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Tilapia (*Oreochromis mossambicus*) Marketing System in greater Jessore region, Bangladesh

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Abstract
The study was carried out to access on the present status of Tilapia (Oreochromis mossambicus) marketing in Jessore sadar in Jessore district. Study period was carried out during June 2013 to December 2013. For the market survey, two important fish markets in Jessore town, namely Boro Bazaar and Rail-station Bazaar Similarly, two important local fish markets in the Jessore Sadar namely Churamonkati Bazaar and Ambot-tola Bazaar were selected to carry out comparative studies of tilapia marketing between town and local markets. A total of 80 traders were interviewed in Local and Town markets, 40 in each area. In the study area 65% of harvested tilapias are sold to the local agents, while the rest (35%) are sold to the suppliers and about 60% of tilapias are transported to the boro bazaar. The rest (40%) of the tilapia, which are under-sized, are transported to nearby local markets. The average farm-gate prices of tilapia varied between Tk 55 and Tk 85 per kg. According to the survey, a wholesaler typically operates with capital of around Tk 11,968 per day, ranging from Tk 8,350 to Tk 27,125 per day. According to the survey, 70% of wholesalers used their own money for fish marketing including tilapia, while the rest (30%) received loans. In the study area tilapia comes from Jhenidah, Satkhira, Jessore then it is supplied to Boro Bazar to wholesaler then it is distributed towards local market. Around 20 to 25 individuals are associated with fish trading including tilapia, except for Boro Bazaar which is larger. The total average marketing costs from producers to consumers was calculated to be Tk 13.02 per kg of tilapia which is sub-divided into: primary market – Tk 3.25 (25%), secondary market – Tk 4.75 (36%), and retail market – Tk 5.02 (39%). In the study area, tilapia prices are generally lower between September and December, rising during the following four to five months. The highest average marketing margin and profit per kilogram of tilapia was found in secondary market, followed by retail and primary market. The proportion of respondents identifying poor road and transport facilities was 24%. Only 20% and 12% of traders identified lack of money for this business. In case of socio economic condition traders 25% has earthen house and 65% has Pucca house and 10% has Semi pucca house. In the study area about 35% traders goes to the MBBS and rest of 65% are goes to the quack or non trained doctor. Traders has earthen toilet of 27%, Pucca toilet is 50% and Semi pucca is 23%. All traders have education at some level, which implies that the reported literacy rate is 83%. Most traders were quite young, with an average age estimated at 36 with a range from 23 to 57. The average family size of tilapia traders was estimated at 5.5 in a single family.

Keywords: *Oreochromis mossambicus*, Marketing System, greater Jessore region

Introduction
The people of Bangladesh, one of the poorest and most densely populated countries in the world, are commonly referred to as "*Macche-Bhate Bangali*" (i.e. fish and rice make a Bengali). The most important food crops for the 160 million people of Bangladesh are rice and fish. Fish account for about 70% of the animal protein intake with annual fish consumption of about 14 kg per person (ADB, 2005a) [1]. The average per capita fish consumption is lower than the world average of 16.1 kg a year (Hishamunda *et al.*, 2008) [12]. Bangladesh is considered one of the most suitable countries in the world for freshwater aquaculture, because of its favorable agro-climatic conditions.

The Mozambique tilapia (*Oreochromis mossambicus*) was introduced to Bangladesh from Thailand in 1954 (Ahmed *et al.*, 1996) [3]. The Chitralada strain of Nile tilapia (*O. niloticus*), a far superior farmed tilapia (faster growing and more manageable than the Mozambique tilapia) was introduced to Bangladesh from Thailand by the UNICEF (United Nations International Children's Emergency Fund) in 1974 **(**ADB, 2005b) [2]. Gradually, the red tilapia (hybrid of *O. mossambicus* x *O. niloticus*) was imported to Bangladesh from Thailand. The Bangladesh

Fisheries Research Institute (BFRI) reintroduced Nile tilapia and Red tilapia from Thailand in 1987 and 1988 (Gupta *et al.*, 1992) [9]. Genetically Improved Farmed Tilapia (GIFT) was introduced to Bangladesh by ICLARM and BFRI in 1994 (Hussain *et al.*, 2004) [13]. Performance of GIFT was found to be significantly superior to that of tilapia previously introduced. Technology was developed to produce all male tilapia or sex-reversed GIFT locally known as mono-sex tilapia, because of avoid the unwanted reproduction and male tilapia grow faster than female (ADB, 2005b) [2].

