



Value chain analysis of tilapia fish seed in some selected areas of Mymensingh district in Bangladesh

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Abstract

Fisheries sector plays an important role in the economic development of Bangladesh due to its commercial and nutritional value. In Bangladesh, tilapia is produced in a wide range of culture systems, including small-scale, low-input, rural ponds, semi-intensive, intensive and commercial operations. Fish seed is the major input for producing tilapia. So this study is an attempt to examine the prevailing tilapia fish seed value chain based on primary data collected from 45 respondents from the Mymensingh District. Fifteen (15) hatchery owners, ten (10) *paikers*, ten (10) wholesalers and ten (10) retailers were selected from the study areas. All these value chain actors perform their marketing functions in Dhalla bazar in Trishal, Gouripur bazar in Gouripur, Ishwarganj bazar in Ishwarganj and Digharkanda mor in Mymensingh Sadar. The data were collected through the direct interview method with the help of pretested questionnaires during September to October 2018. The total cost per 10000 pieces tilapia fingerlings was Tk. 2133.28 and net return was calculated at Tk. 1573.85 by the hatchery owners. In the value chains, the highest sale price per 10000 pieces fingerlings received by the retailer was Tk. 7220.13 and the lowest sales price received by paiker was Tk.5185.80 for Tilapia fish seed. Among all the intermediaries, the highest value addition was 36.32 percent by *paiker* and the lowest value addition was 18.37 percent by retailer. However, net margin was higher for *paikers* (Tk. 1231.84) and lower for retailers (Tk. 760.97).

Key words: Value chain, fish seed, intermediaries, net margin, value addition

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Introduction

Bangladesh is now ranked 5th in world aquaculture production (FAOSTAT, 2016). The fisheries sector is contributing to a very significant role in the agrarian economy of Bangladesh. It contributes 3.57 percent to our national GDP and around one-fourth (25.03 percent) to the agricultural GDP (Bangladesh Economic Review, 2018). Fish alone supplements about 60 percent of animal protein in our daily diet (FAO, 2016). The total fish production in FY 2015-16 stood at 38.78 lakh MT and that reached at 41.34 lakh MT in FY 2016-17 (DoF, 2017).

In Bangladesh, tilapia was introduced from Thailand and contributes 8.1 percent of total aquaculture production (ADB, 2005; Rahman, 2012). Due to its rapid growth rate and high market value, it has become one of the most popular commercial culturable species in Bangladesh (ADB, 2005; Rahman, 2012). A total of around 201,000 farmers are involved in tilapia culture (DoF, 2017). In the year 2017, the area for tilapia culture reaches around 330,000 ha including ponds, ghers, and floodplains. Tilapia is cultured with different fish species such as African catfish (Ibrahim and Naggar, 2010), *Macrobrachium rosenbergii* (Goda

et al., 2010; Asaduzzaman et al., 2009) and carp fish (Frei et al., 2007).

Earlier the main source of tilapia fish seed in Bangladesh was spawn collected from rivers; and the small amounts were produced in Government and private hatcheries and share of hatcheries in supplying fish seed were very minimum. As the fish seed is the major input for fish farming, so the demand for quality fish seeds is growing. Tilapia fish farmers had to depend on wild seed collected from natural breeding grounds (rivers) and they received more than 85 percent of their total requirement from this source (DoF, 2017). But natural breeding grounds and wild seed collection had many problems and that supply system of fish seed seriously affected natural recruitment to inland open water tilapia production. However, for the last few decades, hatching facilities were enlarged to supply sufficient quality seed and the Government of Bangladesh has given great emphasis on large scale hatching production, nursery, and rearing fingerlings.

Despite the large production fish catches and production are not keeping pace with its growing demand. Still there is a shortage of fish production particularly in a specific season in Bangladesh (Khan and Alam, 2003). The shortage of fish seeds/fingerlings is one of the biggest problems for which the production is not increasing rapidly as it is expected. The fish seed marketing system in Bangladesh is neither efficient nor modern and is mainly carried out by private traders with a large number of intermediaries. Thereby it reduces seed producer's share in farmer's taka.

