

Assessing Worker Conditions and Addressing Challenges in Dry Fish Processing: A Case Study from Cox's Bazar, Bangladesh

ABSTRACT

The Research Aimed to Determine the Conditions and Issues Affecting Dry Fish Processing Workers and The Drying Centers. The Data Was Collected with Questionnaires by Semi-Structured Personal Interviews and Focus Group Discussions (FGDS) Of Respondents and Analyzed the Data from Major Sites Nazirartek, Chowfalldandi, Khurushkul, And Nunierchara at Cox's Bazar Upazila; Thakurtala, Ghotibhanga, And Sonadia at Moheshkhali Upazila and Shaporirdip and Shamlapur at Teknaf Upazila. The Majority of the Workers Were Male Ranging From 59.95% To 76.09% With Female Participation Ranging Between 8.94%-18.12%, Children 5.28%-13.37%, and Rohingya Refugees 7.17%-22.78% **cumulatively in Cox's Bazar.** Road Networks, Landing Centre Accessibility, Electrical Connections, Ice Plant Shortage, Inadequate Marketing and Processing Facilities, Inefficient Sanitation and Hygiene Practices, Low Wage Levels, and Extended Labour Hours Were Some of the Limitations Observed. **Better infrastructure, improvement of processing facilities, wage improvements, health and safety measures, ensuring gender equity, and providing administrative support are the possible ways forward of these constraints. The study suggests government and policy interventions to improve socio-economic conditions and infrastructure.**

Keyword: Fish drying, workers condition, constraints

INTRODUCTION

Fish plays an important role in Bangladesh's basic food, and dried fish is used as a protein supplement. The country is the second-largest producer of inland capture production and houses the fifth-largest aquaculture industry in the world (FAO, 2024). 69,866.52 metric tons (MT) of dried fish is produced which is 15 % of 4.91 MT of yearly annual fish production (FRSS, 2023). Marine dry fish from Cox's Bazar account for 48285 MT out of 59487 MT. During 2022-2023, Bangladesh exported 2224.62 MT of dried fish and earned more than 48.72 crore BDT (FRSS, 2023).

Dried fish, constituting 10% of global fish production, is essential in many communities, contributing to livelihoods, trade, and cultural traditions (Lloyd and Harish, 2024). Dry fish (shutki) is a popular food item widely consumed in Bangladesh (Reza, 2024). Dried fish and fishery products are widely regarded as good sources of protein and other essential nutrients for the maintenance of a healthy body (Doe and Olley, 2020)). Drying is the biggest fish processing activity in both value and volume in the coastal region and all over the country (Doe and Olley, 2020; Ahmed et al., 2007; Shamsuddoha, 2007).

Fish drying is an old-aged practice in Cox's Bazar. Sun drying of fish, its local and nationwide marketing, and its consideration as a nutritious food among the local people have been very primitive (Anonymous, 1991). The geographical importance of the belt, improved communication, availability of fish and the extent and magnitude of mono-specific fisheries have made this district ideal for fish drying. The islands of Sonadia and Moheshkhali took a key role in drying this exportable product. Several drying factories have been established and operated in Sonadia, Moheshkhali, Cox's Bazar, and Teknaf areas (Newsad, 2004).

There was always a demand for labor in fish drying but it was seasonal and it would depend on the lunar cycle needing daily hiring. All the major chores associated with washing and drying were done by men while sorting and tying, which employed a workforce of at least half women (Belton, 2018). Men, women, children, Rohingya, part-time, day-to-day, permanent, and semi-permanent, -work in the processing facility (khola or dangary), gutting, salting, washing, hanging, spreading, packing and other activities during drying (Hossain et al., 2015). 50% of the casual labourers of Nazirartek were Rohingya refugees of non-carder status, whereas Bengali workers used to be only seasonal migrants (Ahmed, 2010) women's roles in drying, sorting, and salting foods (Rabbanee et al., 2012)

A few challenges associated with dry fish supply are financial problems, sea-rover issues, business seasonality, the problem of giving the right price, illiteracy, muscle power, natural disasters, lack of technical information, higher import tariffs, quality, and transportation (Mehtaj and Das 2018). There are other issues

such as insufficient capital ((Haque et al., 2016; Mehtaj and Das 2018); costly transport; and unclean market places. Lack of capital, storage facilities, transportation facilities, marketing information and political instability are reported as common constraints in dry fish processing (Al Mehedi et al., 2020). According to the study conducted by Hossain et al. (2015), 80 % of workers in the dried fish value chain were women and children including the Rohingya refugees and unemployed people, who have problems with loans and pointed out storage and pricing problems,) cited problems of sun-drying, attacks by insects, and sanitation (Nowsad, 2023).

