Report of the Scoping Study
on
DRIED FISH VALUE CHAIN IN KERALA, INDIA
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INTRODUCTION

Dried fish has long been an important source of protein in Kerala, especially for fishing communities during lean season. It has also had a niche market among fish eaters residing away from the sea coast. Dried fish has been traditionally produced by fishing communities, when the excess catch is dried by the women of the households and stored for use later or marketed during times when fresh catches were unavailable for sale. Dried fish is a nutrient dense product which has long shelf life and has long been used in different culinary preparations like fried or in curries in India for long. Though the smell of dried fish has been a deterrent to some consumers, there is an increasing demand for the product of late.

From the literature it is observed that the consumption of dried fish in India accounts for 32% of the total marine fish landings. About 17% of the total catch is used for dry fish production. Drying is one of the oldest forms of preserving fish. Dried fish has demand both in domestic and international markets and plays an important role in employment generation of coastal poor people (Goswami et.al., 2002). Dried fish can cater to different sectors such as quality fish/prawn for human consumption, and low value fish for the preparation of fish feed as well as poultry feed (Das et.al.,2013). The cost of raw materials, transportation, packaging and marketing margin were found to be the key factors that influence and decide the income of the dry fish producers according to dry fish producers in Thoothukudi District, Tamil Nadu (Madan et al., 2018). The study also suggests that dried fish reached the consumers by way of three marketing channels viz., channel 1 (producer to consumer) channel 2 (producer, middleman and consumer) and channel 3 (producer, wholesaler, middleman and consumer). It has been found that in dried fish marketing channels, people involved early in the production nodes (fishing and drying) add relatively more value but make little profit due to small scale production, poor product quality, lack of market access and high transportation cost/toll/taxation (Nowsad, 2007). The price of dried marine fish varies with the size, availability, quality of the fish species. Transport, labor and electricity also play significant role in selling price determination (Ghorai et.al., 2014). The main barrier of the sustainable development of the market is lack of infrastructure, poor road conditions, and price instability along the coastal areas in West Bengal (Ghorai et. al.,

2014). Women have been actively engaging in fresh and dry fish marketing in India for ages. They sell fish in local markets or carrying fish via head load to sell door-to-door while men use mechanized transport such as cycles, lorries and three wheelers. Therefore women find it difficult to compete men in fish marketing. They are also deprived of capital for buying fish and depend on credit from informal sources at very high interest rates (Aparna et.al, 2017).

Dried fish production has undergone several changes over the past decades. Though even now the methods used are largely traditional, several local innovations are taking place. Traditional production methods included either sun drying on sandy beaches (eg: sardine) or on coir or jute mats (eg: sharks, ribbonfish, shrimps, anchovies). Large-sized fish are cured in brine before drying, which hastens the dehydration process and prevents spoilage. Smaller-sized fish are sun dried directly. Traditional drying/curing yards called '*chappas*' are crude sheds that have a few cemented tanks where the curing takes place. The roofing is generally thatched, tiled or made from asbestos. There may be a cemented area in front of the *chappa* where drying takes place. Plastic sheets are also being increasingly used for spreading the fish for sun drying.

Drying racks made of PVC pipes and nylon netting set up for a women's group by ICAR-CIFT, Cochin. They are light weight and can be easily transported.

Sardine being dried

Technological innovations by institutes like the ICAR-Central Institute of Fisheries Technology, Cochin have advocated drying on raised platforms. While some adoption has taken place, this has not really penetrated the dried fish production areas. One of the main reasons is the volumes of fish that are dried. These tend to be high as much of the drying takes place during glut periods. This makes drying on raised platforms unviable. Also the platforms made of locally available material like bamboo and coir need to be replaced frequently. Other options that have been tried use more durable materials like PVC and nylon webbings for making the platforms.

Driers have been a recent addition to the list of technologies for drying. Several types of driers are now available, like solar, biomass, LPG based and or hybrid versions. These are now being popularised through state sponsored programmes so may see an increase in uptake of this technology. Popularization of drying racks and identifying separate fish drying yards near to the fishing harbour will go a long way in improving the quality of the fish dried and also increased utilization of dry fish for human consumption (Das et.al., 2014). Drying and the use of salt destroys the non- halophilic spore bacteria and osmophilic fungi from the fishes (Sivaraman et. al., 2015), thereby making it storable for long durations. The quality of the dried product could be improved through increasing awareness among the fishermen to use good quality water and salt. The introduction of simple equipment like solar or other driers for processing can avoid contamination. Another worrisome factor is the use of harmful chemicals during drying purportedly for long term preservation which might prove harmful for consumers in the long run (Pijush et al., 2016) that requires greater attention. Such innovations will in the long run be critical for improving the quality of dried fish.