Since tilapia fish production in Bangladesh is increasing over the years, its disposal pattern is very important as growers, wholesalers, retailers, and consumers - all are affected due to its value addition in the fish seed. For the sustainability of these stakeholders, tilapia fish seed marketing studies are very inevitable. It is important to know the tilapia fish seed value chains for making the market efficient and effective.

Despite the importance of fish seed production in the economy of Bangladesh, a few studies on the value chain aspect of the fish seed have been conducted here. Several studies had conducted on the production and marketing system of fish seed. But, very few studies observed the value chain analysis of tilapia fish seed firms in Mymensingh district. The present study is an attempt to examine the value chain as well as the whole marketing system of tilapia fish seed aiming to determine the profit of market participants. This study analyzes how market intermediaries operate along with value chains and demonstrates how the revenue from trade is distributed over the entire fish value chain. The specific objectives of this study are: to map the value chain of tilapia fish seed, identifying the actors with their functions and to determine the net marketing margins with the estimation of value addition at different levels of the value chain of tilapia fish seed.

Materials and Methods

Study design and data collection: Mymensingh district was selected purposively because recently a large number of tilapia fish seed farms have been established in this area and this area is famous for supplying tilapia fish seed all over the country. Four different Upazilas such as Gouripur, Ishwarganj, Mymensingh Sadar, and Trishal were selected to meet the objectives of the study.

The present study was conducted by covering a total sample of 45 by face to face interviews. In addition to primary data, secondary data were also collected from various publications like journals, articles, the library of Bangladesh Agricultural University and different website. Data were collected during the period from September to October 2018 from the fish seed producers and fish seed traders by using structured survey schedule. The collected data were analyzed according to the objectives of the study.

The interview schedule was prepared according to the need of the objectives of the study. Two sets of interview schedules for all actors involved in the value

addition process were prepared. The draft interview schedule was pre-tested amongst a few respondents. The interview schedule contains questions about the total farm size, total production, cost of production, return of hatchery owners, percent of tilapia fish seed transacted by value chain actors, grading practices, mode of transportation, sources of finance, packaging practices, pricing practices, marketing channel, marketing cost, marketing margins etc. Fifteen tilapia fish seed producing hatcheries, 30 value chain actors (*paiker*, wholesaler and retailer) were selected from the study areas. So 15 hatcheries, 10 *paikers*, 10 wholesalers and 10 retailers for totaling 45 respondents were selected for this study. Fish seed hatcheries from Trishal, Gouripur and Mymensingh Sadar Upazila; and *paikers*, wholesalers, retailers from Trishal, Dhalla bazar, Digharkanda mor, Gouripur bazar and Ishwarganj bazar were selected by applying purposive sampling technique.

Analytical technique: In this study, data analysis was done using Microsoft Excel. The techniques were used as follows:

Cost and return analysis: The following profit equation was used to assess the value addition/gross margin of the selected fish seed at the producers' level:

$$\Pi = PF \cdot QF - (TVC + TFC)$$

Where,

Π = Producer's profit (Tk. /10000pieces)

PF = Price of produce (Tk. /10000pieces)

QF = Quantity of produce (Tk. /10000pieces)

TVC = Total variable cost

TFC = Total fixed cost

Gross return: Gross return was calculated simply by multiplying the total volume of output by its per unit of price in the harvesting period. The following equation was used to estimate gross return (GR):

$$GR = \sum P_F \times Q_F$$

Where,

GR = Gross return from fish seed

P_F = Price of produce (Tk. /10000 pieces)

Q_F = Quantity of produce (10000 pieces)

Gross margin: Gross margin calculation was done to have an estimate of the difference between total return and variable costs. The argument for using gross margin analysis is that the farmers are more interested to know their return over variable cost. The following equation was used to assess the gross margin:

$$GM = TR - VC$$

Where,

GM = Gross margin

TR = Total return

VC = Variable cost

Net margin: Net margin was calculated by deducting all costs (total production and marketing cost) from gross margin.

