



Status of Farming and Marketing of Live Pangas (*Pangasius hypophthalmus*) from Trishal Upazila to Different Areas of Bangladesh

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Abstract

The research was conducted to collect information on the status of farming and marketing of live pangas (*Pangasius hypophthalmus*) from Trishal region to different areas of Bangladesh by interviewing stakeholder and secondary sources. The survey was carried out for seven months from May to November, 2016. Pangas farmers, arotdar, commission agents, wholesaler and retailers were interviewed in accordance with participatory rural methods. The results showed that the best harvesting season were found to be June to July and November to January. It was also found that 90% farmers harvested their fish completely and only 10% of farmers harvested partially. The price of pangas depends on market structure, quality, size, distance, weight, seasonal variation and regional perception. The prices of pangas were found to be highest of 130tk/kg and the lowest of 85tk/kg but sometimes 60 to 70tk/kg when the fish are dead (on the way to destined area) in different districts. On the other hand significant quantity loss was observed in fish 8%, 10%, 15%, 18%, and 19% after reaching to Savar, Manikgonj, Maowa, Sylhet, and Barisal from Trishal. Therefore, it was strongly recommended that proper handling of live fish must be ensured during transportation to attain quality pangas at consumer level.

Key words: Farming, Live pangas, Marketing, Status, Trishal

Introduction

Bangladesh is one of the world's leading fish producing countries with a total production of 36.84 Lakh MT in the financial year 2014-15 (BBS, 2016) and achieving 5th position among the major aquaculture producing countries in the world (FAO, 2014). Out of total fish production, aquaculture contributes 55.93% and remaining 27.79% and 16.28% was from inland capture fisheries and marine fisheries, respectively (DoF, 2016) indicating aquaculture is the fastest growing food producing sector in Bangladesh.

In the fisheries sector, the value chain can be defined as the movement of fish from the landing beach, through the supply chain, to the final consumer taking into the consideration the whole range of activities and the subsequent value addition undertaken by different stakeholders at various levels of the chain in lieu of a profit accruing to them from their operations (Kulmiyei, 2010). Ferdous *et al.* (2012) stated, it (value chain) may be long or short for a particular commodity depending on the qualities of products, size and nature of consumers and producers and the prevailing social and physical environment. De Silva (2011) said, value chains for capture and culture fisheries differ from fish to fish and from country to country and frequently within regions. Value chain describe a high-level model of how fishery businesses receive raw materials as input (captures and culture fisheries) and add value to the raw materials through various processes and sell finished products to customers. Moreover, fishery value chain can be defined as interlinked value-adding activities that convert inputs into outputs which in turn add to the

bottom line and help to create competitive advantage (Awel *et al.*, 2018).

Pangas is one of the best aquaculture species in Bangladesh due to its ease of culture; high market demand and well suited to the weather condition, its propagation and culture. Regionally, inland aquaculture production is dominated in the north-central region, i.e. the greater Mymensingh district, where pangas (*P. hypophthalmus*) farming was started commercially in 1994 by a private fish farm named Al Falah, Mymensingh (Ali, 2009). In fiscal year of 2012-13 Mymensingh contributed about 59.01% of total pangas production of the country. The estimated total pangas production in Bangladesh was about 287032 MT in the year 2013. Pangas (*P. hypophthalmus*) fish are mainly sold at farm gate to traders or local agents. At harvest, it may take fish farmers several days to sell off the fish products depending upon how much fish they have. The pangas farmers are usually sell fresh and live pangas to one of three following buyers: collectors of processing companies, export traders and local traders. The ponds or the cages are the useful storage facilities that can reduce market price pressure or fluctuations and keep pangas alive or fresh to better serve customers. There are two basic transport systems for live fish - the closed system and the open system. The closed system is a sealed container in which all the requirements for survival are self-contained. The simplest of these is a sealed plastic bag partly filled with water and oxygen. The open system consists of water-filled containers in which the requirements for survival are supplied continuously from outside sources. The simplest of these is a small tank with an

aerator stone. For sustainable live transportation of pangas with proper value chain and fair trade issues, development of pangas transportation system is essential. Pangas production can be increased through scientific method but without good transportation system the benefit of fish culture will not be realized. So, proper emphasis should be given to improve the existing pangas transportation system as both are interrelated and closely associated with each other. Considering the importance of pangas transportation, the present study was undertaken to understand the existing pangas (*P. hypophthalmus*) transportation systems and to know the pangas marketing channel/supply chain.