In spite of the long history of tilapia introduction to Bangladesh, culture of tilapia has not yet well established in aquaculture as tilapia culture is beset with socioeconomic, technological, institutional and marketing constraints (Bart *et al.*, 2004; Ganesh and Majumder, 2004) [7, 10]. Nevertheless, in recent years a considerable number of farmers are involved in tilapia culture in rural Bangladesh due to its profitability. Among various tilapia species, GIFT has now become a popular fish among farmers. This fish reaches a marketable size (100 to 150 g) within four months under subsistence fish farming systems which allows for a minimum of two crops per year (Hussain *et al.*, 2000; Hussain *et al.*, 2004) [14, 13]. Although tilapia farming has yet to make a significant contribution to national freshwater aquaculture production, this is likely to change, because the availability and popularity of farmed tilapia are increasing (Dey, 2000; ADB, 2005b) [8, 2]. Mainly due to population growth there is a growing gap between supply and demand of tilapia in markets. Narrowing the gap not only requires increasing production of tilapia but also improvements of all aspects of marketing and distribution systems (Kleih *et al.*, 2002; Ahmed and Sturrock, 2006; Ahmed *et al.*, 2007) [16, 4, 5]. The goal of this study was to develop tilapia marketing systems in Jessore region.

Methodology

The study was conducted in Sadar *Upazilla* (sub-district) under Jessore district of Bangladesh during the period of June 2013 to December 2013. For the market survey, two important fish markets in Jessore town, namely Boro Bazaar and Rail-station Bazaar Similarly, two important local fish markets in the Jessore Sadar namely Churamonkati Bazaar and Ambot-tola Bazaar were selected to carry out comparative studies of tilapia marketing between town and local markets. A combination of participatory, qualitative and quantitative methods was used for primary data collection. A total of 80 traders were interviewed in Local and Town markets, 40 in each area. Interviews were conducted at a time convenient to the traders at the market center in their trading premises. For this study the necessary data were collected from both primary and secondary sources. Data were analyzed using MS Excel 2007. Map of the Jessore is shown in figure 1.

Fig 1: Map of Jessore Sadar Upazilla

Table 1: Data collection methods and sample size for target groups

Target group	Survey area	Sample size	Data collection method	Information gathered
Farmers	Sadar Upazila, Jessore	60	Focus group discussion	Tilapia harvesting and marketing systems, farm-gate price and constraints of tilapia marketing
Wholesalers	Local market, Town market	15,15	Rapid market appraisal	Overall tilapia distribution and marketing systems, financing of tilapia trading, marketing constraints
Retailers	Town market Local market	40,40	Questionnaire interviews	Marketing systems, pricing mechanism, marketing costs and margins, marketing constraints and socioeconomic conditions

Results

Harvesting and marketing of Tilapia

Harvested tilapias are cleaned with pond water and kept in aluminium containers or bamboo baskets until they are sold. According to farmers, 65% of harvested tilapias are sold to the local agents, while the rest (35%) are sold to the suppliers. Supply percentage of Tilapia is shown in figure 2.

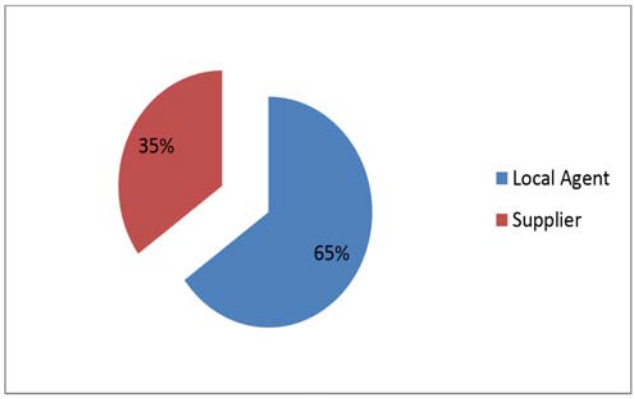

Fig 2: Supply percentage of Tilapia.

According to the survey, about 60% of tilapias are transported to the boro bazaar. The rest (40%) of the tilapia, which are under-sized, are transported to nearby local markets. The farm-gate prices of tilapia depend on their quality, size and weight, supply and demand, and seasonality. Distribution in market of Tilapia is shown in figure 3.

