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Study on fish marketing and packaging system in Natore, Bangladesh

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Abstract
The present study was carried out during the period from January to June, 2006 to find out the fish marketing and packaging system at Singra bazar, Natore lal bazar, Chackoir bazar, Lalpur bazar, Bagatipara bazar and Baraigram bazar. The Paikers carried the fish (about 42%) to the markets by their own or hired transport and sell those to wholesalers who in turn sold those fish to the retailer. On the other hand, farmers sold their fish directly to the wholesaler (about 51%); the wholesalers sold it to the retailer and rest of 7% sold by the fish farmer to the retailer directly. Numbers of retailers were found 45 at Singra, 32 at Gurudaspur, 56 at Natore lal bazar, 26 at Bagatipara, 25 at Lalpur and 36 at Baraigram. Among the fish market, highest fish sold by retailer at Natore lal bazar (210 Kg. /day) and lowest at Bagatipara bazar (98 Kg. /day) and average prices of fishes were down from January to March and high in April to June. We observed that the total marketing cost was estimated at 694 Tk. /quintal from farmers to retailer. Transportation (20.2%) was more expensive sector among other expenses such as aratder commission (15.6%), wastage (13.7%), and personal expenses (12.5%). The average net margin profit of fisherman was 370 Tk. /quintal, aratder was 270 Tk. /quintal, wholesaler was 402 Tk. /quintal and retailer was 604 Tk. /quintal. Among the packaging system, bamboo (30%), aluminum container (22%), plastic half drum (19%), plastic crate (15%), plastic full drum (7%), steel half drum (5%), and cork sheet (2%) were chosen for intermediaries.

Keywords: Fish marketing channel, fish price, marketing cost, marketing margin and packaging

1. Introduction
In Bangladesh, fisheries sector is having a great importance by provide food, employment generation and brush up the economic status of peoples. Fisheries sector contributes 3.65% to GDP and about 18 million people are involved to maintain their livelihood directly or indirectly (DOF 2016) [1]. Most of the fishes come from the inland closed water bodies, which consists of ponds, shrimp farm, haors, baors and seasonal wetland. In Bangladesh, these captured fishes are sold from producers to consumers through a marketing channel. In Bangladesh most of the fish markets are run by a traditional system where peoples are like to purchase the fishes with bargaining. Fish consumers are to depend on an effective fish marketing system, through which fishes will be available to them within a short period before decomposition of fishes. There are many International Non-Government Organization (INGO) and Non-Government Organization (NGO) who are working collaborate with the Government of Bangladesh for increase the fish production but neither the government nor the development partners have taken any pragmatic steps to improve the fish marketing system, which is an important component of fisheries sector. In the fish marketing channel, there are many components such as commission agents (Aratdar), middlemen (paikers, wholesalers, and retailer), producer (farmers) and consumers. According to Khan (1995) [3], two marketing channels were found in the greater Mymensingh area; one of them was producer to consumers through commission agent, wholesalers, and retailers; and another was producer to consumers through only wholesalers. Rokeya *et al.* (1997) [4] have observed that five types of people were involved in the distribution network from producer to consumers in Rajshahi fish markets.

In developed countries, there is a strong correlation between fish famers and fish intermediaries but in Bangladesh there is no well practice to sell their fish from producer to consumers. In 1997, DFID found some constraints in marketing channel such as ice availability and poor road facilities, and where farmers are particularly in weak position than

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intermediaries [5]. Most of the fish farmers and wholesalers do not properly maintains packaging with their products. Packaging can be an important part in the fish marketing channel, in most cases help to promote the product. Different types of packing required due to different size of fishes. Muir *et al.* (1996) [6] noted that markets have become a major issue for many aquaculture sectors, where consumer demands, international competitiveness, health and quality products attributes have assumed far greater importance than in early stages where production level were lower. There are three vital factors such as convenience, protection and attractiveness accorded by the packaging materials used in the actual sales of the products. Thus important functions of packaging are to protect the product against dirt, chemical and biological agents, adulteration, tempering, contamination, damage etc. It also serves as means of communication and distribution, maintain quality, shelf and minimize costs. Biswash (1990) [7] concluded that aratder usually store remaining fish in the open space with ice for very short period of time. So quality of fish is important for getting higher price. During the fishing season, a huge quantity of fish is not marketed and wasted due to inadequate transport and packaging facilities. There is a great dearth of facilities for proper storage and preservation on a large scale. Therefore, it is imperative to develop the marketing system not only to support the marginal fisherman or traders but also to strengthen our national economy. This sector has been developed immensely compare to fin fish or fresh fish marketing system. So the present study was aimed to focus on the marketing channels, functions, packaging, and basic problems in the different fish markets of Natore.