The purpose of the study was to evaluate the present status of fish drying works in existing yards along with identifying the problems related to fish drying at different drying yards in Cox's Bazar district. Following that, conducted in three upazilas where major fish drying stations are Nazirartek, Chowfalldandi, Khurushkul, Nunierchara at Cox Bazar upazila, Thakurtala, Ghotibhanga, Sonadia at Moheshkhali upazila and Shaporirdip, Shamlapur at Teknaf upazila. The goals were to explore the job characteristics of dry fish processors, determine challenges in marine fish drying, and find out a possible way of recommendations. The implication of the findings will help the trader, processor, worker, and policy maker in solving problems in the fish-drying industry.

MATERIALS AND METHODS

2.1 Location

The survey was carried out in three upazilas of Cox's Bazar district and targeted specific fish landing places such as Nazirartek, Chowfalldandi, Khurushkul, Nunierchara (Cox Bazar Sadar Upazila), Thakurtala, Ghotibhanga, Sonadia (Moheshkhali Upazila), Shaporirdip, and Shamlapur (Teknaf Upazila).

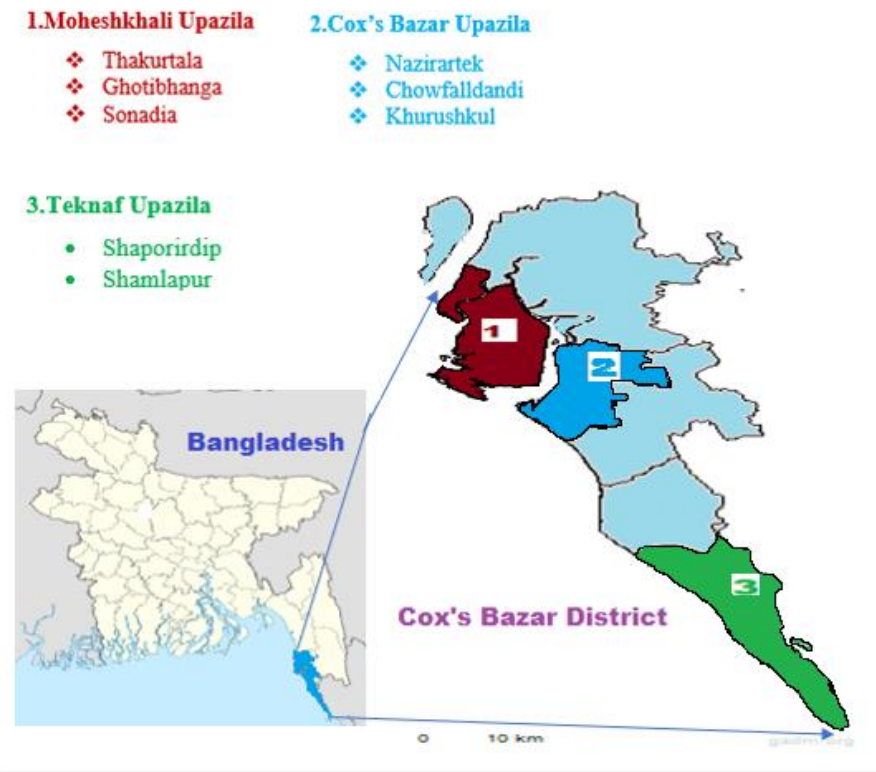


Figure-1- Map Showing study locations

2.2 Study time and target group

The data was collected in response to survey goals over six months in the year 2024, from January to June. The target groups were dried dish processors, entrepreneurs, fishermen, and other employees, both male and female, engaged in fish drying.

2.3 Sample size

About 300 data samples were recorded regarding working conditions and constraints involved in fish drying operations.