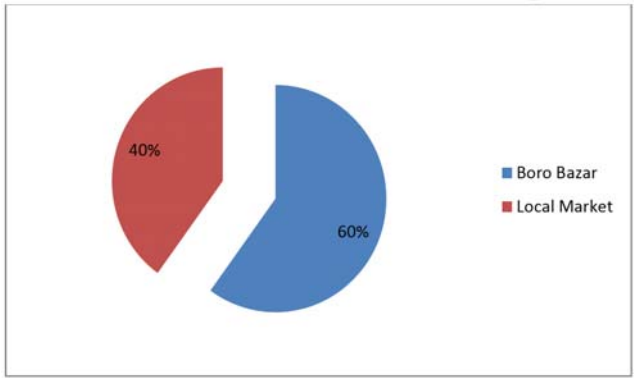

Fig 3: Distribution in market of Tilapia

Farm-gate Price

The average farm-gate prices of tilapia varied between Tk 55 and Tk 85 per kg. Farm-gate Price of Tilapia is shown in figure 4.

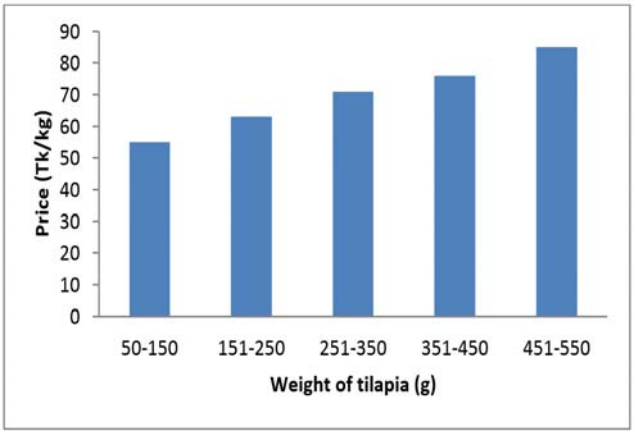

Fig 4: Farm-gate Price of Tilapia

Financing of Tilapia marketing

A quite substantial amount of money is required for tilapia marketing. According to the survey, a wholesaler typically operates with capital of around Tk 11,968 per day, ranging from Tk 8,350 to Tk 27,125 per day. According to the survey, 70% of wholesalers used their own money for fish marketing including tilapia, while the rest (30%) received loans. Credit facilities of tilapia wholesaler are shown in figure 5.

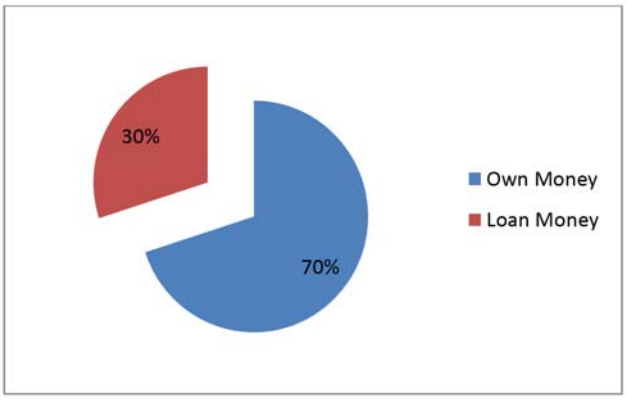

Fig 5: Credit facilities of tilapia wholesaler

Tilapia marketing Chain in Jessore Sadar

According to the survey, a supplier carried an average 18 kg/day of tilapia, ranging from 10 to 39 kg/day. Suppliers commonly use trucks, buses, pickups and taxis to transport tilapia to the wholesale markets in Jessore, which takes 1 to 1.5 hours depending on distance and mode of transportation. Tilapia marketing Chain from producers to consumers is shown in figure 6.