2. Materials and Methods
The study was carried out for a period of six month from January to June, 2006 and was based on fish market survey and its packaging system, obtaining information through a sample survey among fish farmers (fish producer), operators (aratdar) and fish traders (paiker, wholesaler and retailer) and consumers. There are many fish markets in Natore district. The survey area is shown in Fig.2. In this study, we selected prominent one market from each upazila and also arranged one focus group discussion (FGD). In each of upazila market, three aratdars, five farmers, five traders, and five consumers were independently interviewed in the visited fish markets (Table 1). Peak time of almost every arats was early in the morning from 6 am to 7.30 am. During that time some of the aratdars were reluctant to take part in the discussion. Collection methods were divided into three steps; (i) questionnaire interviews, (ii) Focus group discussion and (iii) Crosscheck interviews with key informants (Fig.1).
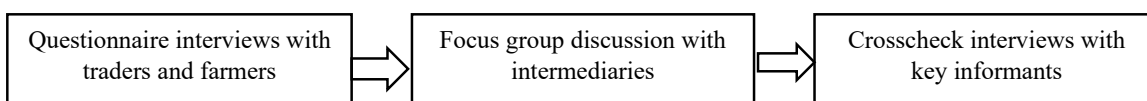
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┌─────────────────────────┐    ┌─────────────────────────┐    ┌─────────────────────────┐
│ Questionnaire interviews │ ⇒ │ Focus group discussion  │ ⇒ │ Crosscheck interviews   │
│   with traders and       │    │   with intermediaries   │    │   with key informants   │
│       farmers            │    │                         │    │                         │
└─────────────────────────┘    └─────────────────────────┘    └─────────────────────────┘
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Fig 1: Steps of data collection methods.

Each Focus Group Discussion (FGD) consisted of 5 to 6 respective representative in related to fish market. During FGD the representatives involved with fish price, commission, fish types, fish sources, transportation system, fish packaging and marketing system. FGDs were arranged after peak period in around 8.00 am to 9.00 am. On the other hand, fish market was surveyed around 9 am to 10 am. During every visit, collected information about on cultivable species, rate of production, availability, marketing channel, transport facilities, cost of marketing, packaging system, consumer behavior and problems of the market from fish traders, farmers and consumers. Crosscheck interviews were conducted with key informants such as local leaders, Upazila fisheries officer, school teacher or relevant NGO workers where information was contradictory or requested for further assessment.

Table 1: Samples sizes in six different markets from Natore district, Bangladesh

Name of Upazila	Prominent Bazar	No. of Aratder	No. fish traders	No. of consumers	No. of fish farmers	No. of FGD	Cross check interviews
Singra	Singra	3	5	5	5	1	1
Guruduspur	Chackoir	3	5	5	5	1	1
Natore Sadar	Natore Lal Bazar	3	5	5	5	1	1
Bagatipara	Bagatipara	3	5	5	5	1	1
Lalpur	Lalpur	3	5	5	5	1	1
Baraigram	Baraigram	3	5	5	5	1	1
Total		18	30	30	30	6	6

Fig 2: Map of Natore district, Bangladesh.

