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Rapid assessment of fish seed and feed in Rangpur and Rajshahi divisions for the Project ‘Aquaculture: increasing income, diversifying diets, and empowering women in Bangladesh and Nigeria’

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This study was conducted for

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We hope the study will enable WorldFish to develop an effective plan for implementing the BMGF-funded project to strengthen its contribution to the development of the fisheries sector in Bangladesh.

List of abbreviations

BFRI	Bangladesh Fisheries Research Institute
DoF	Department of Fisheries
FGD	focus group discussion
GOB	Government of Bangladesh
IDI	in-depth interview
KII	key informant interview
LSP	local service provider
MFI	microfinance institute
NATP	National Agriculture Technology Program
PG	pituitary gland

Glossary

terms	Meaning
Dholok	*Dholok* is the custom of supplying additional volume of fish to brokers and paikers which accounts for the lost weight of fish resulting from dehydration after extraction from ponds
Faria	*Farias* are intermediaries usually operating in the fish marketing process who purchases small quantity of fish from fish producers far from the market and carry it to the terminal point and sell it to a retailer
Paikar/Dalal	A *Paiker/Dalal* is a middleman in the fish marketing chain; often covers the assembly function in the chain
Patilwala	Fry and fingerling seller who collects the fry or fingerling in pots known as *patil* and sells these to the fish farmer either from a central market or door to door
Stages of fish seed	
Spawn/*Renu*	Swimup Spawn- general 3-5 days old. Typically sold by the kg. Chinese and Major Carps about 200,000- 400,000/kg
Fry/*Dani*	Small, 1 inch (2-3 week old fish)
Advanced Fry	1 – 3 inch
Fingerling	3 – 4 inch (1 to 2 months)
Advanced Fingerling	5 – 9 inch

Executive summary

Aquaculture: Increasing Income, Diversifying Diets, and Empowering Women in Bangladesh and Nigeria is a project funded by the Bill & Melinda Gates Foundation. Implemented by WorldFish, the 50-month investment in Bangladesh builds on the country's emerging opportunities for expanding markets in sustainable aquaculture to (1) increase fish supply, (2) improve access to and consumption of fish and fish products among vulnerable groups, and (3) strengthen women's decision-making power and control over resources, assets and the income derived from fish farming and marketing. The project focuses on Rajshahi and Rangpur divisions in northwest Bangladesh. Although these areas have high levels of poverty and malnutrition, they have agro-ecologies and farming systems suitable for enhancing the productivity of fish production systems for smallholder and homestead farmers. This is one of the its key objectives, as outlined by the project itself: "Increase productivity of homestead fish production systems, including nutrition-sensitive polyculture and rice-fish systems, by 50% for 1 million smallholder households in Rajshahi and Rangpur divisions by the end of 2022." In line with this objective, and as part of the project's startup, Innovision conducted a rapid assessment to identify the feed and seed input supply for fish aquaculture in Rajshahi and Rangpur divisions. This document presents the findings of the assessment.

The assessment used several approaches to collect data in Rangpur and Rajshahi divisions, including a literature review, key informant interviews (KIIs), in-depth interviews (IDIs) and focus group discussions (FGDs)—all of which fed back into each other when compiling the data. Field observations were also used in selected areas of the two divisions.

MAJOR FINDINGS

Fish seed

The following are the main results the study team found during its field visits:

- The highest concentration of hatcheries, nurseries, feed mills, feed dealers and other actors is in Bogura and Naogaon districts of Rajshahi Division.
- Bogura, Naogaon and Rajshahi are the most prominent districts for spawn and fry production in Rajshahi Division, and the number of feed mills and dealers is also high in these areas. Sirajganj and Pabna districts also rank high in terms of the number of ponds and fish production volume.
- Bogura is the most prominent district for hatchling production in Rajshahi Division. It has 96 hatcheries, with the highest concentration being in Adamdighi Upazila, which has 56.
- Even though the number of hatcheries is higher in Bogura, Rajshahi produces more seed (70,366 t) than Bogura (69,561 t) between the two districts.
- In Rajshahi Division, the number of nurseries is highest in Naogaon (494) followed by Bogura (309).
- As per Department of Fisheries data (DoF 2017) data, 107,433 kg of hatchlings were produced in Bogura District, nearly 40% of which (42,625 kg) were major and exotic carp species.
- Rangpur Division has a high number of homestead and smallholder farmers who use their pond as nurseries. This is confirmed by data collected from secondary sources.

The study team was able to determine the number of nurseries operational in Rangpur Division but not for Rajshahi Division, as DoF could not provide the number. Among the districts in the two divisions, the number of nurseries is highest in Kurigram (852) then Rangpur (506), according to recent information from DoF. In Rangpur, a large number of homestead and smallholder farmers use their ponds as nurseries, an observation supported by secondary data. Farmers reported that nursing is a profitable business for smallholder farmers who have limited pond area and can gain income at smaller intervals. Kurigram (852), Dinajpur (587) and Rangpur (506) have the highest number of nurseries among the districts in Rangpur Division, whereas Rangpur (20), Gaibandha (17) and Dinajpur (17) have

the highest number of hatcheries. In terms of production volume, Dinajpur ranks number one, with 42,551 t of fish seed, and it also has the most ponds in the region.

In Lalmonirhat District, apart from hatcheries and nurseries in ponds, fingerling production in rice-fish culture in 2018 produced 157 t in Kakina Upazila and 453.75 t in Aditmari Upazila, with prices ranging from BDT 180 to 200/kg. There are about 1000 rice field nurseries in Aditmari alone, spread over 550 ha and involving more than 1000 farmers. The number of rice field nurseries is lower in Kaliganj Upazila, where 244 nurserers produced carp fingerlings from July to September in over 45 ha.

Feed

The highest number of feed mills and dealers are in Bogura, Naogaon and Rajshahi districts. Fish farmers and hatchery and nursery owners use both homemade and commercial fish feed. In homemade feed, hatchery and nursery owners use a mixture of rice bran, mustard oil cake, sesame oil cake and fishmeal. Throughout Bangladesh, there are about 100 commercial fish feed manufacturers, of which 46 are active in Rajshahi and Rangpur divisions. Among commercial feeds available locally, the most noteworthy brands are Quality Feeds Ltd, Aftab Feed Products, Paragon, CP Feeds, Nourish Bangladesh, Mega Feed, Biswas Poultry & Fish Feed, Aman Feed, Nabil Feed Mills and Tongwei Feed Mills Bangladesh. Feed dealers allow large commercial fish farmers to purchase feed on credit, but this service is not extended to small farmers.

Private sector organizations provide some embedded services, presenting themselves as technical experts to solve problems faced by farmers, nursery owners and hatchery owners. There are also some associations for hatcheries and fish fry marketing that also provide support to their members and link them to buyers and sellers. Feed companies also provide technical knowhow to existing and potential customers via sales agents, dealers and sellers. The DoF leads a number of government initiatives, which play a crucial role in encouraging private sector and public sector officials to work together by implementing local level projects targeted toward developing hatcheries and nurseries. Credit facilities are not well tailored or targeted toward hatcheries or nurseries and thus need special attention.

Only five women are involved in hatchery operations. These women work in their husband's or father's hatchery and assist them in injecting hormones and in hatchling production. Hatchery owners do not usually recruit women laborers because of social, religious and cultural issues, even more so since many of the tasks require working at night, which poses a security risk for women. The women interviewed are involved in broodfish selection and spawn production but not in marketing spawn, fry or fingerlings, or in any other task of the hatchery.

There are only a few organizations or institutions connecting hatcheries, nurseries and fish farmers to each other. The GOB's National Agricultural Technology Program (NATP) is trying to develop and popularize a fish farmers website, which will help hatcheries and fish farmers connect and buy and sell products through the site. But using the internet to find information is not prevalent among hatchery or nursery owners. Only a few seek information online and use different apps. They reported that the DoF app is more relevant for fish farmers than hatcheries and nurseries. Most of the hatchery and nursery owners communicate with brokers to get market information, and they rely heavily on technical officers from different aquachemical companies for support over the phone. Over 70% of value chain actors use mobile financial services, like bkash, for payment.

This report gives an idea of the study team's observations from the field and does not necessarily cover the entire production and marketing system of hatcheries, nurseries and feed mills operating in Rajshahi and Rangpur divisions. A comprehensive study is required to collect data from relevant stakeholders to strategize and design appropriate interventions to address the problems identified from the field for achieving the project's objectives by 2022.

1. Introduction

For the BMGF-funded Aquaculture project, WorldFish and partners plan to embed proven and emerging aquaculture technologies and production solutions by harnessing private and public sector products, services and practices, and conducive policies with the intention of sparking the transformation of Bangladesh's aquaculture sector at scale. The main areas for the project are Rajshahi and Rangpur in northwest Bangladesh. Private sector investment and policy change will enable scaling within these two divisions, and elsewhere in the country, in ways that help smallholders achieve fish productivity gains, value chain improvements and inclusiveness that will increase their income and improve the nutrition of vulnerable women and children at scale. The proposed investment is particularly important from a nutrition-sensitive perspective, because strengthening women's empowerment through the production of fish, a highly nutritious animal-source food, is a key pathway to improve the nutrition of women, as well as their family members.

The project's investment in Bangladesh also focuses strongly on developing local service providers (LSPs). These are "frontline" service providers selected from and by the community. The LSP model is a decentralized extension model that encourages local people (e.g. farmers, business owners and breeders) to provide extension services (e.g. knowledge, technology transfer and products) to farmers. LSPs sustain themselves as small businesses largely through commissions on selling products and services to farmers. The investment will help the emergence of professional LSPs and LSP organizations supporting smallholders to engage competitively in aquaculture production and value chains. In turn, this will help transition the LSP model into a private sector-oriented model, supported by private partners and investors.

As part of the project's startup, Innovision conducted a rapid assessment to identify current practices for improving productivity and diversification in the agro-ecologies of Rajshahi and Rangpur. This document presents the findings of the assessment, which attempts to inform the project of the current situation in the northwest divisions against information from government reports and other sources. From the results, WorldFish will know where interventions are required to improve the quality, production and availability of fish feed and seed for fish farmers in Rajshahi and Rangpur. Within these two divisions, a total of seven districts and 21 upazilas were covered in this study to get an overview for all the districts.

1.1 Objectives

The main objectives of the study were to identify the following:

- upazilas and unions in Rangpur and Rajshahi divisions with the most potential for fish aquaculture, using a matrix of available government statistics, other statistics, and data for the concentration of feed dealers, hatcheries and feed mills, as well as production and pond numbers
- the amount of feed mills, feed dealers, hatcheries and other actors in the study areas
- the main sources of feed and seed, and the supply chain or network reaching fish farmers
- the credit system within value chain actors along the feed and seed value chain
- the supply of feed and seed according to customer demand
- the promotion of feed and seed products
- fish seed production by species and volume and area
- sources of seed types and the prices differentiated according men and women farmers
- use of fish feed differentiated by men and women farmers
- production systems and quality control in the hatcheries and the scope for improvement
- marketing fish seed
- role of women in the fish seed sector, especially hatcheries
- access to information and support for hatcheries

- problems in doing business, and possible solutions.

2. Methodology

2.1 Methods of data collection

The rapid assessment used a literature review, KIIS, IDIs, FGDs and field observations to collect data. Together, these methods gleaned information that has been triangulated to get a representative picture of fish farming systems in project area.

Literature review

The study began with a thorough review of existing literature from WorldFish as well as other documents from public sector and development projects available on the web. This was supported by interviews with DoF officials and the private sector. Based on the review and discussions with WorldFish management, as well as the DoF, data collection tools, such as checklists and questionnaires, were developed for the respondents.

Key informant interviews

After consultations with DoF officials—Dr. Zillur Rahman, deputy director of aquaculture, the deputy director in Rangpur, as well as district fisheries officers and fisheries extension officers in both Rajshahi and Rangpur divisions —key experts and specialists to interview were determined, as well as areas to visit.

Figure 1: The consultations held at the different administrative levels

A total of 25 KIIs were conducted with key government fisheries officials and fisheries scientists in the respective divisions from the DoF and the Bangladesh Fisheries Research Institute (BFRI). The purpose was twofold: (1) to understand the prevailing farming systems and fish species most cultured and why, and then further validate this with interviews with lead farmers and private sector organizations, and (2) to understand the interactions among the public and private sector actors, mainly in terms of what support services are available for the farmers in Rajshahi and Rangpur divisions.

Other KIIs were done with four feed and aquachemical companies and dealers in the project areas to identify and confirm specific locations for certain forms of fish culture. Of the 70 KIIs carried out across the districts, only nine were women, because the study team found few women engaged in key positions along the aquaculture value chain.

In-depth interviews

IDIs were conducted to get a more local understanding of each area visited. These included 7 feed dealers, 30 fish farmers, 2 market actors, and 30 hatcheries and nursery owners who had in-depth information on the local practices since they supply the fish seed.

Overall, 70 IDIs were done to get a comprehensive picture of fish feed and seed input availability and quality for fish culture in Rajshahi and Rangpur divisions. The IDIs with the input sellers, nursery and hatchery owners, and farmers were particularly helpful.

Focus group discussions

To complement the information from the KIIs and IDIs, 14 FGDs were conducted with 147 fish farmers (127 men and 15 women). Although women made up only a small percentage of the overall respondents, they made up at least 40% of participation related to collecting data on nutrition and the involvement of women specifically.

Table 1. Number of FGDs in Rajshahi and Rangpur.

Division	District	FGDs	Participants	Men	Women
Rajshahi	Rajshahi	3	30	27	3
	Natore	1	12	12	0
	Naogaon	3	29	27	2
	Bogura	3	35	33	2
Rangpur	Rangpur	2	16	14	2
	Dinajpur	2	20	14	6
Total		**14**	**142**	**127**	**15**

Information from the KIIs and IDIs provided a quick insight into several factors: (1) the current situation on fish culture practices, (2) production systems, (3) requirements for feed and seed in fish production, (4) geographic and comparative advantages and constraints, and (5) the roles of men and women in the input sector. The FGDs talked through various issues, including current fish culture systems, the associated needs for fish seed and feed in the areas in terms of demand and availability, the problems hatcheries and nurseries face, production and quality of inputs, the experience of women in accessing feed and seed, and the role of women overall in this sector.

2.2 Sampling and study respondents

Purposive sampling methods were used to select respondents in the two divisions with specific characteristics to get the best responses for the research questions. Following the value chain approach, data was collected from the respondents at each node using KIIs, IDIs and FGDs.

Table 2. Type of respondents and information obtained.

Respondents	Total interviewed (# of women)	Information	Data collection tool
1. DoF officials	25 (2)	• prevailing farming systems • fish species most cultured and why	KII
2. Fisheries researchers	2 (0)		KII
3. Feed dealers	7 (0)	• types of fish feed used and companies • demand and preferences of fish farmers	IDI
4. Hatchery and nursery owners	30 (5)	• demand for seed based on farmers requirements and problems	IDI
5. Commercial and smallholder homestead farmers	30 (9)	• fish culture practices • production system and harvest methods • associated challenges and opportunities	IDI, FGD

2.3 Study area

In consultation with DoF officials and WorldFish project management, seven districts under the two divisions were selected for field visits. The selection was generally based on the availability of water resources (e.g. ponds and open water bodies), diversified fish culture systems practiced by farmers, the high concentration of feed companies, and the geographic and demographic characteristics of these districts, which are very close to its adjacent areas. DoF officials were able to give an idea of the concentration of farmers, hatcheries and nurseries in these two divisions.

Table 3. Study districts in Rangpur and Rajshahi divisions.

Division	Total districts	Study districts	Districts and upazilas visited
Rajshahi	8	4 (13 upazilas)	Rajshahi: Poba, Durgapur, Mohanpur and Baghmara Natore: Gurudaspur, Singra, Natore Sadar, Baraigram Naogaon: Patnitola, Mohadevpur, Raninagar Bogura: Adamdighi, Kahaloo
Rangpur	8	3 (8 upazilas)	Rangpur: Pirgonj, Mithapukur Dinajpur: Kaharole, Dinajpur Sadar, Parbatipur, Fulbari, Birampur Gaibandha: Gobindaganj

2.4 Limitations

One of the limitations of the rapid assessment was the qualitative nature of the study. This restricted collecting quantifiable data from all the districts to formulate strategies to address the problems identified. A comprehensive study is required to collect household-level data to design appropriate interventions to achieve the objectives of the Aquaculture project by 2022.

It was not possible to cover every district in each division because of limited resources in the given timeline. However, the team tried to make up for this by interviewing central- and divisional-level DoF officials, as well as referencing recent DoF literature and other available studies.

The number of women participants was very low in both the FGDs and KIIs because most of the women who were invited did not attend the meetings. For KIIs, the study team did not find any women working for feed companies to interview. For the FGDs, no women were found who were knowledgable enough about feed. As a result, since men collect feed from feed companies and representatives, male members came forward in these FGDs and few women showed up for the discussions.

3. Fish seed overview and status in study divisions

3.1 Status of fish seed production and distribution in Bangladesh

Hatcheries and nurseries are necessary to ensure quality seed for inland fish farmers doing aquaculture, and they are also a valuable source of information for them. Together with various feed and seed company dealers, these seed multiplication farms often arrange training sessions to build the capacity of fish farmers. In 2010, the GOB developed the Fish Hatchery Act, which was a significant step toward ensuring quality fish seed. It dictates that every hatchery has to register in order to operate and must also comply with the requisite rules and regulations. This has helped the DoF to monitor and enforce the act effectively. There are 80 government hatcheries (Yearbook of Fisheries Statistics 2016–2017) that produce seed for various fish species, including major carp, exotic carp, pangas, Thai punti, bata, koi, shing, magur and other species (Table 4).

Table 4. Hatchling production of government hatcheries by division (2017).

Division	Number of hatcheries	Hatchling production (kg)								
		Major carp	Exotic carp	Pangas	Thai punti	Bata	Koi	Shing or magur	Other	Total
Dhaka	8	609	315		70	85	-	-		1,079
Mymensingh	9	861	262	5	137	60	-	-	10	1,335
Khulna	11	729	134		3	2	-	-		867.5
Barisal	10	334	126	50	10	10	-	-		530
Rangpur	11	347	430	0	77	54	-	-	20	928
Rajshahi	15	1156	1303	30	59	306	-	-	4	2,858
Chittagong	10	629.5	189.5	0	42.5	13	-	-		874.5
Sylhet	6	584	175	0	132		-	-	5	896
Total	80	5,249.5	2,934	85	530.5	530	-	-	39	9,368

Source: Yearbook of Fisheries Statistics of Bangladesh 2016–2017.

