, 34% of them were semi-paka houses and 16% were paka houses. According to Kubra et al. (2020), the majority of dried fish producers in the Barisal and Kuakata regions were located in tin shed houses, with Barisal having 53.33% and Kuakata having 41.67%. Shuchi et al., (2022) reported that 25% of the processors' houses were found to be in tin sheds with bamboo, 60% were in sheds with tin walls, and 15% were paka houses. It was observed that all of the respondents interviewed used tube-well water for drinking purposes whereas 40% used their own tube-well and the rest of them (60%) used a neighbor's tube-well. Almost similar findings were also stated by Kamal et al., (2023) that 53.33% of dry fishermen used their neighbor's tube well, compared to 46.66% who used their own.

Sanitation condition and sources of drinking water

By this research, it is observed that kacha (50%) sanitary were in the highest position in this area followed by paka (16%) and semi-paka (34%) respectively (Table-3, Fig.6). All of the processors of the studied area used tube-well water. 40% used own tube-well water and 60% used neighbours tube-well water (Table-3, Fig. 6). Khatun et al. (2013) found that the percentage of respondents who used a kancha, semi-pucca, or pucca toilet was 6%, 68%, and 26%, respectively. In their study, Ali et al. (2009) observed that 62.5%, 25%, and 12.5% of the processors used semi-pucca, kancha, and pucca toilets.

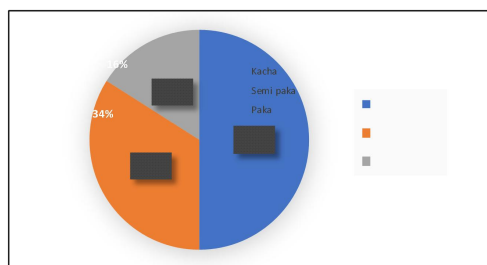


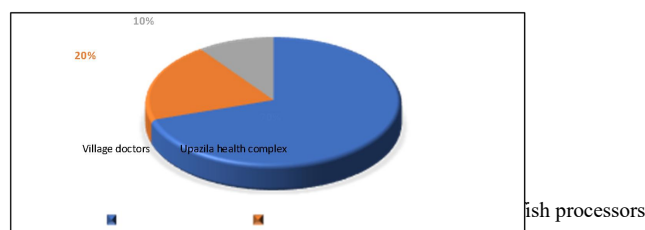
Figure 6: Toilet facilities of dry fish processors

Electricity facilities

In the study area, 70% processors have electricity facilities and 30% processors have no electricity facilities. They always try to finish their work before sunset.

Disease treatment

According to the results of the current study, 70% of fish processors relied on village doctors, whereas 20% and 10%, respectively (Table-3, Fig. 7), received medical care from MBBS and Upazila Health Complex doctors. Kubra et al., (2020) also found almost the same findings that 74% of the fish processors were dependent on village doctors followed by 22% upazila health complex and 4% MBBS doctors for health services. 44% of farmers received medical care from village doctors, 29% from upazila health complexes, and 27% from MBBS doctors, according to Rahman et al., (2007).



Income and Personal savings

According to the present study, the lowest monthly income was less than 10,000 (4%) and the highest monthly income was more than one lakh (2%). The majority of the processors earned 31,000 to 45,000 BDT (44%) where 66% processors have no personal savings and 34% have their own savings (Table-3, 8). Flowra et al. (2010) revealed the average monthly income of dried fish processors in her study area, which was 30.71%,

50.00%, and 14.28% for seasonal dried fish processors earning BDT 2000-5999, BDT 6000-10999, and BDT 11000-15000, respectively. Kleih et al. (2003) stated that laborers can make 3,000 BDT per month, whereas dry fish processors can make between 1,00,000 and 2,00,000 BDT per season.

