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Profitability, efficiency and gender equity in smoked fish value chain of North Eastern Region of India

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Abstract

The drying, fermentation and smoking are the traditional preservation and value addition techniques for perishable plant and animal based food products. The smoking is common indigenous practice popular in Manipur state of North Eastern Region. This study was conducted in Manipur in 2015 and using multistage stratified sampling technique a total of 71 respondents such as processors, traders, wholesalers, retailers were chosen for collection of information. The profitability in smoked fish processing, marketing cost, marketing margins and marketing efficiency of the different marketing channels were analyzed using descriptive statistics. The processors of smoked fish in Manipur earned Rs. 17276.54/quintal excluding imputed value of family labour and it constituted about 35.31 % of the total revenue. It indicates that this indigenous value addition economic activity undertaken by women is economically viable. A value chain map showing physical and value flow through alternative routes and linkages among the value chain actors was developed for smoked fish. Based on market efficiency measured for all the sub value chains, a value chain with chain actors Fishermen-Fish Processors-Wholesalers-retailers-Consumers was identified as an efficient marketing chain. The women participation was encouraging value chain activities like processing as well as in trading of smoked and other processed fish products.

Keywords: Profitability, marketing efficiency, smoked fish, gender equity, value chain

Introduction

The drying, fermentation and smoking are the traditional preservation and value addition techniques for perishable plant and animal based food products. In case of fish also these techniques are applied for preservation, reduction, value addition and increase in shelf life of the produce. Different types of traditional fish processing and preservation techniques described by several scientists are handling, washing, curing, clearing salting, sun drying, smoking, fermentation, brining, freezing, icing, etc. (Ghaly *et al.*, 2010; Cooke *et al.*, 1993; Tawari and Abowei 2011; Emere and Dibal 2013 and George *et al.*, 2014)^[1, 2, 3, 4, 5]. Smoking is a process of treating fish by exposing it to smoke from smouldering wood or plant materials to introduce flavour, taste, and preservative ingredients into the fish. This process is usually characterized by an integrated combination of salting, drying, heating and smoking steps in a smoking chamber. The drying effects during smoking, together with the antioxidant and bacteriostatic effects of the smoke, allow smoked products to have extended shelf-life. Smoked seafood includes different varieties like, smoked finfish and smoked bivalves. Many of the smoked products are in the form of ready-to-eat (Kumar, 2018)^[6]. This technology is used in many part of the world particularly in African Countries, for producing smoked fish at large scale and exports it to the US, UK and other European countries. The smoked fish is one of the popular and highly consumers' preferred products in Manipur. Total quantity of fish dried/salted or smoked products produced in Manipur was 2673 MT in year 2017 (Anon., 2018)^[7]. Fish smoking prolongs the shelf-life of the fish, enhances flavor, increases utilization of the fish, reduces waste and increases protein availability to the people (Jallow, 1995)^[8]. A variety of smoked products are popular in the tropical countries (Gopakumar, 1997)^[9]. Though, there are several reports on smoke curing of fish in India and abroad, the smoking of fish in Manipur is unique in nature. No salting is involved in the entire smoking process (Singh *et al.*, 1990; Lilabati and Viswanath, 1996)^[10, 11]. In India, fish smoking is widely practiced in Orissa, West Bengal, Assam, Arunachal Pradesh, Manipur, and Madhya Pradesh, some pockets on the west coast and the Godavari and Krishna deltas in Andhra Pradesh.

However, it is more common in Manipur. In Manipur Nga-Ayaiba is one of the most indispensable food items of Manipur since time immemorial (Meitei and Singh, 2017) [12]. Smoking is also practiced in some part of the country like Odisha, Assam, Arunachal Pradesh, and Madhya Pradesh, some pockets on the west coast and the Godavari and Krishna deltas in Andhra Pradesh. However, it is more common in Manipur particularly in surrounding areas of Loktak Lake in Bishnupur district. This product is prepared with locally available fresh water fishes, using furnace drying technology. The market demand for this product is very high and also gradually increasing due to increase in population and purchasing power of the consumers. In this study value chain of smoked fish in Manipur was analyzed.

