

Fish seed marketing network in Digharkanda, Mymensingh District

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ABSTRACT

The study focused on the fish seed marketing network at Digharkanda, near BFRI, aiming to identify the diversity of actors involved, distribution patterns of fish seed across Bangladesh, seasonal demand, and value chain benefits for various stakeholders. Primary data were gathered from Fish Seed Selling Shops (FSSSs) during the breeding season. Results showed that 65% of fish seed was sold locally within Mymensingh, while 35% was distributed to other districts. Each FSSS employed 8-9 individuals, sustaining livelihoods through the fish seed business. During the breeding season (March to October), FSSSs transacted approximately 2524 kg of hatchery-produced seed, 2000 kg of nursery-produced seed, and 2500 kg from external sources. The marketing channel generated profit margins of BDT 3,350,000 for hatcheries and BDT 6,000,000 for nurseries. Fish seed demand was found to fluctuate seasonally, but the year-round marketing of catfish and carp seeds helped sustain FSSS operations. Notably, Chital seeds were priced higher than others, with tilapia seeds being the lowest in price. The study also identified several key challenges faced by seed producers and traders, including brood fish disease, inbreeding issues, transportation difficulties, and limited access to credit.

INTRODUCTION

Bangladesh's fisheries sector is separated into three sub-sectors: inland capture, inland culture, and maritime fisheries (DoF 2016). The inland fishery is further divided into two sub-sectors: inland capture and inland culture fisheries. Capture fisheries include i) Freshwater capture fisheries and ii) Marine water fisheries. Besides, culture fisheries include freshwater aquaculture and coastal aquaculture. The principal input of culture fisheries or aquaculture is quality fish seed and the extension and improvement of aquaculture production depend on availability of seeds. Aquaculture is related to the cultivation of both aquatic animals and aquatic plants. Aquaculture is generally perceived as fish farming and it involves the natural or controlled cultivation of shellfish, fish and seaweed in freshwater and marine environments.

Bangladesh is an important country for fish production. The fish production in river or open water is decreased for different causes. At present,

there are huge number of fish are produced from aquaculture. Aquaculture contributes 58% of inland fish production in Bangladesh (DoF, 2022). Fisheries and aquaculture together, directly or indirectly, play an essential role in the livelihoods of millions of people around the world. It was estimated that 15 million peoples were directly or indirectly involved in fish production of Bangladesh (DoF, 2022). Over the last three decades, aquaculture has been developed as the fastest growing food producing sector in the world playing an important role in poverty elevation. In 2020-2021, the total fish production of Bangladesh was 46.21 lacMT of which 26.38lac MT came from inland aquaculture (DoF, 2022). The two principal sources of fish seed are natural sources, such as rivers, and government and private hatcheries (Bhuyan et al., 2011). In 2021, total fish seed production from combined sources was 670.953 metric tons (MT), over 2.5 times greater than 276.481 MT in 2001-2002. More than 99% of fish seed comes from fish hatcheries, demonstrating that the fast expansion of inland aquaculture in Bangladesh has been enabled by

increased access to hatcheries producing fish seed (Hasan and Bart, 2006; Barman et al., 2007; Brummett, 2007). The increasing seed demand for the developing aquaculture sector and the decrease in seed supply from natural sources resulted in the creation of many hatcheries throughout the country (Islam et al., 2017). Currently, aquaculture is primarily dependent on fish seed generated in hatcheries (Debnath et al., 2020). Modern aquaculture technologies have many influences on fish seed production (Islam, 1989). It helps on fish seed production by induced breeding (Goswami, and Dana, 2007).

In 1967, Mr. Yusuf was first started induce breeding in Bangladesh. The induced breeding and fish seed stocking were started by private and government hatchery in 1980. Fish seed production can be increased through the introduction of scientific and intensive culture and can easily be done in controlled water bodies like ponds and borrow pits.

The main sources of fish seed in Bangladesh were natural spawn collected from rivers and those produced in public and private hatcheries. The share of hatcheries in supplying fish fry was very minimum. So, the fish farmers have to depend on wild seed collected from rivers and they received more than 85 percent of their total recruitments from this source. There is no actual estimate what amount of fish seed is needed annually for culturing in ponds and other possible areas. However, it has been observed that the demand for fish seed is very high during stocking period and gradually both demand and price of it are increasing.

The good quality of fish seed are produced by BFRI due to use of scientific technology. BFRI produced good quality of fish seed with scientifically and the extension work for seed production is done through DoF. The fish seed production technology of BFRI helps to develop business among many entrepreneurs. As a result, fish seed selling shops (FSSSs) were developed at Digharkanda beside BFRI, Mymensingh. They supply fish seed in different districts of Bangladesh. But there is no absolute information in this regarding field. So, the aim of this research

is to know the fish seed marketing network at Digharkanda under Mymensingh district.

MATERIALS AND METHOD

Selection of the study area

Degharkanda area beside BFRI (Bangladesh Fisheries Research Institute) head quarter, under Mymensingh district was selected for this study. This area is renowned for selling a huge number of fingerlings and marketing. There are number of successful hatchery owners, fingerling producers, traders, retailers, fish producers etc. available in this area.

