

An Assessment of Supply Chain Mechanisms of Pisciculture: A Case Study in Debipur, Durgapur, Rajshahi

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Abstract

Bangladesh has a wealth of resources that can help fisheries and aquatic life. The fishing sector accounts for 22.60% of Bangladesh's agricultural GDP and 3.69% of the country's overall GDP. About 60% of Bangladeshi people's daily animal protein consumption comes from fish. In Bangladesh, the fish culture is primarily done in Satkhira, Khulna, Cox's Bazar, Bagerhat, and Rajshahi District. The fish culture is the primary source of income for the residents of Durgapur. The leading supply chain begins when the supplier sends the fish to Dhaka or fish arot, which is the main reason for the deflection of the fish price. The supply chain manages the entire production flow of a good or service, from raw components to delivering the final product to the consumer. So, the main problem is that the fish is sold for a high price, according to consumers, and producers claim they do not make a profit. The primary determinants include transportation, extortion, middlemen, production, drug and feed costs, and soil quality and prices. The study's main objective is to investigate pisciculture's present scenario and supply chain mechanism in that area. The data collection approach will be prepared following observation of the study area. Reconnaissance surveys and PRA tools will be used to collect preliminary data. Primary and secondary data will be collected. This research mainly focuses on the benefit of both consumers and producers. The study's primary goal is to reduce these factors to ensure that both the supplier and the consumer profit equally. This will equalize the number of fish deficiencies in our country, and the consumers will be able to buy at a considerable rate.

Keywords: GDP; Supply chain management; Participatory rural appraisal (PRA).

1 Introduction

Bangladesh has abundant river and inland water systems. Substantial aquaculture and capture fisheries potential. Due to its geographic location, Bangladesh has excellent resources available to assist fisheries and aquatic creatures (Shamsuzzaman et al., 2017). Potential. In the national cuisine, fish is a common addition to rice. Cuisine gives rise to the saying, "A Bengali is a Bengali" cooked with rice and seafood" (Ghose, 2017). Generally, fisheries caught in inland waters are divided into three categories: aquaculture and marine fisheries are among the fisheries sector and provide more than 65% of overall production (DoF, 2016, Shamsuzzaman et al., 2017). According to the FRSS (2016), the fisheries industry contributes 22.60% of the agricultural GDP and 3.69% of the nation's overall Gross Domestic Product (GDP). Fisheries growth during the past ten years (2004-05 to 2013-14 FY) was broadly consistent and averaged 5.38% yearly (FRSS, 2015, Shamsuzzaman et al., 2017). About 60% of Bangladeshi people's daily animal protein consumption comes from Fish (DoF, 2016, Shamsuzzaman et al., 2017). For their livelihoods, more than 17 million people, including around 1.4 million women, rely on the fishing, farming, handling, and processing of Fish (BFTI, 2016, Shamsuzzaman et al., 2017). In Bangladesh, the fish culture is primarily done in Satkhira, Khulna, Cox's Bazar, and Bagerhat District (Background - Directorate of Fisheries - Government of the People's Republic of Bangladesh, 2015). Just like that, Durgapur residents get profit by cultivating the fish. Pisciculture provides most of the resident's income. Living conditions are determined by a household's capabilities, assets (natural, physical, human, financial, and social capital), activities, and access to these through institutions and social relationships (Chambers & Conway,

1992). This industry provides a direct or indirect source of income to almost 12 million individuals (Ali et al., 2008; Shamsuzzaman et al., 2017 Background - Directorate of Fisheries - Government of the People's Republic of Bangladesh, 2015) Nearly two-thirds of rural households engage in fishing during the monsoon season, even though there are over 1.2 million fishermen nationwide (DoF, 2015). By studying the secondary resources, it is found that the supply chain is the main reason behind the price variation in different regions. Supply chain management (SCM) is the management of the complete manufacturing, distribution, and marketing procedures used to provide a consumer with the desired good (Woods et al., 2002). Input providers, farmers, collectors, interstate wholesalers, retailers, and consumers are all included in managing the pisciculture supply chain. The study aims to identify factors affecting pisciculture's supply chain mechanism in local and national markets, reducing instability and promoting livelihood for producers and consumers. It also seeks to understand the reasons behind the high market prices of fish products and provide transparent, reliable data for policymakers to address this issue. This research aims to involve all residents in decision-making, focusing on market chain mechanisms and socio-economic conditions. It uses unique PRA tools like social maps, resource maps, cause-and-effect diagrams, and systems diagrams to generate data and suggest solutions. Planners and policymakers can use this research to establish policies and minimize factors affecting the market chain. So, if we can minimize this problem, the producer and the consumer can get a better profit and sell and buy comfortably.