Table 5. Hatchling production in government fish farms and hatcheries.

Hatchery (location)	Number of hatcheries	Hatchling production (kg)								
		Major carp	Exotic carp	Pangas	Thai punti	Bata	Koi	Shing or magur	Other	Total
Central Fish Breeding and Training Centre (Jhenaidah)	1	726	799		14	20				1,559
Fish Breeding and Training Centre (Raipur Lakshmipur)	1	540	190	10	60					800
Fish Seed Multiplication Farm and Training Centre (Parbatipur, Dinajpur)	1	225	375	0	35	80				715
Hatchery of BFRI (Mymensingh)	1	255	31	10	31		7			334
Faridpur Training and Extension Center (Faridpur)	1	40	10		0		0			50
Total	5	1,786	1,405	20	140	100	7			3,458

Source: Yearbook of Fisheries Statistics of Bangladesh 2016–2017.

Apart from the government hatcheries, there are large numbers of privately owned hatcheries, which also contribute considerably to fish production. According to DoF data (Fisheries Statistics 2016–17), there are 818 hatcheries operating in Bangladesh.

Table 6. Annual hatchling production of private hatcheries (2017).

Division	Number of hatcheries	Hatchling production (kg)									Tilapia juveniles (million)
		Major carp	Exotic carp	Pangas	Thai punti	Bata	Koi	Shing or magur	Other	Total	
Dhaka	42	16,137	6,906	0	2,332	2,339	268	804	607	29,393	58.291
Khulna	94	49,381	30,222	3,837	1,849	3,618	1,134	232	2,122	92,394	3,93.477
Barisal	41	14,057	5,437	120	762	27	328	77	109	20,919	19.495
Rangpur	71	17,467	20,391	5,234	2,904	5,949	307	532	299	53,082	7.373
Rajshahi	174	43,866	38,994	52,934	4,774	13,318	1,451	1,938	2,435	159,711	5,09.537
Chittagong	178	51,962	26,679	13,853	4,356	965	571	618	1,107	100,109	8,10.3
Sylhet	19	9,263	1,843	77	2,852	19	0	88	38	14,179	90.638
Total	818	253,741	178,576	103,400	28,523	29,183	8,474	16,253	32,486	650,636	25,77.
Percentage	-	*39*	*27.45*	*15.89*	*4.38*	*4.49*	*1.3*	*2.5*	*4.99*	*100*	-

Source: Yearbook of Fisheries Statistics of Bangladesh 2016–2017.

3.2 Fish seed overview for study divisions

The study team collected information on the number of hatcheries and their production level in each district from the divisional, district and upazila fisheries offices (Table 7). The number of spawn varies among fish species (Table 8).

Table 7. Annual hatchling production per district for private hatcheries in Rajshahi Division (2017).

District	Number of hatcheries	Hatchling Production (kg)									Tilapia juveniles (million)
		Major carp	Exotic carp	Pangas	Thai punti	Bata	Koi	Shing or magur	Other	Total	
RAJSHAHI											
Bogura	96	22,368	20,257	48,975	2,680	9,598	1,367	1,772	416	107,433	1,97.820
C. Nababganj	2	580	523	0	33	55	0	0	0	1,190	-
Joypurhat	10	3,955	1,674	246	109	284	0	0	1,945	8,213	9.591
Naogaon	23	1,521	3,005	3,713	120	678	84	123	8	9,252	-
Natore	10	1,443	1,346	0	63	211	0	0	0	3,064	2,21.799
Pabna	8	6,164	3,206	0	617	596	0	0	0	10,583	74.333
Rajshahi	13	3,591	5,560	0	517	474	0	44	67	10,252	-
Sirajganj	12	4,244	3,424	0	634	1,422	0	0	0	9,724	5.995
Total	174	43,866	38,994	52,934	4,774	13,318	1,451	1,938	2,435	159,711	5,09.537
RANGPUR											
Dinajpur	11	2,056	1,263	0	88	268	0	0	60	3,735	-
Gaibandha	14	2,355	4,211	0	476	1,714	197	13	66	9,031	-
Kurigram	12	3,973	3,709	0	591	1,659	0	0	0	9,932	1.139
Lalmonirhat	11	11	2,948	5,234	0	0	0	0	0	8,193	-
Nilphamari	10	4,074	3,992	0	443	268	0	0	0	8,778	-
Panchagar	2	1,050	0	0	44	0	0	0	0	1,094	-
Rangpur	20	3,454	3,658	0	1,035	1,626	110	518	154	10,556	6.234
Thakurgaon	7	493	609	0	229	413	0	0	19	1,763	0
Total	87	17,467	20,391	5,234	2,904	5,949	307	532	299	53,082	7.373

Source: Yearbook of Fisheries Statistics of Bangladesh 2016–2017.

Table 8. Number of spawn per kilogram for fish species.

Species	Number of spawn/kg

Major carp	350,000–400,000
Exotic carp	350,000–400,000
Pangas	500,000–600,000
Thai punti	700,000–800,000
Bata	450,000–500,000
Koi	700,000–800,000
Shing	200,000–250,000
Magur	200,000–215,000
Pabda	250,000–300,000
Gulsha	650,000–700,000

Source: AHM Kohinoor, principal scientific officer, BFRI, Mymensingh.

According to DoF statistics in Tables 4–7, the concentration of hatcheries is high in Bogura (96) and Naogaon (23) districts of Rajshahi Division, while in Rangpur Division the numbers are low, with only 20 hatcheries in Rangpur District and 14 in Gaibandha District. The DoF's deputy director's office supplied data on the number of nurseries in Rangpur Division, along with the annual production and financial aspects. However, the district fisheries office could not provide data for Rajshahi Division. An in-depth study is required to collect data from every district fisheries office. Table 9 gives the nursery and production details in Rangpur Division and for Naogaon District in Rajshahi Division.

Table 9. Nursery and production details.

District	Number of nurseries	Number of ponds	Pond volume (ha)	Annual production capacity (million)	Total expenses (BDT million)	Total income (BDT million)
Rangpur Division						
Rangpur	506	1,361	408	141	57	107
Gaibandha	379	1,150	414	134	28	53
Kurigram	852	1,199	363	106	52	88
Lalmonirhat	227	965	267	76	40	94
Nilphamary	403	839	209	63	52	82
Dinajpur	392	1,378	438	248	78	142
Thakurgaon	229	178	511	0	27	47
Panchagarh	133	437	160	34	32	51
Total	3,121	7,507	2,770	802	366	665
Rajshahi Division						
Naogaon	335	1,496	594	186	81	102

Source: Deputy director's office, Rangpur, DoF, 2018; district fisheries office, Naogaon, Rajshahi.

From the Rangpur district fisheries office, we gathered data on fry production per species for each district in Rangpur Division. Dinajpur District is number one with 181,194 million fry followed by Gaibandha (1277.6 million), Rangpur (1123.15 million) and Kurigram (1024.21 million) districts.

Table 10 shows the breakdown of fry production in Rangpur division.

Table 10. Fry production in the districts of Rangpur Division.

District	Fry production (million)													Total (million)
	Rui	Catla	Mrigal	Silver	Bighead	Grass carp	Mirror carp/ common carp	Sorpunti	Bata	Calbasu	Pangas	Tilapia	Catfish	
Rangpur	17.6	9.3	19.1	23.1	7.2	1.7	18.0	8.1	8.3	-	-	-	-	112
Gaibandha	23.6	12.7	23.2	22.8	8.2	0.6	6.3	4.2	19.6	0.1	2.9	3.5	6.0	128
Kurigram	21.3	7.1	17.2	24.3	5.8	1.4	6.4	6.9	9.5	-	0.0	2.3	6.3	102
Lalmonirhat	9.8	2.5	9.8	13.9	4.9	0.7	2.9	4.9	6.2	-	-	-	-	56
Nilphamari	12.3	3.0	9.1	10.4	3.0	1.9	5.6	2.3	1.9	0.1	-	0.3	0.6	50
Dinajpur	29.3	14.2	24.0	39.5	11.3	4.1	21.3	15.1	18.9	-	0.8	2.6	-	181
Thakurgaon	11.3	2.6	8.7	9.3	2.8	1.7	2.3	2.0	1.7	-	0.1	0.4	0.3	43
Panchagarh	7.3	5.2	5.5	4.7	3.6	1.2	2.3	3.2	1.3	-	-	-	-	34
Total	132.6	56.7	116.7	147.9	46.7	13.3	65.0	46.7	67.6	0.2	3.8	9.2	13.2	706

Source: Deputy director's Office, Rangpur, DoF (2018).

The data for Rangpur Division shows that fry production is mainly for fish species that grow to table size quickly, because most ponds in the division are seasonal. Fry for silver carp, rui and mrigal are produced the most, but bata is also important, as are catla, mirror carp, common carp and sorpunti.

3.3 Concentration of hatcheries and nurseries

Taken together, Bogura, Naogaon, Rajshahi, Rangpur and Dinajpur districts make up the hub of hatchery and nursery operations in the study area. In Bogura, Adamdighi Upazila has the highest number of hatcheries compared to the surrounding areas. It has 56 (one of which is owned by a woman) out of 96 hatcheries in the entire district, making it the largest source of spawn and fry in northwestern Bangladesh. However, hatchery owners in Adamdighi are concerned over the large number of hatcheries springing up in the upazila and are hoping that the government will impose restrictions on new hatcheries. Since running a hatchery has become a lucrative business, many youths have gotten involved, but these new hatcheries do not usually maintain the quality required in fry production. Table 11 shows the major areas of hatchery concentration in the study divisions.

Table 11. Areas with the highest concentration of hatcheries.

Species	Rajshahi Division (district: upazilas)	Rangpur Division (district: upazilas)
Shing, magur, pabda, gulsha	Bogura: Sadar, Kahaloo, Dupchachia, Shajahanpur, Adamdighi Natore: Singra Naogaon: Raniganj	Rangpur: Mithapukur Nilphamari: Domar Dinajpur: Kaharole Gaibandha: Sadullapur
Pangas	Bogura: Adamdighi, Kahaloo Naogaon: Raniganj	
Carp	Naogaon: Raniganj Natore: Gurudaspur, Singra Rajshahi: Poba	Rangpur: Mithapukur Dinajpur: Kaharole, Parbotipur Lalmonirhat: Aditmari, Kaliganj

The findings from the field support the data collected from secondary sources, while data collected from the DoF and the fisheries statistical yearbook backs the field findings. When taken together, the data shows that the highest numbers of hatcheries and nurseries (as well as feed mills and feed dealers) are in Bogura and Naogaon districts of Rajshahi Division, while Rajshahi, Pabna and Sirajganj districts also show promise in the volume of seed production for hatcheries (Figure 1).

Figure 2. Heat map of hatcheries in Rajshahi and Rangpur divisions.

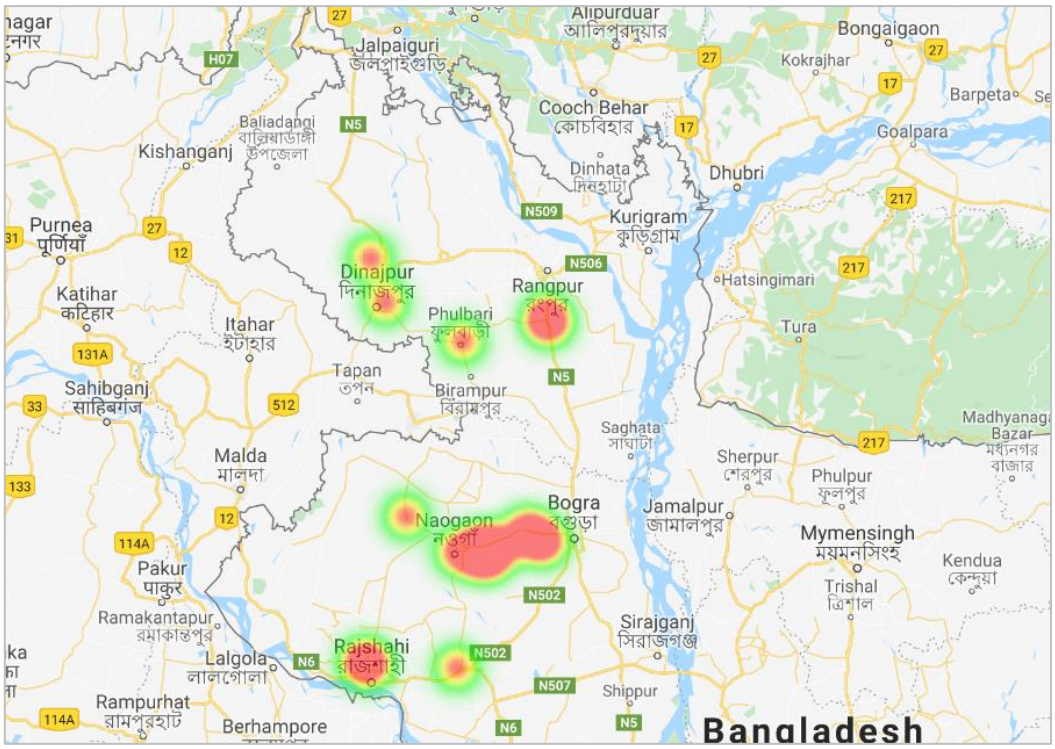


Table 12 shows the number of hatcheries, nurseries, ponds (over 10 decimals), feed mills and dealers in the districts of Rajshahi and Rangpur divisions. The number of nurseries in Rajshahi were not available from the DoF, so data based on 2011 district statistics from the Bangladesh Bureau of Statistics (BBS) and has been used instead. (Data for the number of feed mills and dealers in Rangpur Division was also unavailable, so a further study would be required to collected this information.) The number of ponds is for those that are 10–20 decimals in size based on DoF data.

Table 12. Number of hatcheries, nurseries and ponds, and total fish seed production in Rajshahi Division.

District	Hatcheries	Nurseries	Ponds	Total seed production (t)
Bogura	96	309	54,222	69,561
Naogaon	23	494	43,969	69,856
Rajshahi	13	144	41,552	70,366
Sirajganj	12	191	17,900	58,847
Pabna	8	183	34,660	65,566
Natore	17	91	20,969	48,316
Joypurhat	10	97	14,046	25,487
C. Nababganj	2	136	8,618	15,691

Source: district fisheries offices.

As Table 12 shows, Bogura, Naogaon and Rajshahi are the most prominent districts for spawn and fry production in Rajshahi Division. The number of feed mills and feed dealers is also high in these areas. Sirajganj and Pabna districts rank high as well in terms of number of ponds and total fish production volume.

In Rangpur Division, a large number of homestead or smallholder farmers use their ponds as nurseries. and data collected from secondary sources confirms this. Fish farmers interviewed in the division report that nursing is a profitable business for smallholder farmers who do not have space to grow cultured fish and can gain income in shorter periods. Kurigram, Dinajpur and Rangpur districts have the highest

number of nurseries in the divisions, while Rangpur, Gaibandha and Dinajpur districts have the most hatcheries. In terms of production volume, Dinajpur ranks number one, and it also has the most ponds in the region.

Table 13. Number of hatcheries, nurseries and ponds, and total seed production in Rangpur Division.

District	Hatcheries	Nurseries	Ponds	Total seed production (t)
Rangpur	20	506	25,810	29,713
Gaibandha	17	379	34,344	24,724
Dinajpur	17	587	53,875	42,551
Kurigram	12	852	17,364	28,262
Lalmonirhat	11	227	9,315	12,219
Nilphamari	10	403	27,967	17,223
Thakurgaon	7	229	13,238	23,389
Panchagar	2	133	12,290	11,448

In Lalmonirhat District, the study team found that 157 t of fingerlings were produced in Kaliganj Upazila and 453.75 t in Aditmari Upazila in 2018, with prices ranging from BDT 20 to 180/kg. There are about 1000 rice field nurseries in Aditmari alone, spread over 550 ha and involving over 1000 farmers. In Kaliganj Upazila, the number of rice field nurseries is lower, with approximately 250 nurserers covering over 45 ha who produce carp fingerlings from July to September.

3.4 Fish seed suppliers

The study team defines fish seed suppliers as those who supply spawn, fry, fingerlings and advanced fingerlings (*pona*) to fish farmers. These include hatcheries, nurserers and fish farmers who produce small to medium-sized fish. Along with producers, there are brokers (*paikers*) and patilwalas (fry and fingerling seller who collects and sells in pots) who also supply fry, fingerlings or advanced fingerlings to farmers and act as trading intermediaries. Hatcheries normally produce spawn and fry, which are then sold to brokers, nurserers and farmers. The nurseries produce fry and fingerlings or advanced fingerlings and then supply them to farmers through *paikers*, dealers and *patilwalas*.

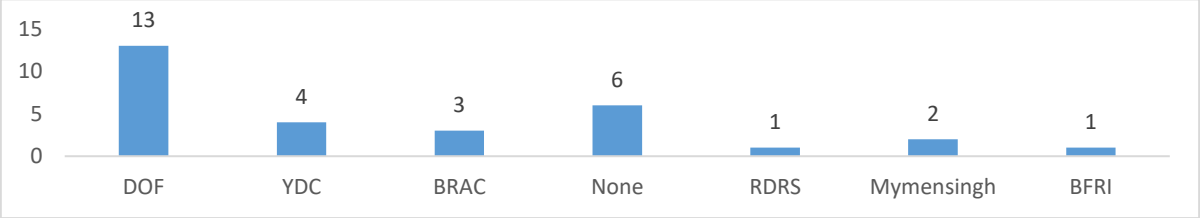
In fish seed production, hatcheries are the main sources for carp, pangas, local catfish (shing, magur, pabda and gulsha) and koi. Seed are also sourced from hatcheries in Mymensingh.

For tilapia, some feed and aquachemical companies, such as Mega, CP, Quality and Fishtech BD sell monosex fry through dealers. Private tilapia hatcheries sell their fry through *paikers*, personal contacts and dealers. Some commercial farmers nurse the fry purchased from hatcheries, dealers or brokers for 30–40 days to produce fingerlings, which are then used for table fish production. In total, the study team collected information for 30 hatcheries to identify the species they culture and sources of broodfish along with the fish feed they use (Annex 6).

Most hatchery owners lease ponds while maintaining their own ones. These hatcheries collect their carp broodfish from natural sources, such as the Padma, Jamuna and Halda rivers, as well as other government and private hatcheries, farmers and market places. The hatchery owners mostly use homemade feed along with other commercial brands, such as ACI, Mega, CP, Nourish, Quality and Tonguewei.

