PROFITABILITY OF SHING FISH (HETEROPNEUSTES FOSSILIS) IN SOME SELECTED AREAS OF MYMENSINGH DISTRICT IN BANGLADESH

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CERTIFICATE

THIS IS TO CERTIFY THAT THESIS ENTITLED, "***PROFITABILITY OF SHING FISH (HETEROPNEUSTES FOSSILIS) IN SOME SELECTED AREAS OF MYMENSINGH DISTRICT IN BANGLADESH.***" SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS, SHER-E-BANGLA AGRICULTURAL UNIVERSITY, DHAKA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (M.S.) IN AGRICULTURAL ECONOMICS EMBODIES THE RESULT OF A PIECE OF GENUINE RESEARCH WORK CARRIED OUT BY ***NADIA NUSRAT MOUTUSI*** BEARING ***REGISTRATION NO. 13-05714*** UNDER MY SUPERVISION AND GUIDANCE. NO PART OF THIS THESIS HAS BEEN SUBMITTED FOR ANY OTHER DEGREE OR DIPLOMA IN ANY OTHER INSTITUTION.

I FURTHER CERTIFY THAT ANY HELP OR SOURCES OF INFORMATION RECEIVED DURING THIS INVESTIGATION HAS DULY BEEN ACKNOWLEDGED.

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DEDICATED TO
MY
BELOVED PARENTS

ABSTRACT

Fish is one of the most valuable components of agricultural sector which contributes to the livelihoods and employment of millions of people in Bangladesh. In 2017-18, this sector contributes 3.57 percent to the national Gross Domestic Product (GDP) and more than one-fourth (25.30 %) to the broad agricultural sector GDP, which plays a significant role in meeting the protein demand, earning foreign exchange and socio-economic development of the rural poor people. The overall objectives of the present study were to depicts the socio-demographic profile of shing producing farmers and estimates profitability of shing fish (Heteropneustes fossilis) at Haluaghat upazila in Mymensingh district where adequate amount of shing farm were available. We collected data from 60 sample farmers through face-to-face interview. After analyzing the data, per hectare gross return, net return, and gross margin were estimated as Tk. 1,720,891 Tk. 864768 and Tk. 953968 respectively. Per hectare total cost and total variable cost were calculated as Tk. 856123 and Tk. 766923 Finally, I found Benefit Cost Ratio (BCR) was 2.01 on total cost and 2.24 on cash cost basis which indicates that shing fish farming is highly profitable. In this thesis, I found five variables which are Fingerling cost, Human labor cost, Feed cost, Cost of fertilizer and cost of medicine where feed cost and Cost of fertilizer were highly significant and other three variables were insignificant in shing fish production. Moreover, I calculated R^2 value was 0.62 which indicated that goodness of fit of the regression model was satisfactory. In this study number of problems were also identified which were classified as technical problem, economical problems, and social problem during shing fish farming. Some policy recommendations were also given at the end of the study which will be helpful to the shing fish farmer to establish a well-planned production system.

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Nadia Nusrat Moutusi

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ABBREVIATIONS AND ACRONYMS

BBS: Bangladesh Bureau of Statistics

BCR: Benefit cost ratio

FRSS: Fisheries Resources Survey System

BER: Bangladesh Economic Review

BRAC: Bangladesh Rural Advancement Committee

CARE: Cooperative for Assistance and Relief Everywhere

DoF: Department of Fisheries

et al.: and others (at all)

etc.: et cetra (others and so forth)

FY: Fiscal Year

GDP: Gross Domestic Product

GNP: Gross National Product

ha: Hectare

kg: Kilogram

ln: Natural log

MOP/MP: Muriate of Potash

NGOs: Non – Government Organizations

No.: Number

OC: Operating Capital

OLS: Ordinary Least Square

ABBREVIATIONS AND ACRONYMS

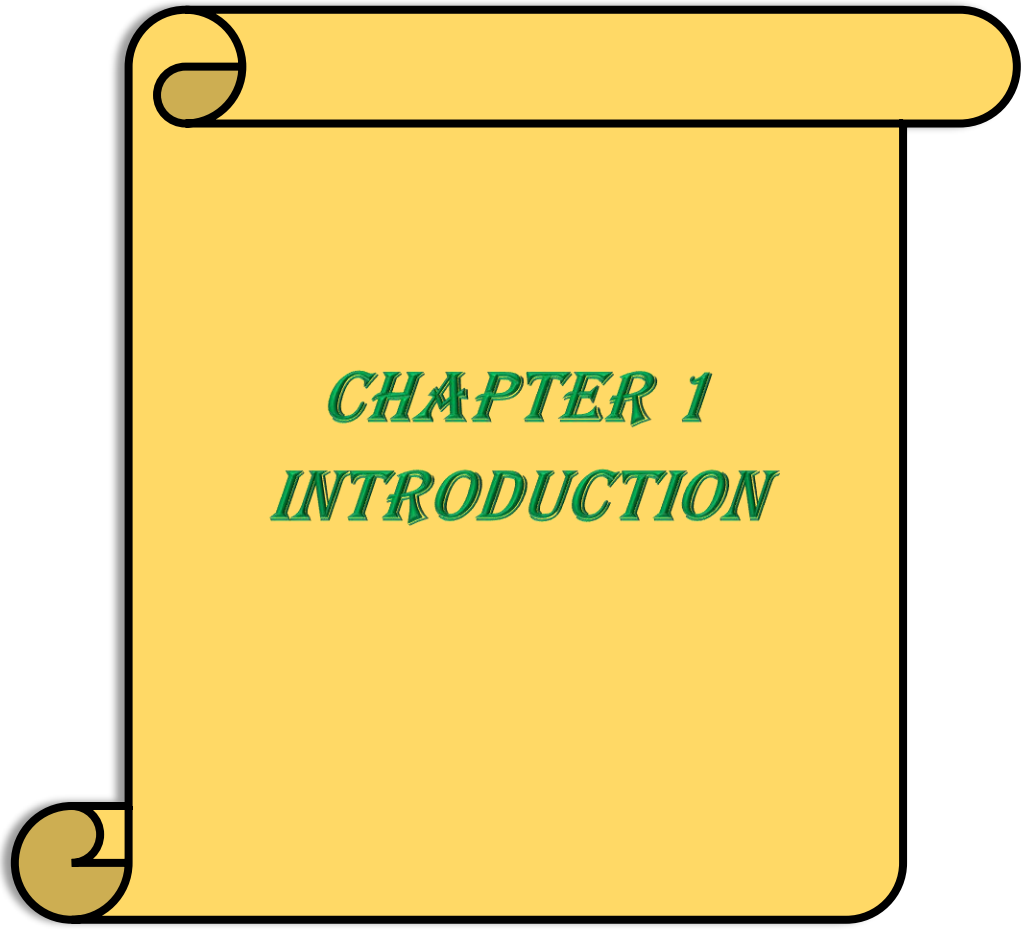
SPSS: Statistical Package for Social Sciences

ULO: Upazila Livestock Officer

BDT: Bangladesh Taka

Sq. Km: Square Kilometer

Fig.: Figure


CHAPTER 1
INTRODUCTION

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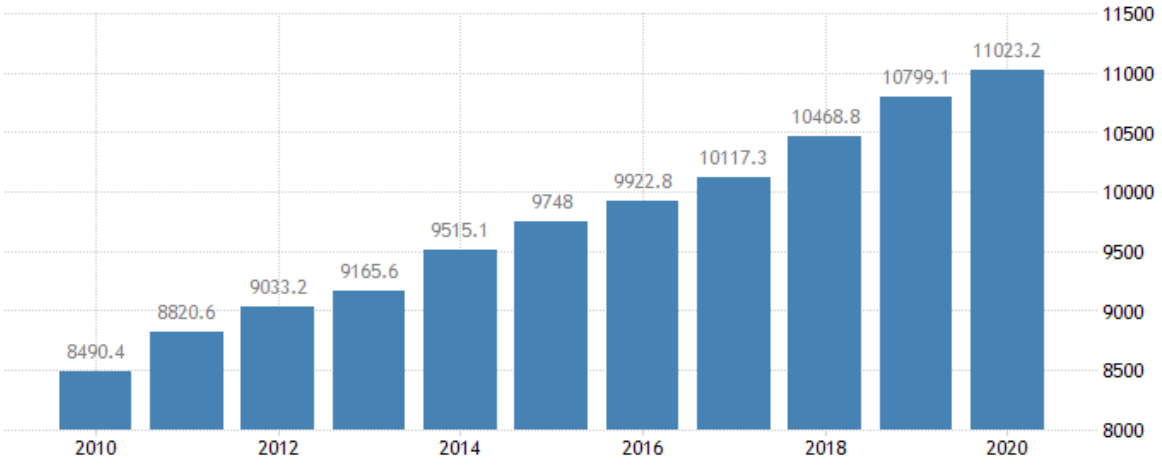
INTRODUCTION

1.1. Background of the Study

Bangladesh has done remarkable progress in agriculture sector. The role of agriculture is impeccable to create opportunity of jobs for large population by increasing productivity and growth. The agriculture sector contributes a lot to the country's GDP, provides employment for nearly half of the labour force and supplies raw materials to the Agro-based industries. Agriculture is a special field of social activity which is closely related to important issues like ensuring food and nutrition of people, creating scope of income and poverty alleviation. Agriculture remains the most important sector of Bangladeshi economy, contributing 19.6 percent to the national GDP and providing employment for 63 percent of the population. It is found that GDP From Agriculture in Bangladesh increased gradually to 11023.20 BDT Million in 2020 from 10799.10 BDT Million in 2019. (Fig. 1.1)

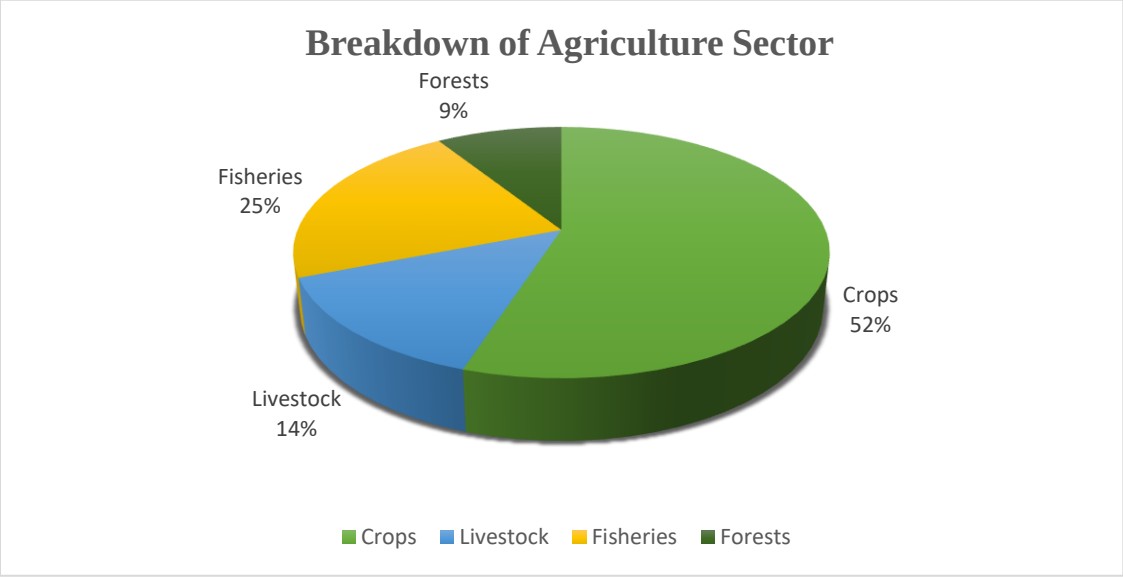


Source: Tradingeconomics.com (BBS 2019)

Fig 1.1: Agriculture Growth from 2010 to 2020. (BDT Million)

The agriculture sector can be broken down into four main components: crops, livestock, fisheries, and forests. Among these, crops make up 55% of the sector with aus/amon/boro rice paddies, jute, potato, and wheat as major crops. The country is the second largest producer of jute (after India) and the world's largest exporter of the fiber.

As an agro-based country fisheries sub-sector is one of the most important and promising sub-sectors having vital contribution towards her economic development in Bangladesh. In 2017-18, this sector contributes 3.57 percent to the national Gross Domestic Product (GDP) and more than one-fourth (25.30 %) to the broad agricultural sector GDP. (BER, 2019) (Figure 1.2). This sector plays a significant role in meeting the protein demand, earning foreign exchange and socio-economic development of the rural poor by reducing poverty through employment generation.



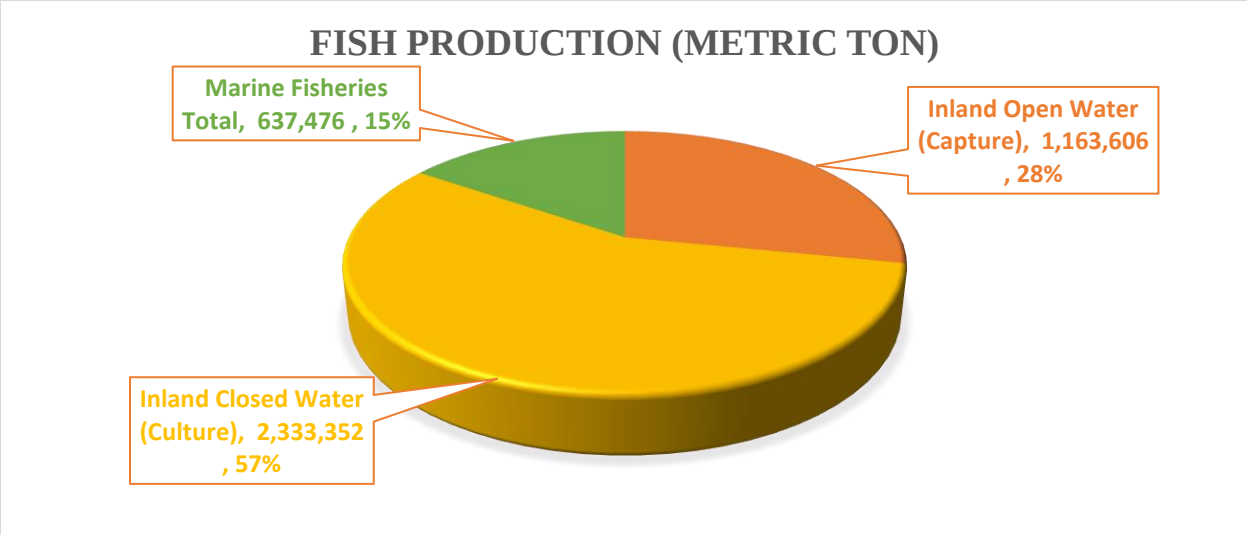
Source: BER 2019

Fig 1.2: Agriculture Sector Breakdown in GDP.