Target groups

The main target respondents were from fish seed selling shops (FSSSs). However, within the shop's other stakeholders such as workers in the shops were the main respondents.

Semi-structured questionnaire interview

A set of items were listed and grouped in the logical sequence, so that the managers and owners of the hatchery and nursery could answer easily. The questionnaire includes questions on physical facilities that were available in the hatchery and nursery, cost of seeds production and rearing of fry and fingerlings, income from sale of spawn, fry and fingerlings and other relevant aspect of seed production and marketing.

Data for this study were collected from the respondents of the study area by the researcher himself. Then the questions were asked in a sample manner with explanations and the replies were recorded on the schedules. Whenever any respondent faced difficulty in understanding any question, the researchers took out most care to explain the question clearly.

Data processing and analysis

For achieving the objectives of the study data were analyzed. After filling up semi-structured questionnaire, these were scrutinized and the collected data were processed and edited. Data were presented mostly in the tabular form, because

it is simple in calculation, widely used and easy to understand. Then the collected data were transferred to Microsoft Excel where these data were compiled, classified, summarized to facilitated tabulation and analyzed. A list of tables was prepared in accordance with the aims and objectives of the study and appropriate graph were used in data analysis.

RESULTS

Actors involved in the seed selling shops

Fish seed selling shops (FSSSs) play an essential role in aquaculture. Over the years, there were number of FSSS developed at Digharkanda beside Bangladesh Fisheries Research Institute (BFRI), Mymensingh. There were about 13 fish FSSSs situated beside BFRI, Mymensingh. There were about 8-10 peoples found involved in each FSSSs. They have many activities. The activities of the people in the FSSSs are as follows in Table1.

Table 1: The diversity of actors/stakeholders involved in the FSSSs

Name of the person	No. of people involved	Activities
Fish seed transporter	2	They bring fish seed from hatchery to FSSSs
Fish seed carrier	2	They caring fish seed
Fish seed transporter	1	He manages the track or other vehicle
Seed shop manager	1	He keeps record of sale of seed in shop
Seed shop caretaker	1	He arranged and cleaning the seed whole sale
Security guard	1	shop. They maintain the security of selling
Total person involved	8	shop

Table 2: Actors involved in the hatchery operation

Name of the people	No. of people involved	Activities
Brood fish carrier	2	Manage and carry brood fish for induced breeding
Hatchery technician	1	Inject brood for induced breeding
Hatchery operator	2	They operate the hatchery for breeding of fish
Pump operator	1	Operate pump for water supply in the hatchery
Security guard	1	Maintain the security of hatchery
Total person involved	7	

Table 3: Price of different fish seed in the study area

Species	Size (cm)	Price BDT. per individuals	Number of fish seed/Kg
Catla	1.27-2.54	0.6	4500
Carpio	1.27-2.54	0.6	4000
Shing	1.27-2.54	1	5000
Magur	1.27-2.54	2	5000
Pabda	1.27-2.54	2	4300
Gulsha	1.27-2.54	2	4500
Chital	1.27-2.54	15	4200
Thai koi	1.27-2.54	0.6	4500
Pangas	1.27-2.54	1	4000
Tilapia	1.27-2.54	0.5	5000
Black carp	1.27-2.54	7	5000

Price of fish seeds

Price of fish seed depends mainly on the fish species, size of fish seed, time of stocking demand

and supply. Price of Chital (*Notopterosus chitala*) seed was found to be the highest in seed selling shop and the lowest was Tilapia (*Oreochromis*

mossambicus). The price of different fish seed in study area are shown in Table 3.

Diversity of actors (hatchery)

There are 86 fish hatcheries in Mymensingh functioning currently. There are many people involves in hatchery operation activities Table 2.

The distribution network of fish seed from the fish seed selling shops (FSSSs)

Fish seed distribution is an important factor for the fish seed marketing network. Proper quality of fish seed depends on the distribution system or transportation system. The fish seeds are transported with open system or close system with oxygen. An oxygenated bag contains 250-300 g hatchlings for the best use with 24 h (Haque et al., 1991). Traders used to use track, van, pickup, microbus, train, auto-rickshaw, bicycle etc. Forias were seen to sell the fingerlings to the fish farmers door to door on foot hanging aluminum patils (pot) on their shoulder. Train or pickups vans were found to the main means of transportation of fry to the distance place.

There was a large amount of fish seed produced in the hatchery (Shagor Fish Farm and Hatchery) at Digharkanda beside BFRI, Mymensingh which is engaged with a FSSS designated with the same name. It was found that each hatchery owner produced an average of 2524 Kg of hatchings each season. About 65% fish seed were sold in the FSSSs beside BFRI, Mymensingh and the rest were sold in other districts of the country. Hatchery owner or shop owner sold their fish seeds in different districts such as Dinajpur, Rangpur, Nilphamari, Gaibandha, Joipurhat, Kurigram, Bogra, Pabna, Nator, Tangail, Gazipur, Jamalpur, Sherpur, Kishoreganj, Comilla, Sylhet, Chittagong, Tangail, Noakhali, Fani, etc. This means most of the seed from this place are traded to northwest Bangladesh.