2.4 Participatory Rural Appraisal (PRA)

For stakeholder involvement, semi-structured survey questionnaires and focus group discussions (FGDs) as PRA tools were used.

2.5 Key Informant Interview (KPI)

Primary data generated by the survey and FGD were varied with Key Informants Interviews with DFO officials, local government personnel, civil society men and NGO workers.

2.6 Questionnaire for data collection

2.6.1 Design and formulation of the questionnaire

A semi-structured questionnaire was designed to collect data from various drying sites and processing stakeholders depending on the study's objectives. Throughout the processes, the survey forms were checked, changed, and reviewed several times until a functional final form was achieved. The questionnaire was designed in such a way that stakeholders could answer it easily and logically once completed. Field data were acquired through face-to-face interviews.

2.6.2 Data collection methods

Data collection involved three steps: structured and semi-structured questionnaire interviews which was targeted the dried fish processors and the workers, focus group discussions with the intermediaries and value chain actors, and then crosschecked through Key Informant Interviews.

2.6.3 Questionnaire interviews

In choosing the interviewees from the stakeholders, simple random sampling was employed. This was followed by the distribution of objectives to the participants, as well as the guarantee that the data obtained would be utilized solely for research purposes. Questions in the survey form were self-explanatory, as these were easily understandable and asked one by one.

2.6.4 Focus group discussion

Focus group discussions were carried out with the processors and workers in the sun-drying yard, which involved four to twelve people in the group to obtain qualitative data for practices, livelihoods, and socio-economic issues.

2.6.5 Cross-check with key informants

After that, data were cross-checked with the district fisheries officer (DFO), senior upazila fisheries officer (SUFOS), assistant field officer (AFO), local leaders, and members of the Non-Government Organization (NGO).

2.7 Data analysis

The data collected was quantified and analyzed statistically for accuracy and to evaluate relationships between the variables. Tools were used in Microsoft Office 2019 for data analysis and report writing.

3. RESULT AND DISCUSSION

3.1 Worker's condition

Most of the dry fish processing workers in Bangladesh were from the fishing industry and belonged to low-income earners or even below the poverty line. Workers in fish drying centres include males, females, and children, with distinct roles: Women sort, grade, and spread the fish while men manage transportation from the boats to the drying yard and any form of lift job. It was observed that Rohingya refugee populations were present in all the studied sites more prominently in Cox's Bazar as the site for Rohingya rehabilitation. Figure 2 displayed below shows the percentage of the workers.

According to the survey taken in Moheshkhali's three fish drying locations 70.52% of the total workforce (2705±51) were men, 8.94% of the total workforce (343±25) were women, 13.37% of the total workforce (513±17) were children and 7.17% of the total workforce (275±65) of were Rohingya refugee. In this area, the women working forces were mostly observed at the Ghotibhanga site and most of the women were also involved in business activities. Processing is a labour-intensive part of value addition in dried fish; Ahmed et al. (2007) estimated that 80% of the labourers working at this stage are female or children. All in all, over fifty-four thousand nine hundred seventy people are engaged in the fish drying sector, of which 7,719 are child labour and 26.1% are women, according to BBS and ILO (2010). While men occupy the major fishing positions, women are also involved in post-harvest processes, as Nuruzzaman et al. (2014) noted.

The report estimated number of people at two fish drying sites in Teknaf were 592±22 (76.09%) men, 80 ±16 (10.28%) women, 42±9 (5.40%) children and 64 ±14 (8.23%) Rohingya refugees. According to a survey by Hossain et al. (2015), 4958 permanent and day labourers were surveyed of which 43% were men 44% were women and 13% were children. There were 9000 workers 3000 women and 1000 children were also there. Shuchi et al. (2022) observed that owners prefer to employ women and children because of their

perceived willingness to accept lower wages. Furthermore, Rahman et al. (2024) also found the gender ratios, the workers were mostly male, 66% in Dumuria and 71% in Rampal; however, the females were 33% in Dumuria and 29% in Rampal.

Working reported at the BFDC landing centre fish drying site, 59.95% (1250±129) were male, 11.99% (250±41) were female, 5.28% (110±25) child and 22.78% (475±96) were Rohingya refugee workers. This paper confirms Belton's (2018) observation that women and children are part of the casual workforce, especially with children under twelve and such constitutes at least fifty percent of these individuals.