This field work of the scoping study was carried out from 27th January to 1st February 2020 in Ernakulam district of Kerala and in Aroor, Alappuzha district (Aroor borders Ernakulam district). Due to COVID-19 pandemic related restrictions from about mid-March in the state, the follow up information was mostly gathered by communicating with stakeholders over several phone calls.

The sites visited included a range of dried fish production units and sellers with respect to scale, technology and innovation are concerned. They included traditional dried fish producers and production yards (small scale, home based and large scale), traditional producers willing to look for better drying technologies, innovative dried fish producers and dried fish traders selling in traditional and modern conditions. There are a number of organizational variations, which also are "gendered" in terms of how women and men are involved therein. Interactions were carried out with several traders across the markets to get an idea of the different modes of operation different traders employ. A couple of enterprises using modern driers for drying fish as well as several sites where fish is dried using traditional sun-based methods.

METHODOLOGY

During the field work, observations were recorded and are described in the passages that follow. They are presented as individual case studies broadly categorised as (i) traditional drying and marketing; (ii) Improved traditional drying & marketing; and (iii) modern drying & marketing. The scoping study was based on personal interviews with the respondents, who were either selected purposively (category ii and iii) and randomly like in the case of sellers in markets. We tried to briefly assess the ways fish is dried and the people involved in the activity and the trade. We also looked at the technology used in drying, basically whether there has been any change from the traditional ways. While a quick look at the labour in the sector was given, we will need to explore this in greater depth to actually assess it from the gender perspective.

OBSERVATIONS

Traditional Drying & Marketing

I: Traditional drying and marketing through wholesalers and retailers

The *chemmeen kettu* (traditional shrimp farm)

Mr. Michael belongs to Edavanakkad village in Ernakulum district. Michael and his son Manu are engaged in drying shrimp. They produce shrimp in leased traditional culture ponds (*Chemmeen* kettus) in Edavanakkad where they culture *thelly chemeen* shrimp (*Metapenaeus dobsoni;* flower tail prawn or brown shrimp). The farm is spread in two areas of 2 acres and 3 acres respectively. Juveniles of shrimp and fish get into the farm from the river/ backwater, to which these farms are linked, through sluice gates which are opened during the night. This is done during December - January. Sluice gates are opened during night time to allow the entry of the juveniles shrimp seeds. They also buy seeds from nearby hatcheries to stock the farm.

Traditional sun drying is followed. The only improvement, as we also saw in other cases, has been the construction of concrete flooring for drying the raw material which is spread on plastic sheets. Their platform is in about 15 cents of land (own land). The shrimp are transported to this place in their own vehicle. About 500-800 kg of shrimp can be dried in one lot. The drying of shrimp takes place during from November to April 15 (5 months) and in each month on average 8000 kg shrimp are dried. Raw material from the *chemmeen kettu* is harvested for 20 days in each month. It costs about Rs. 500 to transport this raw material for each trip (Rs. 10,000 per month).

Drying on plastic sheets over a concrete floor

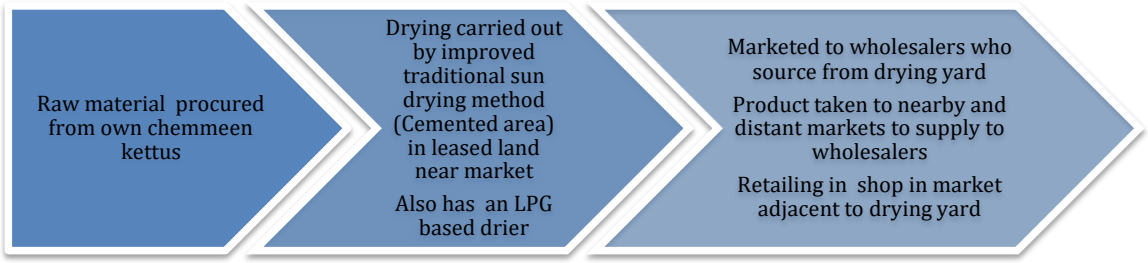
In addition to both the father and son, a few workers have been engaged to dry the fish. They are paid Rs. 4000 for drying 1000kg of shrimp, Rs. 2000 and Rs. 400 for 500kg and 100kg respectively. Other expenses include plastic covers (140/kg) for packing and jute bags (5 Rs. /no). for bulk packaging, which are purchased from the markets they frequent for sale (Paravoor and Ernakulam market). There are several other charges that they have to bear mainly in the form of commissions, like 10% at the

Dried shrimp stored at home

wholesale level, 1% as market charges to the municipality or corporation owning the market, and 2.5% of the weight of the dried product extra to the wholesaler.

