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Economics of Fish Drying in Digha Mohana Khuti, West Bengal, India

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A B S T R A C T

For a social and economic standpoint fish drying will remain an important part of the rural economy. The present investigation was conducted to find out the economics of Digha khutiin coastal belt of West Bengal. The survey was done from September 2017 to April 2018. The study area was purposively selected and the total economics involved in this system was analyzed. Survey question schedule was made for the collection of data. Several species of coastal and marine dried fish like *Harpodon nehereus, Trichiurus savala*, prawns and crabs, *Sardinella longiceps*, *Chirocentrus dorab, Polynemus indicus, Rastraliger kanagurta, Pama pama, Leognathus* sp., *Setipina phasa, Arius sp, Escualosa thoracata*and *Polynemus paradiseus* etc. were commonly used for drying. Different types of businessmen are involved in the trading system like fish processor, Beparis, Aratdars, Wholesalers, and Retailers etc. The price of dried marine fish varies with the size, availability, quality of the fish species. The study revealed that the dry fish industry can made it a major contributor in earning foreign exchange for our country and at the same time play a crucial role to the employment generation and socio-economic upliftment of a major portion of coastal rural fisher folk.

Introduction

The fisheries and aquaculture segment is an important source of livelihoods, nutritious food and economic opportunities. With increased production and higher availability for consumers, per capitafish intake continues to increase from 10 kg in the 1960s to more than 19 kg in 2013 (Bharda *et al.*, 2017). Fish being an extremely perishable commodity, the proven preservation method of curing is still being practised in India (Khan and Khan, 2001; Musa *et al.*, 2010; Dewi *et al.*, 2011). In India, consumption of dried fishes is about 32% of the total marine landings and about 17% of the total catch used for the production of dry fishes (Shakila *et al.*, 2003). In relations to nutritional quality of fish, sometimes dry fish show higher quality standards than of fresh fish (Payra *et al.*, 2016). Dry fish is an essential source of animal protein supplement, which is preferred as a keydish or used as a flavouring agent in combination with other food items. However, all dry fish are in great demand during the fishing ban period when the availability of fresh fish in the market is lower (Das *et al.*, 2013). Indian dry fish export

contributed 8% in fish exports and earned 754 crores during 2012-2013 (MPEDA, 2013). But, exported dried items have revealed a negative growth of 38.59% in quantity 28.17% in rupee value and 32.59% in USD terms respectively, even though unit value realisation picked up from 2.35 to 2.58 in the year of 2015-16 with a positive growth of 9.77% (GoWB, 2016).

Fish drying is evolved from a subsistence occupation to a full-fledged flourishing business in the coastal districts of West Bengal. Drying of low value fishes is widely practiced by the coastal fishers. Dried fish now caters to different sectors such as quality fish/prawns for human consumption, and low-value fishes for the preparation of fish feed as well as poultry feed. In "Khutis" fishes are dried under natural sunlight in bamboo poles in the coastal areas of West Bengal. The major Khuties located at coastal West Bengal includes Digha mohana, Sankarpur, Jaldha, Junput, Mandarmoni, Petuaghat etc. (Payra *et al.,* 2016). These khuties have produced 10152 tons dry fish during 2015-16 (GoWB, 2016). Purba Medinipur is the leading district of dry fish production in West Bengal with 7475 MT production in 2015-16 (GoWB, 2016). Although few authors has studied the marketing network of dry fishes in West Bengal, the economics of fish drying and marketing is less explored (Samanta *et al.,* 2016; Ghorai *et al.,* 2014; Shyam *et al.,* 2016).To study the economics of fish drying and associated marketing channels of Digha Khuties, the current study was performed.

Materials and Methods

Sampling frame

To assess the economics of fish drying Digha Mohona of Ramnagar-I block from Contai sub-division was purposively selected as representative from the district of Purba Medinipur. A list of 150 families connected with fish drying who are living in the surrounding area of the selected Khutis were prepared, and ten Khuti owners and dry fish processors were randomly selected for questionnaire and interview.

Similarly, two auctioneers, two wholesalers and two retailers were also randomly selected for marketing analysis through interview and questionnaires.

Questionnaires and data collection

The questionnaire was developed in a logical sequence of that the target group could answer chronologically. For this study, a combination of questionnaire, interview, Participatory Rural Appraisal (PRA) tool such as Focus Group Discussion (FGD) and cross-check interviews with key informants were used.

Data collection

Secondary data were collected from the available sources. Primary data were collected in 2017 using pretested structured questionnaires and interview in local language and subsequently converted to English. Collected data were suitably categorized, tabulated for interpretations, generalizations and implications.

Analysis of data

The collected data were statistically analyzed using the statistical package SPSS 20.0 computer program (SPSS Inc. Chicago, Illinois, USA). Microsoft Excel was used for representation of data and results.