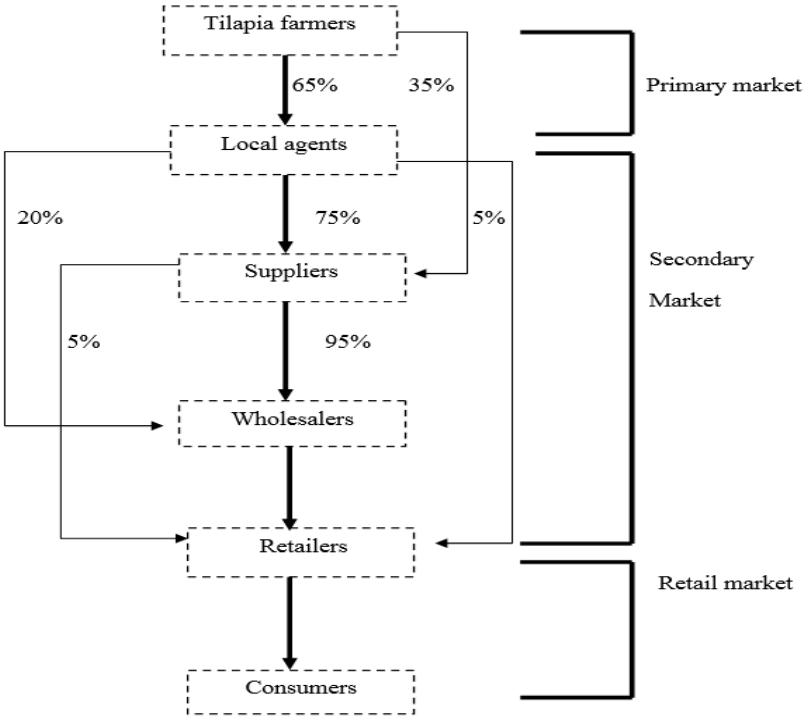

Fig 6: Tilapia marketing Chain from producers to consumers

Tilapia Marketing System in Jessore Sadar

Tilapia comes from Jhenidah, Satkhira, Jessore then it is supplied to Boro Bazar to wholesaler then it is distributed towards local market. And finally it purchase consumer from retailer. Sometimes fish directly come from Jhenidah, Satkhira, Jessore to the retailers and then consumer get it from primary market. Tilapia marketing system in Jessore Sadar is shown in figure 7.

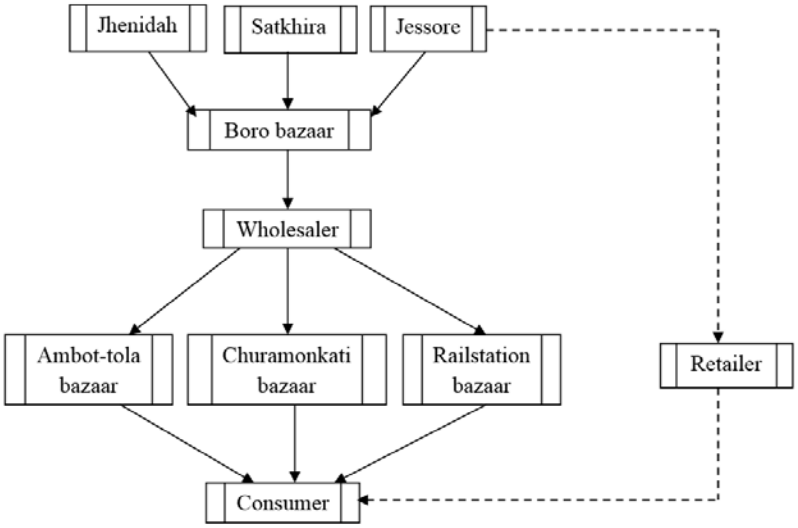

Fig 7: Showing the Tilapia marketing system in Jessore Sadar

Tilapia trading in retail markets

For the market survey, four important retail fish markets were selected: Boro Bazaar, Station Bazaar, Ambot-tola Bazaar, Churamonkati Bazaar. In each market, around 20 to 25 individuals are associated with fish trading including tilapia, except for Boro Bazaar which is larger. Although tilapia trading is a year round business, the peak season of tilapia marketing is from September to December. Markets are open every day and traders in Boro Bazaar spend more time due to greater supply of tilapia. Seasonal trading pattern of Tilapia is shown in figure 8.

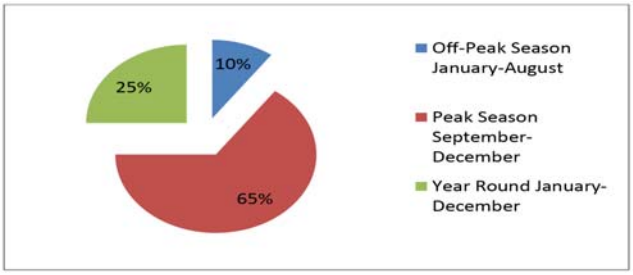

Fig 8: Seasonal trading pattern of Tilapia.