1.2 The economic contribution of fish in Bangladesh

Fish is one of the most valuable components of agricultural sector in Bangladesh and its production contributes to the livelihoods and employment of millions of people. The importance of fisheries sector in Bangladesh on the growth and development of its economy. The culture and consumption of fish therefore has important implications for national income and food security. Fisheries sector in Bangladesh has been playing a very vital role from the time immemorial. Bangladeshi people are popularly referred to as “Mache Bhate Bangali” or “fish and rice makes a Bengali”.

Bangladesh is blessed with vast and rich fisheries resources. Fisheries sector represents one of the most productive and dynamic sectors in Bangladesh. Bangladesh fisheries have plenty scope of development to strengthen the national economy. Fish is an important component of human food consumption. About 80% rural people of Bangladesh suffer from malnutrition and low protein intake. About 22% of the daily dietary protein requirement should be met from the animal sources. Fish alone shares 63% of per capita protein intake and contributes about 74 % of animal protein. Fisheries sector plays an especially important role in the national economy having a share of 3.69% in national GDP, almost one-fourth (22.60%) in agricultural GDP. About 60% of total required animal protein comes from fish (FRSS,2015). Bangladesh is ranked fourth position in In-land fishery production just after China, India and Myanmar and fifth position in closed waters (FAO, 2014). About 1.5 million people are directly employed by this sector (DOF, 2012).



Source: FRSS, 2017-18

Fig 1.3: Fish Production in different aquaculture

Bangladesh is one of the world's leading fish producing countries where inland aquaculture contributes 56.44%, and inland capture contributes 28.14%, to total production in 2017-18 (Table 1.1). The marine fisheries production contribution to total fish production in 2017-18 was 15.42% with a growth rate of 1.75% (Table 1.1).

Bangladesh has achieved self-sufficiency in fish production where per capita consumption of fish was 7 kg/year in 1990, and that stands at 30 kg/year in recent years (FRSS, 2017). Main Aquatic sources are Inland Open Water (Capture), Inland Closed Water (Culture) and Marine Fisheries. Inland Open water sources contains River and Estuary, Sundarbans, Beel, Kaptai Lake, Floodplain etc. which covers almost 3927142 Hectare area. Year 2017-18 almost 1,163,606 Metric Ton fishes were captured from that source which covered almost 28.14 % of national fish demand (Table 1.1).

Table 1.1: Fish production of Bangladesh in different aquatic resources in 2017-18.

Types of Fisheries	Sector of Fisheries	Water Area (Hectare)	Production (Metric Ton)	Percentage of Production (%)
Inland Open Water (Capture)	River and Estuary	853863	271639	6.57
	Sundarbans	177700	18086	0.44
	Beel	114161	98117	2.37
	Kaptai Lake	68800	9982	0.24
	Floodplain	2712618	765782	18.52
Capture Total		**3927142**	**1163606**	**28.14**
Inland Closed Water (Culture)	Pond	384700	1833118	44.34
	Seasonal cultured water body	136273	215547	5.21
	Baor	5488	8002	0.19
	Shrimp/Prawn Farm	272717	246406	5.96
	Crab*	27010	14421	0.35
	Pen Culture	7564	13368	0.32
	Cage Culture**	1.10 lakh cu. Meter	2490	0.06
Culture Total		**833752**	**2333352**	**56.44**
Inland Fisheries Total		**4760894**	**3496958**	**84.58**
Marine Fisheries	Industrial (Trawl)		108479	2.62
	Artisanal		528997	12.79
Marine Fisheries Total			**637476**	**15.42**
Country total			**4,134,434**	**100.00**

Source: FRSS, 2017-18

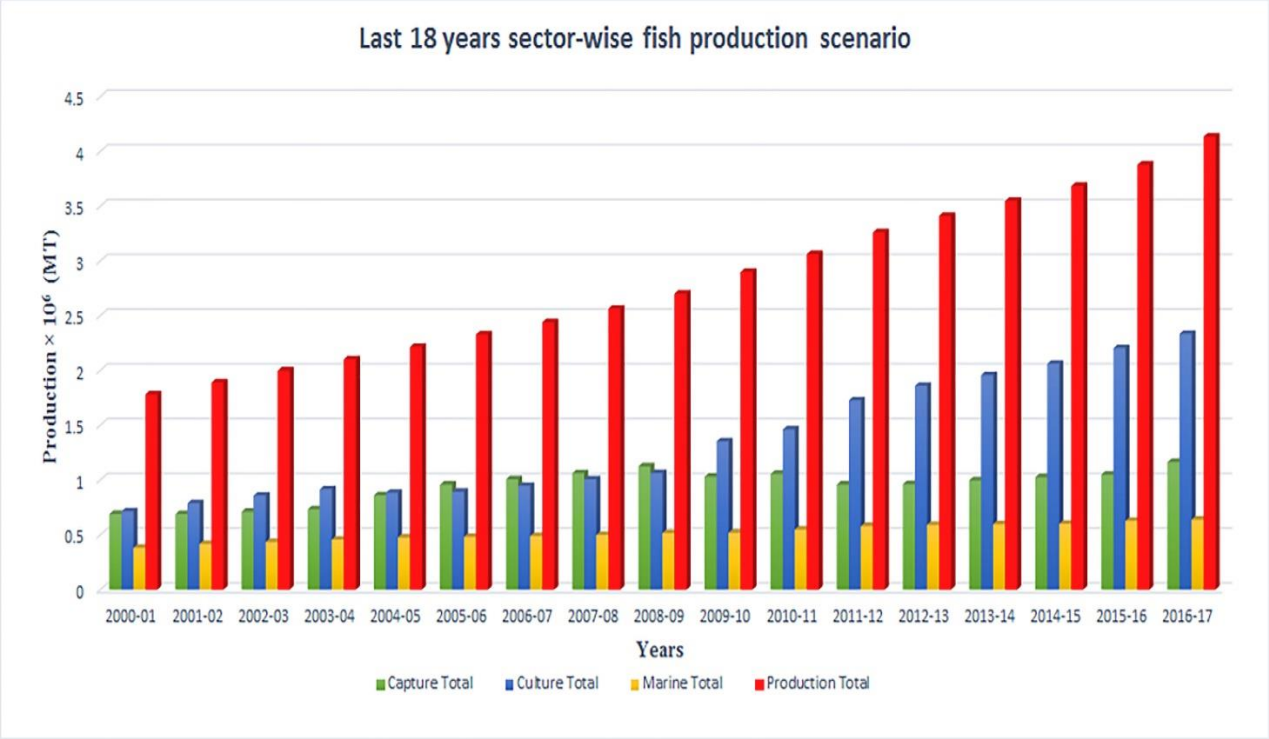
Inland Closed Water (Culture) is another important source of fish which contains culture in Pond, Seasonal cultured water body, Haor, Baor, Shrimp/Prawn Farm, Crab, Pen Culture, Cage Culture

etc. that covers almost 833752-hectare area. In FY 2017-18 almost 2,333,352 metric ton fishes were produced from these sources which covered almost 56.44 % of national fish demand (Table 1.1).

In 2017-18, the output of capture fishery was 11.63 lakh MT, and the culture total was 23.33 lakh MT. As a result of recently achieved an enormous amount of maritime boundary, marine fisheries production has increased. Total marine fisheries production in 2017-18 was 637476 Metric Ton, whereas industrial trawl fishing is 1.08 lakh MT and artisanal fisheries are 5.29 lakh MT (Table 1.1). which covered almost 15.42 % of national fish demand.

1.3 Fish Production Trend in Bangladesh

Total fish production in Bangladesh has increased sixfold in the last 34 years, and fish production is now expected to reach 45.52 lakh tons by 2020–21 (FRSS, 2017). This study found that there remained an increased general trend of overall fish production during the last 18 years in Bangladesh. In 2000–01 there was a production of 17.81 lakh metric tons while it reached up to 41.34 lakh metric ton in 2016–17. There was a general trend of increasing fish production from 2010-11 to 2015–16 with a production value of 30.61 lakh MT in the previous year and 38.18 lakh MT in the last year. In 2016–17, the demand for fish production was 40.50 lakh MT, but the annual output was 41.34 lakh MT which is a significant achievement for the country (Fig. 1.2).



Source: DoF, 2017

Fig 1.4: Annual fish production in Bangladesh (2000 to 2017)

The overall production trend of species wise capture fishery showed a gradual increase from 2000-01 to 2012–13. But in the next years suddenly the production dropped due to a decline in capture habitat area. It has been found that profoundly changed occurred in case of Catfish group, while the lowest change in Major Carp and other Minor Carp fish group. At present, significant carp's species such as *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala* and *Labeo calbasu* along with exotic carp, such as silver carp (*Hypophthalmichthys molitrix*); grass carp (*Ctenopharyngodon idella*); and common carp (*Cyprinuscarpio*) are the most widely practised culture system and available in the market. Now a day's new interest is growing in live fishes like koi (*Anabas testudineus*), singh (*Heteropneustes fossilis*), magur (*Clarias batrachus)*, pabda (*Ompok pabda*), gulsha (*Mystus cavasius*), etc. Live fish production was tripled 1.27 lakh MT in 2016–17 from the

base year of 2000–01 (45638 MT). Both live fish and indigenous carp fishes have high market demand and getting consumer preference.

1.4 Justification of the Study

The stinging catfish (Heteropneustes fossilis) is extremely popular air-breathing freshwater fish species and high priced among other air-breathing catfish. This fish is locally known as shing and it can tolerate slightly brackish water. Stinging catfish H. fossilis is commercially and aquaculturally a significant species in many Asian countries. This fish is considered to be highly nourishing, palatable and tasty and well preferred due to its less spine, less fat and high digestibility (Khan et al., 2003).The stinging catfish Heteropneustes fossilis (Bloch, 1974) belongs to the family Heteropneustidae is a commercially important fish species in Bangladesh. It is extensively fished because of its invigorating quality that includes taste and its nutritional and medicinal values (Jha and Rayamajhi, 2010).

Majority of the people in Bangladesh depend on fish which is a principal source of animal protein. Indeed, fish is an important component of total human food consumption. Protein is essential for health and growth of the body. Fish alone shares about 60 percent of protein intake and contributes about 74% of animal protein. It is nutritionally equivalent to protein in meat, high in essential minerals and low in saturated fats (Islam, 1987). Fish has higher amount of protein with balance proportions of amino acids, vitamin B12, essential fatty acid and low in cholesterol (Edwards and Kaewpaion, 1981).It also provides vitamin A which is vitally important to control blindness of children. Therefore, fish can make an outstanding contribution to the nutritional development of Bangladesh.

About 60 percent of the world populations receive lower than 2200 Kcal per day per capita and 80 percent have to be contented with less than 30 grams of animal protein per day. The fish species have also great use in medical remedies for common aliments in everyday life. Fish supplies are a valuable source of oil containing 6 polyunsaturated fatty acids which are helpful in keeping down the cholesterol level of blood.

Shing fish can survive for an exceptionally long time when kept in captivity even in a small quantity of water, because it has massive, paired sac-like pharyngeal lungs as accessory respiratory organs (Das 1927). Due to accessory respiratory organs it can thrive well in water in low oxygen levels. The stinging catfish belongs to the phylum Chordata, class Actinopterygii, order Siluriformes, family Heteropneustidae, genus Heteropneustes, species H. fossilis (Bloch 1794).

It contains high content of protein, iron (226 mg 100g-1), calcium and low amount of fat compared to many other freshwater fishes (Saha and Guha, 1939; Alok et al, 1993; Kohinoor et al. 2012); and it is recommended in the diet of sick and convalescents. Being a lean fish (fat content only 2.57 ± 0.24%), it is conducive to people on low-fat diets (Rahman et al., 1982).

Fig 1.5: The stinging catfish (Heteropneustes fossilis)

It is considered as an ideal fish species for aquaculture due to its fast growth, high market value, ability to survive in low oxygen content and high stocking densities, adapts well to hypoxic water bodies, high protein and iron content, low fat and high medicinal values (Dehadrai et al., 1985; Alok et al., 1993; Vijayakumar et al., 1998; Haniffa and Sridhar, 2002). It is a very hardy fish, can respire aerially by gulping in air (Munshi, 1993) and can survive for quite a few hours outside the water due to presence of accessory respiratory organs (Kohinoor et al., 2012).

Stinging catfish (Heteropneustes fossilis) is a highly nutritious food and contribute to the fulfillment of animal protein. Now a day, this fish is commercially cultured through the country. Fish feeds play important roles in growth, survival, and development of stinging catfish.

Aquaculture of H. fossilis has not been well flourished in Bangladesh due to lack of appropriate culture techniques, though this fish has enormous aquaculture potential, and it could be easily grown in ponds and small ditches. Although the market demand of this air breathing fish is extremely high, nevertheless truly little attention has been paid to develop culture techniques of this species.

The focus of the study is to generate and provide information about the cost and return of shing monoculture and returns from different inputs used. Furthermore, results of production function analysis will indicate which input provides relatively higher contributions to total output. From such studies, fish firm managers and other persons may get ideas, which would make shing monoculture more profitable, under the present farming condition, using current available production practices.

1.5 Objectives of the Study

This study was done by focusing on the following objectives:

1. To examine the socioeconomic characteristics of Shing Fish farmers in the study area.
2. To estimate the profitability of shing fish production in the study area
3. To identify the factors that affect shing fish production in the study areas
4. To identify the major problems and make some suggestions for policy guidelines to improve future development of shing fish in the study areas.

CHAPTER 2

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

Review of literature in any research is essential because it provides a scope for Reviewing the stock of knowledge and information relevant to the proposed research. The purpose of this chapter is to review the previous research works which are related to present study. There are a lot of socio-economic studies of fisheries sector, because growth of fisheries sector increased day by day in Bangladesh. Different evaluation committees and research organizations in this country encourage all to do research work in this sector. Despite the fact that many studies have been done on pond fish culture. It was found that a few limited numbers of works conducted in Bangladesh which was particularly related to this research. However, in this chapter only the most common and relevant studies which have been conducted in the recent past are reviewed.