Materials and Methods

The present study was based on market survey, obtaining information through a sample survey among fish traders, fish farmers, operators (middlemen) and consumers. The method of collecting data and sample depends on much consideration, such as the nature of research problem, time, constraints, availability of funds etc.

Though there are various methods of collecting field level data, the survey method was chosen in the present study because it was thought to be more advantageous. To overcome some shortcomings of this method, several visits were made to collect data in the study area and the questions were asked in such a manner that the interviewers could answer from the memory. The survey was carried out for 6 months from May to November 2016, Singair (Manikgonj), Savar (Dhaka), Maowa (Munshigonj), Sylhet, Rasulpur fish landing centre (Barisal) (Figure 1). The study had been undertaken and completed according to the following order of methodology (Figure 2).



Fig. 1. Map of study areas in Bangladesh

Selection of the study area

Keeping in view the main objectives of the study, Trishal upazila under Mymensingh district was selected for study as Mymensingh is an important district for fish marketing due to its proximity to Dhaka, Barisal, Munshigonj, Manikgonj, Sylhet, Faridpur, Sirajgonj. It is also a famous district for pangas fish culture and associated activities. Closed water fish culture has been increased in recent years due to the activities made by Mymensingh Agricultural Extension Project (MAEP). In addition Mymensingh is important for fisheries sector for the presences of Bangladesh Fisheries Research Institute (BFRI) and Faculty of Fisheries, Bangladesh Agricultural University (BAU). Both organizations play vital role for technology invention, dissemination and giving logistic supports to the farmers in the fisheries sector.

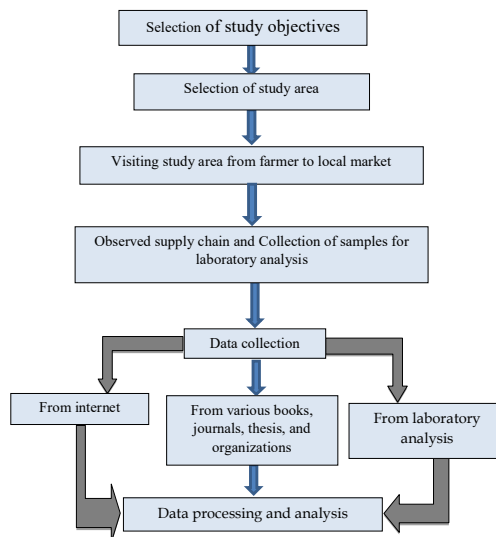


Fig. 2. Design of the experiment

Target groups

In order to get a representative picture of the fish marketing system of Mymensingh the following groups of the people were selected:

Pangas farmer

Farmers in Trishal upazila under Mymensingh district culture pangas in their ponds, tanks, ditches etc. A few farmers are financially solvent who possesses own land as well as ponds but other have very little cash and almost all "Small and marginal" farmers are poor. They produce pangas two times a year (Plate 1). Farmers produce fish themselves by hired labors. Most of the fish farmers in Trishal upazila are highly dependent on middlemen or moneylenders who provide money and take the lion's share of total earning from pangas production (Hannan, 1988). They are in a chain of indebtedness to the moneylenders who prevent the farmers entangled to approaching commercial banks for credit, as the procedures to borrow money from the financial institute are too complex (Chandrasekera, 1994). Moneylenders have therefore, developed strong bonds with the fish farmers.



Plate 1. Activities in pangas farm before selling (a. harvesting system of fish from pond, b. carrying pangas for loading in truck, c. loading pangas in plastic barrel)

Arottdar and Commission agent

Arottdar involves in pangas marketing and bring fish directly from farmer in farm. They carry these fish by plastic barrel and transport by own truck/rented truck from their selected commission agent. The payment of commission as remuneration for services rendered or products sold is a common way to reward sales people. Payments often are calculated on the basis of a percentage of the goods sold, a way for firms to solve the principal agent problem by attempting to realign employees' interests with those of the firm. Commission agent sell their product with limited profit.

Wholesalers

Wholesalers purchase the fish from pangas suppliers and paikers in bulk quantity. They are the professional fish traders. Usually most of the wholesalers run their business independently. They also purchase fishes from farmers or fishermen and sell in the wholesale market. They invest a big amount of capital for purchase of pangas for short period of time. They sell the fish in massive quantity to the retailers. They are very influential in the marketing network. Sometimes they act as money lenders and give credit to the paikers or fish supplier at a very high rate of interest. They also earn profit though buying and selling fish.