From the observed situation at Nazirertek considered the largest fish drying site workers distribution was 63.33% men (11089± 838), 18.12% women (3173±250), 7.36% children (1288±323) and 11.19% Rohingya refugees (1960±100). Mitu et al. (2021) identified from a study that 16% of male and 41% of female workers engage with dry fish producers (30%) and traders (8%) most of the workforce are women, especially widows and divorcees. As stated above, Belton et al. (2018) and Rabbanee et al. (2012) noticed that the casual workforce in Nazirertek also comprised women and children; up to half of the workers are Rohingya refugees. Kamal et al. (2023) reported that in the study area, namely Nazirertek, the female and male engagement in drying activities were 86.66 % and 13.33 % respectively. Since 1992, a year the Rohingya refugees were displaced, the integration of the refugees into the labour force has compounded competition for fishing jobs in the households, with the Rohingya women undertaking low-paid seasonal employment between October and July. Moreover, Hossain et al. (2015) also observed that a majority of fish drying workers are migrants from Cox's Bazar, and other parts of Bangladesh, who don't even possess land.

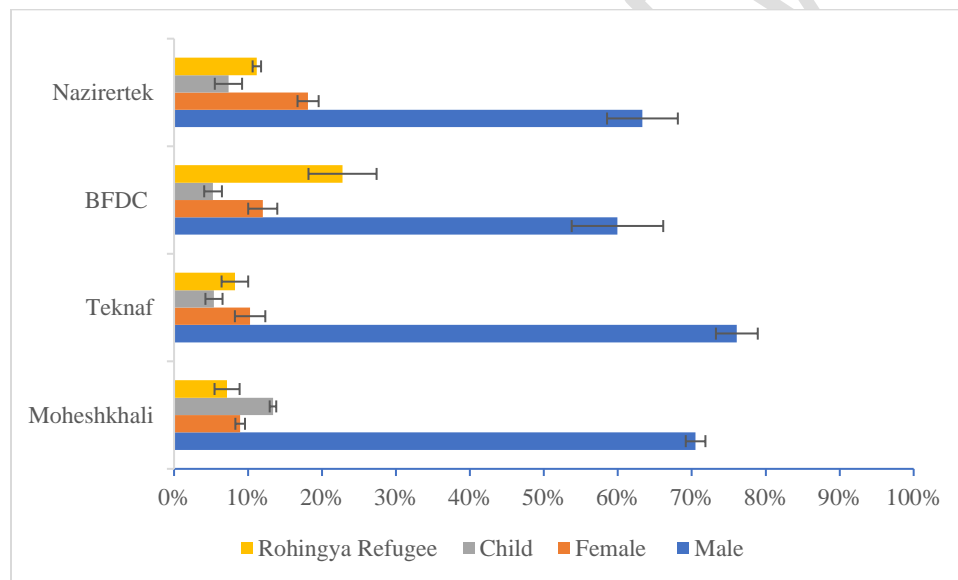


Figure-2: % workers condition of different landing centers

3.2 Constraints way forward as perceived with fish drying

Dried fish is a conventional food for Bangladeshi people and Cox's Bazar is the major hub of marine dried fish production for supplying all over the country. But then again, all the players in the dry fish processing value chain are likely to experience numerous challenges. Some issues found from the interviews with the selected respondents may help to guide the governmental action although this study concentrates on major issues. Details of challenges faced by stakeholders in fish drying at the studied drying yards and suggested solutions are presented in Table 1 below.

This study exposed some of the challenges such as poor road access, often lacking landing tracks, erratic electricity supply, limited availability of water and poor capacity for storage that affected drying yard owners. Similar problems affecting the fish drying operations were also reported by Fersoushi et al. (2015) and Amin et al. (2012). Al Mehedi et al. (2020) and Mozahid et al. (2017) have pointed out some constraints for dry fish processing, namely, scarce capital, lack of appropriate storage, restricted transportation, poor market information and political instability. Kubra et al. (2020) and Rabbanee and Yasmin (2011) also identified

some problems of dried fish marketing channels that including lack of adequate storage facilities, inadequate capital, and the participation of middlemen.