According to the survey, a typical trader in Boro Bazaar sold an average of 25 kg/day of tilapia during the peak season, while in Station Bazaar, Ambot-tola Bazaar, Churamonkati Bazaar sold an average of 20, 10 and 15 kg/day, respectively. There was a significant difference of tilapia sales by markets.

Marketing costs

According to the survey, the total average marketing costs from producers to consumers was calculated to be Tk 13.02 per kg of tilapia which is sub-divided into: primary market – Tk 3.25 (25%), secondary market – Tk 4.75 (36%), and retail market – Tk 5.02 (39%). Among retail markets, the average marketing costs were higher in Boro Bazaar due to higher cost for electricity, ice, transportation and labour. Marketing costs of Tilapia in Jessore region is shown in figure 9.

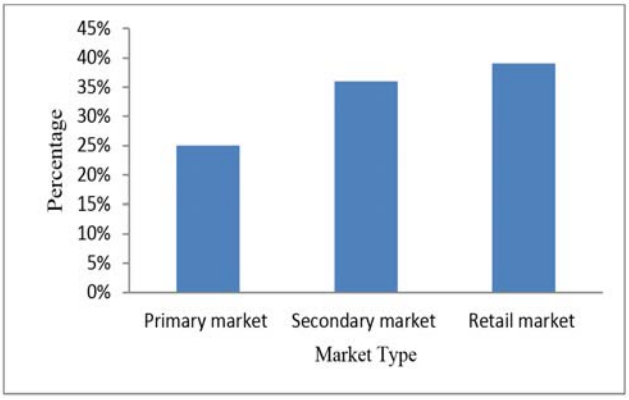

Fig 9: Marketing costs of Tilapia in Jessore region

Table 2: Average marketing costs (Tk/kg) of tilapia in different retail markets in Jessore area

Cost item	Local market Ambot-tola Churamonkati		Town market Boro Railstation bazaar		Average
Rent of marketplace	0.24	0.38	0.29	0.41	0.33
Electricity	0.51	0.54	0.57	0.53	0.54
Ice	0.75	0.81	0.95	0.92	0.86
Wage of labourers	1.83	1.84	1.91	1.87	1.86
Transportation	0.97	1.04	1.21	1.11	1.08
Miscellaneous	0.34	0.37	0.33	0.35	0.35
Total	4.64	4.98	5.26	5.19	5.02

Tilapia is sold according to size, rather than species. The average price of tilapia from traders to consumers was found to be Tk 111.15 per kg, ranging from Tk 70 to Tk 142 per kg depending on size. There was a significant difference of tilapia prices in different markets.

Table 3: Average prices (Tk/kg) of tilapia in different retail markets in Jessore area

Size (g)	Local market Ambot-tola Churamonkati		Town market Boro bazaar Railstation bazaar		Average
50-150	74	73	70	72	72.25
151-250	105	105	100	104	103.5
251-350	120	123	115	117	118.75
351-450	127	130	120	122	124.75
451-550	140	142	130	134	136.5
Average	113.2	114.6	107	109.8	111.15

Factors influencing price of Tilapia

There are many factors affecting the price of tilapia through supply and demand. Tilapia supply is determined according to the biological environment, the technology used, the policy and institutional environment, and the producer's profile. Likewise, the demand side is influenced by policy and the profile of consumers. In the study area, tilapia prices are generally lower between September and December, rising during the following four to five months. Interaction of tilapia supply and demand in markets is shown in figure10.