In this study, questionnaires were prepared in consistent with the objectives for collecting relevant information.
Marketing margin of each type of intermediary was calculated by deducting the purchase price of fish at farm level, the sale price while the profit component was calculated by deducting the marketing cost from his share of marketing margin. The gross margins, marketing cost, net margin, price spread, gross share and net share were calculated as i. Gross margin = Price paid by an agency – Price received by the preceding agency, ii. Marketing cost = Labor cost + transportation cost + Packaging cost + Storage cost etc. iii. Net margin = Gross margin – marketing cost iv. Price spread= Retail price-farmer's net price v. Farmer's share (%) =Farm price /Final

retail price * 100 vi. Paiker's share (%) = Paiker's margin/ Final retail price* 100 vii. Wholesaler's share (%) = Wholesaler's margin/Final retail price *100 viii. Retailer's share (%) = Retailer's margin/Final retail price *100 The data were processed and finally analyzed using Microsoft Excel software and SPSS (Statistical Package for Social Science).

3. Results and Discussion
3.1 Fish production
In Natore, fish farmers usually culture both Indian major carps, Exotic carps, Pungus and Tilapia. Production of fish varies with the place and management techniques. From survey, it was found that production was highest in Singra upazila (3523 kg/ha) and then Baraigram (3369 kg/ha), Gurudaspur (3254 kg/ha), Natore sadar (3235kg/ha), Bagatipara (3212 kg/ha) and Lalpur (2761 kg/ha) respectively, (Table 2). In the polyculture system, the stocking density of fishes were indian major carps about 35%, exotic carps 30%, pungus 15% and tilipia 20%. According to MAEP (1996) [8], the level of fish production was 2500 - 4000kg/ha/yr. which was lower than the present study. The production of fish depends on the species, harvest size and the culture period (Hasan and Middendrop, 1999) [9].

Table 2: Mean fish production (kg/ha) by farmers of Natore district in January-June, 2006.

Fish	Singra	Gurudaspur	Natore Sadar	Bagatipara	Lalpur	Baraigram
	Mean (Kg/ha)	Mean (Kg/ha)	Mean (Kg/ha)	Mean (Kg/ha)	Mean (Kg/ha)	Mean (Kg/ha)
Indian Major Carps	1189 (33.74%)	1089 (33.46%)	1143 (35.33%)	1067 (33.21%)	985 (35.67%)	1127 (33.45)
Exotic Carps	1004 (28.5%)	1009 (31%)	960 (29.67%)	989 (30.79%)	856 (31%)	1072 (31.81%)
Pangasius pangasius	550 (15.15%)	450 (13.83%)	510 (15.76%)	500 (15.56%)	410 (14.84%)	485 (14.39%)
Tilapia mossumbicus	780 (22.14%)	706 (21.69%)	622 (19.22%)	656 (20.42%)	510 (18.47%)	685 (20.33%)
Total	3523 (100%)	3254 (100%)	3235 (100%)	3212 (100%)	2761 (100%)	3369 (100%)

Note: Figures in parentheses indicates percentages.