2.2 Shing Fish Related Studies

Salam (2003) conducted a study on the "effect of stocking density on growth and survival of indigenous catfish, heteropneustes fossilis (bloch) reared in cemented cisterns" in this study. an experiment was conducted to evaluate the growth, survival and production performances of indigenous catfish (h. fossilis) under three stocking densities three different stocking densities (8,16 and 24 fishes/m2) were applied and designated as treatment-i, treatment-ii and treatment-ill respectively. The weight gain of fishes in treatment-i (16.4 g) was significantly (po.05) higher than

that of treatment-ii (11.7 g) and treatment-111 (8.8 g). the highest production (0.406 kg/m /90days) were recorded in treatment ill.

Chowdhury et al. (2013), Observed that among the endemic catfishes Shing (Heteropneustes fossilis) is very important fish for culture for its high market price and demand. Success in artificial breeding, availability of fingerling, and high rate of return made it a suitable species for aquaculture. Farmers for culture of catfish are also growing day by day.

Haque et al. (2013), In this study shows that Air-breathing fishes provide a significant advantage for pond culture, as they tend to be resilient to harsh conditions, particularly during periods of low-oxygen, which can occur with high temperatures, drought or poor water quality. Currently, production of shing (Heteropneustes fossilis, stinging catfish) and koi (Anabas testudineus, climbing perch) is limited to monoculture systems with intensive use of commercial-grade feeds (30%–35% crude protein). As feed can comprise up to 60% of total production costs, the current practices for these fish limit participation by small homesteads and therefore comprise a significant impediment to further expansion of this industry.

Kamruzzaman et al. (2013*),* Evaluates the effect of formulated feed on growth performance and feed utilization of shingi fish (Heteropneustes fossilis) (Bloch) in glass aquarium culture system. Two formulated feeds; A & B with two different protein levels 35% & 28% were used as treatment feed. The prepared fish feed is found to be effective for the better growth and culture of the experimental shingi fish (H. fossilis). The fish feed containing 35% protein is the best feed for better growth. ADG, condition factor, SGR% of the shingi fish at the Laboratory Condition showed results similar to the results of other worked scientists both at home and abroad.

Rahman et al. (2014), Conducted a research on Culture Potentials of Stinging Catfishshing (Heteropneustes Fossilis) Under Different Stocking Densities in Northern Region of Bangladesh. Seed production of H. fossilis through induced breeding and culture technology have been developed in Mymensingh region (Azadi and Siddique, 1986) but in northern region of Bangladesh has not yet been well flourished due to scarcity of fry and fingerlings and lack of appropriate culture technology. Therefore, the present study was undertaken to optimize and evaluate production potentials of H. fossilis at Freshwater sub-station experimental ponds, Bangladesh Fisheries Research Institute (BFRI), Saidpur, Nilphamari in northern Bangladesh under different stocking densities.

Ali et al. (2014), Comparative study on induced breeding of shing, Heteropneustes fossilis (Bloch) between HCG and PG with different combination. From the experiment it was observed that for H. fossilis a single dose of PG 10 mg/kg for male and 70 mg/kg for female gave the best result in both case of fertilization (95%) and hatching (93%) compared with other combinations (HCG-HCG, HCG-PG and PG-HCG) and doses. The induced breeding of H. fossilis by using HCG and PG has been conducted to develop a successful artificial breeding of the species, which was helpful in producing good quality fry.

Ahsan (2016), Conducted a project on Stinging catfish cultivation proves profitable in Pirojpur. Stinging catfish culture has opened a new horizon here. A farmer Alhaj Aktaruzzaman Fulu said the stinging fish culture is 10 times more profitable than carp fish.

Rahman et al, (2016) , Assess the effects of stocking density on growth and production of shing (*Heteropneustes fossilis)*in ponds, Three stocking densities used were 80, 160 and 240 fish decimal and designated as T1, T2 and T3, respectively. A commercial feed fed at the rate of 50%

of body weight up to first 15 days and then gradually it was readjusted to 35%, 25%, 15%, 5% and 2% respectively. From the present experiment, it was found that the total production was increased with the increase of stocking density, but the individual fish growth rate was decreased with the increase of stocking density. The cost-benefit ratio was 1.59, 1.48 and 1.10 in T1, T2 and T3 respectively. The net profit in T2 was (BDT 2591) highest among the treatment. Based on the present experiment, it can be recommended that farmers could be suggested to rear shing (*Heteropneustesfossilis)* at lower stocking density (80 fish/dec) to get higher growth and survival and thereby higher profit in a short period of time but commercial purpose the total production was increased with the increase of stocking density.

Monir et al. (2016), Conducted an experiment on the Identification of pathogenic bacteria isolated from diseased stinging catfish, Shing (Heteropneustes fossilis) cultured in greater Mymensingh, Bangladesh. This study has shown that bacterial diseases could be a major cause of considerable economic loss to Shing (H. fossilis) farmers in greater Mymensingh, Bangladesh. Isolation and identification of causative agent and determination of the antimicrobial profile of bacterial agents associated with skin lesions and internal organs is necessary for effective antimicrobial treatment. However, disease prevention of Shing (H. fossilis) should be carried out by means of the better culture practices and health management to ensure the optimum yields and the best quality of the products.

Hossain et al. (2016), Conducted a research on the Development of sustainable cage culture technique of stinging catfish (Heteropneustes fossilis) in southern coastal region of Bangladesh From this experiment, it can be concluded that cage culture of stinging catfish (H. fossilis) may

be a profitable business especially in the southern coaster region of Bangladesh. More research will be required for appropriate stocking density, culture period, feeding frequency and requisition of shelter and resting place compare to stocking density to develop sustainable cage culture technique of stinging catfish.

Samad et al. (2017), Conducted a research project on Stocking density of threatened catfish Heteropneustes fossilis (Bloch, 1792) in seasonal ponds of Rajshahi. Shing (Heteropneustes fossilis, Bloch) is a commercially important air breathing catfish which is one of the high ranking valuable fishes of Bangladesh. It is a highly popular, delicious table fish. Catfish is important due to its faster growth, easy culture system, disease resistant and tolerant to a wide range of environmental parameters. H. fossilis can survive at a reduced oxygen level (Stickney, 1979). Moreover, possession of accessory respiratory organs enables it to breathe in atmospheric air. The fish is very hardy and can be cultured in seasonal ponds of northern Bangladesh where carp culture is not possible. They require relatively small area for culture and can be stocked at higher density than any other species

Rahman et al. (2017), Carried out an experiment on Evaluation of growth, survival and production of stinging catfish shing (Heteropneustes fossilis) at different stocking densities in primary nursing. The Asian stinging catfish, Heteropneustes fossilis (Bloch), is a species of air sac catfish. It is locally known as shingi or Shing. His species breeds in confined waters during the monsoon months, but can breed in ponds, derelict ponds, and ditches when sufficient rain water accumulates. It is always marketed in live condition. It contains high amount of iron (226 mg100 g-1) and fairly high content of calcium compared to many other freshwater fishes [2].H. fossilisis of high economic importance and of great demand because of its medicinal value. It is considered to be highly nourishing, palatable and tasty.

Ahamed et al. (2017), Present study was carried out to evaluate the growth performance of polyculture Heteropneustes fossilis in different stocking density in seasonal ponds of greater Northern region, Bangladesh. Present study was carried out to evaluate the growth performance of polyculture Heteropneustes fossilis in different stocking density in seasonal ponds of greater Northern region, Bangladesh. The survival, growth and production were inversely related to the stocking densities of fingerlings of H. fossilis in earthen ponds although feeding frequency and other species

combination was same in different treatments However, stocking density of 1,23550 fry ha-1 maybe suggested for polyculture of (H. fossilis) in seasonal ponds in northern region of Bangladesh. Based on the present findings, polyculture H. fossilis might be suggested to the fish farmer as a potential adaption option to utilize the seasonal water bodies .The polyculture technology of shingi may also help to meet the dietary needs and improve the socioeconomic status of the people of Bangladesh.

Alam et al. (2017), Conducted an experiment on assessing stocking density of shing fish (heteropneustes fossilis) in homestead pond at two different locations to assess the effects of three different stocking densities of 500, 600, and 700 shing fish (heteropneustes fossilis) per decimal (1 decimal = 40 m2) in monoculture system in homestead pond conditions. Stoking density of 500 fish/decimal has resulted in higher growth and profitability compared to that of 600 and 700 fish/decimal.

Samad et al. (2017), Conducted an experiment on Culture of indigenous catfish Shingi, Heteropneustes fossilis (Bloch, 1794), with available low cost formulated feed in earthen ponds of Bangladesh. In the experiment protein levels of formulated feed used in three treatments were 31% in T1, 29% in T2 and 27% in T3 respectively. The results show the production of H. fossilis and

CBR in T1 were significantly higher. From the study, considering water quality, production and economics, it is proved that the higher growth and survival rate of H. fossilis was found with 31% protein level of the feed in earthen ponds of Bangladesh.

Ali et al.(2018), Conducted a study on the Production of Stinging Catfish (Heteropneustes fossilis) in different stocking densities with GIFT (Oreochromis niloticus) and Thai Sharpunti (Barbonymus gonionotus) in ponds The results of the study shows that H. fossilis might be suggested to culture in ponds with O. niloticus and B. gonionotus at the stocking density of 148,200 individuals per hectare. further study is needed to optimize the culture technique (such as nutrient requirements, effects of physiochemical parameters and feeding frequency) for better growth, more production and benefit.

Nahar et al. (2019), A Study on optimization of stocking density of air breathing fish (Shing, Heteropneustes fossilis Bloch, 1794) in cemented dewatering canal at BAPARD campus, Gopalganj. From the experiment, it can be decided that treatment T1 (20 fingerlings/m2 or1,97,600 fingerlings/ha) is suitable for H. fossilis due to higher total weight gain, better feed conversion ratios as well as higher net profit. Application of this findings for H. fossilis culture might be developed the aquaculture production especially in cemented dewatering canal.

2.3 Concluding Remarks

The above review and discussion indicate that a limited number of studies on shing fish culture were conducted. The result of these studies varies widely in different reasons. The review of literature was helpful to re-design methodological aspects with a view to overcome the limitations of previous studies. From the above studies the researcher felt the need of conducting and analyzing the productivity of shing fish farming in Bangladesh within the current development context, which will help the policy makers to understand the current situation. On the other hand, researcher believed that the findings of this study would provide useful updated information, which would help the policy makers and researcher for further investigations.

CHAPTER 3

METHODOLOGY

CHAPTER 3

METHODOLOGY

3.1. Introduction

Methodology is the broad philosophical underpinning and integral part of any thesis or research work. The reliability of a specific Study finding largely depends on the appropriate methodology used in the study. Methodology refers to the process of collecting information and arranging it in the terms of the relevant issues of the study where various strategies and techniques are normally used to solve research problems. It is designed in a way so that it correspondent to achieve the objectives of the study. Use of improper methodology very often leads to erratic results.

3.2. Selection of the Study Area

Selection of the study area is an important task for researcher of the thesis work. Mymensingh district is well known for the fish production in Bangladesh. According to Yang (1965), "the area in which a farm business survey is to be conducted relies on the particular purpose of the survey and possible cooperation from the farmers and other respondents". Keeping in view the main objectives the study was carried out at three villages named Bildora, Swadeshi, Shakuai of Haluaghat upazila in Mymensingh District. The areas were more accessible to the researcher because she was familiar with the local language, living, belief and other socioeconomic characteristics of the villagers. These familiarities and accessibility encouraged the researcher to select these areas for this study.

3.3 Sources of Data

Primary data regarding research work was collected by face-to-face interview. Before preparing the final survey schedule, a draft survey schedule was prepared in accordance with the objectives of the study. Then the draft was pre-tested to verify the relevance of the questions and the nature of responses of the sample of the producers.

3.4 Selection of Sample

The collection of necessary information for a research study from each and every elements of population become costly and time consuming. So the selection of sample size was one of the crucial aspects for the study. A reasonable size of sample to achieve the objectives of the study was considered. A sample of representative farms is therefore chosen in such a way that the information meets the purpose of the study. As the population is not so large and considering the limited time, efforts and fund a sample size of 60 farmers were selected.

3.5. Period of Data Collection

Data were collected by the researcher herself through personal interviews with the respondents. Data were collected during the period from July to August 2019. Prior to final data collection the interview schedule was pre-tested by collecting information from selected samples.

3.6 Data collection

As the shing fish farmers do not keep any record of their activities they rely on their memory and at first, they hesitate to share the information of their activities. However, all possible efforts were made to ensure the collection of reasonably accurate data from the field. Data were collected from the sample producer by direct interview with a set of interview schedules designed for this study. During the interview, each respondent was given a brief introduction about the nature and purpose

of the study. Sample questions and required data tables were printed out initially and taken interview in a systematic manner, few new records were also added during interview time which was initially unknown to researcher therefore not available in sample question paper. After completion of each interview schedule were checked and verified to be sure that answer to each question was properly recorded. If any data appeared to be inconsistent then farmers were again interviewed for relevant answers. In order to minimize errors, data were collected in local units.

3.7 Data Analysis

After collection of primary data, the filled schedules were edited for analysis. These data were verified to eliminate possible errors and inconsistencies. All the collected data were summarized and scrutinized carefully. For data entry and data analysis, the Microsoft Excel programs, and SPSS programs were used. Initially Information were collected by local units and after checking the collected data, these were converted into standard units. Finally, to meet the objectives of the study, a few relevant tables were prepared according to necessity of analysis.

3.8 Analytical Techniques

Data were analyzed with the purpose of fulfilling the objectives of the study. Both descriptive and statistical analysis were used for analyzing the data.

3.8.1 Descriptive Analysis

Tabular technique of analysis was generally used to find out the socio-demographic profile of the respondent, to determine the cost, returns and profitability of shing farm enterprises. It is simple in calculation, widely used and easy to understand. It was used to get the simple measures like sum, average, count, percentage etc**.**

3.8.2 Statistical Technique

In this study, the production function technique was applied as a supplement to the tabular technique. It is expected to be a compromise among (i) adequate fit of the data, (ii) computational feasibility and (iii) sufficient degrees of freedom unused to allow for statistical testing with the help of samples. One of the most widely used production function for empirical estimation is the Cobb Douglas production. This function was originally used by C.W. Cobb and P.H. Douglas in twenties to estimate the marginal productivities of labour and capital in American manufacturing industries.

Moreover, the special advantage of using Cobb- Douglas production function was that the regression under Ordinary Least Squares (OLS) in logarithm, yields coefficients which stand for production elasticities and if all the inputs related to the production are taken into account as the independent variables, the sum of the production elasticities demonstrates whether the production process as a whole yields increasing, decreasing or constant returns to scale.