The majority of the hatchery owners listed in Annex 5 have received training from the DoF and the youth development centers in different districts. They could not recall receiving any training sessions from other projects that have been implemented in this area, such as those for shing, magur, pabda and gulsha that Katalyst conducted in collaboration with Eskayef (SK+F) in 2016. Figure 3 shows the sources of training for the 30 hatchery owners.

Figure 3. Sources of training for 30 hatchery owners.



The hatchery owners in Adamdighi were dissatisfied with the government extension services, claiming these services have not been helpful for their businesses.

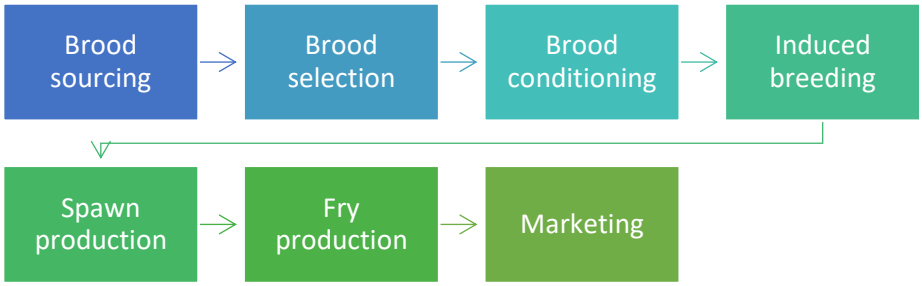
3.4.1 Input and production

Although the current supply of fish seed may address the overall demand for fish culture in the northwest districts, the seasonality and quality of the seed are of some concern. There are real concerns regarding the quality of fish seed, because most hatcheries collect carp broodstock annually from wild sources or ponds. Apart from tilapia, whose broodstock is supplied by WorldFish (GIFT), CP, Nam-Sai (Meghat) and Chitralada (AIT), the hatcheries do not use any other improved broodstock. To meet demand during the peak season, from April to June, hatchery owners start producing carp spawn or fry in late February. In the northwestern divisions, cold weather prevents hatchery owners from starting production earlier, because it hampers the proper development of the broodfish and restricts pond preparation activities. There is a high demand for fish seed in March and April among commercial farmers, but a shortage of supply prevents them from starting production until April, which is considered the lean period.

Fish farmers mostly face a scarcity of spawn or fry of desired size during the initial and last phase of breeding, because spawn and fry production is highly dependent on environmental factors, such as rain, drought and temperature. Hatchery owners cannot supply fry or spawn during the off-season (March and October) if the hatcheries or nurseries suffer higher than expected levels of mortality among fry.

Hatchery owners collect broodfish from various sources depending on species, and the spawn and fry are cultured from these broods. Figure 4 shows the steps of the spawn culture process.

Figure 4. Pond culture process.



Source of broodfish

Most hatchery owners collect broodfish from other farmers or the market. Some hatcheries also produce their own broodfish in brood tanks. Different species require different times to grow into broodfish for spawn production. The characteristics used to identify healthy broodfish include bright color, age, and proper size and weight. For a few species of carp, hatchery owners in Rajshahi and Rangpur divisions prefer to collect broodfish from rivers and then rear them in their farm pond until they reach the required

age and size. According to Mr. Akbari Ali, president of hatchery owners' cooperative society, broodfish are not collected from India. Instead, they are collected in Bangladesh and sold to Indian brokers. Interviews with different hatchery verified this.

Hatcheries separate the best quality broodfish they collect in November. They use quality feed, vitamins and pond water throughout the breeding period (November–August) to ensure that high quality spawn are produced. Rui, catla and mrigal broodfish are generally collected from natural sources, such as the Jamuna and Halda rivers. Shing, magur, pabda and gulsha broodfish are collected from natural sources, other hatcheries and the market in Singra Upazila in Natore and Rajshahi districts. Hatchery owners also collect ready broodfish from carp fattening ponds in Naogaon District. Some small hatcheries do not own sufficient broodfish ponds, so they depend on local farmers and markets. Broodfish purchased from local markets or other farmers are not always of good quality, however, because these sources often use smaller fish for spawn and hatchling production. This practice is mostly seen among carp, shing, magur, pabda, gulsha and koi hatcheries. Table 14 lists the sources of broodfish per species.

Table 14. Sources of broodfish species.

Species	Source
Common carp	Own production, BFRI, government hatchery, market, other farmers; no improved lines
Silver carp, big head, grass carp	Own source, farmers ponds; no improved lines- many hybrids
Rui, mrigal, catla, calbasu	Natural source (river) and own production and purchase from other farmers, government hatchery. No improved lines
Pangas, koi	BFRI, Vietnam, Thailand, different private hatcheries
Shing, magur	Market, different culture ponds, natural sources, hatcheries; no improved disease free lines.
Pabda, gulsha	Hatcheries in Mymensingh region, farmers ponds, from the wild; no improved lines
Tilapia	GIFT, (CP, Nam Sai, AIT seed from several feed dealers etc.), BFRI, GIFT Cohort breeding nucleus of some hatcheries (e.g., BRAC, EON, Nova, etc.) supported by WorldFish, several hatcheries own production

Carp hatchery owners in Rajshahi Division collect broodfish of Indian major carp from carp fattening farms or wholesale markets. In Chitol, hatcheries and nurseries collect fertile eggs and spawn from riverine sources (Padma, Jamuna and Arial kha) and rear them up to advanced fingerlings (4–5 inches) in their nursery ponds.

Broodfish selection

Broods are selected by inspecting the fish for eggs. For females, the anus should be swollen, highly elastic and look pink or orange, and the belly should be round. For males, the anus is checked for milt. The broods are then carried in drums or plastic tanks (made from tarpaulin) from the market to the hatchery for spawn production.

Broodfish conditioning

Carp, catfish and koi broodfish are conditioned in a hatchery for at least 6–8 hours. They are then released into a circular or rectangular tank where the hatchery owners continuously supply water to mimic natural breeding conditions and force the fish to empty their stomachs.

Induced breeding

After conditioning, the broodfish are injected with hormones. Two types of hormone are normally used for induced breeding: one is a pituitary gland (PG) hormone, and the other is a commercial artificial hormone, like Flash, Oveprim, Ovulin or Ovupin, which is sold as a solution that contains OvaRH

(sGnRHa) and a dopamine inhibitor. While in the tank, the females release their eggs and the males release milt for external fertilization. Table 15 summarizes the breeding methods for cultured fish species.

Table 15. Summary of breeding methods.

Species	Method
• Pangas • Magur • Carp (rui, catla, mrigal, silver carp, big head, bata, calbasu, common carp, mirror carp, sorputi)	Natural breeding: • After injecting the broodfish with hormones, they are placed in a circular tank and supplied with water to mimic natural breeding conditions. • After 6–8 hours, the females release their eggs and the males fertilize the eggs naturally. • After fertilization, the broodfish are shifted from the tank to the spent pond. Stripping: • After injecting the broodfish fish with hormones, they are placed in a tank with sufficient water supply. • After 5–6 hours, the females are collected from the tank and the eggs are collected using the stripping method. • Milt is then collected from the males and mixed with the eggs for fertilization.
• Shing • Pabda • Gulsha • Koi	Natural breeding: • After injecting the broodfish with hormones, they are placed in a circular tank and supplied with water to mimic natural conditions. • After 6–8 hours, the females release their eggs and the males fertilize the eggs naturally. • After fertilization, the broodfish are shifted from the tank to the spend pond using a hapa or are sold in the market.

To prevent inbreeding, reputed hatchery owners always collect male and female broodfish from different sources. However, owners of small hatcheries who do not have sufficient brood tanks buy them from markets and other farmers, and they usually do not concern themselves with inbreeding. When broodfish of the same species are scarce, these hatchery owners often ignore the rules of the Hatchery Act (2011) and do crossbreeding.

Aside from koi and common carp, broodfish do not lay eggs in ponds, and hormones are used for induced breeding for seed production. In Adamdighi Upazila in Bogura District, hatchery owners report that they receive best results when using PG hormones for breeding of all types of fish. PG hormones are preferred because they increase the hatchling percentage of the eggs and reduce the mortality rate of spawn. Owners of small hatcheries generally use artificial hormones, such as Ovaprim, Ovulin, Ovupin, ovatide and Flash. PG hormones cost on average BDT 5500/g while artificial hormones such as Ovaprim, Ovulin and Ovupin (BDT 1750/10 ml x 5 samples), Ovatide (BDT 750/10 ml) and Flash (BDT 1200/10 ml) are much cheaper. These hormones are widely available in the markets throughout Rajshahi and Rangpur divisions. Table 16 lists the types and dosage used by hatchery owners.

Table 16. Doses of PG and other GnHRa used in induced breeding in Rajshahi and Rangpur divisions.

Hormone	Species	Sex	Dose (mg/ml per kg of bodyweight)		Breeding season
			1st injection	**2nd injection**	
PG United Aqua Farm,	Rui, mrigal, catla, Common Carp	Female	1.5–2	5–6	Common Carp: November–April Carps: April–August
		Male		1.5–2	

Jessore and Indian source	Pangas	Female	2	6	March–August
		Male		2	
	Silver, big head	Female	250 I. U HCG	5–5.5 PG	March–August
		Male	-	1.5–2 PG	
	Grass carp	Female	1–1.5	4–5	March–August
		Male		1.5–2	
	Pabda	Female	60–70	14–18	February–August
		Male	14–18	7–8	
	Koi	Female	60–70	-	February–August
		Male	14–18	-	
	Magur	Female	80–100	-	May–August
		Male	20	-	
	Gulsha	Female	8–10	-	May–August
		Male	4–5	-	
	Shing	Female	8–10	-	April–October
		Male	4–5	-	
Flash (EON Animal Health)	Rui, mrigal, catla, Common Carp, silver, big head, kalibaush, grass carp, bata	Female	0.125–0.1		
		Male	0.07–0.56		
	Pangas	Female	0.11–0.13		
		Male	0.07–0.06		
	Singh	Female	0.4–0.5	-	
		Male	0.18–0.2	-	
	Magur	Female	0.83–1	-	
		Male	0.13–0.16	-	
	Gulsha and koi	Female	0.2–0.25	-	
		Male	0.1–0.13	-	
	Pabda	Female	0.28–0.33		
		Male	0.18–0.2		
Ovaprim (China Source)	Shing	Female	0.5	-	
		Male	0.16	-	
	Magur	Female	2		
		Male	0		
	Pabda	Female	0.33	-	
		Male	0.13	-	
	Gulsha	Female	0.25		
		Male	0.15		
Ovupin/ Ovulin (China)	Shing	Female	0.5	-	
		Male	0.25	-	
	Magur	Female	0.5		
		Male	0.25		
	Pabda	Female	0.5	-	
		Male	0.25	-	

	Gulsha	Female	0.5		
		Male	0.25		

Small hatchery owners often purchase broodfish from farmers or markets and use hormones for spawn production.

Spawn production

In the next phase, after fertilization, the eggs are cleaned and placed in an incubator for hatching. After 20–24 hours, the eggs are hatched and the spawn are collected. They are then nursed in tanks for up to 3 days, depending on the temperature. There they grow from hatchlings to swim-up fry until the yolk has been depleted and the spawn begin feeding and are big enough to sell. Usually, hatchery owners sell spawn at 5 days old. Table 17 shows the spawn production season per species and the required brood size for spawn production.

Table 17. Spawn production per species.

Species	Spawn production season	Required time for brood maturity	Preferred average size of broodfish
Common carp	December–April	12 months	Above 1.5 kg
Silver carp, big head	February–August	18 months	2–3 kg
Grass carp	March–August	36 months	3–4 kg
Rui	April–August	18 months	Above 1.5 kg
Mrigal, calbasu	April–August	18 months	Above 1.5 kg
Catla	April–August	18 months	Above 3 kg
Pangas	April–August	36 months	Above 3 kg
Shing	April–October	12 months	80–100 g
Magur	May–August	12 months	80–100 g
Koi	February–September	12 Months	250–300 g
Pabda	February–August	12 months	Above 50 g
Gulsha	May–August	12 months	Above 50 g

Fry and fingerling production

Spawn are then stocked in the nursery ponds from which two-week-old fry up to 1 inch long (locally known as dani) are produced for sale, along with fingerlings according to the hatchery owners Tables 18 and 19 lists the sources and stocking density of spawn and fry.

Table 18. Main sources of spawn and fry for nurseries per species.

Species	Source
Common carp	BFRI, government and private hatcheries
Silver carp, big head, grass carp	BFRI, government and private hatcheries
Rui, mrigal, catla, calbasu	Local and government hatcheries
Pangas, koi	BFRI, local and government hatcheries
Shing, magur	Hatcheries in Mymensingh, local hatcheries
Pabda, gulsha	Hatcheries in Mymensingh, local hatcheries

Table 19. Stocking density of spawn used for fry production in a 0.133 ha nursery pond per species.

Species	Stocking weight of spawn (g)	Fry (1–1.5 inches) production
Pangas	1,000	100,000
Koi	2,000	170,00–180,000
Rui and mrigal	2,000	200,000
Catla	1,000	125,000–150,000
Pabda	1,500	80,000–90,000
Gulsha	750	300,000

Singh	1,000–1,500	125,000–150,000
Magur	1,000	50,000–60,000
Silver carp	2,000–2,500	250,000
Big head	1,000	80,000–90,000
Grass carp	1,000	80,000–90,000

Table 20. Total spawn production for 30 hatcheries in Rajshahi and Rangpur divisions.

Species	Use of brood for breeding (kg)	Spawn price/kg	Production (kg)
Shing	0.08	3,725.00	2,265
Magur	0.19	3,743.75	1,483
Pabda	0.04	4,100.00	1,528
Gulsha	0.04	3,870.59	1,214
Pangas	4.57	2,671.43	3,320
Koi	0.19	2,250.00	800
Rui	2.35	2,366.67	1,795
Mrigal	2.31	1,728.57	2,270
Catla	4.95	3,805.00	678
Bata	0.27	2,466.67	1,065
Silver carp	4.38	2,276.92	1,395
Big head	5	2,300.00	440
Carpio (common carp)	4.63	2,725.00	210
General carp	5.19	2,975.00	337
Kalbasu	4	2,566.67	23

3.4.2 Marketing system

Hatchery owners sell spawn to local nurseries, who are the biggest buyers. In addition to spawn (known as *renu* locally), they also sell fry (known as *dani* locally) to farmers, patilwalas and brokers. The nurseries collect spawn from hatcheries and culture them in nursery ponds for a minimum of 4 weeks before selling the fry or fingerlings. Some nurseries also produce fingerlings (3–4 inches), which are sold to local farmers, brokers and local markets. Spawn, fry and fingerlings are generally sold to nurseries and fish farmers in phases: fry are usually 5 to 6 days old, while fingerlings are usually 40 to 45 days old. The spawn or fry are weighed and transported to the market using open plastic drums. The largest fish seed producers cooperative society, the Mathsya Pona Byabsayi Samabay Samity, is in Adamdighi Upazila, Bogura.

Patilwalas also collect fry from hatcheries and sell them to small and medium farmers. The study team found that the concentration of patilwalas is high in areas that are well connected by rail. For example, patilwalas collect fry from Santahar and Parbotipur in Dinajpur and then sell them to different areas of the northwest region where railway transportation is easy. Fry are also collected by hawkers or feriwalas, who commute using bicycles. They collect fry from the hatcheries and nurseries and sell them to adjacent farms.

Figure 5. Supply chain of the fish seed from the hatcheries to the different buyers

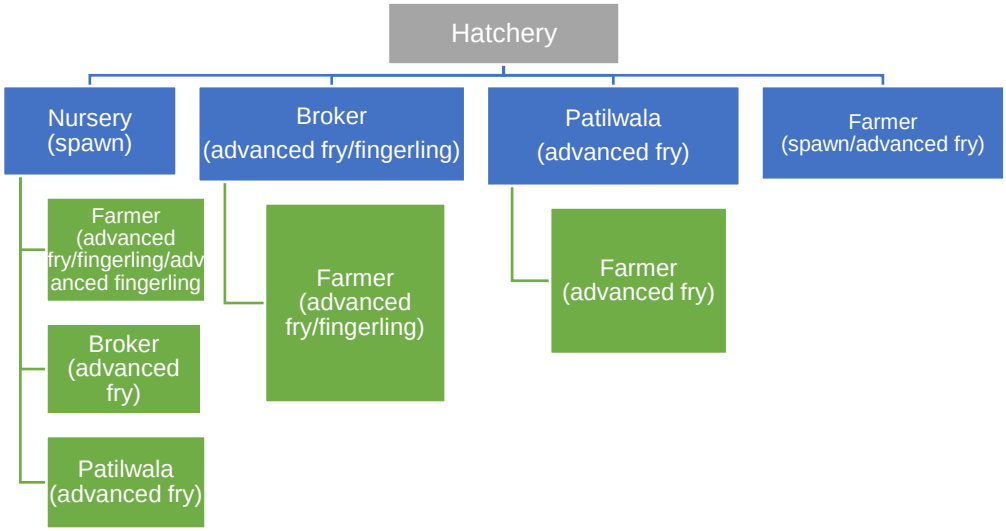


Table 21. Role of actors in marketing.

Actor	Role	Target group for marketing
Hatchery	Producing spawn and fry	Nurseries, brokers, farmers, patilwalas
Nursery	Producing fry, advanced fry, fingerlings and advanced fingerlings	Brokers, farmers, patilwala
Broker	Marketing advanced fry and fingerlings from hatcheries and nurseries	Farmers and Indian brokers
Patilwalal feriwala	Marketing advanced fry from hatcheries and nurseries	Farmers

In addition to spawn, hatcheries sell fry to local and regional markets in places such as Mymensingh, Rangpur, Joypurhat, Dinajpur, Sylhet, Jessore and India. Table 22 shows the species, hatchery locations and market regions of fry sold by hatcheries in the northwest districts.

Table 22. Species, hatchery locations and market regions of fry sold by hatcheries in the northwest districts.

Species	Hatchery district (upazila)	Market area
Pangas	Bogra (Adamdighi)	*Regional markets:* Mymensingh, Rangpur, Joypurhat, Dinajpur, Sylhet, Jessore Also sold to Indian brokers
Pabda, koi, gulsha, shing, magur	Naogaon (Gurudashpur, Singra, Potnitola) Bogra (Adamdighi, Kahaloo) Gaibandha (Gobindaganj) Dinajpur (Kaharole)	*Local and regional markets:* Mymensingh, Sylhet, Comilla, Norsingdi
Carp (rui, catla, mrigal, silver carp, big head, bata, calbasu, common carp, mirror carp, sorpunti)	*Rajshahi Division:* Rajshahi, Natore, Naogaon, Chapainawabganj, Pabna, Sirajganj, Joypurhat and Bogra districts *Rangpur Division:* Rangpur, Kurigram, Nilphamary, Thakurgaon, Dinajpur, Lalmonirhat and Gaibandha districts	Local and regional markets in Rangpur and Rajshahi divisions
Tilapia	Rangpur, Bogra, Dinajpur, Gaibandha, Naogaon	Sold through dealers across the country

Chitol	Bogra (Adamdighi)	Sold through brokers across the country

Table 23 shows the hatcheries and nurseries the study team visited in Adamdighi Upazila of Bogura District to determine the prices of the fry.