3.2 Fish distribution and marketing system
In the market structure of Natore district, many buyers and sellers were together to explain their marketing systems and distribution. There were 45 at Singra, 32 at Chackoir, 56 at Natore lal bazar, 26 at Bagatipara, 25 at Lalpur and 36 at Baraigram retailers and about 5 to 7 labors who participated with traders. The wholesale market starts from 5.30 am to 8.30 am and the retail market from 9 am to 2 pm. We found muddy floor of all of wholesale market and has lack of drainage facilities, inadequate of sales area, packaging area and materials, lack of water supply and maintenance and repairs except very few. Hossain and Uddin (1995) [10] have also reported the same constrains and infra structural status of the fish market. A total of 30 fish farmers were interviewed for market survey and a portion of farmers stated that they sold their fishes to the paikers who collect the fish from the pond side. With a few exceptions, fish farmers never directly communicated with the consumers. Market communication was usually being made through middleman. The Paikers carried the fish (about 42%) to the markets by their own or hired transport and sell them to wholesalers who in turn sold those fish to the retailer (Fig.3). On the other hand, Farmers sold their fish directly to the wholesaler (about 51%); the wholesalers sold it to the retailer (Fig.3). In a very rare cases, farmers carried the fishes to the markets and sold them to the retailer (7%) (Fig.3). Traders generally operate a capital of around BDT 10000 -50000 per day. From the survey, it was found that about 70% retailers used their own money for fish trading while the rest (30%) received loans from friends, relatives without paying any interest. Flowra *et al.* (2013) [11] have found that four channels were existed in the fish marketing and fish distribution were 60%, 25%, 10% and 5% respectively. Rahman *et al.* (2105) [12] also found the three marketing channel at Panchagarh.
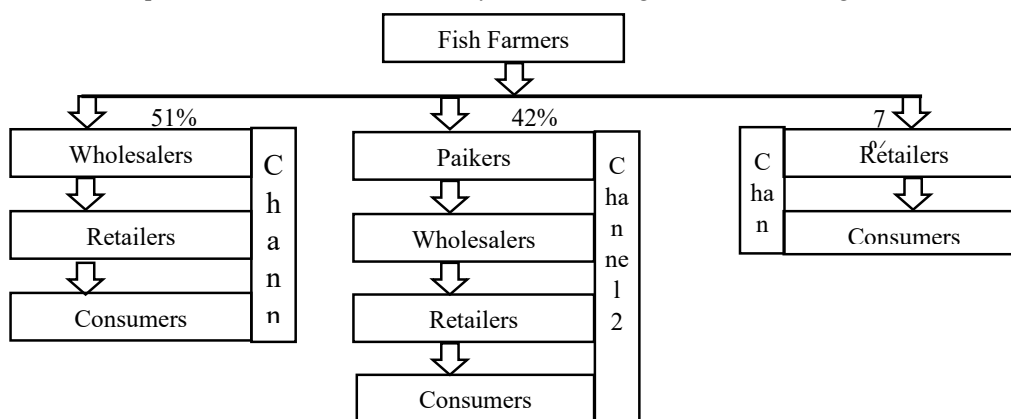

Fig 3: Fish marketing chain from farmers to consumers in Natore district.

3.3 Amount of fish sold
According to the study, it was found that a fish retailer of Singra bazar sold an average at 178 kg/day, Chackoir bazar at 117 kg/day, Natore lal bazar at 210 kg/day, Bagatipara bazar at 98 kg/day, Lalpur bazar at 105 kg/day and Baraigram bazar at 139 kg/day (Fig.4). The main sources of the fishes were Chalon beel, pond, Atrai River, Boral River, Padma River and wetland. The daily supply of total fish in Singra bazar was estimated at 8.01 tons, Chackoir bazar at 3.7 tons, Natore lal bazar at 11.76 tons, Lalpur bazar at 2.62 tons, Bagatipara bazar at 2.55 tons and Baraigram bazar at 5.0 tons respectively.
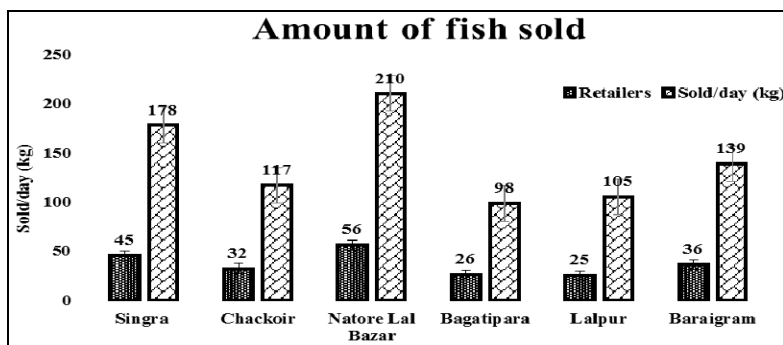
Fig 4: Amount of fish sold in different bazar of Natore district from Jan.-June, 2006.

3.4 Average price of fish

The price of fish varies with the types of species, sizes, freshness, market demands and seasons. From the market survey, we observed that the prices of fish were low from January to March but higher in April to June. We did survey six big markets in Natore district. From survey, we concluded that the average retail price of fish was higher in Natore lal bazar (78 Tk. /Kg) and lower in Boraigram bazar (64 Tk. /Kg)

and others four markets were almost similar price (66 Tk. /Kg) (Table 3). Among the exotic carps, the higher price was for *Cyprinus Carpio* (65-79Tk. /Kg) and lower for *Puntius gonionotus* (40-48 Tk./Kg) and in case of Indian major carps, the most valuable fish species was *Labeo rohita* and the price range was 80-98 Tk./Kg and lower price was for *Labeo bata* (60-67 Tk./Kg).