Net marketing margin: The following profit equation was used for calculating net marketing margin:

$$\Pi = GM - MC$$

Where,

Π = Net marketing margin (Tk./10000 pieces)

GM = Gross margin

MC = Marketing cost

Marketing margin and net margin of value chain actors: The marketing margin and net margin of different value chain actors were estimated by the following formula:

Gross Marketing Margin = Sales price – Purchase price

Net Marketing Margin = Gross marketing margin – Marketing cost

Value Addition (percent) = (Sales price – Purchase) / Purchase price × 100

Results and Discussion

The value chain map of tilapia fish seed and the actors with their functions: The analysis revealed that

the marketing of tilapia fish seed in Mymensingh was moved from the hands of hatchery owners to the hands of the fish farmers through five separate chains. Chain I was the longest value chain and chain V was the shortest value chain. In chain V, tilapia fish seed was transferred through the direct marketing channel that was directly from the hatchery owners to fish farmers. In chain I, the major marketing actors were the hatchery owners, *paikers*, wholesalers and retailers who performed value adding functions and in chain V, the major marketing actors were the hatchery owners and fish farmers.

Channel I: Hatchery Owners → *Paikers* → Wholesalers → Retailers → Fish Farmers

Channel II: Hatchery Owners → *Paikers* → Wholesalers → Fish Farmers

Channel III: Hatchery Owners → Wholesaler → Retailer → Fish Farmers

Channel IV: Hatchery Owners → Retailer → Fish Farmers

Channel V: Hatchery Owners → Fish Farmers

Along with the farmers, several actors participated in the marketing of tilapia fish seed from the production point to the consumption point. The roles and interrelationships of major actors involved in the tilapia fish seed value chain (Figure 1) are discussed as follows:

Hatchery owner: Hatchery owners are the first stakeholders and key people in the tilapia fish seed marketing channel. They do hormonal sex reversal for high production. In tilapia fish seed farming, hormone is used to convert the female tilapia into a male as tilapia males are preferred for culture because males grow faster than females. For that reason, hatchery owners produce spawn and directly rear fingerlings in the nursery pond. Hatchery owners also sell the fingerlings to the wholesalers, *paikers* and fish farmers. Fish farmers sometimes buy directly from the hatchery owners with very few quantities of fingerlings.

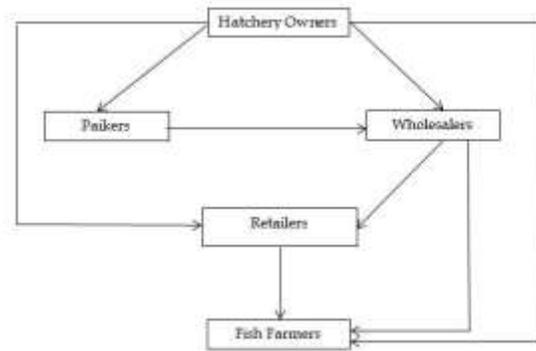


Figure 1. Value chain map of tilapia fish seed

Paiker: The *paikers* are non-licensed traders. They buy tilapia fingerlings directly from hatchery owners and sell them to the wholesalers with a certain commission. They transport the fingerlings to the distant market also.

Wholesaler: Wholesalers are very influential in the marketing network. They invest a big amount of capital for purchasing fingerlings for a short period. They sell the fingerlings to the retailer and fish farmers. In the survey area, it was found that the wholesalers collect fingerlings from the hatchery owners via *paikers* in bulk quantity.

Retailer (patil-wala): The retailer is the last link of the participant in the tilapia fish seed marketing channel. They are also called the fingerling hawkers. The retailers buy fingerlings from the hatchery owners or wholesalers to resell directly to the pond owners. During business period, retailers collect fingerlings from the nursery owners or hatchery owners and the wholesalers. They sold their all collected fingerlings to the fish farmers.

Fish farmers: Fish farmers/pond owners are the ultimate customers of tilapia fish seed in this trade. They mainly purchase tilapia fingerlings from retailers or wholesalers. Sometimes they also purchase fingerlings directly from the hatchery owners. In the study area, fish farmers collected above all fingerlings from the retailers, some portion from the wholesalers, some from the hatchery owners. Due to the indirect

marketing channel of this trade, the pond owners had to pay more than the actual price of tilapia fingerlings.

As discussed above a number of market participants like hatchery owners, *paikers*, wholesalers, and retailers were involved in the marketing of fish seed to transfer the products from hatchery-gate to the ultimate customers. The functions performed by these value chain actors are described in the following section.