A large number of people were found involved in the fish seed transportation system and fish seed marketing network. The price of fish seed are increased with the transportation cost. The distributions of fish seed from this market to different area in Bangladesh are shown in Table 4.

Table 4: Districts with their location where seed are traded from FSSSs

Name of the districts	Distance from Digharkandha, beside BFRI, Mymensingh	Time take to carry	When start to carry the fish
Dinajpur	450 Km	8.00 h	Early morning
Rangpur	395 Km	7.00 h	Early morning
Gaibandha	278 Km	5.30 h	Early morning
Bogra	220 Km	4.00 h	Morning
Rajshahi	265 Km	5.00 h	Early morning
Nator	210 Km	4.30 h	Morning
Nowgon	275 Km	5.00 h	Early morning
Netrokona	70 Km	2.00 h	Morning
Sirajgonj	145 Km	3.00 h	Morning
Khulna	545 Km	9.00 h	Night
Joshore	485 Km	8.30 h	Night
Tangail	97 Km	2.00 h	Morning
Jamalpur	80 Km	2.00 h	Morning
Sherpur	60 Km	1.30 h	Morning
Gazipur	55 Km	1.30 h	Morning
Kishoregonj	70 Km	2.00 h	Morning
Comilla	255 Km	5.00 h	Early morning
Noakhali	330 Km	7.00 h	Night
Sylhet	326 Km	6.00 h	Early morning
Chittagong	425 Km	9.00 h	Night

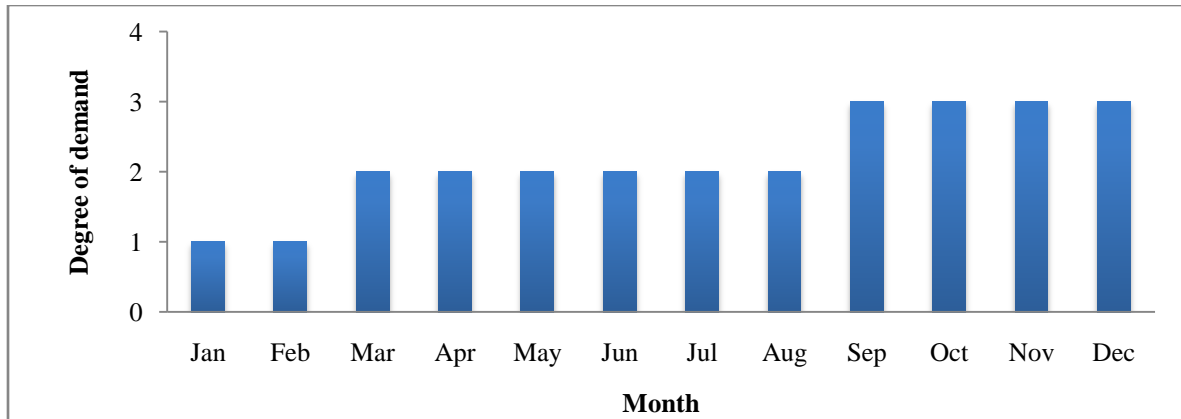


Figure 1: Seasonal demand of Common carp (*Cyprinus carpio*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

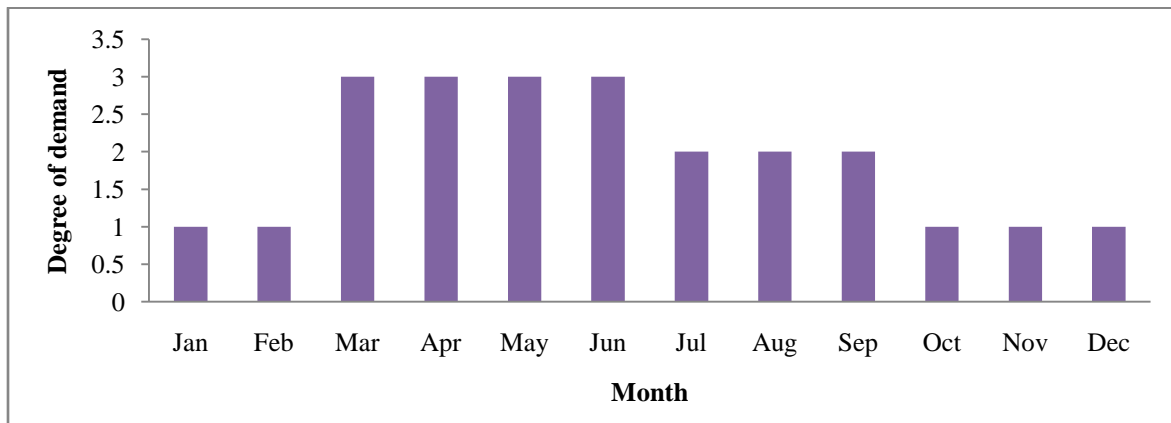


Figure 2: Seasonal demand of Catla (*Catla catla*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high).