In the study, problems encountered by fish suppliers include poor quality fish, inadequate access to ice, limited access to vehicles and transportation, and layoff during the off-season. The existent constraints captured by Haque et al. (2016) include insufficient capital, expensive transportation, inadequate storage facilities, and unsanitary market conditions. Mehtaj and Das (2018) and Kubra et al. (2020) also highlighted these issues in the drying process that fish suppliers encounter.

The research used in this study revealed that dry fish processors experience challenges such as raw material constraints, outdated technology, inadequate market information, capital issues, and business gaps. As similar issues, Shuchi et al. (2022); Al Mehedi et al. (2020) and Mehtaj and Das (2018) also mentioned. Furthermore, using a survey method, Nayeem et al. (2010) analyzed that the marketing gaps in dry fish management and technology are species, region, season, and stakeholder-dependent. In addition to Sulaiman and Subramanian (2019) findings, Kubra et al. (2020) and Rabbanee and Yasmin (2011) explored other hygiene and sanitation problems and a lack of marketing knowledge at fish drying stations.

The study showed that some of the problems fish drying workers experience include; low wages, ill health, long hours of work, unhygienic conditions, and job insecurity during the off-season. The authors Belton et al. (2019) and Deb and Emdad (2011) identified that the vulnerable groups (states, widows, refugees, religious minorities, and lower casts) who were involved in dried fish chains are prone to health and safety hazards. Hossain et al. (2013) observed that the demographic characteristics of the respondents indicated that the workers in the marine dry fish processing sector had long work hours, keys working in the sector, poor access to safe drinking water, poor drainage facilities across the sector and low wages. Amuna (2014) and Majumdar and Basu (2010) also described the hygiene state of dry fish enterprises as woeful.

There were concerns which affect female employees such as wage discrimination, lack of access to urination facilities, insecurity in workplaces, and poor hygiene as saw in this study. Similar problems of women in the dry fish sector were identified by Belton et al. (2018), Mehtaj and Das (2018), Deb and Emdad Haque (2011), Rabbanee, et al. (2012), and Majumdar and Basu (2010). As mentioned by Rabbanee and Yasmin (2011), other issues for women are; constrained credit position, lack of social security provisions, weak bargaining capability, low income and wages, illiteracy and high level of interest rates for loans.

It said that refugee workers were paid low wages, had no job security, and were harassed and employed on a short-term basis. Shuchi et al. (2022) and Ahmed (2010) pointed to similar conditions as the ones described in the current study. As stated by Belton et al. (2018), paid casual workers, women and men, earn almost negligible wages of US \$1.85 to \$2.50 per day working full day, and children USD 0.4-0.6 per day. Similarly, Sakib and Ullah (2023) have noticed the in-employment relationships between small-scale fishers and processing labour.

In particular, as regards, small-scale fishers and processing labourers cannot even right to bargain wages or working hours. These are also in line with Hossain et al. (2015), in terms of prospective unfavourable impacts on sustainable food security for consumers and the income and sustainability of aqua-entrepreneurial livelihoods. Mehtaj and Das (2018) also discussed the variations like dry fish such as; financial problems, seasonal business, fluctuation in price, illiteracy, natural calamities, dearth of technical and scientific know-how, disputed authorities, problems in the warehouse, inadequate market facility are the existing issues of the dry fish chain supply. Other barriers were institutional, namely, transport costs, taxes, as well as non-tariff measures. Looking at the way the benefits and challenges are incurred within the chain of value this research study seeks to provide guidance of policy that can improve the socio-economic sustainability of the dried fish sector.

Table 1: Constraints of fish drying and way forward as perceived by the dry fish processors