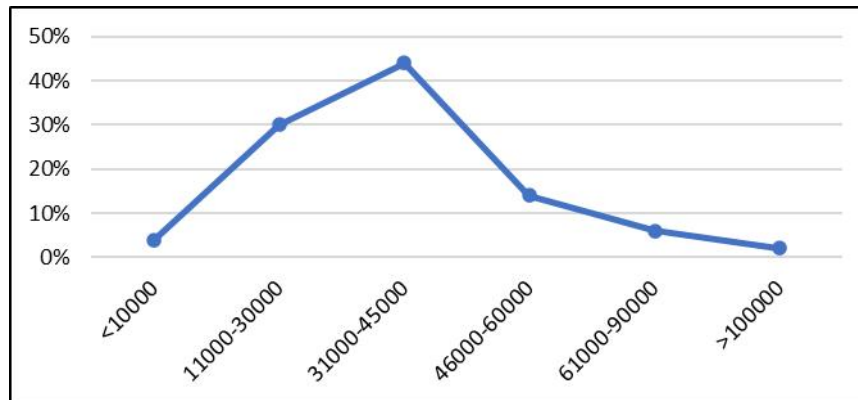


Figure 8: Income of dry fish processors

Table 3: Socio-economic profile of dry fish producers in Cox's Bazar

Parameters	Patterns	Respondents	Percentage (%)
Age group	Less than 20	4	8
	21-30	17	34
	31-40	14	28
	41-50	6	12
	Above 51	9	18
Educational status	Illiterate	19	38
	5 or below	11	22
	8 or below	9	18
	SSC	6	12
	HSC	3	6
	Above	2	4
Religious status	Muslim	47	94
	Hindu	3	6
Family members	Below 4 to 4	37	74
	5-7	8	16
	8-10	4	8
	Above 10	1	2
Earning members	2 or below	28	56
	3	13	26
	4	8	16
	Above 5	1	2
School going person	No one	5	10
	1-3	38	76
	4 or above	7	14
Housing condition	Paka	8	16
	Semi paka	17	34
	Kacha	25	50
Source of drinking water	Own tube-well	20	40
	Neighbour's tube-well	30	60
Electricity facilities	Yes	35	70
	No	15	30
Sanitary condition	Kacha	28	56
	Semi paka	7	14
	Paka	15	30
Disease treatment	Village doctor	35	70
	Upazila health complex	10	20

	MBBS	5	10
Engagement with this profession	Below 5 years	10	20
	6-15	17	34
	16-25	15	30
	26-30	5	10
	Above	3	6
Alternative occupation	Yes	10	20
	No	40	80
Monthly income	Below 10000	2	4
	11000-30000	15	30
	31000-45000	22	44
	46000-60000	7	14
	61000-90000	3	6
	Above 1 lakh	1	2
Personal savings	Yes	17	34
	No	33	66
Source of investment	Own	8	16
	Bank	11	22
	NGO	11	22
	Own with bank/NGO	18	36
	Mahajan	2	4
Social influence	No	9	18
	Low	20	40
	Medium	14	28
	High	7	14
Participation in training programs	Yes	18	36
	No	32	64

Alternative occupation

In the surveyed area, 80% of the fishers were engaged in fish drying activities as their primary occupation and about 20% were engaged in other activities along with drying activities like agriculture, daily labor, livestock rearing, etc. During the off-season, most of the processors (78%) remain jobless whereas 16% are involved with local shops or worked elsewhere as a labor, 2% in agriculture, and sometimes they collect money from Mahajan (4%). The study revealed that most fish processors or traders were affected by natural disasters from Kutubdia, Chakaria, and Moheshkhali, and lived in Nazirartek permanently for 15-32 years. The majority of dry fishers (34%) had 6-15 years of experience, while 30% had 16-25 years, 20% had below 5 years, 16% had 16-20 years, 10% had 26-30 years, and 6% had more than 30 years.

Access to credit and training program

It was observed in the study that, the source of their capital was different. 16% had their own source, 22% had a bank, another 22% had an NGO, 36% had owned with bank/NGO, and 4% had borrowed from Mahajan. In the study area, most of the dry fishers (64%) had never been trained before, while 32% had been trained by different organizations. Kamal et al., (2023) stated that (76.66%) of dry fishers did not receive any training and 23.33% had received training from government organizations which is more or less similar to the findings of the current investigation.

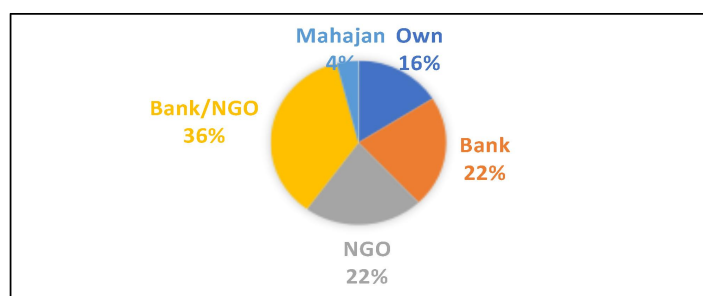


Figure 9: Investment sources of dry fish processors

IV. CONCLUSION AND RECOMMENDATIONS

Bangladesh has a wonderful possibility to become one of the world's leading dried fish-producing countries because it has numerous marine fisheries resources, favorable weather, a large coastline, and capable fishermen and producers of dried fish. Dried fish marketing contributes significantly to our national economy by enhancing production, generating foreign exchange, and creating job opportunities. However, there were several problems observed during the investigation including financial difficulties, livelihood insecurity of dry fishers, inadequate training programs, etc. Through various government assistance programs and relevant policy initiatives, the government should take the required actions to solve the socio-economic difficulties associated with the community. Raising awareness about proper fish handling techniques, using high-quality fresh raw materials, and implementing the right procedures will only greatly enhance the quality and shelf life of dried fish products.

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