Table 23. Price of fry for different fish species (1 g or 1 month old).

Species	Price/BDT 1000	Weight (number of pieces/kg)
Koi	500–700	3,000– 3,500
Magur	1,200–1,300	1,500–2,000
Singh	600–700	2,500–3,000
Pangas (white meat) (*Pangasianodon hypophthalmus*) – sourced from Vietnam	600–700	2,000–2,500
Pangas (red meat) (*Pangasianodon hypophthalmus*, formerly *pangasius sutchi*) – sourced from Thailand	300–400	2,000–2,500
Gulsa	700–750	2,000–2,500
Pabda	700–800	2,000–2,500
Rui	250–300	800–1,000
Catla	35–400	1,000–1,200
Mrigal	200–250	800–1,000
Grass carp	300–350	800–1,000
Big head/silver carp	259–300	1,000–1,200
Mirror carp	250–300	600–7,00
Calbasu	250–300	800–1,000

Table 24. Price of fingerlings (5–50 g).

Species	BDT/40 kg
Rui	5,000
Catla	6,000
Mrigal	5,000
Grass carp	4,500
Big head, silver carp	3,000
Mirror carp	4,000
Calbasu	3,500

Table 25. Price for spawn (3 days old).

Species	BDT/kg
Koi	2,500–2,000
Magur	6,000–5,000
Singh	3,000–2,000
Pangas	3,000–2,500
Gulsa	6,000–5,000
Pabda	5,000–4,000
Rui	2,000–1,000
Catla	4,000–3,000
Mrigal	1,500–1,000
Grass carp	2,500–2,000
Silver carp	1,500–1,000
Big head	1,500–1,000
Common carp	1,500–1,000
Calbasu	1,500–1,000
Bata	3,500–3,000

Prices generally vary based on the demand and supply of spawn and fry in the market subject to the season. In the early production stocking season (March–May), prices escalate because the supply of

spawn and fry is low and so demand is very high. From May to August, the demand for spawn and fry falls, resulting in lower prices.

Promotion activities

Some of the larger hatcheries, such as Mohalakhkhi Matshya Projonon Kendra and Sonar Bangla Hatchery, use small-scale promotional activities to market their products. In association with various projects and aquachemical companies (SK+F, Fishtech BD and Uttara Feed), they conduct training for farmers, nurseries and patilwalas, which helps position the companies as opinion leaders. As a result, nurseries and farmers flock to those hatcheries for good quality spawn. Hatchery owners also develop a personal network with farmers and nurseries, which leads to further sales of spawn and fry.

The aquachemical companies and feed suppliers also form mutually beneficial relationships with hatcheries that promote their products to farmers and nurseries. In return, the companies refer their customers to their partner hatcheries for spawn and fry.

Some hatcheries use brokers, patilwalas and dealers to promote their products through word of mouth. They also try to promote their products to upazila fisheries officers, who sometimes refer these hatcheries to farmers attending their training sessions.

Transportation expenses

Once hatcheries receive orders for fry from farmers, they prepare open plastic drums, which are used to transport fry to different regions. Table 26 shows the cost of transporting fry.

Table 26. The cost of transporting fry to regional cities from Adamdighi or Bogura to various districts.

From	To	Rent (BDT)	Remarks
Adamdighi	Norshindi	16,000	5 ton
	Dhaka	14,000	3 ton
	Dhaka(Gazipur)	12,000	2 ton
	Khulna	22,000	5 ton
	Khulna	20,000	3 ton
	Khulna	17,000	2 ton
	Chittagong	30,000	5 ton
	Chittagong	27,000	3 ton
	Chittagong	25,000	2 ton
	Rajshahi	8,000	5 ton
	Rajshahi	6,000	3 ton
	Rajshahi	4,000	2 ton
	Bogra	4,000	5 ton
	Bogra	3,000	3 ton
	Bogra	2,000	2 ton
	Rangpur	6,000	5 ton
	Rangpur	5,000	3 ton
	Rangpur	4,000	2 ton
	Sylhet	28,000	5 ton
	Sylhet	25,000	3 ton
	Sylhet	23,000	2 ton
	Comilla	20,000	5 ton
	Comilla	18,000	3 ton
	Comilla	16,000	2 ton
	Mymensingh	8,000	1 ton
	Mymensingh	10,000	3 ton

3.4.3 Scope of improvement

Most hatcheries and nurseries reported facing many problems while running their business. These included high lease costs, the cost of feed ingredients and labor wages, and operational costs.

However, there is scope for improvement. The following are some of the suggestions given by nursery and hatchery owners during the study interviews:

- Ensure quality broodfish for spawn production.
- Introduce an aeration system in hatcheries to increase hatchling production.
- Supply electricity to hatcheries at the agricultural farming rate (as enjoyed by crop farmers), instead of the commercial rate, to reduce operation cost.
- Use filters to reduce the concentration of iron in water.
- Provide flexible credit options for the hatcheries and nurseries.
- Introduce contract farming systems for hatcheries and homestead farmers to increase spawn production and generate additional income for homestead farmers.
- The BFRI, in Santahar, Bogura, has developed a cost-effective technology to build a greenhouse for fish production that helps maintain the optimum temperature of the pond. This would enable farmers to start production earlier.
- Homestead farmers with perennial ponds can easily act as nurseries and purchase spawn from hatcheries and produce fry in lean periods to maximize profit within a short period of time.
- The contract farming concept is gaining popularity among crop farmers. This can be adapted for fish farming by hatcheries and homestead fish farmers, as seen in the Mymensingh region, which could boost income and benefit both parties.

4. Fish feed overview and current status in Rangpur and Rajshahi divisions

4.1 Status of fish feed in Bangladesh

Along with fish seed, feed is also a major concern, as availability and use of good quality fish feed increases the production rate. As such, it will play an important role in terms of national and household-level food security, employment and income generation, particularly for people living in rural areas, by pushing the production level to approximately 4.5 million metric tons of fish within 2020–2021, as per the target set by the GOB.

Realizing the importance of fish feed, the GOB formulated the Fish Feed Act of 2010 and Fish Feed Rules, 2011. These have played a major role in assuring the quality of feed inputs. These laws look into the proper nutrition balance in feed for fish in various stages of life. They also look into limiting the use of additives and extending policy support for the growth of fisheries sector. As fish farmers are trying to increase production capacity from semi-intensive to intensive methods, the use of fish feed has grown substantially to support production all over Bangladesh. Along with the use of fish feed, the number of feed producers, importers and retailers has also grown rapidly, as per market demand. Currently, there are over 100 fish feed producers operating in Bangladesh. Fish feed production in the country stands at 1.5 million metric tons (DoF 2016).

The Fish Feed Act 2010 has set a minimum standard for fish feed, which producers must comply with. DoF officials are empowered to test feed samples in government-approved laboratories at any stage of marketing to ensure the law is being followed properly, with scope for penalties against any feed producer for noncompliance.

4.2 Fish feed in Rajshahi and Rangpur

In Rajshahi and Rangpur divisions, fish farmers and hatchery or nursery owners use both homemade and commercial fish feed for production. There are about 100 commercial fish feed manufacturers in Bangladesh according to the Feed Industries Association, Bangladesh, and about 78 listed feed

companies. Among them, CP, Nourish, Mega, Quality, Nabil, Biswas and Paragon are well-known brands. Apart from these companies, the study team found about 46 active feed mills in Rajshahi Division (Annex 8). Data for all of Rangpur was unavailable from the division's district fisheries office. A comprehensive study is required to find out the number of feed mills and dealers operating in both Rajshahi and Rangpur.

4.3 Fish feed suppliers

Using the data collected from feed companies, the study team found that ACI Godrej, Paragon and Biswas are the most used feed brands. The total amount of feed sold in Rajshahi Division is about 15,000 t compared to only 5000 t in Rangpur Division, which matches the narrative of the lower number of commercial farmers and hatcheries in Rangpur compared to Rajshahi. The study team was able to collect data on feed mills in Rajshahi Division from the DoF office, but data from Rangpur Division has not been compiled.

Table 27. Number of feed mills and dealers by district.

District	Feed mills	Feed dealers
Bogura	17	36
Naogaon	5	32
Rajshahi	4	36
Sirajganj	4	11
Pabna	6	4
Natore	2	20
Joypurhat	7	12
C. Nababganj	1	7

4.4 Fish feed usage

Fish farmers and hatchery owners prefer lower quality and cheaper homemade feed, but for fish species like shing, magur, pabda and gulsha, commercial feed is preferred. A further study would assist in identifying the percentage of commercial and homemade feed that farmers use.

Among commercial feed, two types are used, namely floating and sinking feed. The majority of commercial feed mills produce six categories of feed based on fish size: hatchery feed, nursery (mash/powder, crumble), pre-starter, starter, grower, and finisher. Hatchery and nursery feeds are sold in bags of 1, 5 or 20 kg, while starter, grower and finisher feeds are sold in 20 or 25 kg bags. In most feed packages, the nutrition information is given, as per the requirements of the Fish Feed Act.

The prices of fish feed (Table 28) vary depending on type, category and quality and use.

Table 28. The price of the fish feed according to category.

Type of feed	Cost	Comments
Nursery fish feed	BDT 56/kg –BDT 110/kg	
Sinking feed	BDT 26–BDT 30/kg (homemade) BDT 32–BDT 38/kg (commercial)	
Semi-auto feeds	BDT 28/kg–BDT 32/kg	Price depends on brand, quality, season and levels of supply or demand
Floating feed	BDT 42/kg–BDT 44/kg (carp) BDT 44/kg–BDT 58/kg (pangas, tilapia and koi)	Usually more expensive

	BDT 88/kg–BDT 124 BDT/kg (shing, magur, pabda and gulsha)	

Among commercial feeds, CP, MEGA, Quality, Nabil, Nourish, Aftab, Biswas, Aman, Bengal, Tonguewei, Provita, Kazi, Krishibid, Uttara feed and Lily are noteworthy brands that are locally available. The study team could not collect detailed information about the feed companies in Rajshahi and Rangpur because of time and resource limitations. An in-depth study is required for a detailed overview of the feed sector in the two divisions.

Homemade feed

Homemade feed produced by farmers, hatchery owners and nursery owners at the household level is also quite common. They use locally available ingredients, such as rice bran, wheat bran, mustard oil cake and fishmeal. Hatchery and nursery owners use a mixture of rice bran, mustard oil cake, sesame oil cake, fishmeal and other ingredients, while farmers mostly depend on local markets to purchase the feed ingredients. Women are often involved in preparing homemade feed. An in-depth study could be conducted to identify the role of women in homemade feed production and the process in more detail. Table 29 shows the ingredients used for homemade feed and its application.

Table 29. Ingredients and application of homemade feed.

Model	Ingredients	%	Preparation method	Application method	Application rate	Where used
Polyculture low stocking density	Soybean meal	30	Grind soya bean meal first then mix with other ingredients.	Before applying, make a ball and put it under water .	1–2 times per day	Found in carp polyculture ponds in Pirgonj, Rangpur
	Vetch byproduct (anchor dal) or rice bran	20				
	De-oiled rice bran	44				
	Fishmeal	5				
	Salt	1				
75% carp, 25% gulsha	Rice bran	70	Soak mustard oil cake at least 12 hours.	Mix rice bran with mustard oil cake and apply in balls to a specific spot in the pond.	1–2 times per day	Found in carp polyculture ponds in Pirgonj, Rangpur
	Mustard oil cake	30				
70% carp, 25% shing/ magur, 5% tilapia	Broken rice	15	Soak mustard oil cake at least 12 hours and then boil broken rice.	Mix all the ingredients then make a ball and apply it in the pond.	1–2 times per day	Applied in Shantaher, Bogra
	Rice bran	50				
	Mustard oil cake	30				
	Fishmeal	5				
Polyculture high stocking density	Broken rice	50	Boil broken rice and mix with mustard oil cake then soak up to 24 hours.	Apply directly into pangas pond,	1–2 times per day	Applied in Patnitola, Naogoan
	Mustard oil cake	50				

Semi-auto feed

Semi-auto feed is pellet feed made in local feed mills with available ingredients, such as fishmeal, rice bran, wheat bran, mustard oil cake, soybean and maize. A semi-auto feed mill can produce up to 1–3 t of fish feed per day. The ingredients are ground into a powder and mixed together according to the

required ratio, as per the farmer. After mixing the ingredients, the mixture is put through a machine to produce pellets. These are then sun dried before packaging.

Commercial feed

Commercial feed is produced by large companies using auto mills. Hatcheries use commercial floating and sinking feed from reputed companies such as CP, MEGA, Quality, Nabil, Nourish, Aftab, Biswas, Aman, Bengal, Tonguewei and Provita, which increases the production of carp, tilapia, pangas and koi. Most fish farmers disperse feed by hand. For high value species, like shing, magur, pabda and gulsha, farmers prefer to use imported feed, such as De Heus, Skretting and Ocialias.

The feed is applied based on the weight of the fish species and is dispersed twice per day. Farmers generally sample their fish fortnightly and, depending on the weight, calculate the feed amount required for the pond. Generally, they apply 7% to 1% of the total weight of the fish depending on the size as the fish grows. During the growth phase, small fish require more feed, which lessens as they grow. For sinking feed, commercial fish farmers check the pond bottom for accumulation of excess feed. This indicates an oversupply of feed, and the feed application rate is adjusted accordingly.

Small farmers in Bogura said that the reason they started producing “Bangla” fish, such as rui, catla and mrigal, is because they require less feed compared to other fish, like tilapia. Feed is the single biggest cost for fish farmers, and they expressed a keen interest in adopting innovations that would reduce it.

Table 30. Types of feed brand sold in Rajshahi and Rangpur divisions.

Company	Feed sold (t)	
	Rajshahi Division	Rangpur Division
ACI Godrej	14,000	4,000
Paragon	4,723	2,700
Advance Aqua	10	0
Krishibid Feed	225	272
EON Animal Health	3,200	500
Index feed	3,600	0
Biswas Feed	1,400	200
Mega	2,000	1,600
Kazi	4,000	2,500
Quality	-	2,000
Nourish	-	1,000

Mega Feed reports that 1600 t of feed was sold in 2018, which was about 28% less than 2017 (2200 t). This a result of a decline in pangas and tilapia production because the market price fell in 2017 as a result of over production. Meetings with Nourish, Quality and other companies indicate that this was an issue with all feed companies in 2018. This decline in price and production for pangas and tilapia was countrywide.

When comparing the two study divisions, farmers in Rangpur are poorer than those in Rajshahi. Quality feed representatives said that they sell a 50 kg mesh feed pack, which is the cheapest in the market. It has played a decisive role in increasing number of sales in Rangpur for the brand, while the sale for all other brands has faltered.

Most of the feed companies produce both floating and sinking feed, mainly in proportions of about 60% floating feed and 40% sinking feed in terms of sales. The value of floating feed is comparatively higher.

The study team found that floating feed is roughly BDT 8–10 more per kilogram than sinking feed. The price varies between different companies and is not universal for all feeds. The feed companies mentioned above mostly produce fish feed for carp, pangas, catfish and koi.

Aquachemical products

There are about 10 main categories of aquaproducts used in aquaculture activities: antibiotic, disinfectant, gas removal, oxygen supplier, vitamins and minerals, growth promoter, insect killer, algae killer, predator killer and pH balance.

Table 31 shows the use of aquachemical products in hatchery and fish production. The majority of the hatcheries use aquachemical products to run their operations properly. The study team could not collect data on use and expenses related to aquachemical products because of time and resource limitations.

Table 31. Usage of aquachemical products in hatchery and fish production.

Aquaproduct	Purpose	Users
Formalin	Cleaning tanks and apparatuses; sterilizer for fish	Hatcheries
Potassium permanganate	Used for tank cleaning, fish disinfection, fry transportation, foot cleaning; brood dipped in potash after spawning before release	Hatcheries, farmers
Bleaching powder, polgard plus, salt, lime and methylene	Tank cleaning, pond sterilization	Hatcheries, nurseries and farmers
Antibiotics	Low dose for controlling bacterial disease	Hatcheries, nurseries and farmers
Hormones	Induced breeding	Hatcheries
	17 alpha methyl testosterone	Tilapia hatcheries for sex reverse
Vitamins and minerals	Food additives	Hatcheries, nurseries and farmers
Ethanol	Used to dilute methyl testosterone (growth and sex reversal)	Tilapia hatcheries
Oxymore (sustained release active oxygen 13.5%)	Supposedly to increase oxygen level and reduce the mortality rate from sudden depletion of oxygen	Hatcheries, nurseries and farmers
Orsaline	Maintain water quality during live fish transport	Hatcheries, nurseries and farmers

Table 32. Doses of aquachemical products.

Category	Company	Product	Dose
Disinfectant	ACI	Virex	50–60 kg/ha
Gas removal	Fishtech	Geolite Gold	50–60 kg/ha
Oxygen supplier	EON	Oxymax	0.6–1.2 kg/ha
Vitamins and minerals	Opsonin	Renavit C	5–7 g/kg of feed
Growth promoter	Novartis	Aqua Boost	0.5–1 kg/t
Insect killer	Samco	Sumithione	1.25–2.5 L/ha per 3 ft of water depth
Algae killer	Fishtech	Seaweed	5–10 L/ha
Predator killer and pH Balance	Biopharma	BiopH	1 ml/L in the pond
Antibiotics	Renata	Renamycin	500 mg/kg of feed

4.4 Marketing fish feed

Renowned feed companies sell fish feed through dealers, while smaller feed mills produce feed based on demand for farmers and hatcheries. Each feed mill has its own mix of marketing strategies to promote its feed among target segments. Some fish feed companies exclusively use dealers to reach

out to customers, while others use price skimming. Some even offer their feed products at very low prices. Figure 6 shows the general strategies in marketing fish feed among most fish feed companies.

Figure 6. Generral strategies in marketing fish feed employed by most fish feed companies

Dealer meetings

Feed companies promote their products, product quality, nutrition facts, feed conversion ratio and application method to dealers in annual meetings. During these meetings, they also promote and formally recognize their best dealers and award them with various benefits. Posters, brochures and pictures are distributed to be displayed in dealers' shops. Through these events, the feed companies also promote themselves to farmers through word of mouth from dealers.