2 Literature Review

This study assesses the opportunity and needs for the market chain mechanism in pisciculture, a prevalent business worldwide. The market chain mechanism involves producers and consumers, with various stakeholders involved. Pisciculture, also known as aquaculture, produces and processes fish, with a total volume of 167.2 million fish produced worldwide. The FM Global Resilience Index ranked supply chain resilience among 130 countries in 2015, with Singapore ranking no-1 due to its fast connectivity.

The study uses reliable, accurate, and transparent data to focus on the potential of the market chain mechanism of fish farming in local and national markets. A further study was conducted on the PRA (Participatory Rural Appraisal) method, its various tools, and its application to find the results of the case study.

Several factors affect the market chain of pisciculture, making it unstable and not providing producers and consumers with the financial benefits they deserve. However, the modern world ensures a resilient market chain through innovative methods.

Chambers and Conway (1992) studied the local and regional market potential for various food fish species in Sri Lanka, categorizing their markets and determining their prices. The study's methodology included desk research and fieldwork at regional markets and landing sites in Sri Lanka's Western, Eastern, Sabaragamuwa, and North-Central provinces.

Ali and Bashir (2008) developed an optimization model for distributing captured fish in a fish supply chain and purchasing spawn. The model prioritizes delivering fresh fish to the most profitable clients and considers species, raw material sources, harvesting time, mortality rate, farming costs, tank capacity, and feeding expenditures.

The experimental results show that the proposed optimization technique can increase farmers' total profit, highlighting the importance of addressing the challenges faced by the industry in ensuring a resilient supply chain.

3 Study Area:

Debipur, a village in Durgapur Upazila, Rajshahi, is a significant agricultural hub with a population of 3661 and 982 households. The area covers 4685 acres and is connected to the Dhaka-Rajshahi highway and the Rajshahi-Naogaon highway. The primary Pisciculture and Betel Cultivations source is Debipur, 10 km from Baneshwar Bazar. The majority of the population relies on cultivated fish for their livelihood, with fisherman leasing land from their original owners and some digging agricultural land for cultivation. The fish are exported to Bangladesh and abroad, earning 1 to 2 lakh rupees annually. This dependence on fish farming significantly impacts the country's economy.

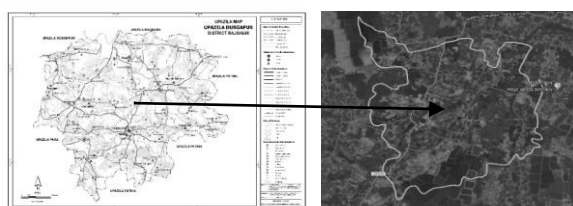


Figure 1. Debipur, Durgapur, Rajshahi

institutions to effect change. The map shows that Debipur’s people primarily use ponds for livelihood, with agricultural land in the northwest and green trees surrounding the area.

5.2 Cause Effect Diagram:

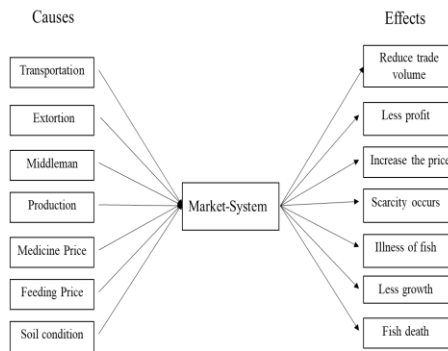


Figure 3. Cause Effect Diagram of the Study

Fishermen faced issues affecting their pisciculture, requiring a cause-effect diagram to identify seven causes and seven effects. A pairwise ranking method was applied to determine the most effective cause. The diagram reveals the reasons and impact of the significant problem.