Materials and methods

This study has been conducted in Manipur and using multistage stratified sampling technique, stakeholders of smoked fish value chain such as processors, traders, wholesalers, retailers were chosen for information collection. For the sampling of value chain actors, one processing centre (Thanga), one wholesale cum retail market (Ema Market, Imphal) and three retail markets (Ema, Nambol Bazar and Thoubal Bazar) were selected keeping the concentration of smoked fish chain actors. A total of 71 respondents including smoked fish processors, traders, wholesalers and retailers were selected using multistage stratified random sampling technique. The information pertaining to species used for smoking, quantity of daily processing, seasonal variation, period of processing, inputs, input costs, purchase price of raw materials, selling price, from different marketing agencies, quantity of purchase, purchase and selling price, varieties of smoked fish, marketing costs, different marketing charges, transportation, selling agency, risks in processing and trading of smoked fish etc were collected with personal interview method. The semi-structured interview schedules were used for recording of information and the data were collected during 2015. Following techniques were used to analyze profitability and marketing efficiency in small scale processing (smoking) and trading of smoked fishes in Manipur-

a) Profitability

Total cost (TC) = fixed cost (Rs) + variable cost (Rs)

$$\text{Total revenue (TR)} = \sum Q_i X P_i$$

Whereas, Q- Quantity of processed product ith species (kg) P- Selling price of the produce (Rs/kg)

$$\text{Profit (II)} = \text{TR} - \text{TC}$$

b) Value chain mapping

Value chains encompass a set of interdependent organizations, and associated institutions, resources, actors and activities involved in input supply, production, processing, and distribution of a commodity (Sharma, 2019) [13]. With the help of information collected on species wise (smoked products) quantity purchased, purchase price agencies from which it purchased, agencies to whom product sold and selling price etc. the value chain for smoked fish in Manipur was developed and depicted through a diagram. In the value chain, volume flow and value flow through alternate routes have been depicted. Further, based on percentage share of volume flow and value flow, sub value chains were ranked.

These ranks, represent their relative importance in whole value chain.

c) Marketing efficiency

There are several methods used for measuring the marketing efficiency. In this study following methods were applied to measure efficiency of sub value chains for smoked fish-

i. Shepherd approach: Shepherd suggested that the ratio of the total value of goods marketed to the marketing cost may be used as a measure of marketing efficiency

$$\text{Shepherd's Index of Marketing Efficiency (ME)} = \frac{V}{I}$$

V-Value of Goods Purchased (Consumer's Price)

I-Total Marketing Cost (Rs)

ii) Acharya approach: According to Acharya and Agrawal, 2006 [14], an ideal measure of marketing efficiency can be calculated by using the formula:

$$\text{Acharya's Modified measures of marketing efficiency (MME)} = \frac{FP}{(MC + MM)}$$

FP-Net Price received by the Producer (Rs/kg)

MC-Total marketing cost (Rs)

MM-Total net margin of Intermediaries (Rs)

Results and Discussion

Processing of fish using indigenous technique

The furnace smoked dried fishes are highly preferred products in Manipur. The furnace smoking of fish prevents from spoilage and wastage of fish, and may be kept for future use. The smoking process reduced the content of water, which contributed to the relative increase in the concentration of nutrients, including crude ash, and crude protein, and reduced the fat content (Kiczorowska *et al.*, 2019) [15]. Processed or cured fish is not only an important dietary food of the people in the region but also a means of livelihood especially for women (Devi and Bagga 2006) [16]. However, smoking is a highly skillful activity where the traditional knowledge and practices are used and it is mostly performed by women. According to Bernasek, 1991 [17], variations in product quality stem from the differences in the freshness of the raw material and the preparation of the fish prior to smoking. *Nga-Ayaibais* none fermented preserved and one of the most indispensable food items of Manipur prepared from raw fishes by furnace drying technique. Indigenous preserved fish products contribute to a large proportion of daily intake of the people of Manipur. *Nga-Ayaiba* being a delicious fish product, it has been consumed as a regular food in every household (Meitei and Singh, 2019) [18]. Differences between fish species may also be reflected in the quality of the smoked fish (Sefa-dede *et al.* 1995) [19]. A variety of fresh water fishes including *Trichogaster* sp., *Puntius* sps., *Amblypharyngodon mola*, *Esomus danricus*, *Labeo rohita*, *Cirrhinus mrigala*, *Cyprinus carpio*, *Channa* sps., *Glossogobius giuris*, *Notopterus notopterus*, *Hypophthalmichthys molitrix*, *Mastacembalus* sps., *Barilius* sps., *Glyptothorax* sps., prawns, shrimps etc. harvested from local water bodies were used for furnace smoking.