3.8.2.1 Profitability Analysis

Five variables such as cost of human labor, fingerling cost, fertilizer, medicine and feed cost, in shing fish farming were considered for Profitability analysis as well as Cobb-Douglas production function. Profit function of the following algebraic form was used in this study,

$$\text{Profit } (\pi) = \sum_{\text{i}=0}^{\text{n}} (\text{Pyi}.\,\text{Yi}) - \sum_{i=0}^{n} (\text{Pxi}.\,\text{Xi}) - \text{TFC}$$

Where, π = Net Return,

Pyi= Price per unit of the ith produce

Yi= Quantity of the ith produce

Pxi= Price per unit of the ith inputs

Xi = Quantity of the ith inputs

TFC= Total Fixed Cost.

3.8.2.2: Specification of the Cobb-Douglas Production Function

For determining the effect of variable inputs to the production of shing fish, Cobb-Douglas production function chosen based on best fit and significance result on output. In this model, yield per hectare was considered as the dependent variable.

The functional form of the multiple regression equation is as follows:

$$Y=aX1^{b1}\,X2^{b2}X3^{b3}X4^{b4}\,X5^{b5}e^{ui}$$

For the purpose of the present empirical exercise, the Cobb-Douglas production function was converted into the following logarithmic (Double log) form:

$$ln\,Y=lna+b1lnX1+b2\,lnX2+b3lnX3+b4lnX4+\,b5lnX5+Ui$$

Where,

Y = Gross Production (Tk./ha)

X 1= Cost of fingerlings (Tk./ha)

X2= Cost of human labor (Tk./ha)

X 3= Cost of feed (Tk./ha).

X 4= Cost of fertilizers (Tk./ha)

X5= Cost of medicine (Tk./ha)

In a = Constant or intercept of the function

bl, b2, b3, b4, b5= Coefficient of respective variables.

i = 1, 2, 3, ..., n.

ln = Natural logarithm; and

Ui= Error term.

3.9 Specification of Variables

Shing monoculture may be considered as a function of various inputs employed in the process of production. As such the purpose of this section is to identify the items of inputs used in shing monoculture and their pricing system. The shing monoculture producer had to incur costs for different inputs such as feed seeds, Fingerling cost, Human labor cost, fertilizer and medicine cost and necessary care for pond management. Some of these inputs were purchased while some others were home supplied. The evaluation of costs for the purchased inputs was not at all a problem and the actual costs paid by the producers were directly considered. Calculation of cost of home supplied inputs can be made based on opportunity cost principle.

3.9.1 Cost of fingerlings

In the study area, it was observed that shing monoculture producers who used fingerlings in their ponds, were purchased. The costs of fingerlings were calculated at the actual market prices paid by the farmers in the locality.

3.9.2 Cost of Human Labour

Human labour is one of most of the important inputs in pond fish fanning. From stocking to harvesting of fish, human labour is required in different operations and management, liming, fingerlings collection, application of feed, providing fertilizers, security netting, harvesting, and selling. Both family and hired labour were used in the fish fanning. In working out the cost of labour wages of labors were considered.

3.9.3 Cost of Feed

Supplementary feed is the most important factor which means of increasing the growth and survival of pond fishes. Its doses vary according to intensity of culture. In the study area, it was observed that the producers used different types of supplementary feeds which are maximum ready-mix feed. Small group of farmers used homes supplied food which ware normally purchased and processed. There was no fixed rate for buying this feed items in the study area. However, major cost was incurred by feed cost of this fish culture.

3.9.4 Cost of fertilizers and medicine

Most of the shing fish farmers used fertilizers like Muriate of Potash (MOP), salt, Diammonium phosphate (*DAP*), Lime etc. Cost of these Fertilizers were estimated at the prevailing marketing price in the study area. Uses of manure is strictly prohibited in shing fish production. If fishpond is attacked by any diseases, then different medicine is used by taking help from fisheries officers. Cost of these medicines are estimated at given market prices.

3.9.5 Interest on Operating Capital

Interest on operating capital was determined based on opportunity cost principle. The operating capital represented the average operating cost over the period because all costs were not incurred at the beginning or at any single point of time. Interest on operating capital was charged for 6 months at the rate of 9 percent per annum. It was assumed that if farmers would deposit money in the bank, they would have received interest at that rate. Interest on operating capital (OC) was calculated by using the following formula:

Interest on operating capital = Al × i × t

Where,

Al = (total investment)/2;

i = interest rate which was assumed at 9 percent; and

t = length of the period of rice production (6 month).

3.9.6 Pond Use Costs

In the study area the leased cost of pond was different to plots depending on location, topography and fertility of the pond. In this study, the cost of pond use was considered as cash rental value of land. If the pond fish producers have rented out their ponds for one year, they could have got money for it. The money, which they would have received was considered as rental value of the pond.

3.10 Calculation of Returns

3.10.1 Gross Return

Gross return is the monetary value of fish production which was calculated by multiplying the total quantity of production by their respective market prices. In this study, gross return was calculated by summing up all the returns earned. Per hectare gross return was calculated by multiplying the total amount of products price.

3.10.2 Gross Margin

Gross margin is defined as the difference between gross return and variable costs. Generally, farmers want maximum return over variable cost of production. The argument for using the gross margin analysis is that the farmers are interested to get returns over variable cost. Per hectare gross margin was obtained by subtracting variable costs from gross return. That is,

Gross margin = Gross return – Variable cost.

3.10.3 Net Return

Net return was calculated by deducting the total production cost from the total return or gross return. That is, Net return = Total return – Total production cost

3.10.4 BCR (Benefit Cost Ratio)

The undiscounted benefit cost ratio (BCR) is a relative measure which is used to compare benefits per unit of cost.

BCR was calculated by using the following formula-

BCR = Gross return/ Total cost

BCR on Cash Cost= Gross return/Total Variable cost

3.11 Problems Encountered in Collecting Data

The researcher faced the following problems in collecting data from the field:

i. Most of the respondents initially did not feel comfortable to answer questions since they thought that the investigator might use the information against their interest. To dispel this confusion a good deal of time was spent to gain their confidence.

ii. The farmers did not keep records of their farming business. Therefore, the author had to depend upon their memory.

iii. Some of the respondents were illiterate which was another hindrance for data collection to the researcher. Sometimes respondents could not answer to questions accurately and to the point.

iv. The farmers usually remain busy with field work. So, the researcher had to visit some of them even at the field. The researcher sometimes also had to pay more than two visits to meet the farmer in cases they were not found either at houses or in the field nearby at first visit.

CHAPTER 4

DESCRIPTION OF THE STUDY AREA

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DESCRIPTION OF THE STUDY AREA

4.1 Introduction

Description of the study area deals with an overall understanding about the Research Area. It plays an important role in the thesis paper since it provides a brief, clear, and unambiguous description of the study area to identify farmers' living standards, environment, and others silent features about the area. The description of the study area includes location, physical features, topography, climate, temperature and rainfall, occupation of the villagers, communication, and marketing facilities. This information is essential for better understanding of the facts and findings of the research and for the selection of the study area.

4.2 Location of the Study Area

Mymensingh is one of the districts of Mymensingh division, Bangladesh which is bordered on the north by the Meghalaya state of India and the Garo Hills, on the south by Gazipur District, on the east by the districts of Netrokona and Kishoreganj, and on the west by the districts of Sherpur, Jamalpur and Tangail. Mymensingh town is the district headquarters. Area of Mymensingh Districts is 4363.48 sq. km, located in between 24°15' and 25°12' north latitudes and in between 90°04' and 90°49' east longitudes. Total Population is 4489726 where male 2297302 and female 2192424; Muslim 4289789, Hindu 168135, Buddhist 27999, Christian 330 and others 3473. Indigenous communities such as Garo, Koch, Dalu, Barman and Hajong belong to this district. Main water bodies contains Old Brahmaputra, Bhogai, Bajua, kangsa. Mymensingh District consists of 12 upazilas, 146 unions, 2201 mauzas, 2700 villages, 8 paurashavas, 84 paura wards, and 217 Mahallahs. Average literacy in Mymensingh Districts becomes 39.1% where male 41.7% and female 36.3%. Main sources of income Agriculture is 64.14%, non-agricultural laborer

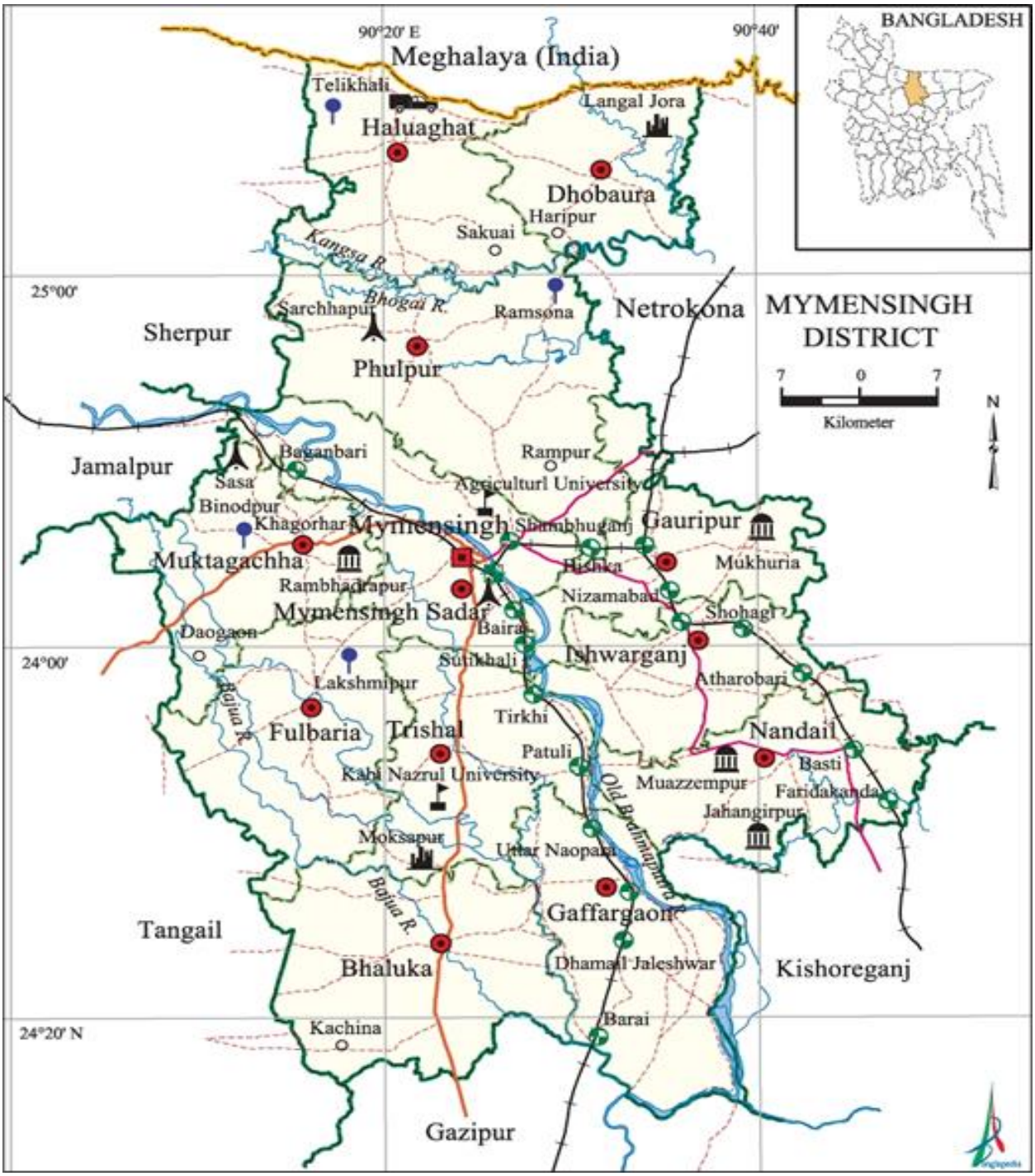
3.65%, industry 0.82%, commerce 11.40%, transport and communication 3.53%, service 6.21%, construction 1.33%, religious service 0.21%, rent and remittance 0.46% and others 8.25%.

The selected Study area was Bildora, Sakuia and Swadeshi at Haluaghat Upazila in Mymensingh District. Haluaghat is one of the upazila in Mymensingh District which is located in between 24°59' and 25°12' north latitudes and in between 90°14' and 90°33' east longitudes. It is bounded by the Meghalaya state of India on the north, Phulpur upazila on the south, Dhobaura upazila on the east and Nalitabari upazila on the west.

4.3 Area, Population and Literacy Rate

Administration Haluaghat Thana was formed in 1916 and which was turned into an upazila in 1983. Area of Haluaghat upazila is 356.07 sq. km which consist 12 Union parishads, 146 Mouza and 208 Villages. Twelves union parishads located Haluaghat Upazila are- Amtail, Kaichapur, Dhara, Gazirvita, Jugli, Dhurail, Narail, Bildora, Sakuai, Swadeshi, Bhubankura and Haluaghat Sadar. Kangsa, Menong and Bhogai are three main rivers located in this area.

According to the 2011 Bangladesh census, Haluaghat had a population of 290,043. Males constituted 49.18% of the population and females 50.82%. Muslims formed 91.34% of the population, Christians 4.40%, Hindus 4.17%, and others 0.09%. Indigenous communities such as Garo, Hajong, Koch, Dalu, Bangshi Barman, Khatrio, Hadi, Kurmi, Mal belong to this upazila. Haluaghat had a literacy rate of 34.8% where male was 37.7%, female was 31.8% for the population 7 years and above.



Source: Banglapedia.com

Fig 4.1: Geo-Code of Mymensingh District

Source: Banglapedia.com

Fig 4.2: Geo-Code of Haluaghat Upazila

4.4 Educational, Cultural and Religious Institutions

We have found 3 College, 29 secondary school, 155 primary school and 12 madrasas available in Haluaghat Upazila. Remarkable educational institutions are Haluaghat Shaheed Smriti Degree College (1972), Haluaghat Adarsha College (1988), Beroi Dakuni High School (1941), Ideal High School (1951), Kutikura Karuapara High School (1924), Saint Andrews High School (1923), Saint Mary's Girls' Junior High School (1929), Haluaghat Mission School (1923), Dhurail Alim Madrasa (1966).

Cultural organization like Three Library, one dance school, one music school, two cinema hall and almost 30 different clubs are available in this upazila. Considering religious institutions, Mosque 441, temple 16, church 6. Noted religious institutions are Haluaghat Dhanhata Jami Mosque, Markas Mosque, Ramsundar Mandir, Beroidakuni Catholic Church and Church of England or Oxford Church (Anglican Church).

Considering Health centres, Upazila health complex 1, family planning centre 11, satellite health centre 2, hospital 2, community clinic 38, missionary operated health complex 3 are available in this upazila.