The highest demand for dried shrimp is from July to August and the lowest from February to March. Dried shrimp are delivered at Kottapuram (19 Kms away) and Paravoor (10 kms away) markets in their own vehicle, which costs about Rs.600-700 per trip. They also do door-to-door retailing in nearby areas.

Wholesalers from Kannur, Malappuram and Kozhikode conduct sales using phone to fix prices and then come and take the product. Wholesale prices vary from Rs.600-650/kg and retail prices are about Rs.750-800/kg.



Expenditure incurred Lease Transportation: • From own chemmeen kettu to drying yard (3 km away) in own vehicle – Rs. 300 per trip	Expenditure incurred • Lease: 300000/ 2 Year for 2000 Square feet (200000/- for advance) • Labour: 3 staff (Regular staff) - 550/head • 2 additional staff during peak season- 300/head • Gas Cylinder cost: 3750/day • Electricity charges: 12000-13000/month.	Expenditure incurred Transportation: • Market : Rs. 2000 • Sales commission to wholesalers : 10% • Market fees : 1% • Unloading charges : Rs. 16 for 20 kgs sack • 2.5kg product extra for every 100 kgs. Packaging bags – Rs. 140/kg Loading charges : Rs. 16 for a 20kg sack (about Rs. 1600 per trip)

II: Traditional drying and direct retail marketing and marketing through wholesaler

Mr. Joy Perandoor is a native of Perandoor Island in Ernakulum district. He owns a 7.5 acres fish farm at Perandoor, in which he cultures Kadal shrimp (*Metapenaeus dobsoni;* locally called *Thelli chemmen*) [the culture practices are same as the one mentioned in the first case]. The entire crop is dried in a drying space adjacent to his farm, and marketed. Joy does not source seed from any other agency and depends entirely on wild seed for his crop.

The traditional sun drying method is used for drying shrimp. Drying is carried out on plastic sheets in front of his residence. About 30kg of raw material can be dried here. A temporary ferry made of empty plastic barrels on which wooden logs are placed is also used as a platform for drying. The dimension is roughly 15'X10'. This lies in the river channel and on this the shrimp are spread for drying. The ferry gets ample sunlight and around 15-30 kg shrimp can be dried per day through this. Joy and his wife [name?] are involved in drying of shrimp and they don't hire any outside labour.

Normally buyers come to his house and purchase the product. A person staying in the same place who is also a wholesaler also procures material from Joy for marketing in nearby Pachalam Market. The price varies from Rs. 400/kg for wholesale and 600/kg for retail sales. The total sales of about 200-250 kgs is carried out during the season for about four months in a year. The only other expense Joy has is in packing for which he spends about Rs. 420 per month.

III: Traditional drying and marketing in a wholesale market

Mr. Anil is a native of Paravoor village in Ernakulam district. Anil's main source of income is selling of dried fish. The raw material for drying is collected from Munambam harbour and Vypin harbour. Fish used for drying are mainly Silver belly (*Leiognathus. Sp.,* locally called *Mullan*), Murrel (*Channa sp,* locally called *Braal*), sole (*Soles sp,* locally called *Manthal*) and mackerel (*Rastrelliger kanagurta,* locally called *Ayila*). These fish are sourced from the local fishing harbour at Munambam, Cochin. The fish is sun dried in a clearing in front of the house, spread over the mat. Around 200- 250 kg of fish is dried daily (about 1kg of dried fish obtained by drying 3kg of fresh fish). Two workers assist in drying and are paid Rs.400/- as wages. Besides this his wife and sister also help in the activity. Dried fish is brought to Paravoor market (about 2kms away) and Kottapuram market (about 6kms away) in his own vehicle. The expense for transportation is approximately Rs.200/- per day. In addition to this, consumers, mostly from the neighbourhood, also buy dried fish from his house directly. The sale prices of different species are given in Table 1.