Small scale processors particularly women of fishermen

families used to smoke locally produced, small size fresh water fishes. The processing of smoked fish is mainly undertaken by women fishers both in group or individual.

Socio-economic profile of key actors of the value chain

The key value chain actors in smoked fish value chain were processors, wholesalers and retailers and their socioeconomic profile were analysed and represented in Table 1. It was found that the female participation in value chain activities like processing, wholesaling and retailing of the smoked fish in Manipur were 83.33%, 45.5% and 77.10%, respectively. It indicates better participation of women not only in processing but in at different stages of value chain. However, majority of people involved in processing (75%), wholesaling (63.6%) and retailing (77.1%) were belongs to age group above 50 years, followed by in age group of 40-49 years and only 9.1% of wholesalers and 2.1% of retailers belonged to 30-39 year age group. This indicates people of older age groups involved in production and trade of smoked fish. Though, the majority of respondents of all three categories were possessed primary or secondary level of education, but significant proportion of processors and retailers were reported to be illiterate. This may be due to greater participation of old age group people in the value chain.

In case of processing all the processors belonged to caste category SC whereas 54.55% wholesalers and 85.42% retailers belonged to OBC remaining belonged to General Caste category. 4-6 members' household size is turned out to be modal class in all three categories of respondents, followed by >6 members' household. These results clearly reflects dominance of supplemented nuclear and joint families (Chakravorty and Singh 1991, Niranjana *et al.* 1998)^[20, 21]. The working experience of the respondents in the value chain activities they pursue varied from 5-10 years and above 10 years. The reasonable business experience help them in managing their business efficiently and effectively (Oteh and Njoku, 2014)^[22]. It also reflects their adaptation with business environments and economic variability that attracts them to remain in the business.

Expenditure Pattern

The consumption spending broadly categorized into necessities and discretionary spending. The spending on necessities includes food and clothing whereas discretionary spending includes all other expenses (Patil, 2017)^[23]. Average monthly expenditure made by wholesalers was highest (Rs.225666.67) followed by processors (Rs.17305.83) and retailers (Rs. 17020.08) (Table-2). In absolute term both necessary as well as discretionary spending was higher in case of wholesalers whereas in percentage term discretionary spending is higher in case of retailers (22.84%) and processors (21.48%) as compared to the wholesalers (18.39%).

Profitability in Processing of Smoked Fish

Smoking is one of the most important value chain activities, commonly performed by women of fishers' families either at individual level or at group level. Small scale processors of Manipur used to smoke locally produced, small size fresh water fishes. This is a seasonal economic activity performed for five to six months in a year mainly in winter and summer seasons. Information related to costs and returns gathered from the smoked fish processors of the selected area of the Manipur, analysed and given in Table-3. The cost and returns

per 100 kg of value added smoked fish were worked out and it was found that the processors incurred cost of Rs. 39639.90/quintal. Expenses made on purchase of raw material is turned out to be major cost accounted for about 50.45% of the total cost followed by cost of firewood and imputed value of family labour shared about 21.38% and 20.13% of total cost, respectively. Marketing cost of input and output constituted for about 7.02% of total cost. Out of total revenue (Rs. 48933.48/quintal) fetched by the processors, Rs. 9293.58/quintal was his net return over total cost. However, the processors earned Rs. 17276.54/quintal excluding imputed value of family labour and it constituted about 35.31 % of the total revenue. It indicates that this indigenous value addition economic activity undertaken by women is economically viable. However, the scale of operation, level of investment, availability of fishes and fish species, time spend on it, availability of fund, price variation, whether condition, season, etc are the major source of variation in income of the small scale smoked fish processors of Manipur.