4.5 Occupational Status

Main sources of income of Haluaghat Upazila is Agriculture 71.54%, non-agricultural laborer 3.60%, industry 0.45%, commerce 10.01%, transport and communication 3.50%, service 3.42%, construction 0.57%, religious service 0.18%, rent and remittance 0.13% and others 6.60%. Ownership of agricultural land Landowner 56.02%, landless 43.98%; agricultural landowner: urban 42.54% and rural 56.49%. (Source BBS: 2007)

4.6 Agricultural Products

Most of the farmers produce Paddy as their main crops. Huge amount of Paddy was produced and distributed from Haluaghat Upazila. Others remarkable crops are jute, wheat, potato, mustard, ground nut, kasaba, vegetables etc.

Remarkable fruits also produced in this upazila which export in the city area like Jackfruit, mango, blackberry, olive, banana, papaya, watermelon etc.

Ample amount of fishes is found in this area. The area is surrounding by Old Brahmaputra, Bhogai, Bajua, kangsa river therefore different types of local fish are caught from these rivers by which local demand are fulfilled. Huge number of fisheries are available which different carp fish like Rohu, catla, Mrigel, Silver carps are produced in fish culture pond. Different local fishes like shing, Magur, papda, tengra are also produced in fish culture pond which have also higher demand in overall Bangladesh.

The farmers of this area also reared cattle, goat, sheep, chicken and duck. According to the opinion of the Upazila Livestock Officer (ULO), chicken and duck population were gradually increasing in the study area.

4.7 Non-Government Organization

At present, several important non-government organization (NGOs) such as BRAC, ASA, CARE, CIDA, Popy, Palli Bikash, Sheba, Proshika, Grameen Bank were operating in the study area in recent years. NGOs help to providing technical training on fish culture, poultry and cattle rising, handicraft, livestock rearing and homestead gardening to the people of the study area. They also provide bank loans to poor women and landless farmers (BBS, 2007).

4.8 Transportation, Communication and Marketing Facilities

Transportation is one of the most important sectors in agricultural and economic development of a country. Without well-developed transportation facilities, it is not possible of the rural people to enjoy the facilities of modern technology. Pucca road 43 km, semi-pucca road 17 km, mud road 350 km (BBS 2007)

Access to electricity All the unions of the upazila are under rural electrification network. However, 5.02%' of the dwelling households have access to electricity.

Marketing facilities are another important field which play an important in modem economic life and rural development as well. The marketing facilities of villages in the study area were not good at all. Formal marketing system locally called ‘Hat’ was present here. Hats-bazars are 20, fair 1, most noted of which Haluaghat Bazar, Baghaitala Bazar, Dhara Bazar, Dhurail Bazar, Surjapur Hat, Chhatugaon Hat, Nagla Hat and Kamakhar Mela which play an important role to provided marketing facilities of the local agricultural products.

CHAPTER 5

SOCIO-DEMOGRAPHIC PROFILE OF SHING FISH FARMERS

CHAPTER 5
SOCIO-DEMOGRAPHIC PROFILE OF SHING FISH FARMERS

5.1 Introduction

Socioeconomic status is the social standing or class of an individual or group. It is often measured as a combination of education, income and occupation. Socioeconomic characteristics of the farmers are important factors which influence their production planning. People differ from one another in many aspects. There are numerous interrelated and constituent attributes that characterize an individual and profoundly influence development of their behavior and personality. In this study, almost 35 percent farmers from Swadeshi, almost 55 percent farmers from Sakhoi and almost 20 percent farmers from bandra at Haluaghat upazilla in Mymensigh. In order to get a complete scenario of Shing fish culture in that areas, it is necessary to know the socioeconomic characteristics of the Shing fish producers. In this chapter, author try to identify and describe the main socioeconomic characteristics of the sample respondents in the study area. Here, Information regarding Age distribution, Level of Education, Occupation Status, Housing Status, Gender wise distribution, Marital Status, Family Size, Land Holding and utilization, Income Sources, Farmer's Yearly Expenditure and Credit Facilities for fish farming are considered as main socioeconomic characteristics in the study area. A brief illustration of these aspects is described below.

5.2 Age Distribution of the Sample Farmers

Generally, in agriculture sector major farmers are aged personnel whereas in fish farming major portion of the farmers are middle aged. Now-a-days new technology and methodology are including in fish farming sector therefore middle-aged farmers are more capable to adapt it and can-do better management of these new farming system.

Table 5.1: Age Distribution of Farmers

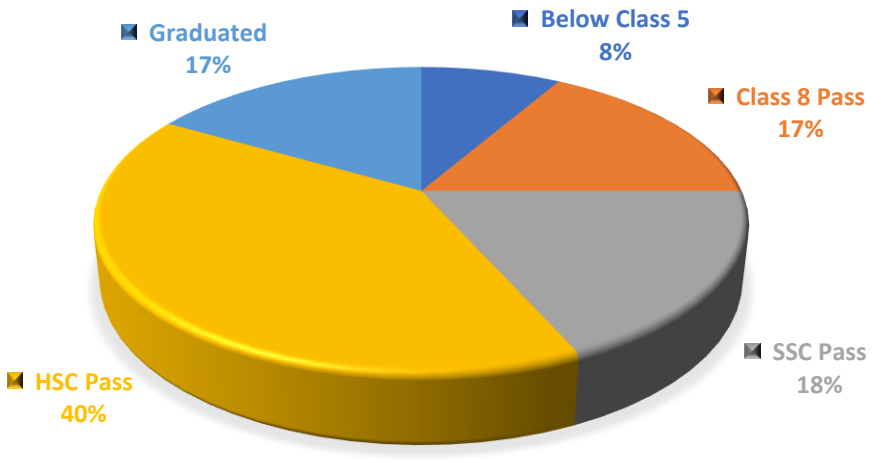
Age Group	Number	Percentage (%)
Up to 30 Years	9	15.0
31-40	27	45.0
41-50	16	26.7
Above 50	8	13.3
Total	60	100

Source: Field Survey, 2019

In this study, sample farmers in the study area were categorized into four different groups which is provided in table 5.1. Out of the total 60 sample farmers 15.0 percent belonged to the age group of up to 30 years, 45.0 percent in age group of up to 31-40 years, 26.7 percent within age group 41-50 years and 13.3 percent in age group of above 50. In the above data a major group of the farmers were middle aged, moreover, we can understand that since shing fish farming is profitable business therefore, young energetic people intended to enter in this field willingly.

5.3 Educational Status of the Respondents

Education is the prime prerequisite to success in any field. Educated farmer can understand easily how to increase productivity. Literate farmers have better access to the relevant technical information for improvement of Shing Fish culture and can make more rational production decision than illiterate farmers.



Source: Field Survey,2019

Fig 5.1: Level of Education of the Respondent

To examine the educational status of the Shing fish farmers, the sample farmers were classified into Five categories. In the study area major shing farmers were literate which is shown in figure 5.1. In the study area out of 60 sample farmers, 8.0 percent farmers (5 farmers) were found within below class 5, 17.0 percent farmers (10 farmers) had Secondary education who were within group Class 8 pass, 18.0 percent (11 farmers) had completed their Secondary education whose were within SSC Pass group, majority of the farmers had completed higher Secondary level, who were within HSC pass group, they belonged to 40.0 percent (24 farmers) of total sample farmers. Finally, 18.0 percent (10 farmers) had completed their graduation who were graduated group. From the above analysis it is clearly found that a vast majority of the educated people were like do such profitable business.

5.4. Occupation Status of the Respondent

In the study area major group of farmers are engaged in Agriculture, Fish Culture and Business as their main occupation. On the other hand, a major group of farmers were related to Fish Culture as their subsidiary occupation.

Table 5.2. Main Occupation and Subsidiary Occupation of the Respondent

Main Occupation	**No.**	**Percentage**
Agriculture	14	23.3%
Fish Culture	16	26.7%
Dairy	2	3.3%
Poultry	3	5.0%
Service	4	6.7%
Business	21	35.0%
Total	**60**	**100.0%**
Subsidiary Occupation	**No.**	**Percentage**
Agriculture	9	15.0%
Fish Culture	44	73.3%
Poultry	1	1.7%
Business	6	10.0%
Total	**60**	**100.0%**

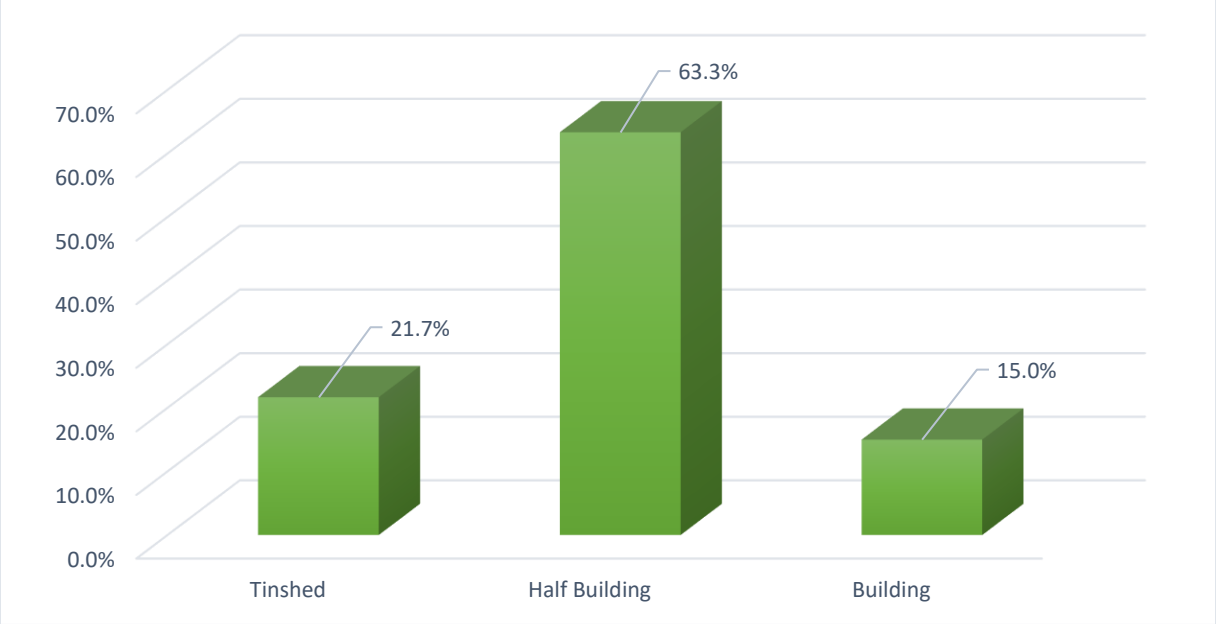
Source: Field Survey,2019

Table 5.2 shows that 23.3 percent farmers engaged in Agriculture, 26.7 percent belonged to Fish Culture, 3.3 percent engaged in Dairy, 5.0 percent engaged in Poultry, 6.7 percent engaged in different service and 35.0 percent belonged to Business as their main occupation.

On the other hand, 15.0 percent engaged in Agriculture, 73.3 percent engaged in Fish Culture, 1.7 percent engaged in Poultry and 10.0 percent engaged in Business as their subsidiary occupation.

5.5. Housing Status of the Respondent

Now-a-days major farmers are well educated, and they have good economic status. Therefore, their housing status are improved also. Previously major farmers had straw roof or tin shed house but in the study area it was observed that major farmers had half building house.

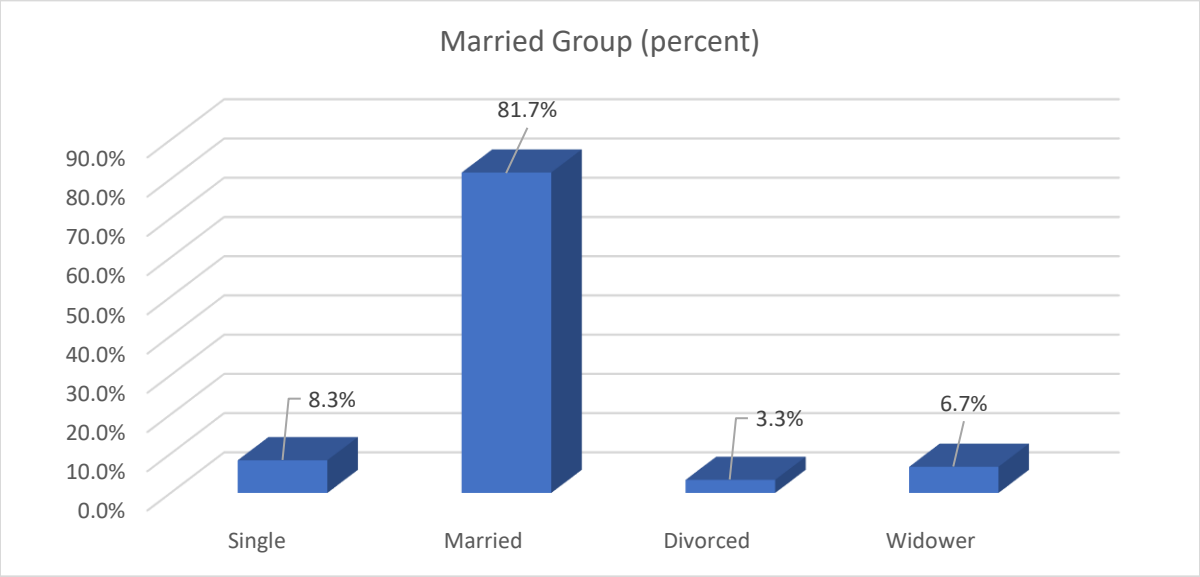


Source: Field Survey,2019

Fig 5.2: Housing status of the respondent

From the figure 5.2, In the study area out of 60 farmers 38 farmers had half-building house and the figure become 63.3 percent. 13 farmers had Tin shed house and 9 farmers had Building and the percentages become 21.7 percent and 15.0 percent respectively.