Seller in Paravoor market

Table 1: Sale price (wholesale and retail) of dried fish in markets

Species	Whole sale price (Rs./kg)	Retail price (Rs./kg)
Silver belly	100	250
Murrel	140	200
Sole	100	150-180
Mackeral	250	330-370

Improved traditional drying & marketing

IV: Improved traditional drying; direct retail marketing and marketing through wholesalers/ retailers

Mr. Vincent of Thundathum kadavu village in Varapuzha is a fish farmer who cultures shrimp (*Chemmeen kettu*) in 18.5 acres at Devasampadam which is nearby village (about 3 kms away). He has also taken on lease 28.5 acres at nearby Kadamakkudy village(about 3 kms away) for 3 years for the purpose. He also does cage culture in the stream near his house. The shrimp harvested from the *Chemmeen kettu are* used for drying. The culture practices are a mix of traditional and modern, with some stocking done and the activities dependent on tidal flows. The main species is *Metapenaeus dobsoni* (locally called *Thelli chemmeen*). It is transported to the drying yard near his residence and the family is involved in the process. He also has a biomass drier (which is now in disuse needing repairs). The shrimp is spread on a concrete platform on 30 cents of leased land. Mats are not used for drying. The heat from the concrete aids in quick drying. About 800-1000kg of shrimp can be dried per day (I kg of dried product requires 4kg of raw material). When the dryer was operational about 100kg of raw material could be dried in 8 hours. 250kg firewood was required for one operation.. Sale prices vary between 500–650 Rs/Kg. The retail price is in the range of 800 Rs/ kg. Whole sale marketing is done at Perumbavoor (Ernakulam district), Chalakudy (Thrissur district) and Thrissur markets. Most wholesalers source dried fish from Vincent's residence or he delivers it to the market in a hired vehicle, the charges to be met by the wholesalers.

Raw material for drying (shrimp) produced in own and leased farm	Drying carried out by improved traditional sun drying method (Cemented area) near residence and on leased land	Marketed to wholesalers Product taken to nearby and distant markets to supply to wholesalers Retailing in small scale done by wife at home
Expenditure incurred Lease: 28.5 aceres-1050000/3 Years Labour: 2 Staff. 800/head Seed: Collect From Andhra Pradesh Roshan hatchery at Trissur (Collected form own vehicle 1500 for 62kms Seed cost: 28 Pisa/no.	Expenditure incurred Transportation: Vehicle is rented at a cost of 750 for 3 kms Lease: 25000/ 3Year for 30 cent Labour: 2 staff 800/head	Expenditure incurred Transportation: Varapuzha market (Own vehicle-150/- for 2 kms) Packing cover: 140/kg

V: Improved traditional drying; direct retail marketing and marketing through wholesalers/ retailers

Mr. Elson Verghese of Varapuzha is engaged in drying and marketing fish like Kadal shrimp (*Metapenaeus dobsoni*; locally called *Thelli chemmeen*), silver belly (*Leiognathus. Sp;* locally called *Mullan*), Indian lizard fish (*Synodusi ndicus;* locally called *Pallikora*), redlip croaker (*Larimichthys polyactis*; locally called *Kuttan*), murrel fish (*Channa sp*;

The drying yard

locally called *Braal*)and shark (*Scoliodon sp*; locally called *Sraav*). Of these, Kadal shrimp is the most common and available from December to the last week of April.

Elson mainly collects raw material from Varapuzha market, Devasam padam (from *Chemmeen Kettus*), and Kadamakudy (from *Chemmeen Kettus*). The other fish are sourced from Varapuzha market. He owns a vehicle for sourcing fish and for marketing. He along with his partner have rented out space near the Varapuzha market for drying fish. Two main methods are used one is sun drying and the other is LPG drier.

The drying yard

The drying area covered with a net to prevent entry of birds

An area of about 2000 sq. feet has been concreted and is used as a platform for drying. About 500kg of shrimp/fish can be dried per day on this. While the conversion is 4 kgs shrimp for 1 kg product, for fish it is about 3 kg of fresh fish for 1 kg of dried product. On an average about 10 mt of fresh shrimp are procured daily, which can vary between 2 mt during peak season (December – May) to about 500-600 kgs at other times. Expenses include transportation charges at about Rs. 5000/- a month. Raw materials are collected daily. The land has been leased for 3 years for Rs. 3 lakh per month and a deposit of Rs. 2 lakh (Rs. 0.2 million). Electricity costs approximately of Rs.12000-13000/- are also incurred. Three women are employed in fish drying work regularly

Woman worker engaged in spreading the shrimp for drying

and an additional two women during peak seasons. The three permanent employees are paid Rs. 550/- per day and the temporary workers receive Rs. 300 per day. No other benefits accrue to the workers.