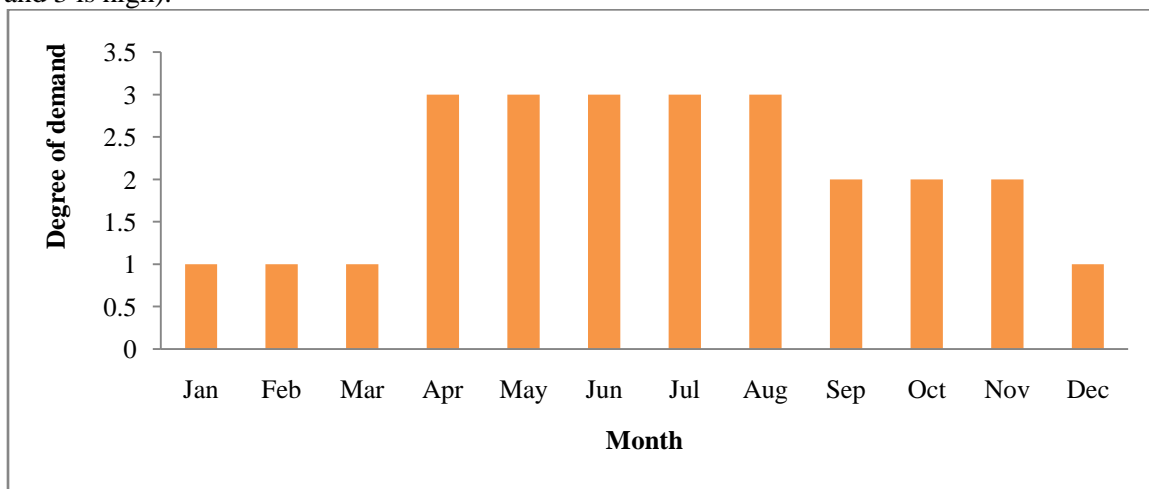


Figure 3: Seasonal demand of Shing (*Heteropneustes fossilis*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high).

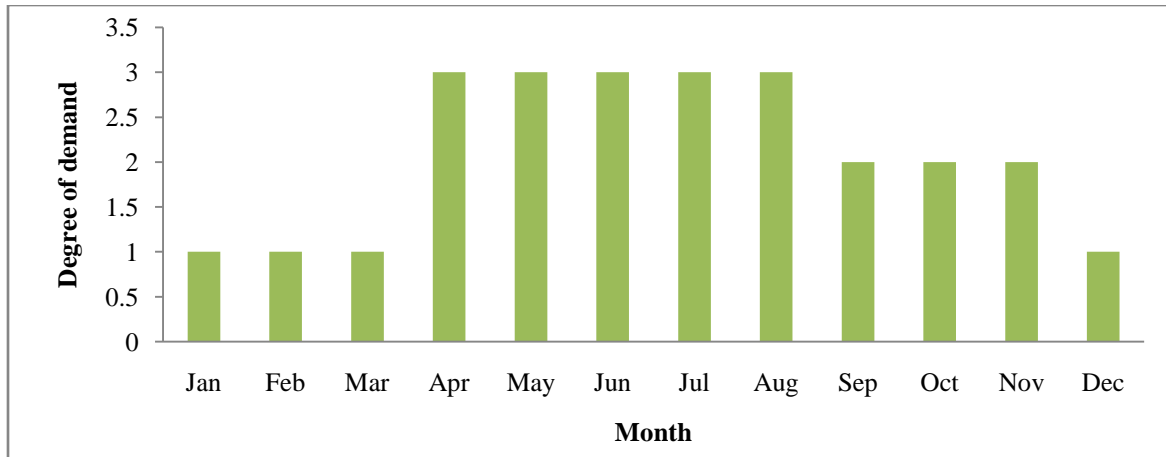


Figure 4: Seasonal demand of Magur (*Clarias batrachus*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

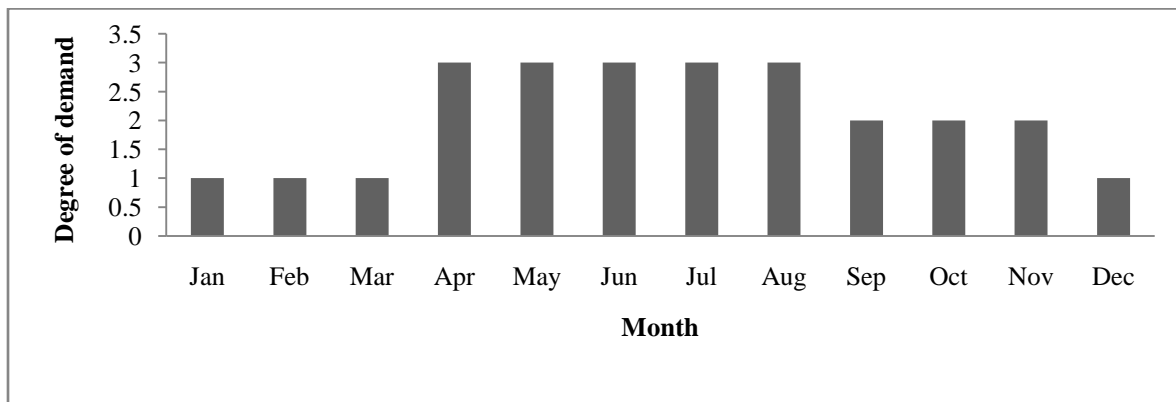


Figure 5: Seasonal demand of Pabda (*Ompok pabda*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