Direct visits

Feed company representatives visit dealers and farmers in person to promote their company's products by dissemination information about their various benefits. These face-to-face visits are useful for farmers to learn about products and the free samples given by feed companies further encourage them.

Farmer training through dealers

Feed companies organize training sessions for farmers, hatcheries or nurseries through dealers. Most of these sessions are accompanied by well-thought out product placements that promote the use of updated technologies for increasing fish production. Farmers are encouraged to try out the new technologies using recommended products from the product lines. The farmers are also supplied with product brochures and booklets to ensure the company brand presence among the target group. When farmers benefit from using any particular brand, they also promote that specific brand to other farmers through word of mouth.

Promotional materials

Feed companies give promotional materials, such as posters, calendars, leaflets, notebooks and pens, to dealers, who in turn promote the brands to their customers.

Result demonstrations on Farmers' Day

In some cases, feed companies collaborate with development projects and demonstrate the results of using their feed in pond aquaculture. They highlight the economic benefits and the feed conversion ratio on Farmer's Day to draw in more customers.

Above the line promotion: Many feed companies, such as Uttara and Lily, sponsor TV and radio programs to promote their brand. Some also publish advertisements in local newspapers to promote their products to local target segments or farmers.

Exposure visits

Some companies take dealers on exposure visits to other areas to showcase the performance of their feed. These exposure visits help companies convince dealers about the strengths of their brand, which is then promoted to the farmers by the dealers in their respective location.

Selling feed on credit to large commercial farmers

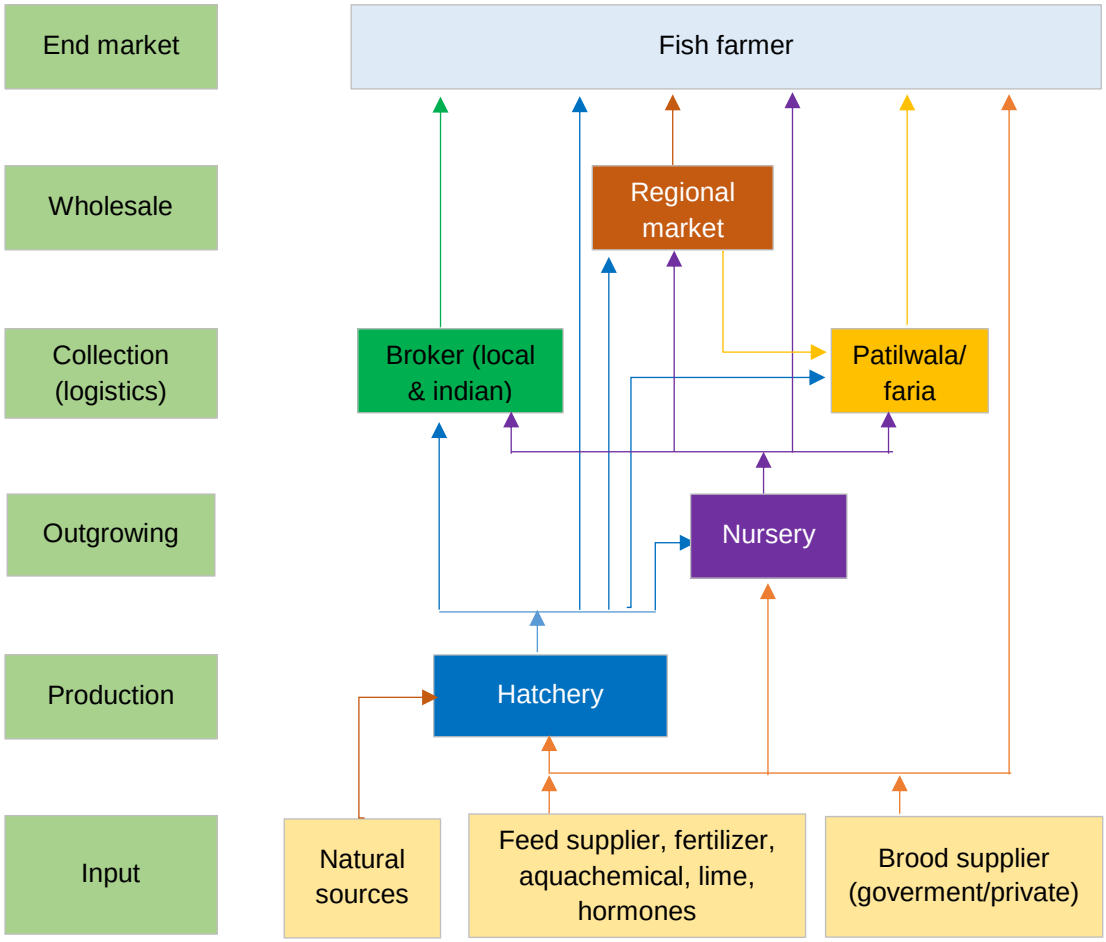
An in-depth study is required to find out the details of credit limits, tenure, loss, interest rates, etc., in Rajshahi and Rangpur divisions.

5. Value chain map

Figure 7 shows the handful of market actors involved along the value chain for hatcheries and nurseries in the spawn and fry sector. Hatcheries supply nurseries with spawn, and nurseries rear them for 4 weeks until they become fry, which they then sell to farmers, patilwalas and brokers. Input suppliers provide feed and aquachemical products to nurseries, hatcheries and farmers.

Brokers, patilwalas and farias collect fry from hatcheries and nurseries and then sell them to farmers. A few hatcheries, brokers and nurseries also supply fry to regional markets. There is a wholesale fry market in Adamdidhi Pourashobha where hatchery and nursery owners aggregate the fry and fingerlings that they produce in a pond with hapas and then sell them to different brokers, patilwalas, hatcheries and fish farmers. Brokers also sell fry to Indian markets through the borders of Benapole, Bhomra and Hili. According to the president of the Broker Association of Adamdighi, about 0.6 to 0.8 billion fry are sold each year from Adamdighi, Raniganj, Akkelpur and Kahaloo upazilas.

Figure 7. Value chain of the fish feed and seed inputs



5.1 Feed and aquachemical companies

Feed and aquachemical companies mostly sell feed and seed to hatcheries, nurseries and farmers. The relationship between feed suppliers and these customers plays an important role in getting the products on credit.

5.1 Brood fish supply

Broodfish is a core input for hatcheries in fish seed production. Broodstock supply thus needs to be categorized as a separate value chain function because of its importance and the complexity in its production and distribution.

5.2 Hatcheries

Hatcheries are the key value chain actors that produce fry from the eggs of broodfish. There are about 261 hatcheries in Rajshahi and Rangpur divisions where farmers and nurseries source fry and fingerlings.

5.3 Nursery

After the eggs hatch, spawn are then stocked in nursery ponds and dani are produced for sale. The majority of fish producers purchase dani from local nurseries and culture advanced fry or fingerlings up to 4 weeks in their rearing ponds. These are then transferred to the stocking ponds and cultured up to an average of 500 g. In most cases, farmers use advanced fingerlings and culture them to a medium size of 250–500 g. For catla, farmers produce fish weighing up to 1–1.5 kg. Some fish farmers and nurserers collect spawn from natural sources, such as the Padma and Jamuna rivers, and rear them in their farm pond. They then sell the fish to hatcheries and commercial farmers when they reach the required age and size.

5.4 Fish farmer

Fish farmers collect spawn or fry from reputed hatcheries and nurseries. In some cases, commercial fish producers collect small fish (0.5–1 kg) from marginal farmers or produce their own by procuring advanced fingerlings and culturing them in their pond up to their required stocking size. When producing their own, they stock fish over the winter (0.5–1 kg), which takes about 6 to 7 months.

5.5 Collection by trading intermediaries

Broker

Brokers collect fry in large volumes from hatcheries and nurseries and then sell them to farmers and Indian brokers as well as regional markets.

Patilwalas/farias

Farias purchase dani and fingerlings from hatcheries, nurseries and regional markets and then sell them to farmers.

Transport brokers

There are transport brokers who facilitate the transportation of fry to local and regional fish markets. They generally use pickups and trucks based on the volume of fish to be transported to different regional markets in plastic drums.

6. Additional findings

6.1 Women's involvement

As there are no fixed work hours in hatcheries, women are uninterested in hatchery operations and rarely engage in them because they have to manage their household and care for the children. During the FGDs, the study team discussed women's engagement in aquaculture-related work and found that education and socioeconomic conditions of the family are deciding factors in women's daily routine and their involvement in activities related to fish culture, even hatcheries. Women from poor families are usually low-literate and dedicate a large portion of their day to doing household chores, looking after poultry or domestic animals (if any), harvesting crops in fields, cooking food for family members and looking after homestead ponds. The women generally do not have decision-making power, and their views are not included in important family discussions. In cases where the husband or a male member of the family is absent, only then do the women take up the role of the head of the family and involve themselves in fish culture in their family owned ponds or take up hatchery management as necessary for maintaining livelihoods. They still hire male laborers for labor-intensive activities, but they often accompany hired help to market their fish.

The scenario is different in middle-income families. They primarily spend their time on household chores and educating their children along with other family responsibilities. In affluent families, educated and empowered female members are encouraged to pursue higher education and seek jobs upon completing their education. However, very few are encouraged to participate in hatchery operations. Since many tasks require working at night, which possess a security risk for women, they are not included in all functions of hatchery management. There are also social, cultural and religious barriers that restrict women from participating in hatchery operations.

"In hatchery business, men are facing hardship due to steep competition. How do you expect women to compete and thrive in this business?"

During the FGDs, men hatchery owners shared their difficulties in managing hatchery and nursery businesses. The also said that since women are involved in managing household ponds, they do not see the need to engage women in commercial production.

The majority of the women involved in fish culture engage themselves in applying feed, observing pond conditions, preparing brood and participating in women producers group discussions, meetings and training sessions. During the study, the team came across only five women involved in hatchery operations who were the family members of a male hatchery owner. In these cases, it is either the spouse or a daughter. Among the women currently working in a hatchery, all are doing so because they are widowed or their husbands work in different districts, or they are assisting their husband or father in hatchery operations. Table 33 shows the activities that women performed in these hatcheries.

Table 33. Activities that women carry out in hatcheries.

Hatchery	Owner	Address	Relationship	Roles
Rana Fish Hatchery	Md. Nur Nabi Sarker	Rangpur	Wife	Assisting in brood selection, checking water circulation, syphoning tank
Bhai Bhai Hatchery	Shamsul Haque	Rangpur, Sadar	Daughter	Preparing hormone solution, injecting

				hormones, stripping, hatchling production
Sham Fish Hatchery & Farm	Hasan Ali	Gongachora, Rangpur	Wife	Brood selection, weighing brood, injecting hormones
Khan Matshya Hatchery	Rina Khan	Adamdighi, Bagura	N/A	Owner involved in managing the hatchery, injecting hormones, stripping, hatchling production
Mamun Kritrim Projonon Kendra	Mamun-ur Rashid	Adamdighi, Bagura	Wife	Brood selection, injecting hormones, hatchling production

Women involved in these hatcheries are capable of brood selection, brood conditioning, injecting hormones and hatchling production, but they are not involved in marketing or any other functions of the hatchery.

Women in feed mills

No women were found to be working in feed mills. Owners said they do not usually recruit women because of the intensive physical labor involved in feed mill operations. Similar to feed mills, no women were found working with aquachemical companies or dealers in this region.

The environment of feed mill companies are not women-friendly, as the majority of the workers are male, who are mainly employed because the work is physically intensive. Feed company representatives from Mega, Kazi, Niharika, Biswas and Krishibid said that their companies do not hire female workers because of security and sexual harassment risks.

Suitable roles for women

In discussions about the role of women, feed companies and feed mills suggested that women can be easily involved in fish feed sectors as nutritionists, chemists, quality assurance officers and in the procurement and human resources departments of large feed companies. Female laborers can also be hired for packing and sorting feed.

Table 34. Suggestions for suitable roles for women in the fish seed and feed sectors.

Industry	Positions
Fish seed (hatcheries and nurseries)	Fish sorting
	Feed dispersal
	Brood selection
	Hatchling production
	Technician
Fish feed mill (large companies)	Nutritionist
	Chemist
	Quality assurance
	Purchase
	Accounts
	Human resources
	Sorting
	Packing

“Info ladies” - Kallyani[1]

One hatchery owner in Saghata, Gaibandha, reported that he has heard about “info ladies” but has not dealt directly with them. Women in the family sometimes interact with these info ladies and discuss about various issues, though not about fish culture or hatchery.

6.2 E-commerce and apps

There are very few organizations working to build links between the hatcheries, nurseries and fish farmers. The government’s NATP project is trying to develop and popularize a fish farmers website, which would help hatcheries and farmers connect and buy and sell products through the site. The initiative still has a long way to go, however, and extensive training would be required to make the value chain actors come together and use this service.

The majority of hatchery and nursery owners use smartphones, and most are comfortable using apps. They also regularly use Facebook for staying in touch with friends and family. Some hatchery and nursery owners look for information online and have used different apps from a playstore, though they do not find the apps very useful because most are very generic. The DoF has developed a mobile application through which fish farmers and nurseries can get information regarding fish culture, but it is not of great use to them since the majority of hatchery work is spawn-related.

Most hatchery and nursery owners communicate with brokers to get market information. They also communicate with technical officers from different aquachemical companies for technical support over the phone. Over 70% of the value chain actors interviewed use mobile financial services, like bkash, for payment.

6.3 Support services

6.3.1 Embedded service

Private sector organizations are contributing to the development of aquaculture and fish production by providing embedded services to fish farmers through hatcheries. They are also positioning themselves as technical experts to solve problems that farmers face in terms of sourcing fry, production, harvesting fish and helping them to maximize production. They provide these services with the aim of converting the farmers into long-term customers. Dealers work closely with farmers and advise them to use certain products proposed by their partner company. The aquachemical companies, along with dealers, also arrange training sessions for farmers. Company representatives report that there are very few female hatchery owners who seek advice and information from them.

6.3.2 Brokers association

The study team found a brokers association in Kahaloo Upazila, Bogura District, headed by Mr. Hafizur Rahman. This association is a group of paikers, dalal and fry or fingerling sellers working together to ensure easy management communication within the buyer and seller network. The association also manages the transportation or logistics network and facilitates the transportation of live fish and fish seed to various part of the country.

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[111] One of the most successful programs that **Dnet** has developed and launched is the 'Infolady' model. This is a model for empowering communities through **women Info**-preneurship. Challenging the status quo and creating the voice – was the essence behind coining the concept of 'Infolady' who are also known as kallyanis (http://dnet.org.bd/page/infolady).

6.3.3 Hatchery association

Farmers also receive support from the hatchery association operating in Adamdighi, Bogura, which has 60 members, out of which 57 are registered hatchery owners. This association makes sure that seed quality is maintained, and it functions as a regulatory authority to control the price of fish seed. It also tries to help its members by connecting them to buyers and aquachemical companies and arranging training for fish farmers through dealers.

6.3.4 Fish Fry Marketing Cooperative Society

The Fish Fry Marketing Cooperative Society (Mathsya Pona Byabsayi Samabay Samity), which is led by Mr. Akbar Khan, is also based in Adamdighi Upazila. The society assists in delivering fry to farmers, maintains seed supply, regulates the market to ensure stable prices, ensures fry delivery, as per demand, and acts as an arbitrator to manage disputes between farmers and hatcheries.

6.3.5 Local Fish Farmers Development Cooperative Society

According to Mr. Rafiqul Islam, secretary of the Local Fish Farmers Development Cooperative Society (Ancholic Matshya Chashi Unnoyon Samity) operating in Adamdighi Upazilla, out of 495 members there are only three active females (Ms. Salma Begum, Ms. Nilufer Yasmin and Ms. Bonna) who regularly participate in various cooperative meetings and activities. None is involved in fish farming.

6.3.6 Government services

In the government sector, the DoF plays a crucial role in encouraging private and public sector officials to work together by implementing local level projects targeted toward capacity development of fish farmers and related agrobusinesses operating in the project region. Some hatcheries and nurseries receive training from the DoF. However, apart from these, there are few fisheries-related projects implemented by the government and NGOs that are contributing to capacity development. The NGOs also educate hatchery owners, nursery owners and fish farmers about fish nutrition and the benefits of eating fish. In most government-organized fish farmers groups, they try to make sure that 30% of the participants are females, who regularly receive services from these support groups.

6.3.7 Other private sector services

Along with the DoF and NGOs, some private sector organizations, such as SKF and Fishtech BD, regularly conduct hatchery and nursery training in Rajshahi and Rangpur divisions. They also publish brochures and manuals on hatchery and nursery culture, which is another source of information for hatchery and nursery owners. These private sector companies also provide embedded services that include information on breeding techniques, brood and hormones, and tips on using probiotics, through dealers and technical officers. This helps hatcheries and nurseries increase production as well as ensure best aquaculture practices.

Most hatcheries and feed mill owners are aware of the feed and hatchery act of Bangladesh and its registration requirements. Mobile courts of the DoF regularly conduct surprise visits as well as scheduled periodic visits to ensure feed mills and hatcheries adhere to the law. The mobile court inspects the quality of brood, expiration dates of products used in production, proper storage of products, and the nutritional value of the products against the declared value on the product package. They also fine hatcheries and input suppliers if they violate any law in spawn or fry production or use any expired or poor quality products.

6.3.8 Financial services

Hatcheries and feed mills take out loans from banks to conduct business. By law, business registration is required to run a hatchery or feed mill, so all owners must keep their registration and trade licenses up to date to be eligible to apply for a formal loan. A number of hatchery and feed mill owners

interviewed said that they have taken out loans from the Bangladesh Krishi Bank at 14% interest and mortgaged their properties. Hatchery owners also take out loans from NGOs and microfinance institutes (MFIs), such as ASA, Grameen Bank and BRAC, up to BDT 300,000. Interestingly, many hatchery owners interviewed have applied for NGO or MFI loans through their wife, because the NGOs and MFIs find that women are more proactive in payment of instalments.

6.3.9 Use of credit by hatcheries and dealers

In term of providing seed or products to farmers on credit, hatchery owners use to supply farmer clients with whom they are on very good business terms. In the past, they supplied seed or products to farmers on credit and collected the promised amount after fish were harvested. However, they do not practice this anymore because of farmers who failed to pay back their loans, which creates a strain on these relationships.