Buying and selling: *Paikers* do the functions of negotiation between buyers and sellers of tilapia fingerlings in return of the commission. Tilapia fish seed farmers sell 76.5 percent of their fingerlings to wholesalers through *paikers*, and the remaining 23.5 percent to wholesalers directly. Retailers sell the entire fingerlings to ultimate fish farmers in the study area.

Transportation: Transportation is an essential function for highly perishable commodities like fish seed. Adequate and efficient transportation is a cornerstone of the modern marketing system (Kohls and Uhl, 2005). In the study areas, the hatchery owner and intermediaries used various modes of transports such as auto rickshaw, van, rickshaw, truck, passenger bus, pickup, Nasimon (locally made pick-up type van for transporting passengers and goods), head load etc., to

transfer product from the producing areas to the consumption centre. Tilapia fingerlings were transported from one place to another place by using water in the plastic drums. If the distance is long, water is then changed twice or thrice depending on the distance. Though all intermediaries used water during marketing, their use of water in tilapia fish seed was not scientific for which quality of seed has being deteriorated.

Grading: Grading is the basic function of sales transactions and is defined as the classification of products according to some standards or measures (Kohls and Uhl, 2005). Grading was the most important marketing function in tilapia fish seed marketing. Grading was roughly done according to the size and quality of the product by the hatchery owners and actors mostly based on the visual estimate. In Mymensingh, all intermediaries graded tilapia fish seed based on the size and physical fitness of fingerlings.

Financing: For effective operation, financing has crucial importance in the whole marketing system of fish seed. The source of finance for the value chain actors in the study areas are shown in Table 1.

Table 1. Sources of finance of hatchery owner and intermediaries.

Sources of fund	Market participants (percent)			
	Hatchery owner	<i>Paiker</i>	Wholesaler	Retailer
Own fund	26.6	50	20	40
Bank	40	30	40	30
NGO	20	10	40	10
Friends and relatives	13.4	10	0	20
Total	100	100	100	100

Source: Field survey, 2018

This table shows that most of the hatchery owners, *paikers*, wholesalers and retailers of tilapia fish seed were self-financed. Other sources of finance for farmers were banks, friends and relatives, and NGOs. A minor portion of sources of finance is bank and

friends and relatives. *Paikers* took a loan from banks, NGOs, friends and relatives. In addition to the use of their own funds, retailers also borrowed from NGOs and friends and relatives.

Market Information: In the study areas, visiting the markets and use of telephone/mobile phones were the most common sources of collecting market information

for all value chain actors. Table 2 shows the sources of market information flows.

Table 2. Sources of market information of hatchery and intermediaries.

Sources of information	Market participants (percent)			
	Hatchery owner	Paiker	Wholesaler	Retailer
Collecting information from the market	55	66	73	85
Telephone/mobile	45	34	27	15

Source: Field survey, 2018

Packaging: Packaging is essential for the proper transportation of fish seed. Poly bag, drum, basket, patil and rope were used by hatchery owners, *paikers*, wholesalers and retailers of tilapia fish seed. Plastic and drums were usually used when fish seed transported to distance places like Dhaka, Tangail, Jamalpur, etc.

Pricing: In the study areas, all intermediaries are involved in buying and selling of tilapia fish seed. Hatchery owner, *paiker*, wholesaler and retailer practiced open bargaining and going market prices method for fixing the price of their products in varying degrees. All of the retailers followed open bargain for selling their fish seed to their ultimate customer (fish farmer). Price depends on quality, size, market condition, supply and demand of tilapia fish seed.

Estimations of cost, returns and margins of tilapia fish seed: The second objective of this study was to the estimate value added by the actors of the value chain, particularly tilapia fish seed producers and various traders. Hence this section is concerned with the estimation and analysis of costs, returns and value addition of tilapia fish seed production. Here the value addition of tilapia fish seed was computed at 10000 pieces' fingerlings. In fish seed cultivation, cost of inputs like human labor, pond preparation cost, fertilizer, hormone, fuel, electricity cost and some fixed cost like land use cost, tools and equipment cost was required. Marketing cost is also estimated at different

stages of the value chain. Table 3 shows that out of the total cost, the hatchery owners spent 95.08 percent on production and 4.91 percent on the marketing of 10000 pieces of tilapia fingerlings.