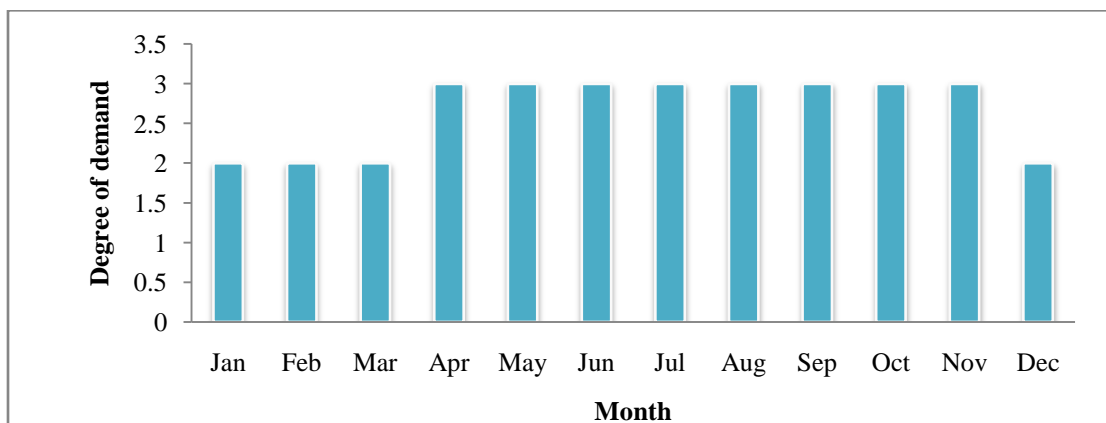


Figure 6: Seasonal demand of Gulsha (*Mystus cavasius*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high).

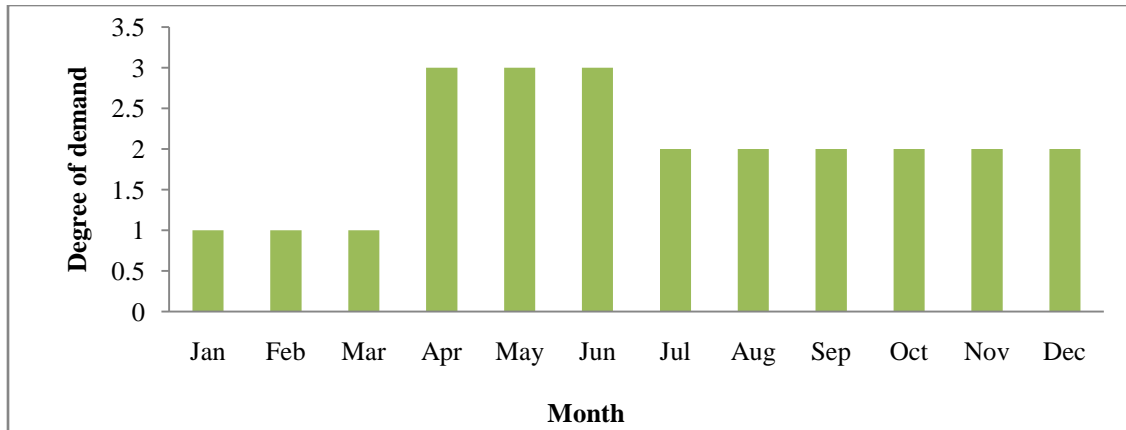


Figure 7: Seasonal demand of Pangas (*Pangasianodon hypophthalmus*), seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

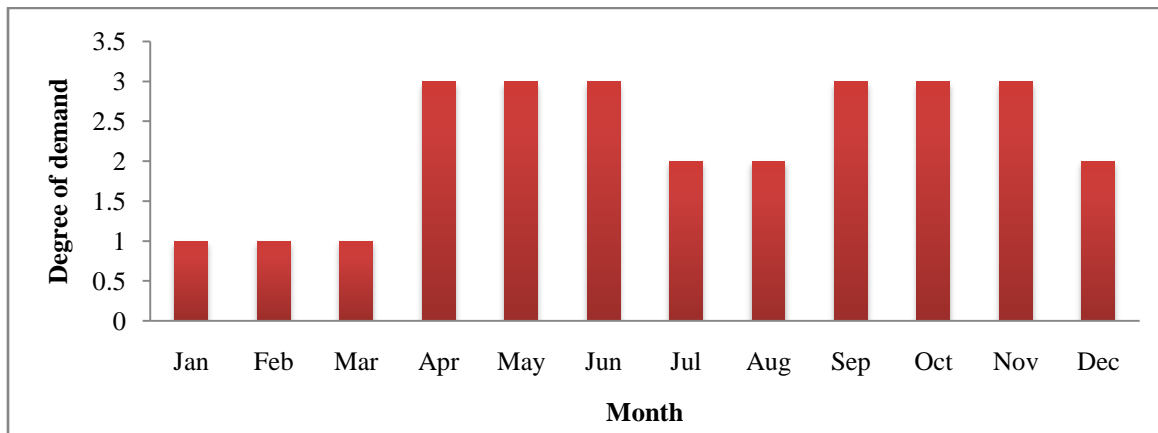


Figure 8: Seasonal demand of Chital (*Notopterus chitala*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