Retailers

The retailers buy pangas from the wholesale market for resale directly to ultimate consumers. They are the last link of intermediaries in the channel of pangas marketing. They also buy fishes from commission agents (middleman) through open auction and sell them to consumers ultimately. The function of retailer is to procure supplies and display them in front of consumers at times convenient for them. Very often retailers buy fishes of different type and categories depending on the species and size of the fish.

Transporters

Transportation is essential for highly perishable commodities like fish. Adequate and efficient transportation is a cornerstone for the modern marketing system (Kohls and Uhl, 2005). In the study areas, the pangas farmers and intermediaries use various modes of transports such as van, rickshaw, truck, passenger bus, pick-up, nosimon, head load etc. to transfer product from the producing areas to the consumption center but mostly use truck from Trishal to different areas for transportation (Plate 1, 2 and 3). They have engaged in pangas transportation from farmers to arattdars, commission agents, traders in the local or town market.



Plate 2. Pangas transport system in local market



Plate 3. Unloading of pangas at Sylhet and Maowa



Plate 4. Selling system of pangas at commission agent



Plate 5. Interviewed with commission agent

Consumers

Almost all the people of Bangladesh like fish as delicious food and it contributes about 63% of animal protein throughout the country (DoF, 2003). Generally the entire domestic production of fish is consumed fresh or iced (Plate 4). Limited amount of fish are smoked and dried. Restaurants and hotels also buy fresh and iced fish, but most of the fish is consumed directly by the households.

Sample size and sampling techniques

In this study, purposive sampling techniques were used for selecting the sample. Total sample size of the study was 40 (Table 1), selected samples consisted of 8 pangas from farmers, 8 pangas from commission agent, 8 pangas from wholesaler or paiker and 8 pangas from local market. The intermediaries dealing with pangas marketing were categorized into two groups, namely wholesalers and retailers.

Table 1. Sample size (no. of pangas) and data collection methods in the study area

| Sampling no. | Study area | Farmer level | Commission agent | Paiker or Wholesaler | Local market level |
|--------------|---|--------------|------------------|----------------------|--------------------|
| 1. | Porabari, Trishal to Singair, Manikgonj | 2 | 2 | 2 | 2 |
| 2. | Konabari, Trishal to Hemayetpur, Savar | 2 | 2 | 2 | 2 |
| 3. | Konabari, Trishal to Mawoa, Munshigonj | 2 | 2 | 2 | 2 |
| 4. | Konabari, Trishal to Kazirbazar, Sylhet | 2 | 2 | 2 | 2 |
| 5. | Porabari, Trishal to Rasulpur fish landing centre (Barisal) | 2 | 2 | 2 | 2 |

Problems encountered during data collection

Some problems were faced during data collection such as; traders were busy in trading and unwilling to talk. Some traders thought that the researchers to be the government official of tax or other department and feared to talk. In addition, language problems or use of local terminologies, data in local units and some traders want something in cash or kind for giving interviews. However, the problems were overcome by the researcher through given extra attention and more discussion on rapport buildup (Plate 5). Clarifications of local terminologies and local units were obtained

from key informants and local units were converted later on. Most of the respondents had little concept about a research work and it was therefore, very difficult to explain the purpose of the study and to convince them. Most of the respondents were illiterate. Moreover, they had no previous idea about such study. They did not maintain any record of their business. It was therefore, a bit difficult for them to answer relevant questions from their memory by recall methods. Sometimes the selected respondents were not available at home and in such cases more than one visit were required to conduct a single interview.

Data processing and analysis

After collection of data from the field, these were verified to eliminate errors and inconsistencies. Some of the collected data were in local units, due to respondent's familiarity with those units. These data were converted into international units, before transferring to the computer. Preliminary data sheets (in computer) were compared with the original questionnaire and result sheets to ensure the accuracy of the data entry. The data were processed and finally analyzed using microsoft excel software. At each stage of the survey, data were checked up and transferred into computer.

Results and Discussion

The livelihoods of large number of people are associated with the pangas (*Pangasius hypophthalmus*) production, distribution and marketing systems from Mymensingh region to different area of Bangladesh, with conspicuous socio-economic conditions. The present results describe the existing pangas marketing systems, problems and value chain issues and quality aspects during transportation. This description is based on results of primary data collected when pangas

transported from Trishal upazila, Mymensing to different region such as Manikgonj, Munshigonj, Savar, Sylhet and Barisal fish market.