Landing center	SH	Constraints facing	Way forward
Moheshkhali	Drying yard owner	<ol style="list-style-type: none"> 1. Road connection not well 2. No landing centers near yards 3. In some areas no electricity supply 4. Insufficient ice plant 	<ol style="list-style-type: none"> 1. Establish a landing center near yards 2. Ensure Electricity supply 3. Establish Pucca road connection 4. Establish more Ice plant
	Fish supplier	<ol style="list-style-type: none"> 1. No landing center causes low-quality product 2. Insufficient ice supply 3. Vehicles insufficiency 	<ol style="list-style-type: none"> 1. Establish a landing center 2. Establish more ice plant 3. Permanent vehicles for the transport of fish 4. Capital support by soft loan
	Dry fish processor	<ol style="list-style-type: none"> 1. Raw materials insufficiency 2. No advanced technology for drying 3. No fixed market channel for final processed products 4. Capital insufficient 5. Low-quality material due to lack of ice 6. Insufficient salt supply 	<ol style="list-style-type: none"> 1. Ensure regular raw materials supply 2. Advanced technology during off-season fish drying 3. Create a proper market channel for final products 4. Soft loan for capital 5. Proper ice and salt supply 6. Provide appliance for drying
	Drying worker	<ol style="list-style-type: none"> 1. Wages not satisfactory 2. Suffering from various health problems 3. Unemployment during off-season 4. Long working hours 5. No available school at Mockchar 	<ol style="list-style-type: none"> 1. Wages should be fixed according to labour acts 2. Provide medical support 3. School for education at Mockchar 4. Another work during off-season 5. Working hours should be fixed
	Women worker	<ol style="list-style-type: none"> 1. Wage indiscrimination 2. Not separate toilets, restroom 3. No fixed working period 4. No medical support 5. No safety at the workplace 	<ol style="list-style-type: none"> 1. Wages should increase 2. Establish toilets and rest room for women 3. The working period should be fixed 4. Provide medical support 5. Ensure safety at the workplace
	Refugee worker	<ol style="list-style-type: none"> 1. Harassment in working 2.No permanent work 3. Very low wages 	<ol style="list-style-type: none"> 1. Wages should increase 2. Permanent work for livelihood 3. Local people and govt. should support them
	Teknaf	Drying yard owner	<ol style="list-style-type: none"> 1. Road connection not well 2.No landing centers 3. In some areas no electricity supply 4. Insufficient ice plant
Fish supplier		<ol style="list-style-type: none"> 1. Lack of transportation problem facilities 2.No establish landing center 3. During lean season no work 4. Capital insufficient 	<ol style="list-style-type: none"> 1. Establish a landing center near yards 2. Establish more ice plant 3. Permanent vehicles for the transport of fish 4. Capital by soft loan

	Dry fish processor	<ol style="list-style-type: none"> 1. Scarcity of raw fish according to demand 2. Lower quality of raw materials 3. Inadequate freshwater supply 4. Restriction on the Import of dried fish due to FDA registration 5. Syndicate in the business 	<ol style="list-style-type: none"> 1. Provide high-quality fish and ensure availability of raw fish 2. Administrative support for Syndicate in the business 3. Create the opportunity to export dried products easily 4. Arrange certification to export directly to USA and EU
	Drying worker	<ol style="list-style-type: none"> 1. Wages not satisfactory 2. Suffering from various health problems 3. Fewer workers are found in lean season 4. Illiteracy 	<ol style="list-style-type: none"> 1. Minimum fixed wages 2. Provide medical support 3. Create another job facility during the lean season 4. Provide education facilities
	Women worker	<ol style="list-style-type: none"> 1. Wage discrimination 2. Separate toilets, restroom 3. Long Working hours 	<ol style="list-style-type: none"> 1. Wages should increase 2. Separate working facilities and personnel appliance 3. Sanitation and hygiene conditions should improve
	Refugee worker	<ol style="list-style-type: none"> 1. Harassment in working 2.No permanent work 3. Very low wages 	<ol style="list-style-type: none"> 1. Wages should increase 2. Permanent work 3. Local people and govt. personal should support them
BFDC	Drying yard owner	<ol style="list-style-type: none"> 1. Insufficient tubewell 2. Insufficient pure water supply 3. No developed road connection 	<ol style="list-style-type: none"> 1. Established deep tube well 2. Raw fish should supply properly 3. Infrastructure development and improvement appliance 4. Establish road connection
	Fish supplier	<ol style="list-style-type: none"> 1. Low-quality raw material near the landing site 2. Lack of transportation facilities 3. No landing center near Khurushkul and Chowfalldandi yards 	<ol style="list-style-type: none"> 1. Raw fish with proper ice by boat 2. Improve transport and communication facilities
	Dry fish processor	<ol style="list-style-type: none"> 1.No IGA (income generating activity) 2. Not well-structured drying Yard 3. Raw materials crisis in dry periods 4. Capital shortage 5.No storage facilities & rough communication 	<ol style="list-style-type: none"> 1. Provide IGA 2. Provide well infrastructure 3. Provide optimum raw materials 4. Provide potable water by deep tubewell 6. Modern storage facilities 7. Provide interest-free loan
	Drying worker	<ol style="list-style-type: none"> 1. Wages not satisfactory 2. Suffering from various health problems 3. Fewer working opportunities during off-season 	<ol style="list-style-type: none"> 1. Minimum fixed wages 2. Provide medical support 3. Create another job facility during the lean season