Value chain of Smoked fish in Manipur

As a descriptive tool, value chain analysis consider both the micro and macro aspects involved in production and exchange between different actors (Chagomoka, *et al.*, 2014)^[24]. A value chain map for smoked fish in Manipur that provided alternative routes and linkages from the fishers to the consumers of smoked via mapping out product and value flows through alternative channels and the relationships between actors was developed and depicted in Figure 1. It is evident from the figure that the value added smoked fish products flows through five sub value chains. These chains are represented in the Table-4. For identifying the core chain of the whole value chain of smoked fish product, such chains were ranked based on proportion of flow of the products and value flows through different sub chains. It observed that the sub value chain-I i.e. traders of Assam-wholesalers-retailers-consumers, which linked processors of outside state of Manipur to the consumers is dominant in terms of product and value flows. However, the sub value chain-IV and sub value chain-II were identified as important sub value chains operates with the state of Manipur. Hence, these two sub chains are crucial for upgrading and making whole value chain more efficient.

Cost and margins of direct Value chain actors

The direct value chain actors who commercially involved in the value chain are processors, traders, wholesalers, retailers and consumers and they also called primary chain actor. Whereas, those agencies and actors involved in providing support services such as transportation, financial services, packaging, brokers or commission agents, infrastructure and communication etc. are called indirect chain actors or secondary chain actors. A market can be said to be efficient if it fulfills the objectives assigned to it. It is expected that the market should maximize the satisfaction of different sections of people at minimum possible cost. An efficient market according to Acharya and Agrawal, 2006^[14], when there is increase in competition, improve transportation system and improve customer relations. An efficient market also improve in response to demand and price change. The marketing costs, marketing margins and marketing efficiency were measured for five marketing channels of Smoked fish and the results given in Table-5. The marketing cost was lowest (Rs. 36.75/kg) in marketing channel-III and it was highest (Rs.

82.36/kg) in case marketing channel-II. The reasons for lower marketing cost in channel-III may due to processors himself supply the smoked fish to the wholesalers. The marketing margins earned by the middlemen was highest in Channel-IV and Lowest in channel-I. The Shepherd's index of marketing efficiency was found to be highest 19.32 in marketing channel-III followed by channel-V (14.86) and lowest in marketing channel-II (8.62). These results indicating that the marketing channel III was more efficient as compared to the other marketing channels. Further, the Acharya's Modified Marketing Efficiency (MME) was highest 4.0 for marketing channel-III, followed by marketing Channel-I (MME=3.81) and it was lowest in case of Marketing Channel-IV (1.87). These results suggested the sub value chain-III that is Fishermen-Fish Processors-Wholesalers-retailers-Consumers was most efficient followed by sub value chain V and I. Whereas, the sub value chain-II on the basis of Shepherd's Index of marketing efficiency and sub value chain-IV on the basis of Acharya's Modified Marketing Efficiency (MME) were least efficient marketing channels.

Gender equity in Smoked fish value chain

Women of most of the tribal societies always have an instilled special position and play in different spheres with great responsibility vis a vis their counterpart men (De and Ghosh 2007) [25]. In Manipur women generally play significant roles in domestic household chores, agricultural and allied activities, marketing as well as other household earning

activities (Upadhyay et al. 2017) [26]. It is evident from the results represented in the socioeconomic profile of the value chain actors of the smoked fish that the women involvement was not only higher in processing of fish i.e. salting, smoking, cooling, packaging and storage but their participation in wholesale (45.5%) and retailing (77.1%) of the indigenous value added fish products such as smoked fish, dried fish and fermented fish. The women involved in smoking of fish characterized by small scale of operation. Many families have a separate area in the kitchen for smoking fishes and all the activities related with smoking are performed by women (Inotombi and Mahanta, 2016) [27].. As it was also reported by Chanu and Singh, 2017a) [28].., that the smoking is the most common and cheapest technique that is suitable for women fishers, the technique is simple and easy in handling and about 91% of women fishers participate in smoking in Manipur. The Ema market or Nupi Keithel is the world's only all-women marketplace and its unique feature is that around 4000 shopkeepers are women representing the greater mobility and economic participation of Manipuri women. The women are highly professional in the business they involved. The Chanu and Singh, 2017b) [28], were also reported that about 70-80% of activities related to processing, preservation and marketing of fish is done by women in Manipur. Gurumayum *et al.*, 2004) [29], reported that although women are better placed in the NEH region as compared to other parts of India, there are many issues that still need to be addressed to improve their involvement in the fisheries activities.