Starting of pangas farming

During the survey, it has been known that the culture of pangas started at Trishal upazila of Mymensingh region by some rich people (mainly construction contractors) in leased ponds. Observing fast growth, high yield and net profit many local farmers and young educated people became motivated and started pangas farming. In this way pangas farming expanded in the region within a few years. Presently pangas are cultured in almost all upazilas of the Mymensingh district and relatively at higher level in Trishal upazila. Among the sampled farmers of Trishal, 6% pangas farmers started pangas farming in 1991-95, 22% farmers started in 1996-2000. 38% started in 2001-05, 22% farmers started in 2006-10 and another 12% farmers started in 2011-2015 (Figure 3). However, the trend of pangas farming is still increasing in this area. Sadi (2013) reported that 7% farmers started pangas farming in 2010-11, 33% in 2005-06, 44% in 2000-2001 and 16% farmers in 1995-96 in Muktagacha, Valuka and Trishal upazila.

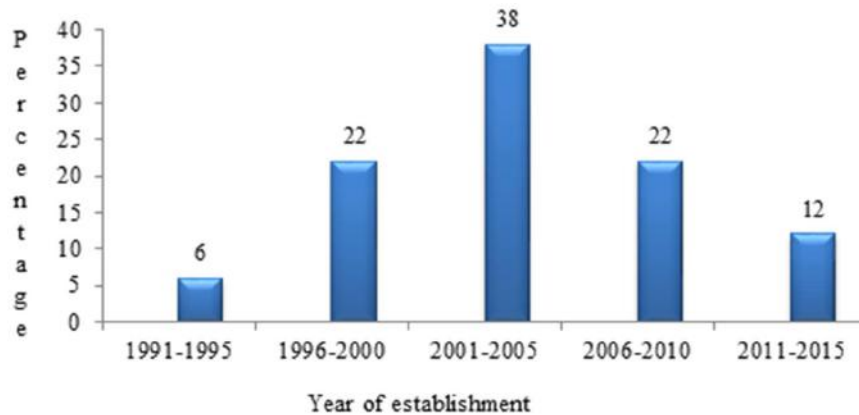


Fig. 3. Years of pangas farming

Category of pangas farmers on the basis of farm size

Among the pangas farmers in studied area, 60% was found to be small (<10 acre), 27% medium (10-50 acre) and 13% large (>50 acre) farmers. The number of small and medium farmer's trend to be higher in selected area (Figure 4).

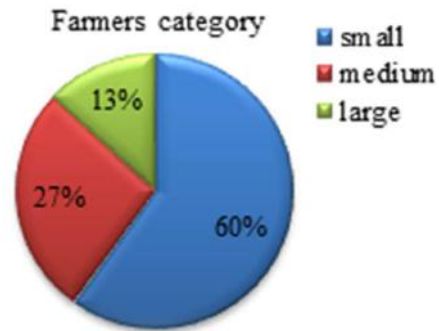


Fig. 4. Pangas farmers on the basis of farm size

Fish culture season and techniques

In the study area, the best season of fish farming was reported to be started in January and end in May. The fish fingerlings are stocked in May to June and harvested from November to January. It was also found that, 87% farmers cultured pangas with other fish (polyculture), whereas 13% farmers cultured only pangas (monoculture). The highest percentage of polyculture farmers was found in this area (Figure 5). Maximum polyculture farmers used carps including Rohu (*Labeorohita*), Silver carp (*Hypophthalmichthys molitrix*), Catla (*Catla catla*), Mrigal (*Cirrhinus cirrhosus*), Tilapia (*Tilapia mossambica*) and Nilotica (*Tilapia nilotica*) with Pangas (*Pangasius hypophthalmus*). Ahmed (2003) observed the best period of polyculture was from April to December. Hossain (2001) reported only 26% of the ponds were used for culture of monoculture and 74% of the ponds were used for pangas with indian major carps. From the survey, it was found that 92% farmers carried out polyculture system. Rahman(2006) showed that around 90% of the farmers cultured pangas with carps.

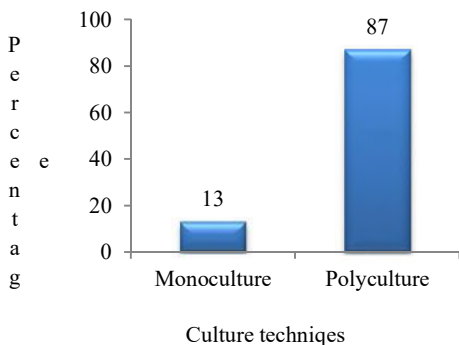


Fig. 5. Fish culture techniques in terms of species composition in the study areas