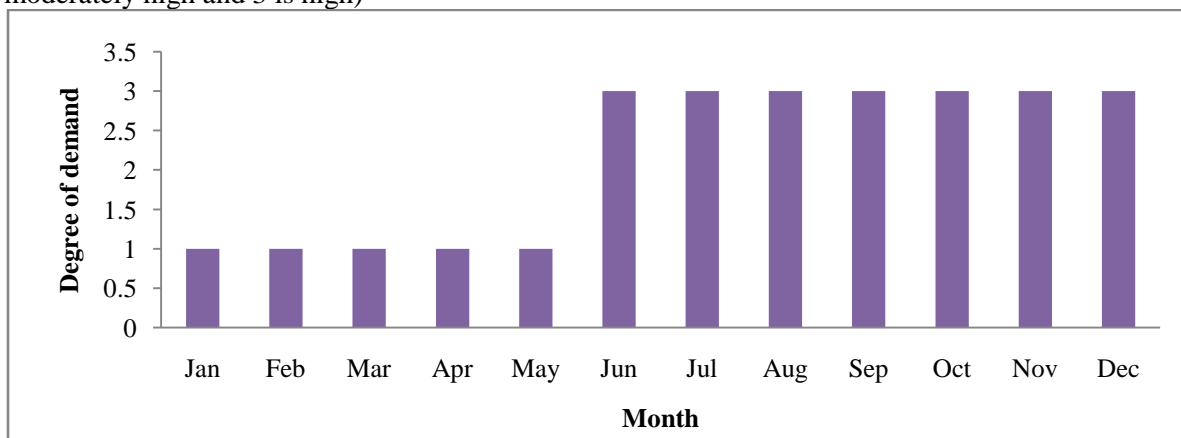


Figure 9: Seasonal demand of Tilapia (*Oreochromis mossambicus*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

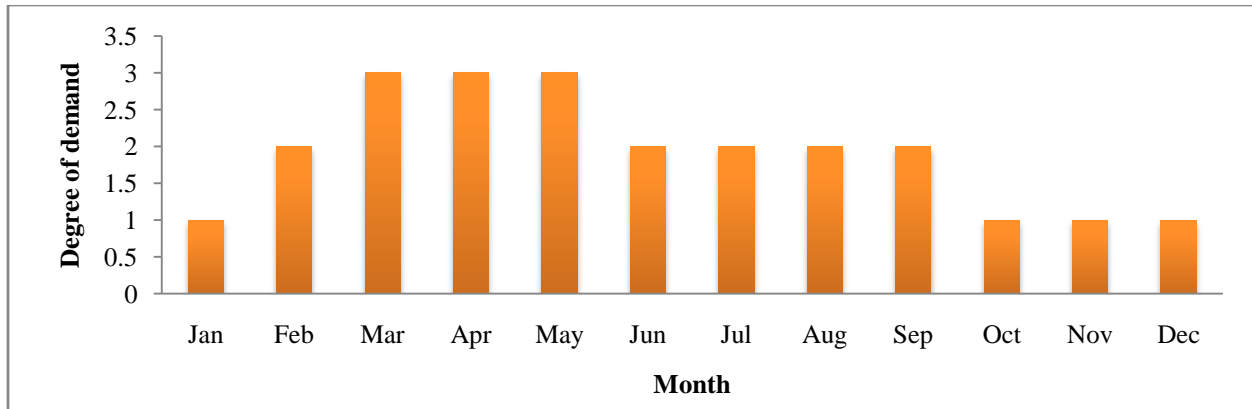


Figure 10: Seasonal demand of Koi (*Anabas testudineus*) seed (degree of demand 1 is low, 2 is moderately high and 3 is high)

The seasonal demand of fish seed

The demand of fish seed is varying with the variation of season. Some fish seed have low demand and other hand some species of fish seed have high demand in same season. The seasonal demand of some fish seeds is shown diagrammatically in Figure 1-10.

Sources of fish seed at FSSS

The fish seed comes in FSSS from different sources specially hatchery, nursery and other sources. The benefits of different level in fish FSSS are shown in Figure 11.

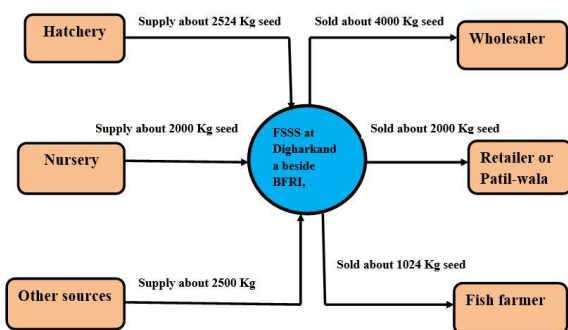


Figure 11: Sources of seed and supply from FSSS.

