PROFITABILITY AND RESOURCE USE EFFICIENCY OF PRAWN FARMING IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

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PROFITABILITY AND RESOURCE USE EFFICIENCY OF PRAWN FARMING IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

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This is to certify that thesis entitled, ***"PROFITABILITY AND RESOURCE USE EFFICIENCY OF PRAWN FARMING IN SOME SELECTED AREAS OF SATKHIRA DISTRICT "*** *submitted to the Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE IN AGRICULTURAL STATISTICS,*** *embodies the result of a piece of bona fide research work carried out* ***NISHAT TASNIM****, Registration No.* ***13-05596*** *under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that such help or source of information, as has been availed of during the course of this investigation has duly been acknowledged.

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ABBREVIATIONS AND ACRONYMS

BARC	: Bangladesh Agricultural Research Council
BB	: Bangladesh Bank
BBS	: Bangladesh Bureau of Statistic
BCR	: Benefit Cost Ratio
BER	: Bangladesh Economic Review
DAE	: Department of Agricultural Extension
DoF	: Department of Fisheries
EU	: European Union
et al.	: and others (*at elli*)
FFP	: Fourth Fisheries Project
FRI	: Fisheries Research Institute
GDP	: Gross Domestic Product
GNP	: Gross National Product
GR	: Gross Return
Ha	: Hectare
HSC	: Higher Secondary Certificate
IOC	: Interest on Operating Capital
JSC	: Junior School Certificate
Kg	: Kilogram
MFC	: Marginal Factor Cost
MPP	: Marginal Physical Product
MT	: Metric Ton
MVP	: Marginal Value Product
MV	: Modern Varieties
NGOs	: Non-Government Organizations
No.	: Number
OC	: Operating Capital
PL	: Post Larva
PSC	: Primary School Certificate
SPSS	: Statistical Package for Social Sciences
SSC	: Secondary School Certificate
sq. km	: Square Kilometer

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PROFITABILITY AND RESOURCE USE EFFICIENCY OF PRAWN FARMING IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

ABSTRACT

Aquaculture spacially prawn farming has significant contribution to the economy of Bangladesh. This study was designed to assess the profitability of freshwater prawn farming in gher systems at Satkhira District in Bangladesh. The overall objectives of the present study were to examine socio-demographic profile of prawn producing farmers, to assess profitability and resource use efficiency of prawn farming. Satkhira district was selected for the study on the basis of extensive cultivation of prawn. Simple random sampling technique had been used for collecting data from 96 sample farmers through interview schedule. After analyzing the data, per hectare gross return, net return, and gross margin were found to be Tk. 1049112.85, Tk. 414716.24, Tk. 496403.23 respectively. Total costs of prawn production were calculated at Tk. 634848.55 per hectare. Benefit Cost Ratio (BCR) was found to be 1.65 for Prawn farming. Thus it was found that prawn farming was profitable. Production function analysis suggested that, among the variables included in the model, cost of prawn fry,cost of fin fingerling, cost of human labor, cost of feed, cost of fertilizer, and cost of lime had a positive and significant effect on the gross return of prawn production, except for cost of water management had a negative and insignificant effect on the gross return of prawn farming. Efficiency analysis indicated that most of the farmers efficiently used their inputs. This study also identified some of the problems and constraints associated with prawn farming. Most of the farmer claimed that the attack of disease was the big obstacal for prawn farming. The problems and constraints, of course, are interrelated with one another and hence, need to be removed comprehensively through an integrated program for the overall development of prawn (Galda shrimp) farming.

CHAPTER I

INTRODUCTION

CHAPTER 1

Introduction

1.1 Background of the study

Bangladesh is predominantly an agrarian country. Due to its very fertile land and favorable weather, varieties of crop grow abundantly in this country. Agriculture sector contributes about 14.23 percent to the country`s Gross Domestic Product (GDP) and employs around 40.60 percent of total labor force. Food grains production is 413.25 lakh MT. in FY2017-18. (BER 2019)

In Bangladesh fisheries sector is one of the most important and promising sub-sectors having vital contribution towards her economic development. 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. It contributes 3.57 percent to our national GDP in FY 2017-18 and around one-fourth (25.30 percent) to the agricultural GDP in FY 2017-2018 (BBS, 2019). The fishing sector is likely to grow by 6.44% in FY2017-18 compared to 6.26% in FY2016-17. This sector provides major (60%) share of animal protein. More than 11 percent of the total population of Bangladesh is engaged with this sector in full time and part time basis for their livelihoods (DoF 2019). Bangladesh earns a considerable amount of foreign currencies by exporting fish, shrimps and other fisheries products.