Harvesting and marketing of fish

In the study area, the best harvesting season were found to be June to July and November to January. It was also found that 90% farmers harvested their fish completely and only 10% of farmers harvested partially. The farmers were reported to harvest their farmed fish when it reached around 500 g to 2 kg in size. Normally all the fishes of a crop in a pond were harvested at a time and then the ponds were made ready for the second crop of the year. Those who cultured only one crop in a year harvested fish when it reached about 1 to 1.5 kg in size in 10-11 months. Some large farmers reported to have their own fishing net and fisher group formed by the farm labors. In the community there are separate fishers group with nets formed by rural poor who do fishing farmers pond on contract basis. In the study area, 95% of the farmers reported to sell their fishes mostly to arottdar, sometimes small traders and occasionally to larger traders. The small traders sell the fishes to retailers in local markets and in neighboring districts, sometimes to larger traders and arottdar or wholesaler sell the fishes by commission agent in different region from

Trishal upazila under Mymensingh district. The medium and large farmers (95%) sell their fishes to large traders who transport the fish in live condition to Dhaka, the capital city and the northern districts of the country. The fish are transported in PVC drums with freshwater. The selling price of fish varied according to the size and qualities; however the average selling price of pangas was BDT 80-85 per kg in farmer level and BDT 120-130 per kg in local market.

Transportation

Fish are generally transported in containers such as cans of different sizes, pots or ceramic or metal, wooden or metal buckets, vats, barrels, plastic bags, and bamboo section but in the study areas, the fish farmers and intermediaries mostly use plastic barrel with deep tube well water to transfer product from the producing areas to commission agent by using truck. They transported 40 kg fish/plastic barrel from farm to commission agent. In the study areas it was observed that, 20% of wholesalers used van, 35% rickshaw, 25% used tempo and 20% used by-cycle to transfer their products from commission agent to local markets. On the other hand, there are about 26% of traders used tukri, 14% used jhuri, 12% used dali, 24% used jhaki and 24% used plastic basket to transporting of pangas from commission agent to local market.

Comparative market survey

In the study area, different fish markets were chosen to carry out comparative market survey namely: 1) Singair fish market, Manikgonj 2) Maowa, Munshigonj 3) Savar, Dhaka 4) Kazir bazar, Sylhet 5) Rasulpur fish landing centre, Barisal. The following address comparative pangas trading in different markets.

History of pangas marketing

The survey results indicated that fish marketing history in Trishal upazila under Mymensingh district was contradictory. None can give the exact information. It was found that marketing first started at Karwan bazar of Dhaka before 1999-2000. Over this time, fish marketing has become a profitable business and has generated new employment. In Mymensingh town, pangas marketing was first started about twelve to thirteen years ago. It was found that pangas marketing started at Dhaka in 1999, while in Manikgonj it started during 2000. As pangas is easily acceptable by all level of people, due to its taste and comparatively low price, the trading of this fish has become more profitable. Now many people are involved in pangas trading.

Season and time of pangas marketing

The season and time of pangas marketing is almost around the year. Since pangas is mainly a cultivable fish, the peak culture season is from July to September. In Trishal, normally farmer sells their fish in arottdar and arottdar are engaged in pangas harvesting directly from farmer pond at afternoon 3.00 p.m. to 8 p.m. Then arottdar were transported these fish from Trishal to different region in their selected commission agent

at night. While in commission agent sell these fish early morning with limited profit. Paiker (wholesaler) brought fish from commission agent and transport in local market by van, rickshaw, auto, by-cycle etc. In local market paiker or wholesaler are engaged from morning 8.00 a.m. to 12.00 a.m. and some fish market engaged from evening (5 p.m.) till night (10 p.m.). Some traders can sell their fish earlier and engaged other works.

Amount of pangas sold and dead fish

According to the survey, it was found that pangas arotdar of Trishal upazila transported 3 to 6 ton pangas from Trishal upazila to different areas and average of 1600-2800 kg fish transported daily every truck, its vary on consumer demand and market price. There are around 8-15 arotdar involved in Trishal upazila for fish transportation from Trishal upazila to different areas. At the time of transportation, some fishes die that's why fish market price become decrease. The traders not only sells pangas fish, they also engage in selling other fish species, like Indian major carps, exotic carps, catfishes, snakehead fish, small indigenous fish etc. in different market.

The study result shows (Figure 6) that after transportation of pangas from Trishal upazila to different areas by truck, huge amount of fish were died and many fish injured. As a result dead pangas fish price ultimately decrease and this losses decrease profited for arotdar business. On the other hand significant quantity loss was observed for the fish due to transportation from different farms of Trishal areas to different areas of Bangladesh such as Savar, Manikgonj, Maowa, sylhet, and Barisal. The quantity loss was found 8%, 10%, 15%, 18%, and 19% after reaching to the different destination from Trishal upazila.