Hatchery owners, however, buy feed products, aquachemical products and hormones from dealers on credit and pay them back within an agreed upon period. Dealers also supply aquachemical products and seed to fish farmers on credit based on relationships.

Feed companies provide credit to dealers if they get a guarantee from a bank. The amount may extend up to BDT 20 million. Some feed companies, like Ruposhi Bangla, often provide credit up to 3 million/1000 t to dealers with good transaction records for a term of 6 months. In most cases, they ask for a blank check from the dealer and prepare a deed of agreement in the stamp paper of BDT 150, stating the terms and conditions of payments and term. A further study is required to find out information regarding the credit strategy of different feed companies and MFIs about the length of credit, amount of credit, payback period, loan and ordering process as well as other details.

7. Recommendations

Seed

- Encourage hatchery owners to develop greenhouses using the cost-effective technology developed by the BFRI in Santahar, Bogura, and rear brood of the most in-demand fish species during the winter season to start producing spawn early.
- Encourage homestead farmers with perennial ponds to purchase spawn from hatcheries and produce and sell fry during lean periods to maximize profit within a short period of time.
- Promote the contract farming concept among hatcheries and homestead fish farmers, as seen in Mymensingh region, to benefit both parties.
- Encourage homestead farmers to purchase fry from hatcheries and use natural water bodies, such as beels and rivers (e.g. Attrai, Padma and Jamuna) using cage culture to produce advanced fry and sell to other fish farmers or culture in their homestead pond to shorten the culture period.
- Promote the use of improved stocks and brood collection of high value fish species from natural sources, because long-term use of the same brood leads to inbreeding and deteriorated quality.
- Replace the existing brood of exotic carp introduced by the DoF before 1980 with a new generation of brood from the DoF, because inbreeding and deteriorated quality among these species has occurred all over Bangladesh.
- Replace existing broodfish of pangas and climbing perch in Adamdighi (which were introduced in 1997) with a new generation of brood available from the BFRI and some other private hatcheries in Adamdighi and the Mymensingh region.
- Arrange training for hatcheries, nurseries and farmers to encourage them to introduce new technologies and mechanization.
- Develop and promote mobile apps targeted toward hatcheries and nurseries addressing different issues of spawn and fry production.
- Link insurance companies to devise crop insurance plans for hatcheries, nurseries and fish farmers.
- Provide incentives to hatcheries to include women in hatchery operations by providing low interest loans from banks and MFIs.

Feed

- Organize hatchery and fish farmer groups to set up a semi-auto feed mill to be used by the group and reduce the overall feed cost up to 15%–20%.
- Encourage large feed mills to recruit women in different positions, such as nutritionist, chemist, human resources and also in packing and sorting feed.

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Annex 1: List of Study Questions

Areas most potential to be covered in Rajshahi and Rangpur division for feed and seed iut for fish aquaculture

1. Which areas are most potential (Upazila & Unions) in Rangpur and Rajshahi division? (Use matrix of available govt. & other statistics, concentration feed dealer, hatchery, and feed mill, production and pond number data)?
2. What is numbers of feed mill, feed dealer, and other actors involved in feeds for fish - provide list with address?
3. What is numbers of hatcheries and other actors in selected areas connected to fish seed provide list with address?
4. Are there women actors,?(provide information about the outliers of women actors, even if there is very few)
5. Sketch value chain diagram for fish seed, fish feed and harvested fish to consumer? Indicate presence of women along this value chain (if possible)

Fish Feed Production and Distribution

1. Do feed suppliers able to supply product according to their customer demand?
2. If not which month this gap is happening and why it is happening?
3. Is it happing for all company feed?
4. What do you do when demand come from customer and cannot provide?
5. What is the percentage of your annual sales is of different category such as; Tilapia feed, Pangusfeed, Koi feed, carp feed
6. How feed company and hatchery promote their product?
7. How many women deal with fish feeds and what role do these women play? Such as; employees, hatchery helpers, family members, nurserers, customers , sub-dealers
8. Have they dealt with women in the past? Why are there such less women? What enabled these women to work with these hatcheries?

Fish Seed Production and Distribution

1. Do fish seed suppliers able to supply product according to their customer demand? If not which month this gap is happening and why it is happening? Is it happing for all hatcheries? What do you do then: when demand come from customer and cannot provide?
2. What is the percentage of your annual sales is of different species of seed tilapia, Pangus, Koi, carp and others
3. How hatcheries promote their product ?
4. What types (species) of fish seed the hatcheries are producing and amount (volume) of those and customer s area wise respectively?
5. What is common size of fry for stocking in ponds for carp & others?
6. What are their sources of brood – do they have a system of breeding to prevent inbreeding?
7. How they get and retain skill technicians required for their work?
8. How do the hatcheries promote their products (fish seed)?
9. Do they work with local nurseries or sub-dealers/forias/patilwala/ developed LSP in addition to marketing to the farmers directly?
10. How many women do the hatcheries deal with and what role do these women play?(These women can be employees, hatchery helpers, family members, nurserers, customers, sub dealers, etc)
11. Have they dealt with women in the past? Why are there such less women? What enabled these women to work with these hatcheries?

Gender (women involvement) in value chain

1. What is women's involvement in different value chain (fish seed, fish feed, fish production, fish selling, etc) and any wages gap ? Bring information of women as business owners, as family members, as employees, as entrepreneurs, as laborers. What is the potential to involve more women? What kinds of roles do women perform, do they make decisions?
2. The roles of women in both fish and vegetable production, harvest, marketing and processing ?
3. How can women better engage with aquaculture? Are there women who can engage with aquaculture without social pressure?
4. Do they know about info ladies or Kallyani's? How do women access information?

Service Sector

1. How they (men and women separately) get information (technical, business gender & nutrition) (i.e. embedded services , DoF, & other) and how much are they (men and women separately) benefited ? Is it continuing still ? Who are the service providers ? Did they (men and women separately) get any extension services, manual, or document from any organization, if they get when and which organization?
2. Do they or did they in the past receive any nutrition or BCC related training, materials, advice? If so, from which organisations/projects?
3. Do they or did they in the past receive any maternal and child health related extension, BCC or projects? IF so from which organization/project?
4. Do they know about feed & hatchery act ? Do they implement any of those ?

Credit facilities

1. What is credit system within value chain actors (feed & seed value chain) ?
2. Is there any adapted credit system from financial organization for farmer, feed dealer, hatchery owner, and other actors in those areas? Name of those credit organization (including micro credit, bank, savings groups) ?
3. Do women access and control credit differently than men?

Open ended question

1. What is the problems in doing business , or are they facing and what possible solution according to them ?

(2 women)

Annex 2: List of Key Informant Interviews (KII)

SL	Name	Designation	Organization	Contact number
Government Officials				
1	Dr. Zillur Rahman	Deputy Director, Aquaculture, Matshya Bhaban, Dhaka	Department of Fisheries (DoF), Matshya Bhaban, Dhaka	01712 237412
2	Mr. Sujit Chakraborty	District Fisheries Officer, Reserve, Matshya Bhaban, Dhaka	Department of Fisheries (DoF), Matshya Bhaban, Dhaka	01711 199014
3	Dr. Tanvir Islam	Deputy Project Director, Sustainable Coastal and Marine Fisheries Management Project. Matshya Bhaban, Dhaka	Department of Fisheries (DoF), Matshya Bhaban, Dhaka	01712902719
4	Mr. Mezbaul Haque	Deputy Director, Rangpur	Department of Fisheries (DoF), Rangpur	01712 514468
5	Ms. Hasna Zahan	Fisheries Extension Officer, Mithapukur	Department of Fisheries (DoF), Mithapukur, Rangpur	01714 802188
6	Mr. Zahangir Alam	DFO, Rajshahi	Department of Fisheries (DoF), Rajshahi	01712 879000
7	Mr. Udoy Rozario	Fisheries Extension Officer, Durgapur, Rajshahi	Department of Fisheries (DoF), Rajshahi	01716 320767
8	Mr. S. M. Nazim Uddin	Assist. Fisheries Officer, Naldanga, Natore	Department of Fisheries (DoF), Natore	01712 493852
9	Mr. Abul Kalam Azad	Senior Upazila Fisheries Officer, Poba, Rajshahi	Department of Fisheries (DoF), Rajshahi	01718 017472
10	Mr. Abul Kalam Sohag	Senior Upazila Fisheries Officer, Mohanpur, Rajshahi	Department of Fisheries (DoF), Rajshahi	01710 839971
11	Mr. Mahbubur Rahman	Assist. Fisheries Officer, Fulbari, Dinajpur	Department of Fisheries (DoF), Dinajpur	01720 992039

12	Mr. Prodip Kumar sarker	Senior Upazila Fisheries Officer, Gobindagonj, Gaibanda	Department of Fisheries (DoF), Gaibanda	01722 158775
13	Mr. Tarapada Chawhan	Senior Upazila Fisheries Officer	Parbotipur, DoF, Dinajpur	01717 785176
14	MS. Anguri Begum	Training Officer	Parbotipur Hatchery, DoF, Dinajpur	
15	Amol Kumar Roy	Fisheries Extension Officer, Naogoan,	Department of Fisheries, Naogoan	01714 022522
16	Mr. Muksudur Rahman	Senior Upazila fisheries officer (SUFO)	Department of Fisheries, Rani Nagor, Naogoan	
17	Mr. Shahidul Islam	Field Assistant, Gaibanda	District Fisheries Office, Department of Fisheries,, Gaibanda	01790 249098
18	Mr. Abdul Latif	Senior Assistant Director	District Fisheries Office, Department of Fisheries,, Dinajpur	01712 535274
19	Mr. Imrul Kayes	Upazila Fisheries Officer	Patnitola, DoF, Naogoan	01719 303383
20	Mr. Diponkor	Senior Upazila fisheries officer (SUFO)	District Fisheries Office, Department of Fisheries,, Aditmari	01733 825157
21	Mr. Mofassalin	Senior Upazila fisheries officer (SUFO)	District Fisheries Office, Department of Fisheries, Kaligonj	01717 672749
22	Mr. Altaf Hossain	Assistant Upazila fisheries officer (AFO),	District Fisheries Office, Department of Fisheries, Kaligonj	01718 837436
23	Mr. Lal Chand	Assistant Upazila fisheries officer (AFO)	District Fisheries Office, Department of Fisheries, Bagmara, Rajshahi	01726 810003
24	Aminul Islam	Field Assistant	District Fisheries Office, Department of Fisheries, Fulbari, Dinajpur	01724-080376
25	Ismat Ara	Senior Upazila Fisheries Officer	Thakurgaon, Rangpur	01757 410149
University & Research Station				
26	Dr. Istiaque Hossain	Professor	Department of Fisheries, RU	01726 514232
27	Dr. David Rintu Das	Senior Scientific Officer	BFRI, Shantaher, Adamdighi, Bogura	01711 422117

Annex 3: List of In-Depth Interviews (IDIs)

SL	Name	Address	Mobile Number
Farmers			
1	Md. Abdur Razzak	Farmer, Kahaloo, Bogura	01725-636337
2	Sajib	Farmer, Kahaloo, Bogura	
3	Abdul Manan	Farmer, Kahaloo, Bogura	
4	Md. Rezaul Akhand	Farmer, Kahaloo, Bogura	
5	Md. Rakibul Hossain	Farmer, Kahaloo, Bogura	
6	Abu Hanif	Farmer, Kahaloo, Bogura	
7	Asma Begum	Farmer, Kahaloo, Bogura	01768-610721
8	Majeda Khatun	Farmer, Rangpur	

9	Abu Bakkar Siddique	Farmer, Pirganj, Rangpur	
10	Abul Hossain	Farmer, Rangpur	
11	Ruhul Amin	Farmer, Rangpur	01751-206980
12	Moksedul Haque	Farmer, Parbotipur, DInajpur	01794 856030
13	Shahera Aktar	Farmer, Parbotipur, DInajpur	01719 548149
14	Shahida Begum	Farmer, Parbotipur, DInajpur	01793 866733
15	Khaleda Begum	Farmer, Parbotipur, DInajpur	
16	Shahnaj Parveen	Farmer, Parbotipur, DInajpur	
17	Amjad Hussain	Farmer, Parbotipur, DInajpur	
18	Sakebul Islam	Farmer, Parbotipur, DInajpur	
19	Yasin Ali	Farmer, Parbotipur, Dinajpur	
20	Abu Taher	Farmer, Rangpur	01719-315825
21	Rahim Uddin	Farmer, Rangpur	01780-665735
22	Mofakkarul Islam	Farmer, Dinajpur	
23	Rakibul Islam	Farmer, Kaharole, Dinajpur	
24	Fahima Begum	Farmer, Gobindagonj, Gaibandha, Rangpur	01719-251391
25	Marufa Akhter	Farmer, Gobindagonj, Gaibandha, Rangpur	01729-829801
26	Monoara Begum	Farmer, Gobindagonj, Gaibandha, Rangpur	01934-608950
Resource Person			
27	Humayun Kabir	Fishery Officer, PKSF, Mohanpur, Rajshahi	01737-037277
28	Alamgir Hasan	Field Facilitator, Integrated Farm Management Project (Danaida Funded), Raninagar, Naogaon	01739-170004
Lead Farmer			
29	Mr. Emdadul Haque Babu	Farmer, Poba, Rajshahi	01712 185136
30	Mr. Tauhidul Islam	Integrated Farm Management Project (Danaida Funded), Gurudaspur, Natore	01713 746327
31	Kazi Abed Latif Murad	Chowdhury Fish, Fulbari Pater, Raipur, Pirgonj, Rangpur	01714 230217
32	Md. Mahbubur Rahman	Farmer, Adamdighi, Bogura	01712 219439
Broker Association			
33	Mr. Akbar Khan	President, Matshya Babshahi Somabai Somity, Adamdighi, Bogra	01711781825
34	Mozaffer Hossain	Secretary, Kudra Mathsyajibi Samity, Adamdigi, Bogra	
Feed Dealers			
35	Mr. Anwarul Islam	Proprietor, Anik Fisheries and Poultry Resource Center, Poba, Rajshahi	01919 319080
36	Mr. Belal Uddin	Proprietor, Al - Riyad Fish & Poultry Feed Mill Ltd, Adamdighi, Bogra	01711 781839
37	Md. Nahid	Proprietor, M/S Nahid Traders, Patnitola, Naogaon	01713-719625
Feed Dealer			
28	Md. Mamun	Fish Feed and Aqua products Dealer, M/S. Noman Enterprise, Kahaloo, Bogra	01718 709168
29	Mr. Abu Raihan	Feed and Aqua product seller, M/S. Modina Traders, Rani Nagor, Naogoan	01716 303199
30	Mr. Taijul Islam	Mega Feed Dealer, Al - Amin Traders, Adamdighi, Bogra	01719 024209
31	Mr. Kamrul Hasan	Senior Executive, Aqua Technical Services, SKF	01769 621030

Annex 4: List of Women involved in Hatchery Activities

Name of Hatchery	Owner Name	Women involved	Address	Phone (Owner)

Khan Matshya hatchery	Rina Khan	Rina Khan	Endoil, Adamdighi	01712 819762
Rana Fish Hatchery	Md. Nur Nabi Sarker	Maleka Begum	Rangpur	01718 270757
Bhai Bhai Hatcghery	Shamsul Haque	Nilufer Yasmin	Rangpur, Sadar	01716-964281
Mamun Krittim Matshya Projonon Kendra	Md. Mamun		Adamdighi, Bogura	01732 021455
Sham Fish Hatchery & Farm	Hasan Ali	Morsheda Begum	Gongachora, Rangpur	01740-575254

Annex 5: List of Hatchery Owners Interviewed

Sl. #	Name of Hatchery	Owner	Address	Cell Number
1	Shah Matsho Hatchery	Emrul Islam	Talsen, Adamdighi, Bogura	01712 905567
2	Bellal Hossain Matsho khamar	Bellal hossain kobiraj	Kahalu, Bogura	01716 326389
3	Riyad Matsho Hatchery	Sahin	Sathia, Pabna	01711 414623
4	Sonarbangla Matsho Khamar	Golam Kibria Porag	Shantaher, Adamdighi, Bogura	01711 013797
5	Sarker Matsho Khamar & Hatchery	A. Rahim	Adamdighi Bogura	01710 794419
6	Shaymal Matsho Hatchery and Khamar	Pankoj Chandra Sarker	Adamdighi Bogura	01711 303064
7	Safin Matsho Hatchery	Md. Azmol Huda	Gaibanda Sadar	01712 703623
8	Kaminibala Matshya Hatchery	Ramji Lal Saha (Baidanath)	Pirgacha,Rangpur	1917487376
9	Jasmin Nahar Matsho hatchery	Faizul Islam Zim	Tajnathtokyapar, Rangpur	01734 089060
10	Mannan Krittim Utpadan Kendra	Abdul Mannan	Bogura	01711-123954
11	K. J Matsho Projanan Kendra	Golam Mostofa	Dupchachia, Bogura	01712 954378
12	Zim Matsho Breeding Center	Md. Shohag Khondokar	Adamdighi Bogura	01712 398097
13	Azizar Matsho Projanan Kendra	Ruhul Amin Santu	Talsen, Adamdighi, Bogura	01716 131833
14	Al-Amin Matsho Hatchery	Bacchu Miah	Adamdighi Bogura	01712 371385
15	Arefa Matsho Khamar	Raja Miah	Arulia, Bogura	01711 584019
16	Bismillah Matsho Hatchery	Mintu Sheikh	Kahalu, Bogura	01716-726450
17	Jobeda Matsho Khamar	Robiul Islam	Adamdighi Bogura	01725-184360
18	JF Matsho Khamar & Hatchery	Ferdous Rahman	Adamdighi Bogura	01724-069391
19	Silver Queen Matsho Hatchery	Jahid Hossain	Bogura, Sadar	01712-566175
20	Sonarbangla Matshao Bij Utpadon Kandra	Monjurul Haque	Bogura , Sadar	01712-137930
21	Vai Vai Matsho Khamar	Moqbul Hossain	Bogura, Sadar	01717-142670
22	Jonaki Matsho Khamar	Torikul Islam	Shajahanpur, Bogura	01915-988712
23	Sorna Matsho Khamar	Ali Atoab Foju	Shahjhanpur, Bogura	01713-705008

24	Rana Fish Hatchery	Md.Nur Nabi Sarker	Rangpur	01718 270757
25	Apon Matsho Hatchery	Md. Basir	Nageshawari, Kurigram	01718-151673
26	Badhah Aziz Matsho Khamar	Badsha Aziz	Domar, Nilphamari	01712-550110
27	Bhai Bhai Hatchery	Shamsul Haque	Rangpur, Sadar	01716-964281
28	Anik Matsho Khamar	Polash Chandra	Mohadepur, Polashbari, Gaibandha	01710-056425
29	Gabura Fish Hatchery (Bhai Bhai Matsho Hatchery)	Md. Anwar Hossain	Dinajpur, Sadar	01725-742782
30	Sham Fish Hatchery & Farm	Hasan Ali	Gongachora, Rangpur	01740-575254