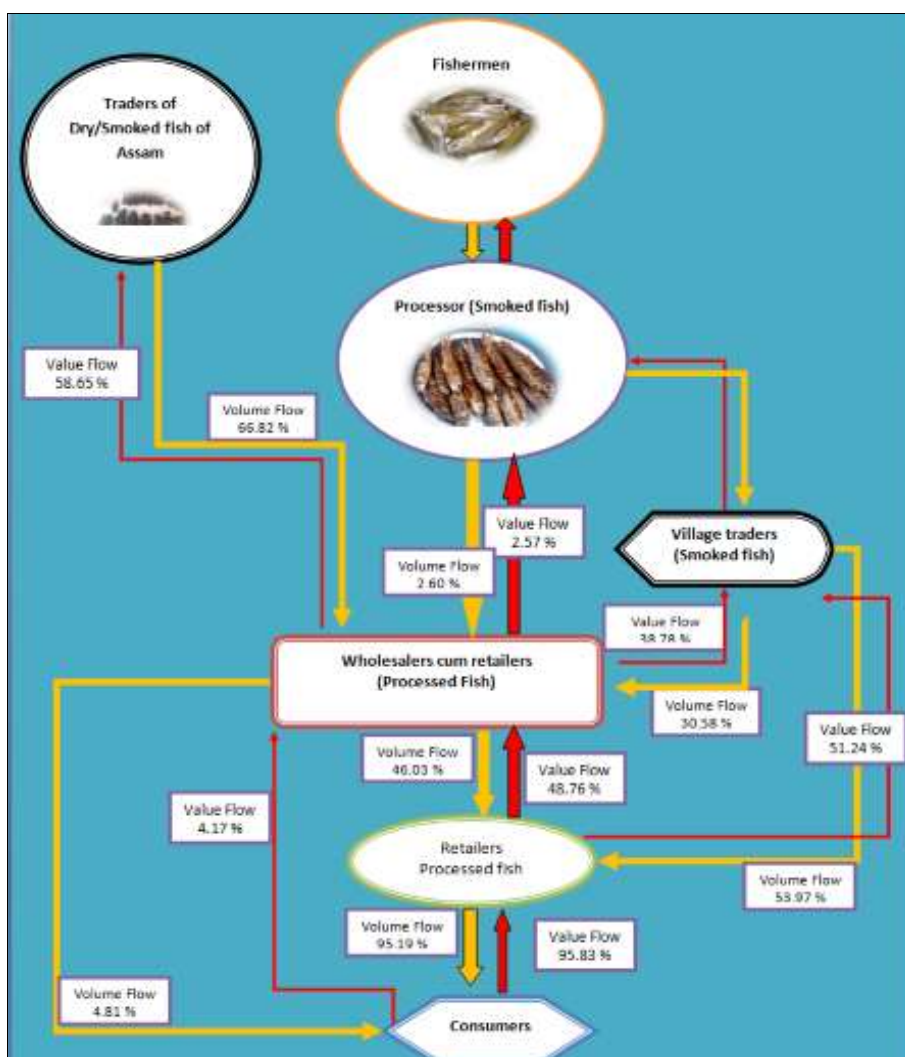


Fig 1: value chain of smoked fish in Manipur, India

Table 1: Socioeconomic characteristics of smoked fish value chain actors

S. No	Variables	Processors		Wholesalers		Retailers	
		Frequency	percentage	Frequency	percentage	Frequency	percentage
A.	Age (years)						
i.	30-39			1	9.1	1	2.1
ii.	40-49	3	25.0	3	27.3	10	20.8
iii.	50 and above	9	75.0	7	63.6	37	77.1
B	Gender						
i.	Male	2	16.67	6	54.5	11	22.9
ii.	Female	10	83.33	5	45.5	37	77.1
C	Education level						
i.	Illiterate	5	41.7			18	37.50
ii.	Primary	5	41.7	2	18.18	14	29.17
iii.	Secondary	2	16.7	8	72.73	15	31.25
iv.	Tertiary			1	9.09	1	2.08
D	Marital status						
i.	Married	12	100.0	11	100	48	100
ii.	Unmarried						
E	Caste						
i.	General			5	45.45	7	14.58
ii.	OBC			6	54.55	41	85.42
iii.	SC	12	100.0				
iv.	ST						
F	Household size(No)						
i.	1-3			1	9.09	4	8.33
ii.	4-6	6	50.0	9	81.82	35	72.92
iii.	>6	6	50.0	1	9.09	9	18.75
G	Experience (years)						
i.	5-10	8	66.7	2	18.2	4	8.3
ii.	>10	4	33.3	9	81.8	44	91.7

Table 2: Monthly expenditure pattern of skate holders of smoked fish value chain in Manipur

Particulars	Processors		Wholesalers		Retailers	
	Expenditure	%	Expenditure	%	Expenditure	%
Necessities						
Food-	12833.33	74.16	16666.67	73.86	12125.00	71.24
Clothing	754.17	4.36	1750	7.75	1008.33	5.92
Subtotal A.	13587.5	78.52	20916.67	81.61	13133.33	77.16
Discretionary Spending						
Education	1780.00	10.29	4250	18.83	1108.33	6.51
Health	208.33	1.20	600	2.66	187.50	1.10
Others	1730.00	10.00	2250	9.97	2590.91	15.22
Subtotal B	3718.33	21.48	4600	18.39	3886.74	22.84
Total (A+B)	17305.83	100	22566.67	100.00	17020.08	100.00

Table 3: Cost and returns in small scale production of smoked fish in Manipur

Head	Cost/return (Rs./100 kg finished products)	%
Costs of processing		
Cost of raw material	20000.0	50.45
Firewood	8474.39	21.38
Marketing cost (transportation/fare)	2778.07	7.02
Imputed value of family labour	7982.97	20.13
Misc. cost including depreciation on furnace etc.	404.47	1.02
Total cost	39639.9	100
Returns		