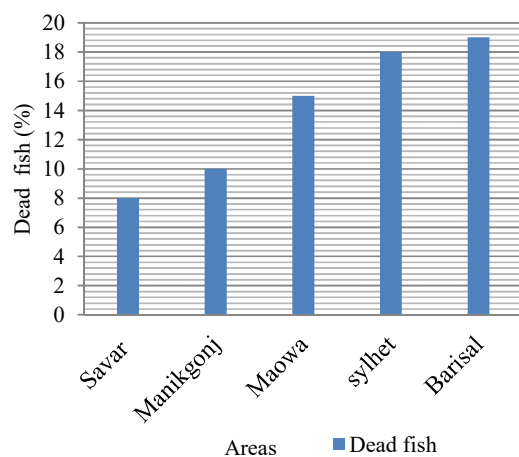


Fig. 6. Dead pangas (*Pangasius hypophthalmus*) fish (%) after reaching to the different destination from Trishal upazila

Supply of pangas

Pangas seems to be accepted by all religious and social groups. In general, the higher income groups buy large size fish and the lower and middle class being able to

afford medium sized and small fish. Small restaurant and hotel also buy pangas but most of the fish is consumed by the households. Pangas is a very tasty fish and it has also low price. So, all level of people is easily access to purchase the fish.

Pangas is mainly supply into the market from different area of Mymensingh district. Most of the fish comes from Trishal, Boilor, Churkhai, Gouripur, Phulpur, Netrokona and Muktagacha. Statistics on fish sale and supply are not available but according to market survey, the daily supply of fish in different market on their market demand. The market share of pangas in different markets varies according to the demand availability in that area.

Supply chain of pangas

Supply chain is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer. Supply chain activities involve the transformation of natural resources, raw materials and components into a finished product that is delivered to the end customer. Distribution functions may be defined as major specialized activities performed in accomplishing the distribution process of equalization. Distribution system plays the connecting link between the first stage fish farmer and the last stage consumers. By the means of the channel members (local traders, fishers or fish farmer, aratdars, mahajans, wholesaler, distributor etc.) the harvested fisheries are transferred from producers to consumers. Fish distribution channel is almost entirely managed, supported, financed and controlled with rules by traditional and skillful middlemen. Tradition and the strength held by separate channel members who affect the distribution system and the fish farmers are very sensitive to this as they never directly communicate with consumers. Fishermen and other paikers have no proper education or knowledge to make the best out of the supply chain management. The fish farmer cannot communicate with the market directly or sell to households because the market communication is mainly made by the middlemen and the wholesaler will not permit this in most of the time and the aggressive behavior of retailer towards the fish farmer who sells their fishes directly to households. This situation involves lots of intermediaries in the fish supply chain. Live pangas have longest supply chain among fishes such as six intermediaries such as fish farmer, aratdar, commission agent, paiker, retailer and consumer respectively.

Khan (1995) conducted a study on fish marketing in some selected areas of Bangladesh. In the study areas, two marketing channels were identified. One was fishermen → aratdar (commission agent) → paiker (wholesaler) → retailer → consumer and the other was fishermen → paiker → consumer (Figure 7). He also identified the problems of fish marketing in the selected areas. Those were shortage of capital, fluctuation and low price of fish, perishability of fish, inadequate transportation facilities and high storage charge. Khan (1995) identified two marketing channel

in Netrokona and Mymensingh town, one was fishermen-aratdars (commission agents)-paikers (wholesalers)-retailers-consumers and the other was fishermen-paikers-consumers. Supply chain of pangas from Trishal are given below-