5.6 Marital Status of the Respondent



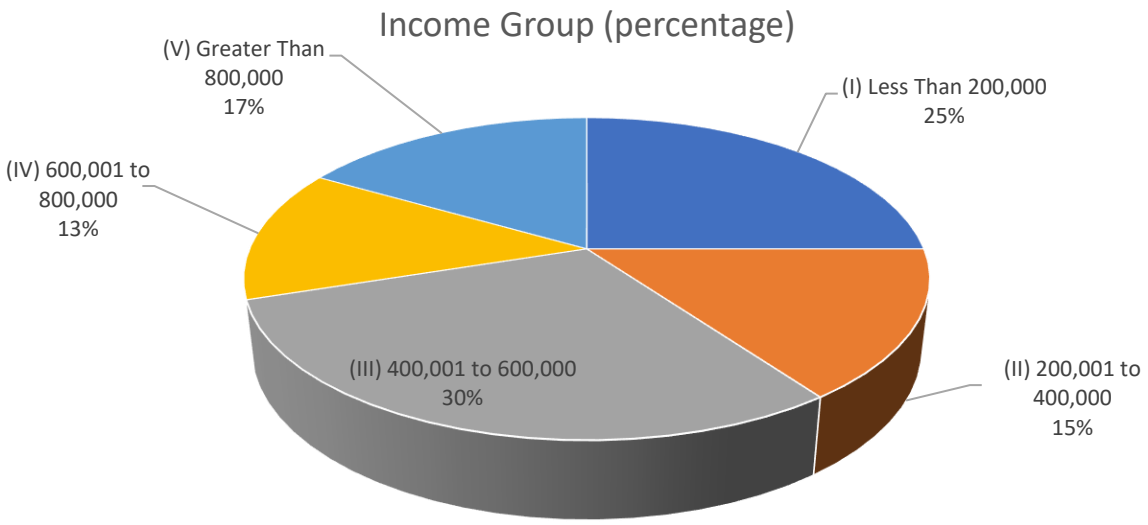
Source: Field Survey,2019

Fig 5.3: Marital Status of the Selected Farmers

In the study area, 49 farmers were married which comprise 81.7 percent of total selected farmers. 5 farmers were single, 2 were divorced and 4 farmers were Widower whose comprise 8.3 percent, 3.3 percent and 6.7 percent respectively.

5.7 Income Distribution of the Respondent

Generally, yearly income of Shing farmers differs from one another. In this study, the incomes of shing farmers were categorized as follows: (i) Less Than 200000 (15 farmers); (ii) 200,001 to 400,000 (9 Farmers); (iii) 400,001 to 600,000 (18 Farmers); (iv) 600,001 to 800,000 (8 Farmers) and (iv) Greater Than 800,000 (10 Farmers).



Source: Field Survey,2019

Fig 5.4: Income Distribution of the Sample Farmers

It is evident from the figure 5.5 that most of the farmer's yearly income belonged to the category (III) 400,001 to 600,000 and the figure was 30.0 percent. 25.0 percent of the shing farmers earned Less Than TK 200,000 per year. 15.0 percent of the farmers were earned Tk. within 200,001 to 400,000 per year. 13.0 percent farmers earned Tk. within 200,001 to 400,000 per year. Finally, 17.0 percent of the shing farmers earned greater than TK. 800,000 per year, in the study area.

5.8 Family Size Group (Based on Family Members)

The farm family includes wife, sons, unmarried daughters, unmarried sisters, brothers, parents etc. The total Family group of all families were classified into three groups: Small Family, Medium Family and Large Family.

Table 5.3: Family Size wise Distribution

Family Group	Number	Percentage
Small Family (1 to 4 Member)	17	28%
Medium Family (5 to 6 Members)	28	47%
Large Family (Above 6 Members)	15	25%
Total	**60**	**100%**

Source: Field Survey,2019

Table 5.3 indicates that 28.0 percent families were under small family, 47.0 percent families were medium family and 25.0 percent were Large Family.

5.9 Land Holding Pattern of the Respondent

Land holding of the sample farmers was defined as the sum of all types of land occupied by the farmers and having legal right on it. Size of land holdings includes homestead area, orchard, pond, cultivated land, fellow land, leased in, leased out and mortgage in as reported by the sample farmers.

Farm size is measured by the entire land area operated by the farmers. It is generally calculated by adding the area of rented and mortgaged in from others and deducting the area of rented and mortgaged out to others. Hence, the farm size was measured by using the following formula:

Total Land = Own land (homestead + pond + own cultivated + Garden) + (Rented in + mortgaged in) – (Rented out + mortgaged out)

Table 5.4: Average Land Holding Pattern of the Sample Farmers

Types of Land	Average Area (Decimal)	Percentage of Area
Homestead area	71.63	15.72%
Pond Area	48.13	10.56%
Own cultivable area	255.86	56.15%
Fallow Land	29.44	6.46%
Rented in	26.18	5.75%
Rented out	4.13	0.91%
Mortgage in	12.13	2.66%
Mortgage out	4.37	0.96%
Leased in	1.8	0.40%
Leased out	2.0	0.44%
Total	**455.67**	**100.00%**

Source: Field Survey,2019

From Table 5.4 we can understand that in the study area, average land holding was 455.67 decimal where major portion was their own cultivable area, and the figure was 56.15 percent and Pond area was 10.56 percent.

5.10. Income Sources of the Respondent

In the study area, Table 5.5 reveals that average annual income of the sample farmers was 453300 Tk. where major percentage came from Agricultural sources and the figure was 71.50 percent. On the other hand, 28.50 percent came from Non-Agricultural sources and the figure was 28.50 percent.

Table 5.5: Average income Sources of the Sample Farmers

Income Sources	Average Annual Income (BDT.)	Percentage
I) Agricultural sources	324,117	71.50%
II) Non-Agricultural Sources	129,183	28.50%
Total Income	**453,300**	**100.00%**

Source: Field Survey,2019

5.11. Expenditure of the Respondent

From previous table we understand that Sample farmers had good income therefore they had scope to lead a better life, which was reflected in their expense pattern. When we analyze their average expense to their family members, we had found that major expense occurred in the food stuffs. Energy (petrol, Gas and Electricity) and Transportation also comprised a good amount of expense.

Table 5.6: Average Expenditure of the sample farmers

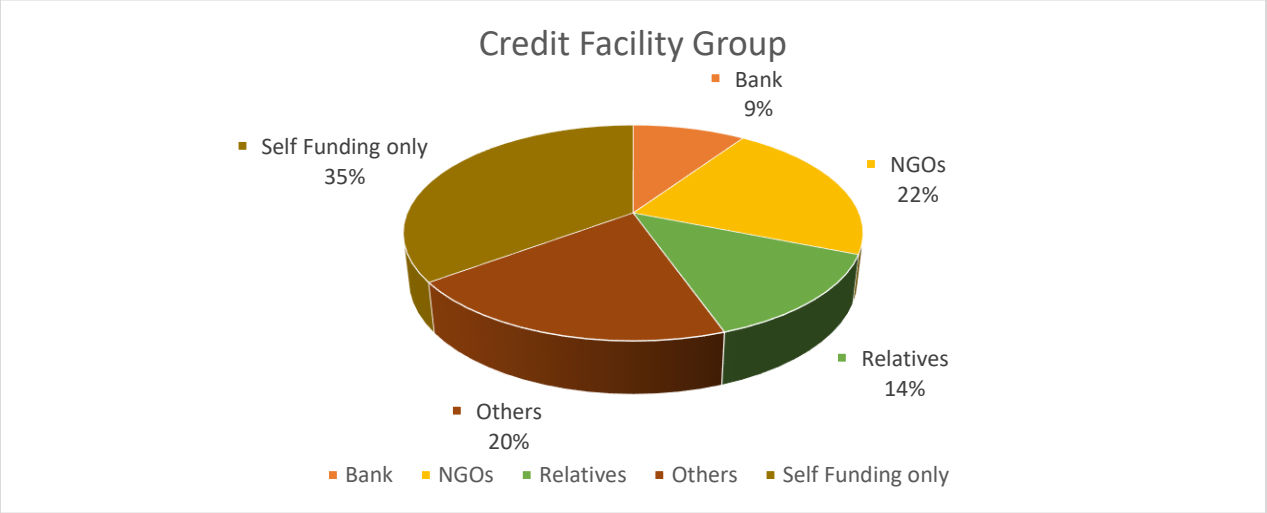
Expense Group	Average Expenditure (BDT.)	Percentage
Food	83,000	47.73%
Energy (Petrol, Gas, Electricity)	18,480	10.63%
Healthcare	8,920	5.13%
Education	11,800	6.79%
Clothing	9,580	5.51%
Transportation	20,440	11.75%
House Rent	4,945	2.84%
Cell phone Expense	5,920	3.40%
Entertainment	5,460	3.14%
Others	5,360	3.08%
Total Expense	**173,905**	**100.00%**

Source: Field Survey,2019

From table 5.6, we have found that Total expense of the average sample farmers was 173905 Tk where main expense item was food and the figure was 47.73 percent. Sample farmers Spent 10.63 percent in energy (petrol, Gas and Electricity), 5.13 percent in healthcare, 6.79 percent in education, 5.51 in clothing, 11.75 percent in transportation, 2.84 percent in house rent, 3.40 percent as their cell phone expense, 3.14 percent as their entertainment and 3.08 percent are considered as others expense.

5.12. Sources of Credit Facilities of the Respondent

Funding facility is one of the key factors for any kind of farming. The sources of credit facilities for the shing producing farmers include Banks, NGOs, Relatives, Friends, acquainted and their own funding also. In the study area different NGOs like BRAC, ASA, CARE etc are operating their services by providing loan to the farmers at moderate interest rate. Bank like Krishi bank also play a vital role to provide loan to the shing farmers at minimal interest rate.



Source: Field Survey,2019

Fig 5.5: Credit Facility Sources of the Sample Farmers

From figure 5.5, About 9.00 percent farmers (7 Farmers) were taken loan from Banks, almost 22.00 percent farmers (16 Farmers) were taken credit from NGOs, almost 14.00 percent farmers (10 Farmers) loaned from their relatives, almost 20.00 percent farmers (15 Farmers) were taken loans form their friends or acquainted which is included to others group and almost 35.00 percent farmers (26 Farmers) were running their business by their self-funding only. that means 35.00 percent farmers had not taken loan from any sources. Some Farmers had taken loan from multiple sources, therefore 74 credit facility events had to consider of 60 farmers.

CHAPTER 6

PROFITABILITY ANALYSIS

CHAPTER 06
PROFITABILITY ANALYSIS

6.1 Introduction

To start any business or production process farmers must consider first the overall costing which was incurred to run that business. Costing plays a pivotal role to make the right decision on every business. In this chapter author provides details estimation and analysis regarding costing of shing fish production in the study area. In this analysis author has considered two types of costs: variable costs and fixed costs whereas human labor, fingerling, feed cost, fertilizer and medicine cost are considered as variable cost. On the other hand, land use cost, Electric Equipment Cost, Construction of guard shed, and other housing cost are considered as fixed costs. On the return side, Gross Return (GR), Net Return, Gross Margin and Benefit-cost ratio (BCR) are estimated. In this study, a brief account is showing how the individual costs and return are estimated are illustrated below.

6.2 Variable Costs

6.2.1 Cost of Fingerlings

Fingerlings cost is considered one of the most essential costs in shing fish production. Cost of fingerlings depends on the size, market demand and availability of fingerlings. There was a variation in the per unit price of fingerling from location to location and time to time. In the study area, it was observed that major shing fish farmers normally purchase fingerlings from different hatchery. Therefore, Stocking density terms should be considered which is per-unit stocking amount or stocking rate, refers to the quantity of fry or fingerlings per unit of water area. In this study area per hectare shing quantity was almost 260,000 pcs fingerlings and size of fingerlings were 1.03 inch where average per kg fingerlings price was 1735 Tk where 2000-3000 pcs fingerlings were available.

Now, Table 6.1 shows that per hectare average cost of fingerlings were estimated at Tk. 181311 which constituted 23.64 percent of the total variable cost.

Table 6.1: Per Hectare Total Variable Cost of Shing Fish Production

Per hectare total variable cost of Shing Fish Production			
Cost Items	**Unit Price**	**Amount (BDT.)**	**Percentages**
Fingerling cost	1735 Tk Per Kg	**181311**	23.64%
Human Labor Cost		**254740**	33.22%
Pond Preparation	383 Tk Man-Day	14626	1.91%
Intercultural Operation	362 TK Man-Day	222,871	29.06%
Harvesting	388 Tk Man-Day	17243	2.25%
Feed Cost	79 Tk Per Kg	**252,185**	32.88%
Cost of Fertilizer		**14722**	1.92%
Potassium (K)	590 Tk Per Kg	2174	0.28%
Lime	18 Tk Per Kg	5251	0.68%
Salt	19 Tk Per Kg	7298	0.95%
Cost of Medicine		**52631**	6.86%
Interest on operating capital		**11,334**	1.48%
Total Variable Cost		**766,923**	**100%**

Source: Field Survey, 2019

6.2.2 Human Labor Cost

Human labour is required for most of the operations during shing fish production which is one of the most important variables in production process. Human labour has been measured in man-day where man-day is equal to 8 hours. farmers actually paid to the hired labor for working a man-day. The labor of women and children was converted into man-equivalent day by presenting a ratio of 2 children day = 1.5 women days = 1 man equivalent day (Miah, 1987). Human labor can be classified as family supplied, hired and operator himself for different operations. Shing fish production comprises various form of activities like pond preparation (reconstruction of pond, fertilizer application, liming, grading, chemical application, raising dyke, stocking of fingerlings etc- average 383 Tk Man-Day was estimated) intercultural operation (feed application, security

netting-average 362 Tk Man-Day was estimated) and harvesting (catching, netting- average 388 Tk Man-Day was estimated). For intercultural operation more labor is needed compared to pond preparation and harvesting operation.

For avoiding complexity, average rate has been considered. Use of human labor and its relevant cost incurred were shown in table 6.1. The per hectare labor cost was Tk. 254740 which constituted 33.22 percent of total variable cost.

6.2.3. Feed Cost

Supplementary feeding is one of the main practices of fish culture. The purpose of supplementary feeding is to provide the nutrients and maintain well growth of the fish during production process. To get a good production farmer has to maintain the healthy environment since dieses can easily hamper the sing fish and almost all the fish in a pond can die within one or two days. Therefore, quality feed plays a vital role in shing fish production. In the study area, to get a optimum production rate almost all the farmers uses ready mix feed from market instead of normal process fish food. The quantity of supplementary feeding differs from size, weight and quantity of the fingerlings. In this study, cost of feeds was estimated at the available market price. Average per kg feed cost was 79 Tk. Considering that feed cost per hectare average costs of feed were calculated as Tk. 252185 which was found to be 32.88 percent of total variable cost (Table 6.1).

6.2.4. Cost of Fertilizer

Fertilizer is generally used in the fishpond to create a better environment which facilitates to increase fish production. The estimation of nutrient requirement for a pond fertilization program depends on the pond morphology, environment, soil and water quality, types of fish cultured and on the types of fertilizer employed. Fertilizer requirements vary from one location to another depending on the pond characteristics (Wahab, 1997). The cost of fertilizer is estimated by using

the prevailing market rate which is actually paid by the farmers. Lime, potassium (k), and salt are used as fertilizers during shing culture. On an average the per hectare cost of potassium, lime and salt was Tk. 2174, Tk 5251 and Tk 7298 respectively. Per hectare total cost of Fertilizer was 14722 which covered almost 1.92 percent of the total variable cost (Table 6.1).