Annex 6: List of Hatcheries in Rajshahi & Rangpur Division

Name of Hatchery	Contact Person	Address	Contact number
Mohaluxmi Hatchery	Badal Maitra	Talson, Adomdighi, Bogra	01718 825778
Sonar Bangla Matsha Khamar and Hatchery	Golam Kibria Porag	Santahar, Adomdighi, Bogra	01711 013797
Jobeda Matsha Khamar & Hatchery	Rabiul Islam	Choto Akira, Adomdighi, Bogra	01725 184360
JF Matsha Khamar and Hatchery	Ferdous Rahman	Kadma Bazar, Adomdighi, Bogra	01724 069391
Shamol Matsha Khamar & Hatchery	Pankaj Chandra Sarkar	Choroktola, adomdighi	01711 303064
Sarkar Matsha Khamar & Hatchery	Sree Bikash Chandro Sarkar	Choroktola, adomdighi	01721 545062
Manik Matsha Hatchery	Faridul Haq Manik	Choroktola, adomdighi	01761 528030
Al amin Poultry & Matsha Hatchery	Bachchu Bhai	Salgram, Adomdighi	01712 371385
Puna Hatchery	Md. Shohad Khandaker	Endoil, Aomdighi	01712 398097
Khan Matsha Khamar & Hatchery	Md. Helal Khan	Endoil, Adamdighi	01961 289054
Hira Matsha Khamar & Hatchery	Sirajul Islam Hira Khan	Endoil, Aomdighi	01712 128237
Mukta Matsha Khamar & Hatchery	Md. Mukta Khan	Endoil, Aomdighi	01711 167628
Sardar Matsha Khamar Ltd	Belal Uddin Sardar	Aomdighi	01711 781839
Bhai Bhai Matsha Projonon & Utpadon Khamar	Abdus Sattar	Aomdighi	01711 171703
Mondol Matsha Khamar & Hatchery	Abdul Motin Maju	Jugaier, Adomdighi	01820 527396
Sentu Matsha Khamar & Hatchery	Ruhul Amin Sentu	Talson, Adomdighi, Bogra	01716 131833
GM Aquaculture Ltd	Abdul Mohit Talukdar	Kalaikuri, Adomdighi	01711 413605
Adnan Matsha Hatchery	Helal Uddin	Kadma, Adomdighi	01726 557748
Abul Matsha Khamar	Abul Hossain	Kadma, Adomdighi	01745 851232
Sahara Matsha Khamar	Moinul Hasan Pintu	Cross Bari, Adomdighi	01712 206715
Shah Matsha Hatchery	Amrul Islam	Talson, Adomdighi, Bogra	01711 905567
Kahalu Upazila Fisheries Officer	Jahangir Alam	Kahalu	01716 358135
Bhai Bhai Matsha Hatchery	Azhar Ali	Lakshipur, Kahalu	01712 102467
Atiq Matsha Khamar	Mahfuzur Rahman Bablu	Kahalu Porosova	01711 359322
Bhai Bon Matsha Khamar	Abdul Razzak	Kahalu Porosova	01711 902644
Bismillah Matsha Hatchery	Mintu Sheikh	Sarai, Kahalu	01716 726450
Belal Hossain Matsha Khamar	Belal Hossain Kobiraj	Kahalu Porosova	01716 326389
Bogra Matsha Projonon Kendro	Abdur Rashid	Chalk Sutrapur, Tannery Road, Bogra	01962 113548
Sarkar Matsha Hatchery	Abdur Rahim	Chalkjopu, subgram, Bogra	01710 794419
East Bogra Matsha Hatchery	Md. Abdul Baset	Chalkjopu, subgram, Bogra	01739 894335
Hadika Hamim Matso Hatchery	Harun ur Rashid	Sikibanda, Arulia, Bogra	01711 314807
Mannan Krittim Matsa Renu Utpadon Kendro	Abdul Hannan	Bandighi, Arulia, Bogra	01711 123954
Arefa Matsa Hatchery	Raja Mia	Bandighi, Arulia, Bogra	01711 584019
Char Bhai Sonali Matsa Kahamar	Comred Mokbul Hossain	Bandighi, Arulia, Bogra	01716 964281
TheUnited Matsa Hatchery	Mahbubur Rahman	Bolodor, Muroil, Kahalu	01720 142156

Kwality Aqua Breeds Ltd.	Md. Shariar Hossain	Kahalu	01713 192123
M/S Sonargaon Matsa Bij Utpadon Kendro	Md. Monjurul Haque	Koichor, Fafor, Bogra	01712 137930
Silver Queem Matsa Hatchery	Md. Jahid Hossain	Koichor, Fafor, Bogra	01712 566175
Dupcacia Upazila Fisheries Officer	Maksudur Rahman	Dupchachia	01748 948996
KJ Matsha Projonon Kendro	Md. Golam Mostafa	Khihali, Modhdhopara, Altafnagar, Dupchachia	01712 954378
M/S Bhai Bhai Matsa Bijagar	Md. Chan Meah	Gobindopur, Dupchachia	01713 739666
M/S Dui Bhai Matsha Hatchery	Mofajjol Hossain	Khihali, Modhdhopara, Altafnagar, Dupchachia	01718 185200
M/S Abdur Razzak Matsha Bijghar	Abdur Razzak	Gobindopur, Dupchachia	01712 951131
Bismillah Matsha Bijghar	Alhaj Kabej Alin	Dokorkola, Dupchachia	01719 330121
Bhai bhai Matsha Bijghar	Safiqul Islam	Boro Nilahali, Kamrul, Dupchachia	01711 010137
Choumohoni Hatchery	Abdus Samad	Bishalpur, Sherpur	01718 427866
S P Hathcery	Alhaj Habibur Rahman	Hospital Gate, Sherpur	01710 189138
Mohaluxmi Hatchery	Ashraf Sarkar	Hatigara, Srabonddighi, Shepur	01712 853810
Maijvandhari Matsha Khamar	Md. Hamidul	Hatigara, Srabonddighi, Shepur	01711 463493
Bogra Matsha Khamar	Motiarul Islam Master	Jora- dewanpara, Ashekpur, Bogra	01711 317093
Bhai Bhai Matsha Khamar	Md. Makbul Hossian	Ranirhat, Ashekpur, Bogra	01717 142670
Sorna Matsha Hatchery	Ali Atoab Foju	Khadas, Gohail, Bogra	01713 705008
Boyradighi Matsha Khamar	Kaisar Niaj	Ranirhat, Ashekpur, Bogra	01711 393771
Sajahanpur Upazila Fisheries Officer	Md. Ferdous Ali	Sahjahanpur, Bogra	01712 171930
Bhai Bon Matsha Khamar	Ekram Hossain	Durulia, Gottapara, Sahjahanpur	01718 568517
M/S Rubel Krittim Renu Utpadon Khamar	Mohibur Rahman Monju	Kopinagar, Kamarpara, Sahjahanpur	01749 456816
Ratul Matsha Hatchery	Md. Rofiqul Islam	Jomadarpukur, Gohail, Sahjahanpur	01711 412 584
Jonaki Matsha Khamar	Abdul Jolil Master	Khadas, Gohail, Bogra	01915 988712
Bismilllah Hatchery	Anisur Rahman Mintu	Telihata, Sukhanpukur, Gabtoli, Bogra	01712 923520
Jaman Matsha Khamar	Md. Kajol	Telihata, Sukhanpukur, Gabtoli, Bogra	01720 190335
Saddam Hatchery	Md. Monju	Sukhanpukur, Gabtoli, Bogra	01719 736513
Joy Matsha Hatchery	Shree Nikhil Chandra	Krishno Chandapur, Langluhat, Gabtoli	01722 626813
Partner agro Firm & Fisheries	Multan Mahmood	Ovirampur,Shibgonj, Bogra	01727637990
Syed Hatchery	Md. Tajul Islam	Ovirampur,Shibgonj, Bogra	01719466096
Nabin Matsho Chashi Bhahumukhi Prokolpa		Rail gate, Sadar, Natore	
Natore Adhunik Matsho Chash Prokolpa Ltd		Majdhiga, Natore	
M/S. G. M Matshobiz and Pona Utpadan Khamar		Bonrailghoria, Natore	
Shanirbhor Matsho Pona o Biz Utpadan Khamar		Ekdala, Natore	
Kobita Matsho Hatchery		Ekdala, Sadar, Natore	
Bismillah Hatchery		Bonrailghoria, Sadar, Natore	
M/S. Al- Amin Matsho Hatchery		Brikachutia, Karbala, Ahmedpur, Baraigram, Natore	

Natore Hatchery & Agro Complex Ltd		Tomaltola, Bagatipara, Natore	
North Bangal Thaitech Tilapia Hatchery		Shaymnagar, Patul, Naldanga, Natore	
Sonali Matsho Hatchery		Vattopara, Madhnagar, Naldanga, Natore	
S. R Matsho Biz Utpadan Khamar		Hat Naogoan, Dubalhati road, Naogoan	01711166994
Ekata Matsho Biz Projanan Hatchery		Boliher, Sadar, Naogoan	01731 607120
The Matsho Khamar & Hatchery		Mohespur Bazar, Bamil, Patnitola, Naogoan	
S. R Pangas Hatchery		Hat Naogoan, Dubalhati road, Naogoan	01711166994
Bank Biheri Matsho Hatchery		Kismot Kosba Baliher,Sadar, Naogoan	01729 673831
Pritom Matsho Hatchery, Kismot Kosba		Baliher,Sadar, Naogoan	01729 673831
Lucky Matsho Hatchery/Khamar		NimgachiUp{ Porail, Raninagar, Naogoan	01757 967041
Mayer Dua Matsho Hatchery		Vill: Dubaghari, Jhalghoria, Paroil, Raninagar, Naogoan	01716 100095
Bhai bhai Matsho Hatchery		Vendergram Bazar, Raninagor, Naogoan	01707 482931
Bhai Bhai Matsho Hatchery		Porail, Raninagar, Naogoan	01845 006441
Abu Sahir Matsho Hatchery		Vendergram Bazar, Paril, Raninagor, Naogoan	01713 703257
Mayer Dua Matsho Khamar		Jagotpur, Paril, Raninagar, Naogoan	01716 176771
Tin Bhai Matsho Hatchery		, Ratlai, Vendergram, Paril, Raninagar, Naogoan	01782 927747
Amzad Matsho Hatchery		Khanpukur, Kaligram, Naogoan	01758 356389
Mother Fisheries & Hatcheries		Kashimpur, Raninagar, Naogoan	
M/S. Naher Matsho Hatchery,		Bhabhaninagar, Ghos nagar, Mohadevpur, Naogoan	
TraspiaMatsho Hatchery		Bilshikari, Mohishbathan, Hatur, Naogoan	
Al - Amin Matsho Hatchery		Vill: Mohadevpur, P.O. Mohadevpur, Naogoan	01718 915867
Saha Matsho Hatchery & Khamar		Bhabhaninagar, Raigoan, Mohadevpur, Naogoan	01713 705827
Tusher Integrated Fish Farm		Singsara, Ahsangonj, Atrai, Naogoan	01711 109603
Grameen Matsho hatchery		Atrai, Naogoan	01761 584765
Shah Jalal Shah Poran Matsho Hatchery		Singsara, Atrai, Naogoan	01714 328259
Tusher Integrated Fish Farm		Singsara, Ahsangonj, Atrai, Naogoan	01711 109603
Adarsho Matsho hatchery		Agra, Agradigun, Dhamerhat, Naogoan	01713 784411
M/S. Nur Matsho Khamar		Chalk Umar, Pharsipara, Naogoan	
Abdul Kader Matsho hatchery		Uttar Chalkjadu, Dhamerhat, Naogoan	01745 279225
The Aqua Matsho hatchery		Ramrampur, Telipara Moor, Dhamoirhat, Naogoan	01710 919327
Shuborna Matsho Hatchery		Kashimala, Deepgonj, Badalgacchi, Naogoan	
The Matsho Khamar & Hatchery		Mohespur Bazar, Bamil, Patnitola, Naogoan	

Dolphin Agro Complex	Md. Masudar Rahman	R.K Road, Mahigonj, Rangpur	01716980067
Farm Line Hatchery	Shah Amanur Rahman	Mithapukur, Rangpur	01711419191
Northern Hatchery		Jummapara, Rangpur	
Shondhi Aqua & Agro Farms	Zweel	Balabari, Ecorchali, Taragonj, Rangpur	
Anjuman Matshya Hatchery	Md. Asaduzzaman Nur Palash	Khanpur, Sundara, Sadar, Dinajpur	01712206728
Motshyo Chetana Hatchery	Md Ishak Ali	Rajarhat, Kurigram	01190473340
M.M. Hatchery		Fulbari, Kurigram	
Khoybor Hatchery		Borovita, Fulbari, Kurigram	
RDRS Carp Hatchery	Md. Johirul Alam	Ulipur, Kurigram	
Motshyo Michil Hatchery		Kalirpar, Lalmonirhat Sadar	
Bismillah Hatchery		Barobari, Lalmonirhat Sadar	
Master Hatchery		Lalmonirhat Sadar	
BoroVita Agro ltd		Fulbari, Kurigram	
Self Reliyance Matsho Hatchery	Nurul Islam Asrafee	Tajhat, Rangpur	01710 870955
Rangpur Matsho Hatchery	M/S. Masuda begum	Khatkhotia, Parshuram, Rangpur	01745 596700
Hazi Matsho Hatchery	Rawshonuzzaman	Tetulia, Emadpur, Mithapukur, Rangpur	01722 849665
Simanta Carp Hatchery	Zohirul Islam Bablu	Tetulia, Emadpur, Mithapukur, Rangpur	01718 582685
Bhai bhai Matsho Hatchery	Badal Mondal	Tetulia, Emadpur, Mithapukur, Rangpur	01723 331787
Rahmat Matsho hatchery	Abdul Mannan Sarker	Naldanga, Sadullapur, Gaibanda	01729 938920
Self Reliyance Matsho Hatchery	Nurul Islam Asrafee	Tajhat, Rangpur	01710 870955
Modina matsho Hatchery	Md. Rafique Miah	Enayetpur, Sadullapur, Gaibanda	01728 005873
Ram Matsho Hatchery	Bijoy Kumar Sarker	Varatkhali, Saghata, Gaibanda	01710 814504
Mayer Dua Matsho hatchery	Md. Abed Ali	South Rajibpur, Dupadanga, Sundargonj, Gaibanda	01718 582685
Tofazzal Hossain Matsho hatchery	Johirul Islam	Naldanga, Sadulapur, Gaibanda	01748 903608
Nur Alam matsho hatchery	Md. Abdul Haque	Shawman Colony, Sadar, Lalmonirhat	01723 072469
Matsho Misil Hatchery	Khon.Arifur Rahman	Fakirer Taukua, Gukunda, Sadar, Lalmonirhat	01712 103433
Bismillah Hatchery	Md. Afzal Hossain	Tista, Gukunda, Sadar, Lalmonirhat	01712 694060
Ghafrunnaher Matsho Hatchery	A. Latif Skeikh	Gukunda, Sadar, Lalmonirhat	01710 490731
Mithi Matsho hatchery	Mahbuba Alam	Taluk Polashi, Namuri, Aditmari, Lalmonirhat	01719 420699
Lam matsho hatchery	Rabiul Islam	Mohishasahor, Namuri, Aditmari, Lalmonirhat	01710 870955
Kabbyo Digonta Fisheries	Komalandu RoyMinto	Kashiram, Karimpur, Kaligonj, Lalmonirhat	01716 280206
Ma- Moni Matsho hatchery	Md. Jasim Uddin	East Bajgram, Naodabas, Hatibanda, Lalmonirhat	01718 009903
Matsho Korner Hatchery & Nursery	Rashidul Islam	Borokhata, Lalmonirhat	01760 583290
Fazlul Haque Hatchery	Md. Fazlul Haque	Hakimpur, kaligonj, Devigonj, Panchagor	01740 929300
Badsha Aziz Matsho Hatchery	Badsha Aziz	Matukpur, Domar, Niphamary	
Naher Matsho Hatchery	-	Chilahati, Domar, Niphamary	

Parbotipur Fish Seed multiplication Farm	Department of Fisheries	Parbotipur, Dinajpur	
Shamsher Ali Hatchery	Md. Shamsher Ali	Sundardighi, Devigonj, Panchagor	01725 120272
M/S. Hai Hatchery	Md. Abdul Hai	Hatisha, Kaharole, Dinajpur	01713 723813
Anjuman Matshya Hatchery	Asaduzzaman Polash	Sundara, Sadar, Dinajpur	
Ishak Ali Hatchery	Md. Ishak Ali	Chatona, Gorialdanga, Rajarhat, Kurigram	
Rezwanul Fish Hatchery	Syed Rezwanul Islam	Sultan Bahadur, Gorialdanga, Rajarhat, kurigram	
Chowdhury Matsho hatchery		Natun Bazar, Birampur, Dinajpur	
M/S. Sawpna Hatchery		Jutnala, Chirirbander, Dinajpur	
Bristi Hatchery	Md. Abdur Rashid	Velajan, Sadar, Thakurgoan	
Parent and Habiba Hatchery		Shibgonj, Sadar, Thakurgonj	
M. Hossain Matsho Hatchery	M. Hossain	Shimulbari, Fulbari, Kurigram	
Maa Matsho Hatchery	0	Chandrakhana, Fulbari, Kurigram	
Roni Matsho Hatchery	Md. Ishak Ali	Balarhat, Fulbari, Kurigram	
Rezwanul Fish Hatchery	Syed Rezwanul Islam	Sultan Bahadur, Gorialdanga, Rajarhat, kurigram	
Chowdhury Matsho hatchery		Natun Bazar, Birampur, Dinajpur	
M/S. Sawpna Hatchery		Jutnala, Chirirbander, Dinajpur	
Bristi Hatchery	Md. Abdur Rashid	Velajan, Sadar, Thakurgoan	
Parent and Habiba Hatchery		Shibgonj, Sadar, Thakurgonj	
Sarder Agro (Adam-dehigi)		Bogra	
Natore Hatchery & Agro Complex Ltd		Natore	01711803104
North Bangol Hi-Tech Hat			01711260077
Chetralada Hatchery		Pabna	01712647760
Hi-Tech Hatchery			01712463011
Rahman agro.			01718219379
Read Fish park			01711414623
Saba Agro Complex			01711819671
Samsagor/Mohonpur			01711348846
Nafiuj Sci. Hatchery		Gaibanda	01717866647
BK Sarker		Rangpur	01712146140
Northen Aquatic. Dev Hatchery	Mr. Kalimullah	New Jummapara, Rangpur	01715005668
Farmline Hatchery			01711419191
S. M. Mono- Sex tilapia hatchery		Paschim Hat, Gopalpur (Dhamerhat), Tilai, Bhurungamari	