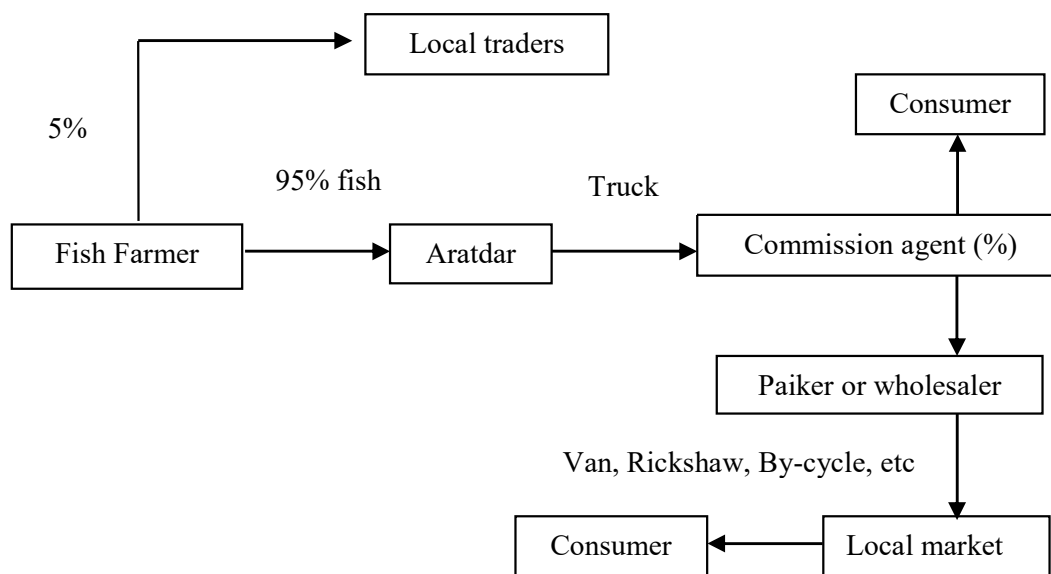


Fig. 7. Supply chains of pangas (*Pangasius hypophthalmus*) from Trishal upazila to different areas of Bangladesh

During the market survey, it was found that the pangas farmers mainly sell their fishes to arotdar and arotdar sell their fish to commission agent. They sell 95% of fish to the wholesalers or paiker, 2% to the local fish traders, 2% to the retailers and 1% to the consumers. Commission agent sells of pangas to the wholesaler or paiker through open auction system. Commission agents play an important role between farmers and traders for selling and buying fish.

Value chain for pangas marketing

Marketing channels are the alternative routes of product flows from producers to consumers. Value chain may be long or short for a particular commodity depending on the qualities of products, size and nature of consumers and producers and the prevailing social and physical environment. Dominant supply chains of pangas in the study areas are shown below: Five major value chains are identified for pangas in Maowa (Munshigonj), Singair (Manikgonj), Savar (Dhaka), Kazir Bazar (Sylhet), Rosulpur fish landing centre (Barisal).

Comparative marketing price of different markets

The average marketing price of fish in farmer was tk 85 to 92 per kg. The average marketing price of commission agent, paiker or wholesalers and retailer in markets were tk 95 to 105, tk 98 to 105 and tk 105 to 110 per kg respectively (Figure 8). Finally consumer get these fish tk 110 to 130 per kg but the price of dead fish decreased nearby half and the price varies from tk 60 to 90 per kg. These variations in price depend on

some factor such as availability of fish in different region, consumer demand, distance, transportation, and road condition etc.

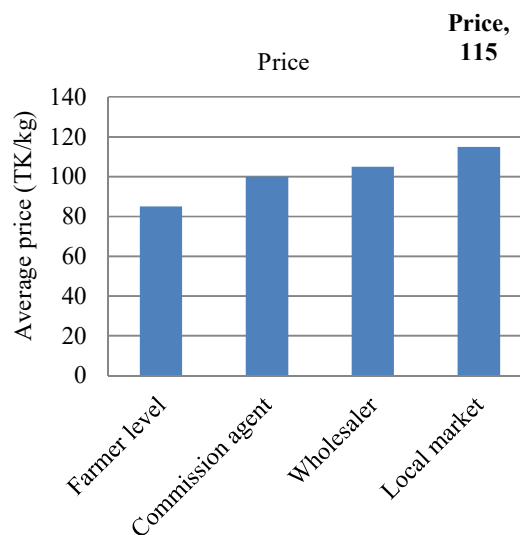


Fig. 8. Average market prices (Tk/kg) of pangas fish in different level constraints in fish distribution

In fish distribution system among different constraint the infrastructure lack of hygienic in fish landing centers, illiteracy, ignorance towards fishermen, lack of awareness, poor economic condition of the

fishermen, appropriate cold storage, transportation and preservation facilities etc. are the most severe. Problems are particularly serious in certain areas where the transportation and distribution facilities are inadequate, and also lack of insulated and refrigerated fish vans, electricity, and wastage of ice and open (cover on truck) for carrying fish. Lack of proper knowledge on modern techniques in controlling fish farms, ignorance or being careless in managing personal hygiene of the worker, isolation of fishermen from their wholesale market etc. are also regarded as the constraints of fish distribution. Dominance of mahajans, aratdar in capture fishing is so firmly established that it is difficult to introduce any new arrangement. The consumers have to pay higher price due to the participation of too many intermediaries in the distribution channel, but the actual fishermen do not get the perfect price for their products and the major shares go to the intermediary's pocket. The wholesale market is not in a good condition also. Lack of adequate drainage system, lack of facilities for washing down, dirty floor, lack of toilets, lack of auction place at peak period, lack of mechanical weighing equipment etc. are regarded as the other constraints for efficient fish distribution system in this market at one hand. People are not eager to buy fishes from market because of unhygienic environment.