To estimate the various cost and income (Salim and Biradar, 2011) and to obtain profitability measures (Dhondyal, 1998) available standard procedures were followed.

Results and Discussion

Capital cost

In Digha khuti the capital cost value (unit: 1 bigha) for land and farm equipment, construction of bamboo rack, construction of cemented tank and miscellaneous was Rs. 6195.4 ± 1119.5, Rs. 27580.19 ± 4824.2, Rs. 8660.1 ± 1241.7 and Rs. 2833.52 ± 227.29 respectively while the total capital cost was Rs. 45269± 6106.

In analysis of correlations of the capital cost of farms in Digha Khuti, it is seen that there is significant (1% level) high positive correlation between construction of bamboo rack and total capital cost (Table 2). Also, it was observed that there is significant (5% level) positive correlation between Land and farm equipment and total capital cost.

Model revealed with stepwise method of regression

Total capital cost = 0.022+ Construction of bamboo rack + 0.999 X Construction of Cemented tank + Land and farm equipment + Miscellaneous

The equation clearly indicates that the most important variables (average value calculated for 1 bigha, in all the cases) are the cost of construction of bamboo rack, construction of cemented tank, land and farm equipment and miscellaneous which showed positive impact upon capital cost. By observing adjusted R^2value, it can be concluded that both parameters explain 100% variability in total capital cost.

Variable cost

The analysis depicted the variable cost value (unit: 1 bigha) for raw fish price, salt price, transportation cost, cost of temporary shed, electricity charges, labour charge and miscellaneous cost was Rs. 852646 ± 131248, Rs. 42952 ± 7317, Rs. 45475 ± 7644, Rs. 24471 ± 4662, Rs. 4774 ± 4774, Rs. 84564 ± 12317 and Rs. 6490 ± 1044 respectively. The total variable cost was Rs. 1061374 ± 161001.

Considering correlations of variable cost of farms in Digha Khuti, it is seen that there is a significant (1% level) high positive correlation between raw fish price and salt price, a significant (1% level) moderate positive correlation between raw fish price and transportation, a significant (5% level) moderate positive correlation between raw fish price and temporary shed, a significant (1% level) high positive correlation between raw fish price and electricity charge, a significant (1% level) high positive correlation between raw fish price and labour charge, a significant (1% level) high positive correlation between raw fish price and total variable cost (Table 3). It was also found that there is a significant (1% level) high positive correlation between salt price and transportation, a significant (5% level) moderate positive correlation between salt price and temporary shed, a significant (1% level) moderate positive correlation between salt price and electricity, a significant (1% level) high positive correlation between salt price and labour charge, a significant (5% level) moderate positive correlation between salt price and miscellaneous cost, a significant (1% level) high positive correlation between salt price and total variable cost. From table 3 it also seen that there is a significant (5% level) moderate positive correlation between transportation and electricity charges, a significant (1% level) high positive correlation between transportation and labour charges, a significant (5% level) moderate positive correlation between transportation and miscellaneous cost, a significant (1% level) high positive correlation between transportation and total variable cost (Table 1).

Table.1 Average economics of Digha khuti and their ratio analysis (Unit: Rs.)

Particulars	Digha
Area of Khuti (bigha)	1
area of farm (Sq. metres)	1337.8
Construction of cemented tank	8660
Construction of bamboo rack	27580
Land and farm equipment	6195
Miscellaneous	2834
Total capital cost	***45269***
Raw fish price	852646
Salt price	42953
Transportations cost	45475
Temporary shed	24471
Electricity charges	4774
Labour charges	84564
Miscellaneous	6490
Total variable cost	***1061374***
Depreciation on capital cost @ 10%	4526.91
Interest on capital cost @ 11%	4115.37
Interest on variable cost @ 11%	96488.55
Total fixed cost	***105131***
Total cost	1166505
Total dry fish produce (5 months)	11219
Average price	132
Gross revenue	***1482567***
Net revenue	***316062***
Operating Ratio (OR)	***71.59%***
Fixed Ratio (FR)	***7.09%***
Gross Ratio (GR)	***78.68%***
Net operating income	***421193***
Net profit	***316062***
Input output ratio	***0.66***
Profitability ratio	***0.30***
Net profit ratio	***0.21***
Productivity Index	***127%***
Per kg. production price	***103.97***

Table.2 Correlation Matrix for Average Economics (unit 1 bigha) in connection with capital cost of dry fish industry considering all the involved parameters in Digha khuti

	Construction of cemented tank	Construction of bamboo rack	Land and farm equipment	Miscellaneous	Total capital cost
Construction of cemented tank	1.000				
Construction of bamboo rack	0.385	1.000			
Land and farm equipment	0.368	0.581	1.000		
Miscellaneous	-0.271	-0.292	0.100	1.000	
Total capital cost	0.565	0.964**	0.721*	-0.230	1.000
****. Correlation is significant at the 0.01 level (2-tailed).**					
***. Correlation is significant at the 0.05 level (2-tailed).**					