It is shown that a large amount of fish seed comes from hatchery, nursery and other sources (Figure13). The total amount was about 7024 Kg of fish seed transected through FSSSs from

different sources specially hatchery, nursery and other sources. The fish seed were distributed, about 4000 Kg through wholesaler, about 2000 Kg through patil-wala and about 1024 Kg seed to fish farmer. So, it can be said that each FSSSs beside BFRI, Mymensingh distributed about 7024 Kg of fish seed in each season.

Fish seed marketing network

Fish seed marketing network with FSSSs at Digharkanda beside BFRI, Mymensingh are shown in diagram bellow Figure 12.

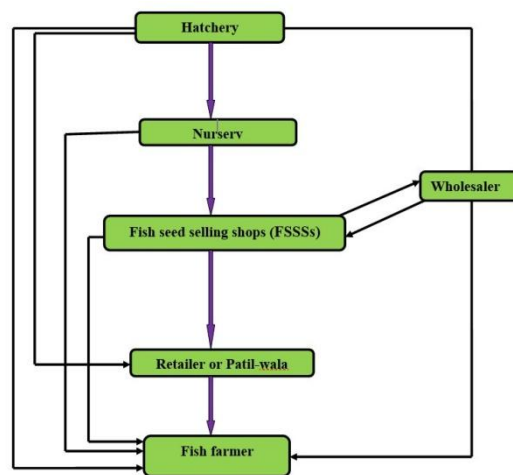


Figure 12: Fish seed marketing network with FSSSs beside BFRI, Mymensingh

Benefits of fish farmers

Aquaculture business is a very profitable business. In this business price of fish seed is an important factor. The price of fish seed fluctuates on the basis of seed size, species, seasonal availability of fish seed. The benefits of fish farmer are shown in diagrammatically Figure 13.

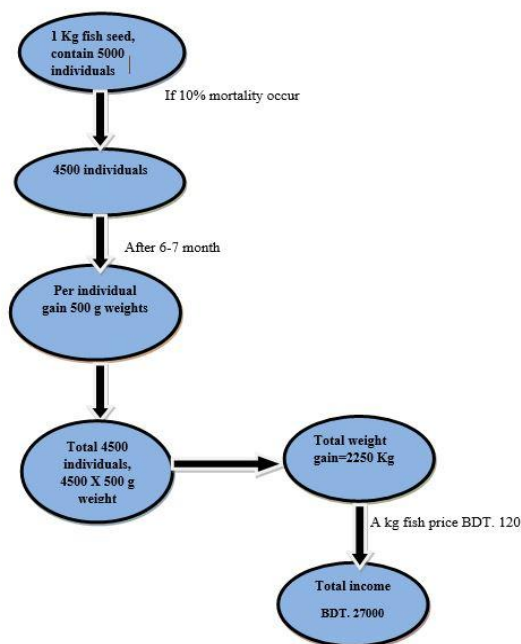


Figure 13: Diagram of the benefits of fish farmer from 1 kg fish seed.

Benefits of hatchery owner

Hatchery business is a profitable business. The benefits of hatchery owner are shown in Table 5.

Benefits of nursery owner

The nursery owner earns much money from this business. The benefits of nursery owner are shown in Table 6.

Demand of fish seed

The demand of fish seed from the selling shop was year-round (Table 7). The major peak of the majoring of the species was between the months of April to November. The remaining month is saturated by the demand of cat fish such as Gulsha (*Mystus cavasius*) and Pangas (*Pangasianodon hypophthalmus*).

Table 5: Benefits of hatchery owner from seed production in each season

Hatchery attributes	Cost/return
Total production in hatchery in a year	2100 Kg
Total production cost for 2100 Kg seed	BDT. 4,000,000
Price of 1 Kg seed	BDT. 3500
Price of 2100 Kg seed	BDT. (3500 X 2100)
Total revenue	BDT. 73500000
Total benefits of a heathery in each season	BDT. (7350000 – 4000000) = BDT. 3350000

Table 6: Benefits of nursery owner from seed production in each season

Nursery attributes	Cost/return
Total amount of nursing seeds in a year	70000 kg
Total nursing cost	BDT. 2500000
Price of 1 Kg fingerlings	BDT. 170
Price of 70000 Kg seed	BDT. (70000 X 170)
Total revenue	BDT. 11900000
Total benefits of a nursery in each season	BDT. (11900000 – 4000000) = BDT. 7900000

Table 7: Seasonal demand of fish seed from FSSS

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common Carp	1	1	2	2	2	2	2	2	3	3	3	3
Shing	1	1	1	3	3	3	3	3	2	2	2	1
Magur	1	1	1	3	3	3	3	3	2	2	2	1
Pabda	1	1	1	3	3	3	3	3	2	2	2	1
Chital	1	1	1	3	3	3	2	2	3	3	3	2
Gulsha	2	2	2	3	3	3	3	3	3	3	3	2
Pangas	1	1	3	3	3	2	2	2	2	2	2	2
Tilapia	1	1	1	1	1	3	3	3	3	3	3	3
Koi	1	2	3	3	3	2	2	2	2	1	1	1
Catla	1	1	3	3	3	3	2	2	2	1	1	1

Note: 1 = Low seasonal demand of fish seed; 2 = Moderately high seasonal demand of fish seed; and 3 = High seasonal demand of fish seed.