6.2.5 Cost of Medicine

Medicine is generally required to maintain good oxygen level, reducing Ammonia from bottom surface of water. Moreover, it is required if any diseases attack to the shing fishes. Generally, probiotics bacteria (Pond care) are used to reduce excess ammonia from pond surface. To Maintain oxygen level generally Sodium Carbonate Per Oxy hydrate (Oxy Ren Powder) is used. The dosages are varying on water condition of the pond, generally 1.5 to 2.5 kg Oxy Ren powder was used per hectare for 5-6 feet water level pond. If any diseases are attack in fishpond then based on diseases and prescription of fisheries officers' different medicine are used. Common types of fishes' medicines are Rena-C, G.P.C-8, Levabon Aqua Powder, Renamycin are used. Generally, 40 to 60 g powder per hectare was used for 5-6 feet water level pond. On an average per hectare cost of medicine was estimated as Tk 52631 which covered almost 6.86 percent of total variable cost (Table 6.1).

6.2.6. Interest on Operating Capital

Interest on operating capital (IOC) is calculated based on opportunity cost principle. The operating capital represented the investment on different farm operation over the period since all the cost is not used at the beginning or at any single point of time. The cost is incurred throughout the whole production period. Therefore, at the rate of 6 percent per annum interest on operating capital for six months is calculated for shing fish production (Interest rate is taken according to the bank rate prevailing in the market during the study period).

Interest on operating capital is determined by using the following standard formula (Miah, 1992).

Interest on Operating Capital (IOC) = Alit

Where, Al= Total investment /2,

t = Total time period of a cycle

i= interest rate which was 6 percent per year during the study period.

The interest on operating capital was estimated at Tk. 11334 which comprised 1.48 percent share of total variable cost (Table 6.1).

6.2.7 Total Variable Cost

The cost which has been changed over at a given period by a farmer and that may be varied with the volume of production are considered as variable cost. In this study area, fingerling cost, labor cost, feed cost, fertilizer and medicine costs are considered as variable costs. Interest on operating capital is also included as variable cost. The total variable cost of Shing fish production was Tk. 766923 per hectare. In percentage terms total variable cost covered 90 percent of total cost.

6.3 Fixed Cost

Fixed cost is such cost which does not depend on the volume of production that means over a period of production it will remain same. In this study, total fixed cost is considered as the summation of land use cost, Construction of Guard Shed and Other Housing Cost and Electric equipment cost.

6.3.1 Cost of Pond Use

The Fish farmers used the land as per conditions of leasing arrangement. The term leasing cost means the cost which was required for shing farmers to take land lease which would be used for shing production to a fixed period. Leasing cost varies from one place to another depending on the location, soil fertility, topography of the soil and distance from the sources of water etc. in the study area almost majority of the farmers have their own fishpond; therefore authors have considered the land use cost as opportunity cost. Pond use cost for shing farming was estimated at the available rental value per hectare in the study area. The rental value of per hectare land was estimated at Tk. 67500 which comprised almost 76 percent of total fixed cost.

Table 6.2: Per hectare total Fixed cost of Shing Fish Production

Total Fixed cost of Shing Fish Production			
Cost Items	**Unit**	**Amount**	**Percentages**
Pond use cost	Tk.	67500	76%
Construction of guard shed and other housing cost	Tk.	8700	10%
Electric Equipment Cost	Tk.	13000	15%
Total Fixed Cost	Tk.	**89,200**	**100%**

Source: Field Survey, 2019

6.3.2 Construction of Guard Shed, and Housing Cost

Normally Guard shed is constructed for security purpose of the fishpond. It is generally a tin shed house where one or two guard stay and look after the pond. Here fish food, net, water pump and others necessary items related to fish framing are kept. The per hectare average construction cost of guard shed, office and other housing cost were calculated at Tk. 8700 (10% depreciation cost per season was considered) for shing fish farming which shared almost 10 percent of total fixed cost (Table 6.2).

6.3.3 Electric Equipment Cost

Water pump is required to maintain standard water level which comprise a major part in electric equipment cost. Lighting is also required as security purpose of the pond during nighttime. Others small electrical items needed as on need basis. In the study area per hectare average cost Tk. 13000 (20% depreciation cost per season was considered) had been estimated which shared almost 15 percent of total fixed cost.

6.3.4 Total Fixed Cost

The total fixed cost of Shing fish production was Tk. 89,200 per hectare. In percentage terms total fixed cost covered 10 percent of total cost.

6.3.5 Total Cost

The total costs were calculated by adding up total variable cost and total fixed cost. In the study per hectare total cost of shing farming was calculated at Tk. **856,123** (Table 6.3).

Table 6.3 Per Hectare Total Cost of Shing Farming

Cost Items	Unit	Amount	Percentages
Total Variable Cost	Tk.	766,923	90%
Total Fixed Cost	Tk.	89,200	10%
Total Cost	**Tk.**	**856,123**	**100%**

Source: Field Survey, 2019

6.4 Return from shing fish production

In this section, gross return, gross margin, net return and benefit-cost ratio from shing fish production culture have been calculated.

6.4.1 Gross Return

Gross return is the monetary value of fish production which was calculated by multiplying the total quantity of production by their respective market prices. In this study, gross return was calculated by summing up all the returns earned. Per hectare gross return was calculated by multiplying the total amount of products price. Total per hectare gross return from shing fish production was Tk. 1,720,891 (Table 6.4).

Table 6.4: Gross Margin and Benefit Cost Ratio (Undiscounted) of Shing Farming

Gross Margin and Benefit Cost Ratio (Undiscounted) of Shing Farming		
Serial No	**Items**	**Amount (Tk./Hectare)**
A	Gross Return (GR)	1,720,891
B	Total Variable Cost (TVC)	766,923
C	Total cost (TC) = (TVC+TFC)	856,123
D	Net Return (GR-TC)	864,768
E	Gross Margin (GR-TVC)	953,968
F	Benefit-cost ratio (BCR) = GR/TC	2.01
G	Benefit-cost Ratio on Cash Cost =GR/TVC	2.24

Source: Field Survey, 2019

6.4.2. Net Return

In general net return is termed as entrepreneur's income. To evaluate the profitability of shing fish production, net return is the main aspect. Net return is the difference between gross return and total costs. Per hectare net return was estimated at Tk. 864,768 which indicates that shing production is profitable business for the shing fish farmers (Table 6.4).

6.4.3 Gross Margin

Farmers usually want to gain maximum return over variable cost of production. The probable reason is that estimation of fixed cost of production is difficult to determine. Moreover, fixed cost items are reusable, and its depreciation cannot be measured by the farmers. Therefore, the gross margin analysis has been considered to calculate the relative profitability of shing farming. The gross margin of shing farming was estimated at Tk. 953,968 (Table 6.4)

6.4.4 Benefit Cost Ratio (Undiscounted)

Benefit cost ratio was estimated by dividing gross return by gross cost or total cost which is expressed the return of per taka invested. It helps to analyze financial efficiency of the farm. From the study area it was found that the benefit cost ratio of shing farming was accounted for 2.01 implying that Tk. 2.01 would be earned by investing Tk. 1.00 for shing production. Hence, the shing farming was found to be profitable for farmers (Table 6.4).

6.4.5 Benefit Cost Ratio (Cash Cost Basis)

Benefit cost ratio on cash cost was estimated based on division of gross return by variable cost. Since some of the fixed cost items can be reused in other seasons therefore, by estimating this factor actual figure of the firm can be realized. In the study area, benefit cost ratio on cash cost was calculated for 2.24 implying that Tk 2.24 would be earned from variable cost Tk. 1.00 for shing fish production which is profitable business for a fish farmer indeed (Table 6.4).

6.5 Concluding Remarks

Considering this study, it can easily be concluded that per hectare return from shing fish farming really encourages the new fish farmers which provides higher returns to the farmers. Shing cultivation is gaining popularity in the country gradually due to its high yield potentiality and high demand in the local market. Sample farmers showed their opinion that higher yield and income encouraged them to continue shing production.

CHAPTER 7

FACTORS AFFECTING RETURNS OF SHING FARMING

CHAPTER 7
FACTORS AFFECTING RETURNS OF SHING FARMING

7.1 Introduction

In this chapter we try to identify and measure the effects of the major variables on shing fish production. We used Cobb-Douglas production function to estimate the contribution of key variables on the production process of shing farming. The resultant values of the model are provided in Table 7.1.

7.2 Functional Analysis for Measuring Production Efficiency

Production efficiency is a situation in which the economy or an economic system (e.g., a firm, a bank, a hospital, an industry, a country, etc.) could not produce any more of one good without sacrificing production of another good and without improving the production technology.

It is mathematical function which specify the maximum output that can be produced with given inputs for a given level of technology. Keeping in mind the objectives of the study and considering the effect of explanatory variables on output of shing farming, four explanatory variables were chosen to calculate the quantitative effect of inputs on output.

Management factor was not considered in the model because specification and measurement of management factor is almost impossible, particularly in the present study area. Other independent variables like water quality, soil condition, surrounding environment, farm size etc., which might have affected production of farm enterprises, were excluded from the model based on some preliminary estimation. A brief description is depicted here about the explanatory variables included in the model.

7.3 Estimated Values of the Production Function Analysis

i. F-value was used to measure the goodness of fit for different types of inputs.

ii. The coefficient of multiple determinations (R^2) indicates the total variations of output explained by the independent variables included in the model.

iii. Coefficients having sufficient degrees of freedom were tested for significance level at 1 percent, 5 percent, and 10 percent levels of significant.

iv. Stage of production was estimated by returns to scale which was the summation of all the production elasticity of various inputs.

The estimated coefficients and related statistics of the Cobb-Douglas production function for shing production are shown in Table 7.1.

Table 7.1 Estimated Values of Coefficients and Related Statistics of Cobb-Douglas Production Function

Explanatory variables	***Coefficient***	***Standard error***	***P-Value***
Intercept	1.252	2.140	0.5607
X1(Fingerling cost)	0.069 NS	0.183	0.7083
X2(Human labor cost)	-0.016 NS	0.062	0.7985
X3(Feed cost)	0.786***	0.106	0.0000
X4(Cost of fertilizer)	0.354***	0.112	0.0025
X5 (Cost of Medicine)	-0.059 NS	0.090	0.5153
R Square	0.62		
Adjusted R Square	0.59		
Return to Scale	1.134		
F-Value	18.80***		

Source: Field survey, 2019.

Note: *** Significant at 1 percent level.
** Significant at 5 percent level
* Significant at 10 percent level
NS: Not Significant

7.4 Interpretations of Results

Fingerling cost (X1)

The estimated coefficient of shing fish was 0.069 it was Not significant for shing farming. It implies that 1 percent increase in the cost of shing, keeping other factors constant, would increase gross returns by 0.069 percent. (Table 7.1).

Human labor cost (X2)

The estimated coefficient of human labor cost was 0.016 which was Negative and statistically insignificant for shing farming. This negative coefficient indicates that 1 percent increase in the human cost, keeping other factors constant, would decrease gross returns by 0.016 percent (Table 7.1).

Feed cost(X3)

In the study area, it was found that major shing fish farmers used ready mix feed for shing fish production. The estimated coefficient of feed cost was 0.786 and positive, which was positive and significant at 1 percent level for shing farming. It indicates that 1 percent increase in the feed cost, keeping other factors constant, would increase gross returns by 0.786 percent (Table 7.1).

Cost of fertilizer (X4)

The fertilizer used for shing farming included potassium(k), lime, salt etc. The regression coefficient of fertilizer was 0.354 and positive which was significant at 1 percent level for shing farming. It indicates that 1 percent increase in cost of fertilizer, remaining other factors constant, would increase gross returns by 0.354 percent (Table 7.1).

Cost of Medicine (X5)

Necessary medicines are required for reducing ammonia from pond surface and for different diseases attack to shing fish. The regression coefficient of medicine was 0.059 and Negative which was not significant. This negative coefficient indicates that 1 percent increase in the medicine cost, keeping other factors constant, would decrease gross returns by 0.059 percent (Table 7.1).

7.5 Coefficient of multiple determinations (R^2)

Coefficient of multiple determination of shing farming was calculated to be 0.62 which implied that about 62 percent of the total variation in the gross return could be explained by the included explanatory variables of this model. Therefore, we can say the goodness of fit of this regression model is satisfactory since R^2 indicates the goodness of fit of the regression model (Table 7.1).

7.6 Adjusted R^2

Here the term adjusted means adjusted for the degrees of freedom. The adjusted R^2 for shing farming was found to be 0.59 which indicated that about 59 percent of the variations of the output was explained by the explanatory variables included in the model (Table 7.1).

7.7 Returns to Scale in Shing Production

The summation of all the production coefficients (X1, X2, X3, X4 and X5) of shing farming is equal to 1.134 This means that production function for shing farming indicates increasing returns to scale. This means that, if all the variables specified in the model were increased by 1 percent, gross return would also be increased by 1.134 percent (Table 7.1).

7.8 F-value

The F-statistic was calculated to denote the overall goodness of fit of any fitted model. The F-value for the shing farming was estimated at 18.80 which were highly significant at 1 percent level. It means that the explanatory variables included in the model were important for explaining the variation in gross return of shing production (Table 7.1).

7.9 Concluding Remarks

After analyzing Cobb-Douglas production function in this study we have found that cost of fingerling, cost of feed and cost of fertilizer had positive effect on shing production. One the other hand cost of human labor and Cost of Medicine had negative effect on shing fish production. In this study cost of feed and cost of fertilizer had significant impact but other variables have insignificant impact on shing fish production, we did not find any coefficient which was 5 percent or 10 percent level significant. Moreover, since R^2 was 0.62, this model can be considered as a satisfactory model for shing fish production.

CHAPTER 8

PROBLEMS OF SHING FARMING

CHAPTER 8
PROBLEMS OF SHING FARMING

8.1 Introduction

Fishery plays an important role in the livelihood of the village people which has been an age-old practice for thousands of fishermen in Bangladesh. Moreover, in recent days young, energetic people are also coming forward and try to do this farming scientifically. However, these fish farmers are facing an ample amount problem. In this study, an attempt had been made to identify and analyze the major problems and constraints faced by the farmers which act as main barriers in running the business of Shing farming which are broadly categorized as Technical Problem, Economical Problem and Social Problem.