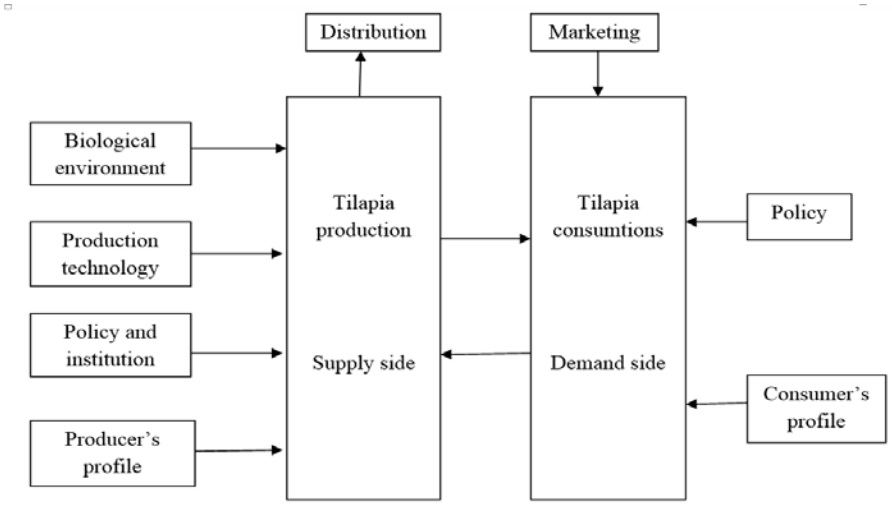

Fig 10: Interaction of tilapia supply and demand in markets

Table 4: Marketing margins and profits of tilapia trading, based on all market survey in Jessore area

Market	Marketing particular	Tk/kg	Market share (%)	Marketing margin (%)
Primary market	Purchase price (PP)	70	63	71-63=8
	Marketing cost (MC)	3.25		
	Sales price (SP)	79		
	Marketing margin (MM=SP-PP)	9		
	Marketing profit (MP=MM-MC)	5.75		
Secondary market	Purchase price (PP)	79	71	89-71=18
	Marketing cost (MC)	4.75		
	Sales price (SP)	99		
	Marketing margin (MM=SP-PP)	20		
	Marketing profit (MP=MM-MC)	15.25		
Retail market	Purchase price (PP)	99	89	100-89=11
	Marketing cost (MC)	5.02		
	Sales price (SP)	111.15		
	Marketing margin (MM=SP-PP)	12.15		
	Marketing profit (MP=MM-MC)	7.13		
Consumer price		111.15	100	

Net profit per day of a typical trader of Tilapia in different retail markets in Jessore

Average marketing costs and profits of a trader in different retail markets in Jessore is shown in figure 11.

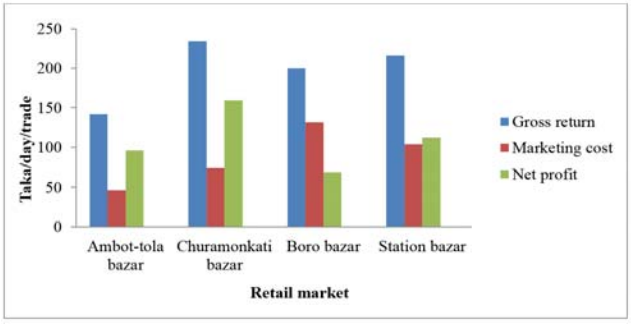

Fig 11: Average marketing costs and profits of a trader in different retail markets in Jessore

Marketing Cost, Margin and Profit

Amongst the intermediaries, the highest average marketing margins were received by wholesalers. As such, the highest average marketing margin and profit per kilogram of tilapia was found in secondary market, followed by retail and primary market. Average tilapia marketing costs and profits in different markets in Jessore area is shown in figure 12.

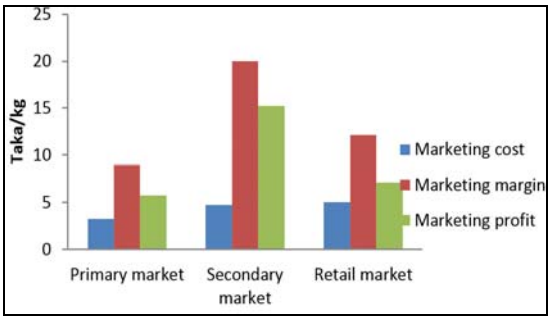

Fig 12: Average tilapia marketing costs and profits in different markets in Jessore area

Constraints of Tilapia marketing

Despite the potential of tilapia marketing, a number of constraints were reported by traders, including poor road and transport facilities, higher transport costs, insufficient supply of ice, unhygienic conditions, lack of credit facilities and poor infrastructure of markets. Political disturbances such as strikes and road blocks also affect tilapia marketing. Tilapia traders were requested to state their single most important marketing constraint. Regardless of market locations, 44% of respondents identified this as high marketing costs. The proportion of respondents identifying poor road and transport facilities was 24%. Only 20% and 12% of traders identified lack of money for this business and poor market infrastructure to be the most important constraints respectively.