	Women worker	<ol style="list-style-type: none"> 1. Separate working facilities problem 2. Hygiene and sanitation problems 3. No restroom and separate toilet facilities 4. Illiteracy 	<ol style="list-style-type: none"> 1. Minimum fixed wages 2. Create other job opportunities during lean season 3. Ensure appropriate hygiene and sanitation 4. Provide medical facilities 5. Provide education facilities
	Refugee worker	<ol style="list-style-type: none"> 1. Harassment in working 2.No permanent work 3. Very low wages 	<ol style="list-style-type: none"> 1. Wages should increase 2. ensure permanent work 3. Local people and appropriate authorities should support them
Nazirertek	Drying yard owner	<ol style="list-style-type: none"> 1.No cold storage 2. Road problem to move easily to the cold storage 3. Absent pucca floor for drying operation 4. Lack of transportation facilities 5. No ice plant in the area 6. No landing jetty 	<ol style="list-style-type: none"> 1. Establish a pucca road connection 2. Establish more ice plant 3. Establish cold storage 4. Establish a landing center near yards 5. Improve transport facilities.
	Fish supplier	<ol style="list-style-type: none"> 1. Lack of transportation facilities 2.No establish landing center 3. During lean season no work 4. Capital insufficient 	<ol style="list-style-type: none"> 1. Establish well transportation facilities 2. Establish a landing center 3. Capital supply by GO or NGO support 4. Alternative work facilities during lean season 5. Provide capital support by soft loans
	Dry fish processor	<ol style="list-style-type: none"> 1. Scarcity of raw fish according to demand 2. Lower quality of raw materials 3. Cannot export dry fish directly due to FDA registration 4. Inadequate freshwater supply 5. Restriction on the Import of dried fish 6. Syndicate in the business 	<ol style="list-style-type: none"> 1. Provide high-quality raw fish 2. Administrative support for Syndicate in the business 3. Create the opportunity to export dried products easily 4. Arrange certification to export directly to the USA and EU 5. Proper water supply
	Drying worker	<ol style="list-style-type: none"> 1. Wages not satisfactory 2. Suffering from various health problems 3. Fewer workers are found in peak season 4. lack of education 	<ol style="list-style-type: none"> 1. Minimum fixed wages 2. Provide medical support 3. Create another job facility during the lean season
	Women worker	<ol style="list-style-type: none"> 1. Wage discrimination 2. No separate toilets and restroom 3. Long working hours 4. Illiteracy 	<ol style="list-style-type: none"> 1. Wages increase 2. Separate working facilities and personnel appliance 3. Fixed minimum working hour 4. Provide education facilities
	Refugee worker	<ol style="list-style-type: none"> 1. Harassment in working 2.No permanent work 3. Very low wages 	<ol style="list-style-type: none"> 1. Wages should increase 2. Permanent work 3. Local people should support them

			4. Provide administrative support
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UNDER PEER REVIEW

4. Conclusion

The nation's economy and food consumption are built around many food items among the specialty of dry fish production while this essential business is neglected. This paper opens a window into the plight of the dry fish processing employees who include refugees from Myanmar Rohingya camps and poor Bangladeshi workers. However, these workers play a significant role within this sector and as such they are subjected to poor socio-economic situations because of lack of or little consideration. This has remained a challenge to processors, workers, and value chain suppliers and thus the sector is still limited. Addressing these issues could enhance the quality of dry fish products and improve livelihoods, urging the government and policymakers to prioritize reforms in this vital industry.

8. Data availability statement

The data presented in this study are available in the article.

Disclaimer (Artificial intelligence)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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