Returns of hatchery owners: To estimate the net return of the tilapia hatchery owners, it was necessary to calculate the owner's gross return. In Table 4, Gross return was calculated by multiplying the total amount of produce by average sales price.

Net margin and value addition of different intermediaries: According to Kohls and Uhl (2005), marketing margin in a sense is the price of all utility adding activities and functions that are performed by the intermediaries. In this study, gross marketing margin was calculated as the difference between the price received by the hatchery owners and the price paid by the final fish farmers. Marketing margins of tilapia fingerling were calculated separately for different intermediaries. Marketing margin of each type of intermediaries was calculated by deducting the purchase price of fingerlings from their sale prices while net marketing margin is calculated by deducting the marketing cost from gross marketing margins.

It was revealed from Table 5 that the marketing margin of *Paiker* was higher (Tk. 1381.84) than wholesaler and retailer's marketing margin. The marketing cost was relatively higher for wholesalers than other intermediaries. The highest sales price per 10000 pieces fingerlings received by the retailer was Tk. 7220.13 and the lowest sales price received by *paiker*

was Tk.5185.80 for Tilapia fish seed. In the value chain, the highest value was added by *paiker* that was 36.32 percent and the lowest value was added by the retailer which was 18.37 percent.

Table 3. Total cost of hatchery owner (Tk./10000 Pieces).

Cost items	Cost (Tk. /10000 Pieces)
variable cost	
Brood fish costs	295.89
Feed costs	245.19
Chemicals &Fertilizers	73.41
Hormone	132.07
Electricity and Fuel	134.46
Dewatering & Re excavation	112.01
Others (Telephone bill, Human labor)	398.69
1.Total variable cost	1391.72
Fixed cost	
Land use cost	273.4
Farm building and other structure cost	188.89
Hapa and Net	79.93
Bucket and Drum	37.55

Table 5. Marketing margin and Value addition of different intermediaries (Tk. /10000 Pieces).

Intermediaries	Purchase price	Sale price	marketing margin	Marketing cost	Net margin	Value addition (percent)
<i>Paiker</i>	3803.95	5185.80	1381.84	150	1231.84	36.32
wholesaler	5116.16	6093.43	977.27	216.3	760.97	19.10
Retailer	6099.36	7220.13	1120.77	148.5	972.27	18.37

Conclusions and Recommendation

The findings of this study indicated that a large number of people were involved in the tilapia fish seed value chain. Most of the hatchery owners and actors were

Cost items	Cost (Tk. /10000 Pieces)
Machine	57.02
2.Total fixed cost	636.79
A. Total production cost (1+2)	2028.55 (95.08percent)
Marketing cost	
Transportation	45.6
Loading and unloading	32.53
Personal expense	26.6
B. Total marketing cost	104.73 (4.91percent)
Total cost (A+B)	2133.28 (100percent)

Source: Field survey, 2018

Table 4. Gross return and net return of hatchery owner (Tk. /10000 Pieces).

Items	(Tk. /10000 Pieces)
Gross return	3707.13
Variable cost	1391.75
Total cost (TPC+TMC)	2133.28
Gross margin (A-B)	2315.38
Net return (A-C)	1573.85

self-financed for production as well as in the value chain activities. Due to the involvement of different intermediaries in this trade, the fish farmers had to pay more price than the actual price of tilapia fingerlings in the study area. Overall, the marketing of tilapia fish

seed was a profitable business. But to bring its maximum profit, several recommendations can be put forwarded. Firstly, operating costs must be reduced as much as possible. This can be achieved through biological and technological mechanisms, such as: reducing seed loss, labor costs, and other operating costs and employing the most efficient methods of production taking into account ecological and environmental factors. Markets should be free from the control of *paikers* so that hatchery owners could receive the actual fair price. Finally, the government's appropriate and flexible policies and incentives will encourage the expansion of tilapia fish seed farming and thereby will contribute to increasing tilapia fish seed production in the study area and the country as a whole.

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