Worker with dried shrimp

Elson also owns three LPG based driers of 650 kg of capacity. About two gas cylinders are being used in a day (Rs. 1500 per cylinder).

Sales of dried fish are high from July to August and low during February to April. Elson also has a shop in the adjacent Varapuzha market for selling dried fish. The wholesale price is Rs.400 – 450/ kg and the retail price is Rs.600/-. During peak season sales of about 10-20 mt of dried shrimp takes place.

It costs Rs. 700 to deliver to the Ernakulam market to wholesalers and Rs. 1500 to deliver to the Thrissur market. Fish are delivered at both of these markets in his own vehicle. In addition, dried fish is also sent to northern districts of Palakkad, Kannur and Malappuram. Transportation charges for marketing on an average are around Rs. 15000-20000 per month. Wholesalers also source dried products from Elson at Varapuzha.

Expenditure incurred

Transportation:

- Varapuzha market (1 km away) in own vehicle – Rs. 50 per trip
- Prawn farm (Chemmen kettu) at Devasampaadam (2 km away) in own vehicle- Rs. 100 per trip
- Prawn farm (Chemmen kettu) at Kadamakkudy (2 kms away) in own vehicle – Rs. 100 per trip

Expenditure incurred

- Lease: 300000/ 2 Year for 2000 Square feet (200000/- for advance)
- Labour: 3 staff (Regular staff) - 550/head
- 2 additional staff during peak season- 300/head
- Gas Cylinder cost: 3750/day
- Electricity charges: 12000-13000/month.

Expenditure incurred

Transportation:

- Varapuzha market (2 kms away) in own vehicle – Rs. 100 per trip
- Ernakulum market (about 16 kms away) in own vehicle – Rs. 700 per trip
- Trissur market (about 68 kms away) in own vehicle- Rs. 1500 per trip

Packaging bags – Rs. 140/kg

VI: Traditional wholesale market

Ernakulam market is one of the oldest markets in the district. Two big wholesale sellers have shops in the market. There are other smaller shops also that do retailing of dried fish. As seen in other markets dried as well as cured fish are displayed. Bulk purchases from dried fish producers are made (some channels mentioned in earlier sections). There are women sellers, mostly from Vypin (about 20kms away), retailing small quantities of dried fish. They come to market on particular days and on other days sell in local markets.

Dried fish wholesale shop

Shop selling dried fish along with other products

VII: Modern fish drying and pickling unit

Discussion with the owner of the unit. The drier set up under the technical guidance of ICAR-CIFT can be seen in the background

The modern fish drying unit **'Chef Kitchen' at Aroor** (site visit on 27 January 2020) is operated by a group of three young educated entrepreneurs, recent MBA graduates from Bangalore, Karnataka. They produce dried fish and pickle (fish, shrimp, mango and lime). Their target clientele is the upper income group and they are marketing their product as hygienic, high quality dried fish with nice packaging and a brand name. The fish is dried using a solar drier of 100kg capacity with electrical backup. The drier is of ICAR-CIFT design and has been fabricated and installed by a firm that is empaneled by the Institute. The unit concentrates basically on dried shrimp. Employees include six women and two men, all from nearby areas, for both drying and pickle production. The production for now is small-scale, which they are trying to expand. They source fish from major harbours through intermediaries there on a daily basis. Their main markets are established shops and supermarkets. They are also attempting further value addition by adding different flavours to the dried fish. They price their product at a higher rate than the dried fish that is usually available in the market and the premium is for the nature of the production process and the packaging. According to them, demand is high since the product is hygienic.

VII: Improved Retail outlet

Aabha Foods, Chambakkara (site visit on 27 January 2020) is a shop which is located in an established market. Chambakkara is also a primary fish market where fresh fish is auctioned from crafts that land there. The firm visited is located just outside the wet market which is where the auctioning takes place. Mechanical dryers are being used for drying in this case as well. The shop has transparent acrylic boxes displaying the dried product. A woman staff manned the shop. Dried shrimp and *nandan* (Glassy perchlet-*Chanda nama*) were displayed for sale.