Table 3: Average retail price (Tk/kg) of fishes in different markets, Natore

Fish	Singra Bazar Average price (Tk./Kg)	Chackoir Bazar Average price (Tk./Kg)	Natore Lal Bazar Average price (Tk./Kg)	Bagatipara Bazar Average price (Tk./Kg)	Lalpur Bazar Average price (Tk./Kg)	Baraigram Bazar Average price (Tk./Kg)
Exotic fish						
Hypophthalmichthys molitrix	57	52	63	54	59	55
Aristichthys nobilis	48	44	65	52	55	46
Cyprinus Carpio	72	65	79	68	68	66
Cyprinus Carpio linnacus	64	65	68	60	62	59
Ctenopharyngodon idellus	51	48	55	49	52	50
Puntius gonionotus	44	46	48	42	40	41
Oreochromis niloticus	48	50	55	47	52	49
Pangasius pangasius	52	55	59	48	50	48
Tilapia mossumbicus	49	52	58	44	49	45
Indian major carps						
Labeo rohita	92	84	98	84	85	80
Catla catla	85	78	92	77	80	75
Cirrhinus mrigala	76	79	83	70	77	72
Labeo calbasu	71	65	75	66	70	63
Labeo bata	65	60	68	61	62	67
Small indigenous fish						
Heteropneustes fossilis	150	136	165	140	135	143
Mystus vittatus	105	95	120	100	94	102
Anabas testudineus	180	165	200	160	155	149
Channa punctatus	40	45	61	42	38	35
Chanjna striatus	69	64	72	59	63	66
Puntius ticto	35	29	42	37	36	41
Amblypharyngodon mola	40	42	51	39	43	38
Chanda ranga	25	22	32	28	34	26

On the other hand, the lower price was for *Chanda ranga* (22-34 Tk. /Kg) and higher for *Anabas testudineus* (149- 200 Tk. /Kg) in the group of small indigenous fishes (Table 3). According to Flowra *et al.* (2012) [13], the price range for exotic carps was 27-53 Tk. /Kg, Indian major carps was 46-65 Tk. /Kg and small indigenous species was 21-134 Tk. /Kg. Rahman (2003) [14] and Ranadhir (1995) [15] reported that major carps such as rohu, catla and mrigal fetched higher price than the exotic carps which was similar to this present study.

3.5 Packaging system and its materials

In Bangladesh, most cheap packaging for fish is bamboo basket. And it is available in everywhere. Fishermen, aratdars, transport facilitator use this bamboo basket for caring fish. They buy these packaging materials from their local markets with price 65-180 Tk. /piece. From the present study, we observed that more users used bamboo basket (42%) in Lalpur bazar and lower 15% in Natore lal bazar. Cork sheet is very popular in fish market because ice melts very slowly in cork sheet. In Natore, this cork sheet was not popular for transporting of fish due to high cost, load low capacity and

temporary uses. The average price range was 90-210 Tk. /piece. Plastic half drums possessed another extensive package for fish market and it is very popular for caring live fish. Fisherman and aratdars use it extensively in Natore district. The price for each half plastic drum was 430 Tk. and can load 80-90 kg or 25-35 kg live fish. About 30% fisherman and aratdars in Lalpur used plastic half drum which was highest of all markets and found lower in Lalpur bazar (9%). In case of plastic full drum, found the highest user in Chackoir bazar (13%) and lower in Baraigram bazar (3%) respectively (Table 4). Aluminum containers are mostly used by retailers in everywhere in Bangladesh. We found that about 29 % user of aluminum container in Lalpur bazar and Bagatipara bazar and lowest in Natore lal bazar (8%). Rokeya *et al.* (1997) [4] have reported that aratdars and fisherman used different kinds of bamboo baskets, plastic baskets, leaves, palm trees and banana leafs, wooden boxes, polythene bag or plastic bag, earthen pot, aluminum can, drum, few aquatic vegetation for the packaging and preservation of fresh fish and fishery products. It's capacity can differ 10- 60 kg and its