5.3 Pairwise ranking method:

Table 1: Pairwise Ranking Method of the problems of the study

Causes	Transportation	Extortion	Middleman	Production	Medicine Price	Feeding Price	Soil condition	Total
Transportation	-	1	0	0	0	0	0	1
Extortion	0	-	0	0	0	0	0	0
Middleman	1	1	-	0	1	0	1	4
Production	1	1	1	-	1	1	1	6
Medicine Price	1	1	0	0	-	0	1	3
Feeding Price	1	1	1	0	1	-	1	5
Soil condition	1	1	0	0	0	0	-	2

The pairwise ranking method is a widely used research method to understand people’s preferences and priorities, enabling decision-making and identifying the most crucial issues. In the Debipur, Durgapur, and Rajshahi study areas, a group of homogeneous participants was selected to address central problems in pisciculture. They identified transportation costs, extortion, middlemen, production costs, medicine prices, feeding prices, and soil conditions as the main challenges. These issues were compared in a matrix, with production cost being the most critical problem. The matrix reveals that production cost mainly affects pisciculture, feeding prices can increase fish prices, and middlemen are a primary concern.

5.4 System Diagram of Supply Chain Mechanism:

The flow chart illustrates the production process of pisciculture products, starting with hatchery and moving to ponds for various cultures. Feeding and medicine are provided for the fish, and technical aid is provided for nourishment. More training seasons are given to producers, and veterinary aid is provided for fish diseases. NGO activities and loan facilities are also essential for the process. Fish are sold in local and urban markets, with wholesalers and merchants being the main culprits in increasing market prices.

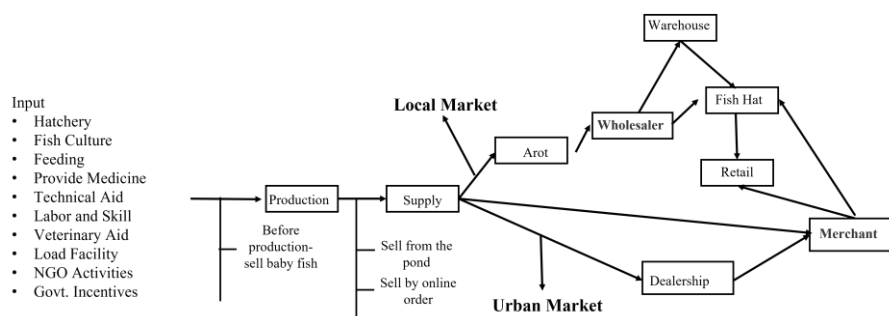


Figure 4. System Diagram of Supply Chain Mechanism of the Study

5.5 Cost of Pisciculture Production (Fisherman):

Fish culture is crucial for daily life in the area, with factors such as oxygen levels, sunlight, soil conditions, food supply, and water levels influencing its success. Pisciculture is the top business, with profits varying depending on fish diseases. 70 kg of baby fish is cultivated on one bigha of land, costing 447,750 Taka. The profit per cultivation is between 100000-150000 Taka, and the yearly profit is between 200000-300000 Taka. The cost of fish products, such as feed, Khail, medicine, and lime, varies by bigha.

6 Recommendation

The participatory survey approach can help solve the issue of low-interest and no-interest loans in the pisciculture sector. This approach allows locals to borrow money for a set amount of time and pay it back when they start making money, temporarily relieved of the constant strain of repayment. This allows producers to concentrate on their business, develop successful plans, and increase revenue. Several governmental and non-governmental groups hold seminars and training sessions to inform the public about pisciculture and fish sickness prevention. The study suggests revising the target audience and reviewing topics after a specific period to help locals. Government approval is required for intermediaries, and the government must determine pricing for each. The presence of a veterinarian is inadequate in the region, with a 3.5 km travel for fish medicine or consultation. A veterinary center with sufficient doctors is proposed to ensure affordable facility access. Large marketing channels have caused the price of fish to increase in all markets, resulting in significant financial burdens. Suppliers should avoid holding products in storehouses and promoting fish culture to minimize rising prices. The fisherman community benefits fishermen by providing information on fish nature, price updates, assistance with fish disease, food recommendations, and veterinary services.

7 Conclusion

Pisciculture is becoming increasingly popular as a side business in rural communities. However, it faces obstacles such as medicine prices, feeding prices, transportation tolls, middlemen, and production differences. Research methods like questionnaire surveys, regression analysis, and prediction models have addressed these issues. However, community involvement is missing in these studies. A participatory survey approach can help solve this issue by generating local solutions and promoting participation. The study uses social maps, resource maps, and seasonal charts to understand spatial characteristics and identify factors affecting price fluctuations. Strategies suggested including no-interest loans, veterinary fish aid, and training opportunities for producers to cultivate their fish correctly. This research emphasizes the importance of community involvement and considers local knowledge and community opinion as significant stakeholders. Regional planners and politicians can improve rural development approaches and provide successful plans by incorporating these strategies.

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