INITIAL INFERENCES

Some initial deductions from the scoping study include the following:

i. Traditional practices still are dominant when it comes to production of dried fish.
ii. There is increasing awareness, especially among younger actors in the value chain of the new innovations and technologies available. They are also more willing to explore the possibilities of using them to increases incomes.
iii. Both traditional and other markets like modern shops and super markets co-exist together. Dried fish is still however sold through traditional marketing channels.
iv. There has been some improvement in packaging, especially bulk packaging which has shifted from traditional bamboo baskets to more durable material like plastic, though even now jute bags are widely used.
v. Women are still widely the predominant work force, but their roles within the dried fish value chains seem to be shifting. Whereas historically fish drying was a family occupation in which women worked in household production units, nowadays they are employed by others as wage labourers. One potential ramification of this shift is that their earnings are restricted to the wage they are paid, rather than a return on sales. As wage labourers, they also likely enjoy less control over the activity and resources than when production was household-based.

LOOKING AHEAD

As a result of our field visits during the scoping study, we now have a much stronger sense of the field work we would like to conduct, which includes some modifications to the original proposal. The research plan will need to be revised accordingly. And it is proposed to cover four main market places – Aluva as originally proposed plus three others. To make the work more holistic, it is also proposed to also extend the geographic range southward to Alappuzha and northward to Kozhikode. Kozhikode has a distinct history and system for dried fish that would be worth including. There is a fair amount of fish drying activity taking place in Alappuzha as well, which was historically an important center.

The major objective of the work will be to "map" the social economy of dried fish production and trade utilizing a feminist commodity chain approach to understand how

fish flows across value chain nodes, i.e., from point of capture/harvest to processing, marketing, and finally consumption and how this has changed over time.

Attempts will be made to map the dried fish market system, identify key sites for fish procurement (landing /harvest sites), processing, and distribution and their relationships to one another; assess if/how the geography of the dried fish market system has changed within the broader economic changes prompted by state-led fisheries development since circa 1959, noting when key sites emerged or shifted and why. Also we will try to analyse labour relations within and across value chain nodes, including divisions of labour (such as gender and communal divisions), the role of financial (credit) relations in structuring the market system, and the relationship between productive, reproductive and household labour in structuring the value chain and how these have changed over time; understand how different groups of actors are connected to dried fish value chains and the power relations underlying the dried fish social economy, particularly focusing on processing and marketing; and investigate how dried fish value chains and the social economy of dried fish is gendered in this region and what factors have driven this change. The work could also Identify potential areas for intervention, assistance, and/or advocacy, such as technology improvement, rights, credit, etc.

References

1. Das, Nityananda & Khuntia, Basanta & Raychaudhuri, U & Dora, K & Ganguly, Subha. (2014). Effect of Salt Treatment in Washing on the Functional Properties of Fish Meat. Advances in Bioresearch. 5. 176-180.

2. Das, Madhumita & Rohit, Prathibha & Maheswarudu, Gidda & Dash, Biswajit & Ramana, P. (2013). Dry fish. Marine Fisheries Information Service. 3-7.

3. Ghorai, Sudipta Kumar., Bera, Santosh Kumar., Jana, Debanjan, Mishra, Somnath. (2014).Status of the largest dry fish market of East India: A study on Egra Regulated Dry Fish Market, Egra, Purba Medinipur, West Bengal, Int. J. Curr. Res. Academic Rev. 2(5)54–65.

4. Goswami M, Satbiadbas R, Goswami UC. (2002). Market flow, Price structure and fish marketing system in Assam-A case study. In: Proceedings of National Conference on Fisheries Economics, Extension and Management, CIFE; Mumbai. 146-155.

5. Madan, MS & Kalidoss, Radhakrishnan & Lakshmanan, Ranjith & Narayanakumar, Ramani & Natarajan, Aswathy & Kanthan, K. (2018). Economics and marketing of dry fish production in Thoothukudi District, Tamil Nadu, India. Indian Journal of Fisheries. 65. 135-141.

6. Nowsad A.K.M. A (2005) Low-cost Fish Processing in Coastal Bangladesh , Food and Agriculture Organization, Dhaka. 88.

7. Payra, Pijush & Maity, Riyanka & Maity, Swaraj & Mandal, Basudev & Correspondence, Basudev & Mandal. (2018). Production and marketing of dry fish through the traditional practices in West Bengal coast: Problems and prospect.118-123.

8. Roy, Aparna AM; Sharma,AP; Bhaumik, Utpal; Pandit Arun, Singh SRK, Saha,S. (2017). Socio-economic Features of Womenfolk of Indian Sunderbans Involved in Fish Drying. Indian Journal of Extension Education 53 (No. 2), 142-146.

9. Sivaraman, G K & Jha, Ashish. (2015). Microbiological Spoilage of Dried Fishes. Online Journal. 10.2139/ssrn.2709070.