Total Revenue (PXQ)	48933.48	100
Profit (π)	9293.58	18.99
Net returns excluding family labour	17276.54	35.31
Benefit-cost ratio	1.23	

Table 4: Sub value chains for value added smoked fish products in Manipur

Sl. No.	Sub value chains	Rank based on volume and value of flow of smoked fish
I	Traders outside states-wholesalers-retailers consumers	I
II	Fishermen-fish processor-traders-wholesalers- retailers-consumers	III
III	Fishermen-Fish processor-wholesalers-retailer-consumers	V
IV	Fishermen-fish processor-traders- retailers-consumers	II
V	Fishermen-fish processor-traders -wholesalers-consumers	IV

Table 5: Estimate of marketing cost, marketing margin and marketing efficiency of sub value chains

Sl. No.	Sub value chains	Marketing cost (Rs./kg)	Marketing margins (Rs./kg)	Shepherd's Index of marketing efficiency	Acharya's MME
I	Traders outside states-wholesalers-retailers consumers	63.4	61.56	11.19	3.81
II	Fishermen-fish processor-traders-wholesalers- retailers-consumers	82.36	158.49	8.62	1.98
III	Fishermen-Fish processor-wholesalers-retailer-consumers	36.74	82.34	19.32	4.00
IV	Fishermen-fish processor-traders- retailers-consumers	63.79	190.24	11.13	1.87
V	Fishermen-fish processor-traders-wholesalers-consumers-	47.75	144.37	14.86	2.48

Conclusions

The study on profitability, efficiency and gender equity in smoked fish value chain of Manipur showed that the smoking is profitable economic activity mainly pursued by women. Further, the analysis of value chain showed that smoked fish value chain in Manipur generates income and employment opportunities both in rural and urban areas and women are more benefitted in it. The marketing channel-III i.e. Fishermen-Fish processor-wholesalers-retailer-consumers was found to be more efficient as compared to other channels exists in the state. Several risks such as loss of product due weather conditions and damage and waste of the products during transportation were reported by the processors and traders which needs to be addressed.

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