Annex 7: List of Feed Dealers

Dealers list collected from Mega Feed, Krishibid group and WorldFish

Name	District	Address	Contact person	Mobile No
M/S. Karnofuli Traders	Natore	Gour Shah Market, Bogra Terminal, Natore	Md. Abdur Rahim	01718865253
M/S. Asad Traders	Natore	Pramanik Plaza, Singra Bus Terminal, Natore	Md. Asadur Rahman	01712204657
M/S. Raj Business Centre	Natore	Manikpur Bazar, Dhaka Road, Baraigram, Natore	Md. Sadikur Rahman	01711577985
M/S. Uttara Fish Feed	Pabna	M.R Shopping Complex, Kashinathpur, Pabna	Md. Mahabububur Rahman	01711267180
M/S. Rabeya Enterprise	Pabna	Sadar Hospital Road, Pabna	Md. Rabiul Islam Obaidul	01711006878
M/S. Mokles Enterprise	Rajshahi	Keshorhat Bazar, Mohonpur, Rajshahi	Md. Moklesur Rahman	01715945971
M/S. Rafid Traders	Natore	Moukhara Bazar, Baraigram, Natore	Md. Abdullah Hil Kafi	01719734782
M/S. Alal Enterprise	Rajshahi	Bhabaniganj, Bagmara, Rajshahi	Md. Alal Uddin	01713704207
M/S. Dayarampur Traders	Natore	Dayarampur, Bagatipara, Natore	Md. Rezaul Karim	01751474331
M/S. Rubel Traders	Natore	Rajapur, Baraigram, Natore	Md. Selim Reza	01768487089
M/S. Murad Traders	Natore	Tomaltala, Bagatipara, Natore	Md. Mofiz Uddin	01761742145
M/S. Agro Life	Natore	Kachikata, Gurudaspur, Natore	Md. Mozahidul Islam	01712934424
M/S. New Hawa Enterprise	Natore	Naldanga, Natore	Md. Alamgir Kabir	01732367545
M/S. Bismillah Enterprise	Rajshahi	Taherpur Bazar, Bagmara, Rajshahi	Md. Kamal Hossain	01731948860
M/S. Rakibul Traders	Rajshahi	Shantipur, Bagmara, Rajshahi	Md. Rakibul Islam Siddique	01711418243
M/S. Noldanga Fish Feed	Natore	Kaliganj, Noldanga, Natore	Md. Abdul Ali	01735084970
M/S. Mim Enterprise	Pabna	Santhia, Pabna	Md. Mizanur Rahman	01757823931
M/S. Paradise Trading	Rangpur	City Bazar, Rangpur Sadar	Md. Kalimullah	01715005668
M/S. Tanvir Traders	Rangpur	Chowdhurani Bazar, Pirgachha, Rangpur	Md. Shariful Islam	01713764029
M/S. Utpal Traders	Gaibandha	Kacha Bazar(near mosque) , Gobindaganj, Gaibandha	Md. Khabirul Ibne Pathan (Utpal)	01712923890
M/S. Zarif Enterprise	Gaibandha	Mondal Market,Noldanga, Sadullapur, Gaibandha	Md. RakibulHaque Mondal	01711984265
M/S. Amazan Traders	Gaibandha	2 No.Traffic More, Gaibandha Sadar	Md. Dulal Miah	01712104538
M/S. New Ripon Traders	Gaibandha	Rangpur Road, Palashbari, Gaibandha	Mominul Islam (Ripon)	01713994084
M/S. Simanto Hatchery & Feed	Rangpur	Tetulia adarsha Bazar,Boiratihat, Mithapukur, Rangpur	Md. Jahuirul Islam(Bablu Mondal)	01718582685
M/S. Ruba Poultry, Dairy & fish Feed	Kurigram	Near Agrani Bank, Rajarhat, Kurigram	Md. Rezaul Karim	01714627008
M/S. Nazir Business	Gaibandha	Barkonabazar, Shaghata, Gaibandha	Md. Abdullah Al Maruf	01717673475
M/S. Opu Tapu Traders	Kurigram	Ulipur Pourobazar, Ulipur, Kurigram	Md. Nurul Islam	01773986411
M/S. Rabbi Dairy & Poultry	Rangpur	Badarganj, Rangpur	Abdul Salek	01737171330
M/S. Bamondanga Poultry Corner	Gaibandha	Bamondanga,Sundarganj, Gaibandha	Sheikh Shahabuddin	01730982356
M/S. M. A. Poultry Media & Fisheries	Kurigram	Andharijhar Bazar,Bhurungamari, Kurigram	Masud Ahmed Sabuj	01738054427
Mehedi Enterprise	Rangpur	Gobindogonj,		01740801116
Shah Jalal Trading	Rangpur	Rangpur Sadar, Rangpur		01784750503
Aurthi Traders	Rangpur	Pirgachha, Rangpur		01725440978
Akbar Hossain (P. Dinajpur)	Dinajpur	Dinajpur Sadar,Dinajpur.		1715152386
R.S Poultry Feed.(U. Dinajpur Sadar)	Dinajpur	Shikderhat,Dinajpur Sadar.		1737377695
M/S. Paradise Trading	Rangpur	City Bazar, Rangpur Sadar	Md. Kalimullah	01715005668

M/S. Tanvir Traders	Rangpur	Chowdhurani Bazar, Pirgachha, Rangpur	Md. Shariful Islam	01713764029
M/S. Utpal Traders	Gaibandha	Kacha Bazar(near mosque) , Gobindaganj, Gaibandha	Md. Khabirul Ibne Pathan (Utpal)	01712923890
M/S. Zarif Enterprise	Gaibandha	Mondal Market,Noldanga, Sadullapur, Gaibandha	Md. RakibulHaque Mondal	01711984265
M/S. Amazan Traders	Gaibandha	2 No.Traffic More, Gaibandha Sadar	Md. Dulal Miah	01712104538
M/S. New Ripon Traders	Gaibandha	Rangpur Road, Palashbari, Gaibandha	Mominul Islam (Ripon)	01713994084
M/S. Simanto Hatchery & Feed	Rangpur	Tetulia adarsha Bazar,Boiratihat, Mithapukur, Rangpur	Md. Jahuirul Islam(Bablu Mondal)	01718582685
M/S. Nazir Business	Gaibandha	Barkonabazar, Shaghata, Gaibandha	Md. Abdullah Al Maruf	01717673475
MoniMukta Traders	Gaibandha	Panitola,Gaibandha		01768925900
Tanzina Poultry Feed	Gaibandha	Hirok More,Gobindaganj		01735461078
Anis Traders	Gaibandha	Saghata,Jumarbari		01735308886
M/S. Karnofuli Traders	Natore	Gour Shah Market, Bogra Terminal, Natore	Md. Abdur Rahim	01718865253
M/S. Asad Traders	Natore	Pramanik Plaza, Singra Bus Terminal, Natore	Md. Asadur Rahman	01712204657
M/S. Raj Business Centre	Natore	Manikpur Bazar, Dhaka Road, Baraigram, Natore	Md. Sadikur Rahman	01711577985
M/S. Mokles Enterprise	Rajshahi	Keshorhat Bazar, Mohonpur, Rajshahi	Md. Moklesur Rahman	01715945971
M/S. Rafid Traders	Natore	Moukhara Bazar, Baraigram, Natore	Md. Abdullah Hil Kafi	01719734782
M/S. Alal Enterprise	Bagmara	Bhabaniganj, Bagmara, Rajshahi	Md. Alal Uddin	01713704207
M/S. Dayarampur Traders	Natore	Dayarampur, Bagatipara, Natore	Md. Rezaul Karim	01751474331
M/S. Rubel Traders	Natore	Rajapur, Baraigram, Natore	Md. Selim Reza	01768487089
M/S. Murad Traders	Natore	Tomaltala, Bagatipara, Natore	Md. Mofiz Uddin	01761742145
M/S. Agro Life	Natore	Kachikata, Gurudaspur, Natore	Md. Mozahidul Islam	01712934424
M/S. New Hawa Enterprise	Natore	Naldanga, Natore	Md. Alamgir Kabir	01732367545
M/S. Bismillah Enterprise	Bagmara	Taherpur Bazar, Bagmara, Rajshahi	Md. Kamal Hossain	01731948860
M/S. Rakibul Traders	Bagmara	Shantipur, Bagmara, Rajshahi	Md. Rakibul Islam Siddique	01711418243
M/S. Noldanga Fish Feed	Natore	Kaliganj, Noldanga, Natore	Md. Abdul Ali	01735084970
Aftab Enterprise	Rajshahi	Rajshahi Sadar	Md. Aftabuzzaman (Babu)	01715637225
Mim Poultry	Bogura	Bagmara	Md. Moslem Professor	01713768417
Ma Baba Enterprise	Bogura	Bagmara	Md. Sohel Rana	01757993436
Sakik Poultry Feed	Natore	Natore Sadar	Md. Jewl Islam	01711583588
Jamuna Traders	Natore	Singra	Md. Mojibor Rahman	01740552052
Asraf Traders	Natore	Gurudashpur	Md. Roni	01734748199
Vi Vi Poultry	Bogura	Kahalu,Bogura		01749890601
Tmss Agro	Bogura	Shibganj,Bogura		01713377094
Bosak Enterprize	Bogura	Sherpur,Bogura		01746105613
Raihan Enterorise	Naogaon	Atrai,Naogaon		01712501792
Raihan Traders	Naogaon	Niamotpur,Naogaon		01770367100
Raj Traders	Naogaon	Adamdighi		01713767399
Taufique Traders	Naogaon	Mohadebpur		01730185766
M/s. Tawhid Enterprise	Kurigram	Sadar		
M/S. Roni Feed Center	Kurigram	Sadar		
M/S. Afzal Traders	Rangpur	Sadar		
M/s. Sohel Traders, Burirhat	Rangpur	Burirhat, Rangpur		
M/S. Sneha Poultry Feed	Nilphamary	Domar		
Pirgasa Agro Business Center	Rangpur	Pirgachha		
M/S. Allah Mohan Poultry	Rangpur	Sadar		
M/S. Agro	Rangpur	Mithapukur		
Shadhin Traders	Gaibanda	Sadar		

Sharif Dairy, Poultry & Fish	Rangpur	Sadar		
Mamun feed	Rangpur	Sadar		
Aquatic Solution	Rangpur	Sadar		

Annex 8: Fish Feed Mills in Rajshahi and Rangpur

District	Upazila	Name and Location of Fish Feed Producing Factories
Rajshahi	Poba	Bangla Feed Mill Limited, Hariyan Poba, Rajshahi
Rajshahi	Poba	ACI Godrej Agrovet Private Limited
Rajshahi	Poba	Nabil Feed Mills Limited, Proprietor Mohammad Aminul Islam, Daudkandi, Poba, Rajshahi
Rajshahi	Bagmara	A S P Agro Industries, Proprietor Mohammad Abdus Sobhan, Daudkandi
Rajshahi	Puthiya	Soguna Food & Feeds Bangladesh Private Limited, Proprietor Bipul Kumar Sarkar
Chapainababganj	Chapainababganj Sadar	Popular Poultry & Fish Limited, Proprietor Mohammad Sadiqul Islam, Nayanagar, Atahar, Chapainababganj
Natore	Natore Sadar	Sadiq Agro Chemicals Company, Ekdala, Natore
Natore	Natore Sadar	Unity Agro Feed Industries, Kadim Saturia, Natore Sadar, Natore
Naogaon	Naogaon Sadar	Kallyani Feeds Mill, Santahar Road, Sahapur, Naogaon
Naogaon	Naogaon Sadar	Messrs Momotaz Feed Mills, Vill: Chawk Jafrabad, Union Parishad: Hapania, Naogaon Sadar, Naogaon
Naogaon	Naogaon Sadar	Ajmir Feeds Mill, Kazi Amzad Bhaban, Dalpotti, Naogaon
Naogaon	Mohadebpur	Al-Mamun Agro Industries, Raigaon, Mohadebpur, Naogaon
Naogaon	Mohadebpur	Messrs Najib Agro Industries, Bridge Mor, Mohadebpur, Naogaon
Pabna	Pabna Sadar	Square Pharmaceutials Limited, Div: Chatiyani, BSCIC Shilpanagari, Pabna
Pabna	Pabna Sadar	Shafiq Feed Mills Limited, Proprietor Mohammad Shafiqul Islam, Mojidpur, Tebunia, Pabna
Pabna	Pabna Sadar	Sajid Saymon Agrofirm Limited, Proprietor Mohammad Faridul Islam, Hamchiapur, Malonchi, Pabna
Pabna	Pabna Sadar	Messrs Molla Agrofeed Products, Proprietor Mohammad Shahidul Islam, Loshkorpur, Pabna
Pabna	Ishwardi	Ishwardi Feed Mills Limited, Alhaj Mohammad Nurul Islam, Pabna Road (Dhulti), Ishwardi
Pabna	Pabna Sadar	R. R. P Agrofirms, Proprietor Mohammad Munsur Alam, Arkandi, Muladuli, Ishwardi, Pabna
Sirajganj	Sadar	Misham Agro Industries Limited, Kadai, Bonbaria, Sirajganj Sadar, Sirajganj
Sirajganj	Sadar	Misham Agro Industries Limited, Kadai, Bonbaria, Sirajganj Sadar, Sirajganj
Sirajganj	Ullapara	Aman Feed Limited, Shinhaghati, Ullapara R/S, Ullapara, Sirajganj
Sirajganj	Kamarkhand	ACI Godrej Agrovet Private Limited, Bhodroghat, Kamarkhand, Sirajganj
Bogra	Sadar	Messrs Toru Feed, Nurani Mor, Bogra
Bogra	Sadar	Al-Imran Agro Industries Limited, Kalibala, Municipality, Bogra
Bogra	Sadar	Nobin Agro Feed Industry Limited, Chadmuha, Gokul, Bogra
Bogra	Sherpur	Alal Poultry & Fish Feed Limited Sherpur, Bogra
Bogra	Sherpur	Acme feed mills Limited Sherpur, Bogra

Bogra	Sherpur	Nourish Feeds Limited, Bhabanipur, Sherpur, Bogra
Bogra	Adamdighi	Al-Riyad Fish & Poultry Fish Seed Limited, Santahar Road, Adamdighi
Bogra	Adamdighi	Golden Agro Industries & Feed Mill, Kulipara, Adamdighi
Bogra	Adamdighi	Five star Agro Feed Mills, Sujit Railgate, Santahar, Adamdighi
Bogra	Adamdighi	G. M. Feed Mill Limited, Kalaikuri, Adamdighi
Bogra	Kahalu	R B Agro Limited, Shitolai, Kahalu
Bogra	Kahalu	Prime Agro Industries, Eruil Bazar, Kahalu
Bogra	Nandigram	Quality Feeds Limited, Kothom, Nondigram, Bogra
Bogra	Shajahanpur	Quality Feeds Limited, Jamunna, Shajahanpur, Bogra
Bogra	Shajahanpur	Tamim Agro Industries Limited, Shajahanpur, Bogra
Bogra	Dupchachiya	Messrs M P Agro, Dupchachiya
Bogra	Gabtoli	Shah Sultan Feed Mills Private Limited, Chawkbochai, Gabtoli, Bogura
Joypurhat	Sadar	Polli Feed Industries, Proprietor Moniruzzaman Jahangir, BSCIC Shilpanagari, Joypurhat Sadar, Joypurhat
Joypurhat	Sadar	Padma Fish & Chicks Limited, Proprietor Mohammad Anwarul Hoque, Bonbibhag (Department of Forestry) Road, Sadar, Joypurhat
Joypurhat	Sadar	Akash Poultry & Fish Feed Mills, Proprietor Mohammad Anisur Rahman, Tukur Mor, Bamonpur, Joypurhat Sadar, Joypurhat
Joypurhat	Sadar	Bijli Fish Mill Limited, Proprietor Mohammad Amanullah, Hichmi Bazar, Sadar, Joypurhat
Joypurhat	Sadar	Rafid Agro Industries Private Limited, BSCIC Shilpanagari, Sadar, Joypurhat
Joypurhat	Panchbibi	Messrs Mehedi Bagi Feed Mills, Proprietor Mohammad Ahsanul Habib Talukdar, Shorail, Mohammadpur, Shorail, Mohammadpur
Joypurhat	Khetlaal	Purobi Agro Industries Limited, Bot toli
Naogaon	Naogaon Sadar	Kallyani Feeds Mill, Santahar Road, Sahapur, Naogaon
Naogaon	Naogaon Sadar	Messrs Momotaz Feed Mills, Vill: Chawk Jafrabad, Union Parishad: Hapania, Naogaon
Aristocrat (Lilly Feed)	Rangpur	Rangpur
SA Feed (Under Consturction)	Rangpur	Rangpur
Kazi Feed	Kurigram	Kurigram
Paragon Feed	Rangpur	Rangpur
Nilsagor Feed	Nilphamari	Niphamari

Annex 9: List of fish names

Common name	Scientific name
Gulsha	*Mystus cavasius*
Koi	*Anabus testdineus*
Magur	*Clarias batrachus*
Pabda	*Callichrus pabda*
Pangas	*Pangasianodon hypophthalmus*
Shing	*Heteropneustes fossilis*
Tilapia	*Oreochromis nilotica*
Sharpunti	*Puntius puntius*
Thai Punti	*Puntius sarana*
Chitol	*Notopterus notopterus*
CARPS	
Catla	*Catla catla*
Mrigel	*Cirrihina mrighala/cirrhosus*
Ruhi	*Labeo rohita*
Kalibaus	*Labeo calibasu*
Common carp	*Cyrpinus carpio*
Bighead carp	*Hypophthalmichthys nobilis*
Grass carp	*Amblypharyngodon mola*
Silver carp	*Hypophthalmichthys molitrix*
Black carp	*Mylopharyngodon piceus*
Bata	*Labeo bata*
Gonia	*Labeo boggut*

About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving aquatic food systems, including fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific. WorldFish is a member of the CGIAR, the world's largest research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.

For more information, please visit www.worldfishcenter.org