DISCUSSION

Fish seed is the main input for aquaculture operation. Successful aquaculture depends on quality fish seed production. Hatchery helps directly for fish seed production. Bangladesh has many government or private hatcheries. In 2020–2021, it was estimated that Bangladesh has 103 government and 953 private fish hatchery (DoF, 2022). These hatcheries produce about 6, 68801 kg fingerlings (DoF, 2022).

The study identified 13 fish seed selling shops (FSSSs) in the study site. Out of 13 FSSSs, 7 of them had own hatcheries. They produce seeds in the hatchery and bring in the selling shop for sell to the customers across the country. At the beginning of the season, they prepare and repaired the ponds and tank if necessary. In present study, it was found that the hatchery and nursery activities start from late February and continued up to August to September. The peak seasons of seed production were April to May.

The shop owner or hatchery owner collect brood fish to produce seed in their hatchery as well as they collected some brood from outside mainly from the Jamuna and the Halda river every year to avoid inbreeding problems. The brood fishes were used for breeding for 5-6 years and then the brood was sold in the market, because the amounts of spawn laying by them after five years were comparatively low.

The hatchery owners involved in FSSSs produced a variety of fish species like Indian major carps,

cat fishes and exotic carps such as Silver Carp (*Hypophthalmichthys molitrix*) Grass Carp (*Ctenopharyngodon idella*), due to higher growth rate and good market price. They also produce fry of Thai Koi (*Anabas testudineus*), Magur (*Clarias batrachus*), Shing (*Heteropnuestes fossilis*), Pabda (*Ompok pabda*) etc.

Hatchery business is very profitable business (Siddique, 1999) in the aquaculture value chain. The owner of FSSS has hatchery that produce huge amount of fish seed for aquaculture production. Each hatchery were produced about 2524 kg of hatchlings in each season for selling in the market. Many people were involved in each hatchery for producing the fish seed. The present study explored that each hatchery had 7 workers. Bangladesh has total 1056 hatcheries both government and private (DoF 2022). So, it is clear that a large number of people are involved in aquaculture business.

The price of fish seeds of different species varies through the year round. The price of fish seeds depends on the size, species and season. The price was higher at the beginning of the season and at the end of the season, but comparatively less than the supplies of the availability. In the study area, the price of Chital (*Notopterus chitala*) seed was found to be highest in the study site and lowest price was of Tilapia (*Oreochromis mossambicus*).

Transportation is essential for live product distribution like fish seed. The major proportion of fish seeds are sold from FSSSs within Mymensingh district. However, the rest of seed

were transported in different districts of Bangladesh. The transportation of fish seed was very important for maintain good quality of fish seed. The transportation was done with open or close system.

Fish seed are transported by means of truck, bus, train, pick-up, auto-rickshaw, van etc. Train, truck or pick-up, are found to be the main means of transportation of fish seed to the far distance. Haque et al. (1991) found that oxygenated bag was used for transportation of fish seeds. An oxygenated bag contains 250-300 gm hatchlings for the best use within 24 hours. Before supplying fish seed into long distance, there is a need to conditioning the fry. The farmers transport in plastic drum with water or in aluminum pot by hand agitation of water. This kind of transportation cause physical damage of fry which sometimes led to caused much more mortality.

There were many people found involved in the transportation system of fish seed. They earn money from the transportation system. The fish seed prices were increased with the transportation cost. The fish seed wholesaler or shop owner sold their seed including their transportation cost. As a result, the price of fish seeds were fluctuated with the transportation cost.

Seasonal demand of fish seed is very important in fish seed marketing. The demand of fish seed varying with the variation of the season. In this observation, it was shown that the demand of fish seed contains year-round. So, it was clear that the fish seed business running whole year.

The price of fish seed depends on the marketing networks of fish seed. In the study site, some FSSSs owner had hatchery and they produce fish seed. The nursery owner, retailer got seed from the hatchery. The farmer can get fish seed from hatchery, nursery, and retailers or FSSSs. The wholesaler's gets fish seed from FSSSs. The farmer can also get fish seed from hatchery through wholesaler. It was observed in the present study that there were some problems associated with the seed marketing which hindered the progress of the business. The real problems were lake of disease tolerant brood in hatchery, lake of technical knowledge, price fluctuation and

unexpected market competition. On the other hand, the lakes of capital, lake of transportation facilities were the main problem for the fish seed traders. A previous study showed that the problem of selling spawns and lack of capital was crucial constraints for hatchery operation in Bangladesh (Siddique, 1999).

CONCLUSIONS

The present study was carried out to understand the fish seed marketing network at Digharkanda beside BFRI, Mymensingh. The seed production activities took place during late February and continued up to September. Peak season of business was found during April to May. It was also found that the fish seeds were distributed from FSSSs in different districts of the country. Many people were involved in transportation of fish seed so it was clear that it creates employment opportunities of many peoples. The present study explored the existing marketing network of fish seed beside BFRI area and benefits of the stakeholders were highlighted.

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