Table 5: Key constraints of tilapia marketing by traders in different markets in Jessore area

Key constraints	Local market		Town market		All traders
	Ambot-tola bazaar	Churamonkati Bazaar	Boro bazaar	Railstation bazaar	
	n=20	n=20	n=20	n=20	n=80
High marketing costs	9(45%)	8(40%)	8(40%)	10(50%)	35(44%)
Poor road and transport facilities	5(25%)	4(20%)	5(25%)	5(25%)	19(24%)
Lack of money	4(20%)	5(25%)	4(20%)	3(15%)	16(20%)
Poor market infrastructure	2(10%)	3(15%)	3(15%)	2(10%)	10(12%)

n: sample size of trade

Socioeconomic features

Housing conditions

Most traders live in poor housing conditions which in turn affect tilapia marketing, because traders are more likely to invest available cash resources in maintaining houses rather than fish trading. Earthen house are 25%, Pucca house are 65% and Semi pucca are 10%. Housing conditions of Tilapia Traders is shown in figure 13.

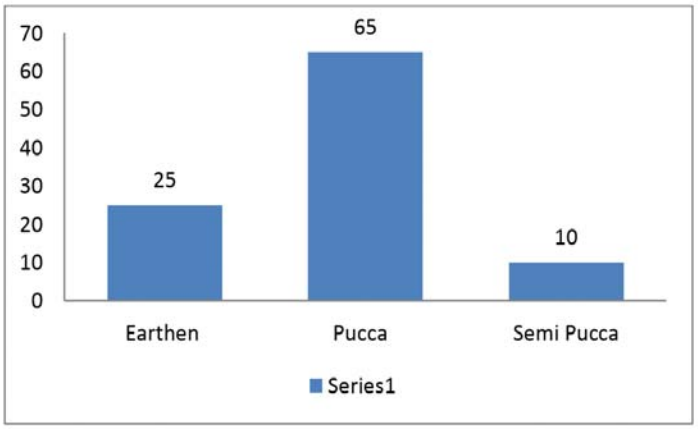

Fig 13: Housing conditions of Tilapia Traders

Medical facilities

Poor health facilities also affect tilapia marketing due to inability of labor. In addition, traders are more likely to spend money in medication of household's members rather than invest in tilapia trading. Most traders reported that members of their households often suffered from diarrhea and cholera due to poor sanitary facilities. About 35% traders goes to the MBBS and rest of 65% are goes to the quack or non trained doctor. Medical facilities of Tilapia Traders is shown in figure 14.

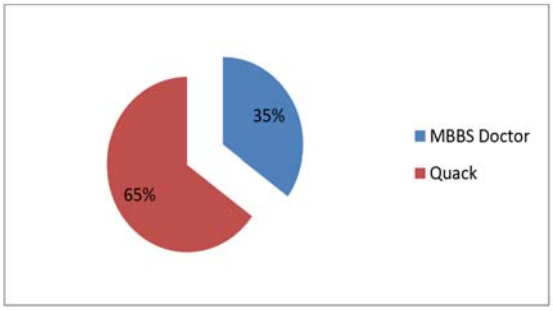

Fig 14: Medical facilities of Tilapia Traders

Sanitary facilities

As a result, the lack of sanitary facilities influencing not only trader's role in tilapia marketing, but their wider opportunities in other income-generating activities. Earthen toilet is 27%, Pucca toilet is 50% and Semi pucca are 23%. Sanitary facilities of Tilapia Traders is shown in figure 15.

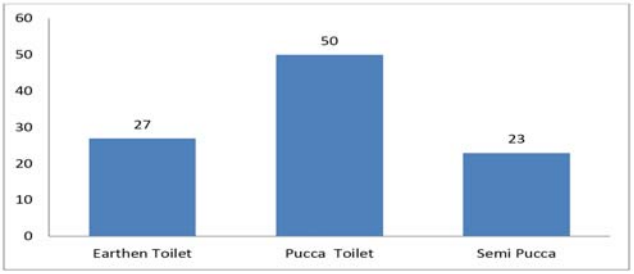

Fig 15: Sanitary facilities of Tilapia Traders.

Education level

Tilapia traders of different markets have different education level, age group, family size and income. All traders have education at some level, which implies that the reported literacy rate is 83%. Education level of Tilapia Traders is shown in figure 16.