price also can differ 130- 370 Tk. /piece. We did not find of any steel half drum in Lalpur bazar but highest found in Natore lal bazar (10%). Steel drum price ranges between 500-700 Tk. and used by aratdars for long transport route. Two sizes of plastic crate were available in those fish markets. They are small size (capacity 20-25 kg) and their price was 100-120 Tk. and medium size (capacity 40 kg) and their price was 550-650 Tk. From the market study, we got some challenges of using traditional packaging; those were get pressure for over loading, loading and unloading problems, fish loss freshness, fish loss sap, lifetime is very short, damage goods, ice melts very quickly, cork sheet break down at any time and double transportation cost for tank and plastic drum. For transportation of live fish, farmers and paikers were used plastic full and half drum. In the survey area, fish traders were used tempo, nosimone, truck, rickshaw, van, bicycle for transportation. Siddique (2001) [16] and Parween *et al.* (1996) [17] stated that trucks, which carry consignments, mostly handle fish distribution in Rajshahi district.

Table 4: Variety of packaging materials and their percentages of uses in the investigated fish market

Materials	Singra (%)	Chackoir (%)	Natore Lal Bazar (%)	Bagatipara (%)	Lalpur (%)	Baraigram (%)
Bamboo Basket	28	21	15	35	42	39
Cork sheet	1	1	4	0	3	2
Plastic half drum	18	28	30	17	9	14
Plastic full drum	5	13	9	6	4	3
Aluminum container	24	18	8	23	29	29
Steel half drum	7	5	10	7	0	3
Plastic crate	17	14	24	12	13	10

3.6 Income of intermediaries
Here wholesalers play a communication role between farmers and retailers and packers and acts as commission agent in the market. From the study, we found that the average daily income of wholesaler in Natore lal bazar (420 Tk.), Singra Bazar (300 Tk.), Bagatipara Bazar (275 Tk.), Lalpur bazar (260 Tk.), and Baraigram Bazar (255 Tk.). Income of the fish retailers depends on demand of fish, quality of fish, fish species and socio economics status of consumers. In this study, we noted that the average daily income of retailer was 424 Tk. (Natore lal bazar), 347 Tk. (Singra Bazar), 234 Tk. (Lalpur bazar), 226 Tk. (Bagatipara bazar), and 218 Tk. (Baraigram bazar). Hossain *et al.* (2015) [18] stated that retailer income was 300-400 Tk. /day and wholesaler income was 350- 600 Tk. /day.

3.7 Marketing cost of intermediaries
The total cost of marketing of fish includes all cost incurred by different types of intermediaries standing between the producer and the ultimate consumers. From the study, total marketing cost was estimated at 694 Tk. per quintal. The average marketing cost of fisherman (230 Tk. /quintal), aratder (140 Tk. /quintal), Paiker (188 Tk. /quintal and retailer (136 Tk. /quintal) in Natore district was estimated. The most expenses sector were transportation (20.2%), aratdars commission (15.6%), wastages (13.7%) and personal expenses (12.5%) in the cost of marketing (Table 5). Flowra *et al.* (2012) [13] have noted that the average marketing cost between 450 -800 Tk. /quintal and this cost may differ on fish species and size.

Table 5: Marketing cost of intermediaries of Natore

Cost items	Fisherman (Tk. /Qnt.)	Aratder (Tk. /Qnt.)	Paiker (Tk. /Qnt.)	Retailer (Tk. /Qnt.)	Total cost (Tk. /Qnt.)	%
Transportation	70		48	22	140	20.2
Personal expenses	30	23	20	14	87	12.5
Aratdars commission	60		22	26	108	15.6
Wastages	35	32		28	95	13.7
Market tolls	20	15	20	14	69	9.9
Entertainment	15	25	16	10	66	9.5
Wages and Salaries		35	33		68	9.8
Storage			14	22	36	5.2
Grading			15		15	2.2
Stationary		10			10	1.4
Total	230	140	188	136	694	100