8.2. Technical Problem

8.2.1 Attack of Shing Diseases

Shing diseases are main threat of shing fish farming. shadowy surroundings, Lack of oxygen in water and excess ammonia gas in the bottom of the pond can lead different diseases of the shing fish. Dangerous part of shing farming is, one disease can destroy the fish of whole pond within one night. Almost 78 percent of producing farmers reported that attack of shing disease hampered the production of shing (Table 8.1). To overcome this problem, scientific use of chemicals should be ensured. Maintain good oxygen level, proper water P^H (Between 7-8.5), sunny surroundings, reducing ammonia in time should be implemented scientifically. Extension workers, Upazila Fisheries Officers (UFO) & FRI scientists may take initiatives to ensure scientific approach to overcome this problem.

8.2.2 Lack of Scientific Knowledge

Scientific knowledge and advance technology are important for shing fish culture. However, a few numbers of farmers have sufficient scientific knowledge with the help of proper training. In this study, about 47 percent shing fish farmers claimed that, they had lack of scientific knowledge and technology.

8.2.3 Lack of Quality fingerlings

Lack of quality fingerlings is another problem area in this study area. Male shing fingerlings have lower growth, on the other hand female fingerlings have better growth. However, some suppliers sometimes supply more male fingerlings which cannot be detected by the farmer initially, therefore, after a few weeks when farmers understand it, they already fall into great loss. Almost 43% sing fish farmers claimed they face such problem.

8.2.4 Lack of Extension Services

Shing fish farming is a complicated farming process where a shing fish farmer generally take huge risk. Therefore, they do need support from extensive services officials. About 38% shing fish farmers claim that they did not receive proper training from neither government services nor any private agencies.

8.2.5. Lack of Quality feeds

Quality feeds is another important factor in shing fish production. Most of the farmers used ready mix feeds from local market. Farmers do not have much scope to analyze the quality of these remixed feeds. Therefore, due to poor quality feeds shing fish production hampered. 30% farmers claimed about such problems.

8.2.6. Over flooding Problems

Since the study area is located in low land and near India-Bangladesh border therefore, during rainy season farmers often faces over flooding problems due to heavy rainfall or flood from India. About 26% of shing producing farmers reported such type of problem in the study area. This problem can be solved by making embankment or proper drainage system.

8.3 Economical Problem

8.3.1 Lack of Sufficient fund

In the study area most of the farmers are middle class and some of them are lower middle class. They are not economically solvent to run the farm smoothly without any financial support. Moreover, they did not get sufficient loan from financial institution to purchase adequate feed for the fingerlings. Sometimes, they had to borrow money from local NGO's at higher interest rate. About 73% shing fish farmers claimed about this financial issue.

8.3.2 Low Market Price

A few shing fish farmers also claimed that they did not receive expected price from market. Some local syndicates are responsible for such issues. Some farmers had to sell their products at home at lower price due to transportation related problems. About 16% shing fish farmers faced such problems. This study indicated that BCR was little high and price of output was also better. Therefore, we understand that there was some inconsistency in their answer.

8.4 Social Problem

8.4.1 Pushing poison to Pond

Number of farmers also reported about such problem in this study area. It is often noticed that either closed acquainted people or relatives did such types of crimes. They did such crimes due to jealousy which hampered overall production in a pond. About 17% of shing farmers reported such problems as major problems. Farmers should look after their shing farm at a regular basis either by security guard or close circuit camera. Social security must be provided by the local government.

8.4.2 Theft of Fish from Pond

Though major fish farm has night guard still they had tension of theft. About 13% of farmers reported that this problem was hampering their total production. To overcome this problem close circuit camera should be installed. Low enforcement team should also come forward to solve this issue.

CHAPTER 9

SUMMARY, CONCLUSION AND RECOMMENDATIONS

CHAPTER 9
SUMMARY, CONCLUSION AND RECOMMENDATIONS

9.1 Introduction

this chapter mainly discuss with summary of the overall study, conclusions, and policy recommendations. here we are going to summaries Chapter 01: Introduction, Chapter 03: Methodology, Chapter 05: Socio-Demographic Profile of Shing Fish Farmers, Chapter 06: Profitability Analysis, Chapter 07: Factors Affecting Returns of Shing Farming and Chapter 08: problems of shing farming. finally, in this Chapter 9 presents, summary, conclusion, and recommendations of the study.

9.2 Summary of the Study

The agriculture sector can be broken down into four main components: crops, livestock, fisheries, and forests. Among these, crops make up 55% of the National GDP on the other hand fisheries sub-sector contributed about 22.61% of national Gross Domestic Product.

Fish is one of the major sources of earning income. Since Stinging catfish (Heteropneustes fossilis) locally renown as Shing fish is a highly nutritious food and contribute to the fulfillment of protein. Shing fish are commercially cultured through the country. Fish feeds play important roles in growth, survival and development of stinging catfish. However, due to inadequate knowledge on effects of feeds on growth, survival and development of stinging catfish, mass and quality production of this fish is not possible.

Considering higher profitability of the shing fish farming this study was done by focusing on following objectives:

1. To examine the socioeconomic characteristics of Shing Fish farmers in the study area.
2. To estimate the profitability of shing fish production in the study area
3. To identify the factors that affect shing fish production in the study areas
4. To identify the major problems and make some suggestions for policy guidelines to improve future development of shing fish in the study area.

The study was carried out at three villages of Haluaghat upazila of Mymensingh district named Bildora, Swadeshi, Shakuai. Purposive sampling technique was used for sample selection.

These areas were easily accessible for researcher as she was familiar with the local language, living, belief and other socioeconomic characteristics of the villagers and these areas were technically acceptable for the research. 60 shing fish farmers were selected and collected necessary information to fulfill the objectives of the study. Data were collected during the period from July to August 2019. Primary data regarding research work was collected by face to face interview as well as through questionnaire from selected farmers. Secondary information was collected from different reports. Bangladesh Bureau of Statistics (BBS), Bangladesh Economic Review (BER), Department of Fisheries (DoF) and other related agencies in Bangladesh. The tabular and different statistical analysis was done to examine the objectives.

In this study, an attempt had been made to identify the socioeconomic characteristics of the sample farmers. Out of 60 sample farmers 15.0 percent belonged to the age group of up to 30 years, 45.0 percent in age group of up to 31-40 years, 26.7 percent within age group 41-50 years and 13.3 percent in age group of above 50.

Level of Education in this study area also remarkable, 8.0 percent farmers were found within below class 5, 17.0 percent farmers had Secondary education who were within group Class 8 pass, 18.0 percent had completed their Secondary education whose were within SSC Pass group, majority of the farmers had completed higher Secondary level, who were within HSC pass group, they belonged to 40.0 percent of total sample farmers. Finally, 18.0 percent had completed their graduation who were graduated group. From the above analysis it is clearly found that a vast majority of the educated people were like do such profitable business. It was found that family size of the respondents was 4.90 and male-female ratio was 0.97. Business was the main occupation and Fish culture is the second most popular occupation in the study area and the figures are 35.0% and 26.7% respectively.

Since major farmers are well educated, and they have good economic status. Therefore, their housing status are improved also. Previously major farmers had straw roof or tin shed house but in the study area it was observed that major farmers had half building house. In the study area 63.3% houses are half building, 21.7% houses are Tin shed, and 15.0% houses are buildings. The major income comes from Agricultural sources and some amount comes from non-agricultural sources, figures are 71.5% and 28.50%.

In this chapter an attention had been given to depicts the research finding in terms of objectives of the study. Costs and returns were calculated to determine the profitability of shing fish farming. Per hectare Fingerling cost was 181311 Tk, per hectare cost of Human Labor, Feed, fertilizer and Medicine were 254740 Tk., 252,185 Tk., 14,722 Tk and 52,631 Tk. respectively. Cost of Interest

on operating capital was 16,837 Tk. Land use cost, Construction of guard shed and other housing cost, Electric Equipment Cost were considered as fixed cost which total worth was 89,200 Tk.

Therefore, in this study we found Gross Return (GR) was 1,720,891 Tk/Hectare, Net Return 864,768 Tk/Hectare, Gross Margin (GR-TVC) was 953,968 Tk/Hectare and Benefit-cost ratio (BCR) on Total cost and Benefit-cost ratio (BCR) on Total variable cost were 2.01 and 2.24 respectively which indicated that shing fish culture was highly profitable.

Cobb-Douglas production function analysis was used to examine the effect of input use and resource use efficiency. It is mathematical function which specify the maximum output that can be produced with given inputs for a given level of technology. Keeping in mind the objectives of the study and considering the effect of explanatory variables on output of shing farming, four explanatory variables were chosen to calculate the quantitative effect of inputs on output and the input were Fingerling cost, Human Labor cost, feed cost and Cost of fertilizer and medicine.

The sum of the co-efficient of different inputs was 1.134 indicated that the production functions exhibited increasing returns to scale which indicated that more profit can be obtained by increasing each input included in production function. Therefore, if all the variables specified in the model were increased by 1 percent, gross return would also be increased by 1.134 percent. In the analysis of production function, we have found that the coefficients of Fingerling cost, feed cost and Cost of fertilizer were positive, but the coefficients of Human Labor cost and cost of Medicine were negatives. Moreover, coefficient of feed cost and coefficient of fertilizers cost were significant at 1 percent level and others three were insignificant.

In this study researcher also found some of major problems faced by farmers ware attack of shing diseases, lack of scientific knowledge, lack of quality fingerlings, lack of extension services, lack

of quality feeds, over flooding problems which were considered as technical problem. lack of sufficient fund, low market price, were considered as economical problem. pushing poison to pond and theft of fish from pond were found as social problems.

9.3. Conclusion

It can be concluded that Shing fish farming is highly profitable fish culture which we can easily realize by focusing on Benefit Cost Ratio which was 2.01 and Benefit cost ratio on cash cost was 2.24. Attack of shing disease is the prime concern in shing fish production, to avoid such losses modern production technology should be implemented. Feed costs play a significant role in shing fish production, therefore quality feed with low price should be established. There is a huge future potential market and demand for shing fish which can also fulfil the nutritional shortage of the people in Bangladesh. By producing shing fish, farmers can play a vital role in national GDP therefore, a well-planned production program from national level should be established.

9.4 Policy Recommendations

Enormous opportunities are available to improve per hectare shing fish production. To enhance the productivity, efficiency, and effectiveness in shing farming, the following recommendations are made as a part of present study which acts as a formulating strategy for enhancing shing fish production in Mymensingh district.

i. Attack of diseases is the prime concern of shing fish production to reduce this problem need to maintain good oxygen level and reducing ammonia from pond surface on regular basis. PH level should be maintained between 7 to 8.5 to achieve good shing fish production.

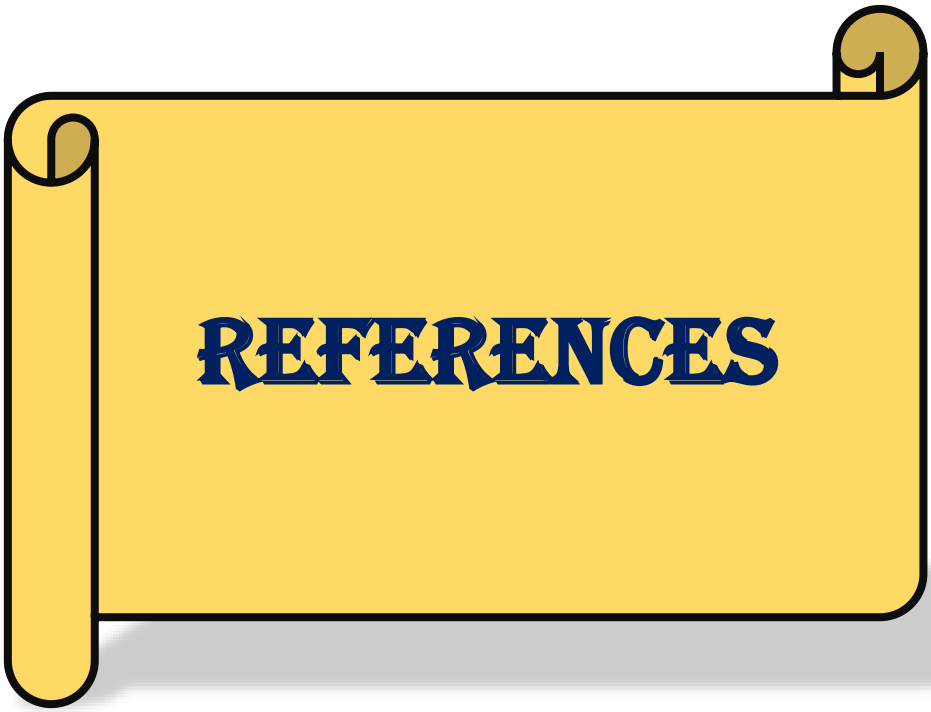
ii. Surrounding environment of pond is another important factor in shing production which should be free from big trees. Moreover, water should be kept clean therefore removal of weeds should be done on regular basis.

iii. Application on scientific method should be ensured and production data should be preserved for future production. Moreover, they should take help from fisheries officers. Different training program should be arranged form government fisheries office or private agencies.

iv. Need to establish Strong market network for better Fingerlings and Feeds supply, Government is already provided subsidy on different fertilizer but need to be ensured that others input should get at a reasonable price.

v. Transportation and marketing facilities should be improved in the study area.

vi. Close circuit cameras can be installed to maintain security on large projects. Moreover, Law enforcing agencies should be vigilant in the study area to minimize the social tension in the study area.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APPENDICES

APPENDICES

Linear Regression Statistics

Regression Statistics	
Multiple R	0.7864
R Square	0.6185
Adjusted R Square	0.5856
Standard Error	0.4516
Observations	64

ANOVA					
	df	***SS***	***MS***	***F***	***Significance F***
Regression	5	19.17380752	3.834761504	18.80416345	4.59135E-11
Residual	58	11.82802776	0.203931513		
Total	63	31.00183528			

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***
Intercept	1.2523	2.1399	0.5852	0.5607	-3.0311	5.5358
X1(Fingerling cost)	0.0689	0.1834	0.3759	0.7083	-0.2981	0.4360
X2(Human labor cost)	-0.0159	0.0621	-0.2565	0.7985	-0.1403	0.1084
X3(Feed cost)	0.7860	0.1064	7.3878	0.0000	0.5730	0.9989
X4(Cost of fertilizer)	0.3543	0.1120	3.1645	0.0025	0.1302	0.5784
X5 (Cost of Medicine)	-0.0591	0.0904	-0.6546	0.5153	-0.2400	0.1217