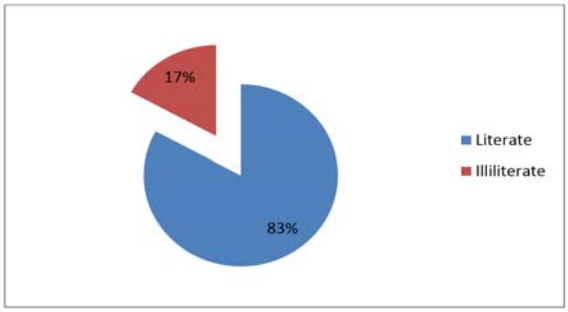

Fig 16: Education level of Tilapia Traders.

Age group

Most traders were quite young, with an average age estimated at 36 with a range from 23 to 57. There was insignificant difference of age among markets.

Family size

The average family size of tilapia traders was estimated at 5.5 in a single family.

Discussion

Farmers partially sold their fish directly to the wholesalers (about 15%); the wholesalers sold it to the retailers. The *paikers* carried the fish (about 80%) to the markets by their own or the retailers Hossain, *et al*. (2015) [11]. According to farmers, 65% of harvested tilapias are sold to the local agents, while the rest (35%) are sold to the suppliers. About 60% of tilapias are transported to the boro bazaar. The rest (40%) of the tilapia, which are under-sized, are transported to nearby local markets. Which is more or less similar to the previous study.

Sharif, B.M.N. and Asif, A.A. (2015) [17] was observed that 25% of credit are contributed by nurserer, 40% farmers got

loan from bank whereas 35% farmers took loan from local moneylenders with high interest of credit. In the study of Asif *et al*. (2014) [6] it was observed that 24% farmers got loan from bank whereas 31% farmers took loan from local moneylenders with high interest of credit In this present study 70% of wholesalers used their own money for fish marketing including tilapia, while the rest (30%) received loans. Which is more or less similar to the previous study.

Hossain, M. A. *et al.* (2015) [11] Studied the problem of marketing It included higher transport costs, poor road communication facilities, inadequate drainage system, poor supply of ice, poor water supply, unhygienic condition, poor sanitary facilities, lack of capital, higher demand of labors, exploited by middlemen, lack of storage facilities, lack of marketing facilities, lack of market information etc. According to retailers, political disturbances sometimes affect fish transport as well as marketing. Where, 20% of the respondents identified unhygienic market place 25% poor supply of ice, 15% lack of capital, 15% exploited by middlemen, 25% mentioned inadequate drainage system, were the most important problems for fish marketing. In the present study the proportion of respondents identifying poor road and transport facilities was 24%. Only 20% and 12% of traders identified lack of money for this business and poor market infrastructure to be the most important constraints respectively. Which is more or less similar to the previous study.

Islam, M. A. *et al.* (2014) [15] studied that 36% of housing structures were Katcha, 30% were semi pucca and 34% were pucca. Present study reported that earthen house are 25%, Pucca house are 65% and Semi pucca are 10%. Which is more or less similar to the previous study.

Islam, M. A. *et al*. (2014) [15] study showed that 80% of the population in the study area was dependent on village doctors of medical science, while 12% and 8% go health service from upazila health complex and MBBS. In the present study the reported about 35% traders goes to the MBBS and rest of 65% are goes to the quack or non trained doctor. Which is more or less similar to the previous study.

Asif *et al.* (2014) [6] found that 69% and 31% of fish farmers used semi-*pucca* and *pucca* toilet respectively. Earthen toilet is 27%, Pucca toilet is 50% and Semi pucca are 23%. Which **is** more or less similar to the previous study.

Hossain, *et al.* (2015) [11] studied that highest percentage of fish retailers was primary educated and only 18.33% are secondary educated. In the present study the reported literacy rate is 83%. Which is more or less similar to the previous study.

Conclusion

Sustainable tilapia marketing can play an important role to increase food supply. However, the present study identified a number of bottlenecks affecting the efficiency of tilapia marketing, and thus, need for appropriate interventions,: such as Infrastructure, Hygiene and quality Supply of ice, Credit facilities, Market information services, Training facilities, Government policy etc. The present study focused on assessing factors affecting marketing of tilapia, but more research is needed to assess overall prospects (in terms of aggregate supply and demand) for tilapia market development in Jessore region, including analyzing the technological dimensions of tilapia farming, as well as consumers' preferences. It might also be relevant to investigate how the establishment of well-functioning assembly markets at important fish landing linked to modern wholesale markets in large urban areas, and may help develop sustainable markets for tilapia in Jessore region.

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