3.8 Marketing margin of intermediaries
Marketing margin at a particular stage of transaction may be defined as the difference between purchase price and sale price of a commodity. We calculated the total marketing

margin by the difference between the price of consumer and the fish farmer. According to Khol and Uhl (1980) [19], marketing margin is the price of all utility, adding activities and functions that are performed by the intermediaries. The

average net margin of fisherman was 370 Tk. /quintal, aratder was 270 Tk. /quintal, wholesaler was 402 Tk. /quintal and retailer was 604 Tk. /quintal (Table 6). Here the average margin paid by the consumer as 2340 Tk. /quintal. Ara *et al.* (2010) [20] reported that the average marketing margin per quintal of fish for fishermen was 305.56 taka and for aratder,

paiker and retailer were 334.65, 515.80 and 340.40 taka, respectively which is similar to our present study. According to Ali *et al.* (2008) [21], noted that marketing margin was 38.38 per cent for fresh fishes where the producer's share was 61.62 per cent.

Table 6: Average marketing margin (Tk. /quintal) of intermediaries in Natore district

Intermediaries	Purchase/Production price (1)	Sale Price (2)	Gross margin 3=(2-1)	Marketing cost (4)	Net Margin 5=(3-4)
Fisherman	6350	6950	600	230	370
Aratder	6950	7360	410	140	270
Wholesaler	7360	7950	590	188	402
Retailer	7950	8690	740	136	604

3.9 Consumer behavior
According to the consumers, price of fish has increased less than the meat in general during last 10 years. From the survey, it was also found that the average price of carps significantly varied from producer's level to consumer's level. Of the total 30 consumers interviewed, 21 (70%) mentioned that they spent more money for buying fish than meat, while the remainder 9 (30%) spent more money for meat (Fig. 5). It was found that young group of people (below 35 years) more like meat than the older people (above 50 years old). Dasgupta (2004) [22] have noted that consumers behavior may differ with the availability of fish, price of fish, area and types of species.
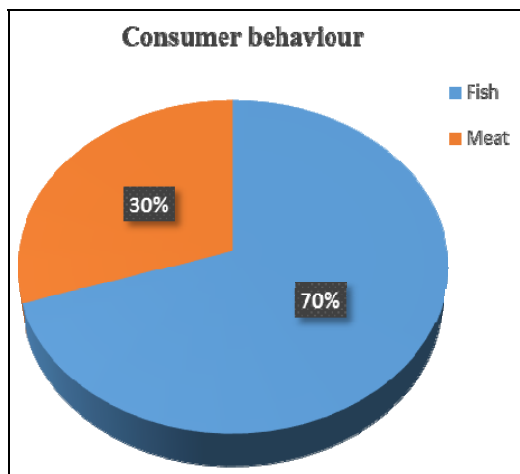

Fig 5: Consumers behavior in the fish market at Natore

3.10 Constraints of fish marketing
The intermediaries were asked to mention the problems faced by them in the fish market. Most of them were lack of marketing facilities (79%), poor communication and higher transportation cost (62%), financial assistance (55%), higher marketing tolls (58%), price fluctuation and low prices of fish (70%), storage facilities (88%), and perishability of fish (77%), drainage facilities (85%), lack of packaging materials (52%) and cleaning facilities (88%). Due to lack of facilities, fish became get quick in rigor stages and traders were willing their fish as a low rate compare to purchased value. Hossain *et al.* (2015) [18], and Gupta (2004) [22] have noted similar problems compare to our present study.

4. Conclusion
The study was performed through using conventional survey techniques. From the FGD, interview and cross check interviewed, we did find out the actual marketing channel in

Natore district, price of fishes, estimated the marketing cost and margin at different stages, packaging system and problems of the market. For the development of the fish market, Government (GO) and Non-Governmental Organizations (NGOs) should necessary action against the problems of the markets such as drainage system, ice facilities, water supply, sanitary issues, infra-structure development, training the fish trader, transportation system, packaging materials. If proper step is taken, it will be helpful to ensure hygienic and good quality of fishes to be available to the consumers at a reasonable price.

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