Table.3 Correlation matrix for average economics (unit 1 bigha) in connection with variable cost of dry fish industry considering all the involved parameters in Digha khuti

	Raw fish price	Salt price	Transportation cost	Temporary shed	Electricity charges	Labour charges	Miscellaneous	Total variable cost
Raw fish price	1.000							
Salt price	.948**	1.000						
Transportation cost	.863**	.964**	1.000					
Temporary shed	.715*	.722*	0.561	1.000				
Electricity charges	.849**	.788**	.696*	0.536	1.000			
Labour charges	.889**	.936**	.866**	.858**	.756*	1.000		
Miscellaneous	0.613	.735*	.738*	0.536	0.467	.784**	1.000	
Total variable cost	.997**	.966**	.886**	.743*	.843**	.920**	.653*	1.000
****. Correlation is significant at the 0.01 level (2-tailed).**								
***. Correlation is significant at the 0.05 level (2-tailed).**								
c. Listwise N=10								

Table.4 Correlation matrix for average economics (unit 1 bigha) in connection with fixed cost of dry fish industry considering all the involved parameters in Digha khuti

	Depreciation on capital cost @ 10%	**Interest on capital cost @ 11%**	**Interest on variable cost @ 11%**	**Total fixed cost**
Depreciation on capital cost @ 10%	1.000			
Interest on capital cost @ 11%	1.000**	1.000		
Interest on variable cost @ 11%	.894**	.894**	1.000	
Total fixed cost	.908**	.908**	.999**	1.000
****. Correlation is significant at the 0.01 level (2-tailed).**				

In case of temporary shed, it was seen that a significant (1% level) high positive correlation between temporary shed and labour cost, a significant (5% level) moderate positive correlation between the temporary shed and total variable cost. In electricity cost, it was observed that there was a significant (5% level) moderate positive correlation with labour cost, a significant (1% level) high positive correlation with total variable cost.

In labour cost, it was observed that there was a significant (1% level) moderate positive correlation with miscellaneous cost and a significant (1% level) high positive correlation with total variable cost. In miscellaneous cost it was seen that a significant (5% level) moderate positive correlation with total variable cost.

Model revealed with stepwise method of regression

Total Variable Cost (T.V.C) = 2815.102 + 0.989 X Raw fish price + 1.273 X Labour charges + 1.796 X Salt price + 0.464 X Temporary shed + 0.416 X Transportation cost

The equation clearly indicates that the most important variables (average value calculated for 1 bigha, in all the cases) are raw fish price, labour charges, salt price, temporary shed and transportation cost which showed positive impact upon variable cost. By observing adjusted R^2 value, it can be concluded that both parameters explain 100% variability in total variable cost.

Fixed costs

The fixed cost for Khuties includes depreciation on fixed costs (@ 10%), interest on capital costs (@ 11%) and interest on variable costs (@ 11%). The values were Rs. 4526.91 ± 610.65, Rs. 4115.37 ± 555.14 and Rs. 96488.55 ± 14636.50 respectively and the total fixed cost was Rs. 105130 ± 15686. Analysis reveals that there is significant high correlation (1%) between interest on capital costs and depreciation on capital costs, interest on variable costs and depreciation on capital costs, total capital costs and depreciation on capital costs, Interest on capital costs and interest on variable costs, interest on capital costs and total fixed costs and interest on variable costs and total fixed costs (Table 4).

Model revealed with stepwise method of regression

Total fixed costs (TFC) = 0.03747 + 1.0x interest on variable costs + 1.909 X depreciation on capital costs. The equation clearly indicates that the most important variables (average value calculated for 1 bigha area, in all the cases) interest on variable costs and depreciation on capital costs which showed positive impact upon Total fixed costs. By observing adjusted R^2 value, it can be concluded that electric both parameters explain 100% variability in total fixed cost.

Shifting from an underdeveloped sector towards a promising sector, first of all, it requires the attention of the government towards both the fishery and fishers related to the industry. In case of fishery it requires a sustainable policy starting from the procurement of fishes, up-gradation of the process maintaining the hygiene and the quality of the product through branding along with an appropriate marketing opportunity free from intervention of the middleman. Credit facility side-a-side insurance schemes may be incorporated to safeguard the fishers. As women's participation had the lion's share of the process, different measures related to health, education of the children, sanitary condition, safe and quality accommodation is of utmost importance towards the growth of the industry. With a synergistic effect of the above clauses obviously, make a turn of the industry towards the prosperity of both the industry and its allied community in near future meeting up the protein security of the underprivileged humanity of the country.

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