Conclusion

From the obtained results the present study some important observations were recorded that, the best harvesting season were found to be June to July and November to January; about 90% of the farmers harvested their fish completely; daily supply of pangas from five farms of Trishal upazila was estimated to be 1.38 tons by truck to different areas; price of pangas depends on market structure, quality, size, distance, weight, seasonal variation and regional perception. On the other hand, significant quantity loss was observed in fish 8%, 10%, 15%, 18%, and 19% after reaching to Savar, Manikgonj, Maowa, Sylhet, and Barisal from Trishal. Therefore, it was strongly recommended that proper handling of live fish must be ensured during transportation to attain quality pangas at consumer level.

References

Ahmed, F. 2003. Comparative study on carp polyculture practices of three different NGOs in Mymensingh district, MS Thesis, Department of Fisheries Management, Bangladesh Agricultural University, Bangladesh.

Ali, H. 2009. Assessment of stakeholder's perceptions on pangas aquaculture dialogue (PAD) standards in two villages, Mymensingh, Bangladesh. MS Thesis. Department of Aquaculture, Bangladesh Agricultural University, Bangladesh.

Awel, M., Shumeta, Z, Mitiku, F. 2018. Analysis of Fish Value Chain: The Case of Gilgel Gibe Dam Reservoir, Southwest of Ethiopia, *Journal of Economics and Sustainable Development*, 9 (19): 38-48.

BBS.2016. Bangladesh Bureau of Statistics. Statistics Division. Ministry of planning, Government of the People's Republic of Bangladesh.

Chandrasekera, C. H. M. T. 1994. Fishery Cooperatives in Asian countries. In socio-economic issues in coastal Fisheries Management, Proceedings of the Indo-Pacific Fishery Commission (IPFC) Symposium, Bangkok, Thailand, 8: 230-236.

De Silva, D. A. M. 2011. Value chain of fish and fishery products: origin, functions and application in developed and developing country markets, Value chain project, and Food and Agriculture organization.

DoF. 2003. Compendium on fish fortnight 2003, Department of Fisheries, Ministry of Fishery and Livestock, the People's Republic of Bangladesh.

DoF. 2016. Fishery statistical yearbook of Bangladesh, 2014-2015 fisheries resources survey system, Department of Fisheries, Bangladesh.

Ferdous, A., Salauddin, P., Idris, A.M., Madan, M. D. 2012. A Value-chain Analysis of International Fish Trade and Food Security with an Impact Assessment of the Small-scale Sector.

FAO. 2014. The State of World Fisheries and Aquaculture. Fisheries Department. FAO. *Fisheries Technical Paper* No. 500. pp. 196-197.

Hannan, M. A., Alam, A. K. M. N., Mazid, M. A., Humayun, N. M. 1988. Preliminary study of the culture of *Pangasius pangasius*. Bangladesh. *Journal of Fisheries science*, 11(1): 19-22.

Hossain, M. I., Islam, M. S., Shikha, F. H., Kamal, M., Islam, M. N. 2005. Physiochemical changes in Thai pangas (*Pangasius sutchi*) muscle during ice-storage in an insulated box. *Pakistan Journal of Biological Sciences*, 8(6): 798-804.

Khan, M. A. R. 1995. Fish marketing in some selected areas of Bangladesh, MS Thesis, Department of Co-operation and Marketing BAU, Bangladesh.

Kohl, R. L., Uhl, J. N. 2005. Marketing of Agricultural product, New York, Macmillan Publishing.

Kulmiyei, A.J. 2010. Assessment of the Status of the Artisanal Fisheries in Punt-land through

- Value Chain Analysis, Prepared for VSF Suisse and UNDP Somalia.
- Rahman, M. M. 2006. Livelihoods of the people involved in pangas catfish (*Pangasius hypophthalmus*) farming in Mymensingh, MS Thesis, Department of Fisheries Management, BAU, Bangladesh.
- Sadi, A. A. 2013. Status of pangas culture in three upazilas of Mymensingh region. MS Thesis. Department of Aquaculture, BAU, Bangladesh. 17p.