Bangladesh is considered one of the most suitable countries in the world for giant freshwater prawn (*Macrobrachium rosenbergii*) farming, because of its favorable

resources and agro-climatic conditions. A sub-tropical climate and a vast area of water bodies provide a unique opportunity for the production of *Macrobrachium* spp. (Akand & Hasan1992; Ahmed 2001; Muir 2003).

Table 1.1: Species of freshwater prawns

English name	Scientific name	Local name
Giant freshwater prawn	*Macrobrachium rosenbergii*	Golda chingri
Monsoon river prawn	*Macrobrachium malcolmsonii*	Chotka icha
Oriental river prawn	*Macrobrachium nipponense*	Icha/chingri
Freshwater prawn	*Macrobrachium villosimanus*	Dimua icha
Freshwater prawn	*Macrobrachium mirabilis*	Lutia icha
Freshwater prawn	*Macrobrachium birmanicus*	Thengua icha
Freshwater prawn	*Macrobrachium rude*	Goda icha
Freshwater prawn	*Macrobrachium dayanus*	Kaira icha
Freshwater prawn	*MSacrobrachium lamarrei*	Icha
Freshwater prawn	*Macrobrachium dolichodactylus*	Icha

Source: Akand and Hasan (1992), Mirza and Ericksen (1996), Saifullah, Rahman, Jabber, Khan and Uddin (2005)

Prawns are omnivores and essentially scavengers. Some are planktivorous and vegetarians. Others feed on aquatic small insects and other animals. The type of food varies according to the developmental stage and species of the prawn. Some females carry fertilized eggs under their abdomen with the pleopods until they hatch, others shed the fertilized eggs in water. Eggs of most species usually hatch as a nauplius larva and pass few larval stages, similar in appearance with the primitive crustacean groups. Bangladesh has very rich source of prawns in the Bay of Bengal, estuaries and freshwater. A total of 56 species is reported, of which 37 are salt water,

12 are brackish water, and 7 are freshwater in habitats. However, some species migrate in between lower and higher saline zones. The prawns are classified under six families, Palaemonidae, Penaeidae, Pandalidae, Alpheidae, Hippolylidae, and Sergestidae. The freshwater species are included in the family Palaemonidae (Banglapedia). Twenty-four species of freshwater prawns including 10 species of Macrobrachium are found in Bangladesh (Table1.1). However, only *M. rosenbergii* has significant aquaculture potential and is commercially cultured. (Akand & Hasan1992; Ahmed 2001; Muir 2003).

The farming of the freshwater prawns starts in Bangladesh dates back to the early 1970s in the Satkhira districts. In the early 1990s, the cultivation of these freshwater resources gradually spread to the southwest Bagerhat district and further to other neighboring districts including Khulna and Jessore. Around 75% of the prawn farms are still located in the southwest part of Bangladesh. The farming of the freshwater prawn continued to expanding over the recent years at an average rate of 10% annually.

The freshwater prawn, locally known as Golda, is a highly valued product for international markets. Almost all prawns are therefore exported to about 30 countries of the world including USA, Japan, Belgium, UK, The Netherlands, France and Germany. (www.bdembassybeijing.org). Freshwater prawn farming is mostly concentrated in southwest Bangladesh mainly Khulna, Bagerhat and Satkhira districts. In southwest Bangladesh, thousands of farmers have converted their paddy fields to ‘Ghers’ to accommodate a profitable prawn culture practice.

An estimated 71% of prawn farmers engage in Gher systems with the remaining percentage concentrated in pond culture systems.

Traditional “Gher” aquaculture had been practiced in the tidal area of Bangladesh to grow shrimp with fish long before the introduction of current shrimp culture practice which is to some extent, a modification of the traditional “Gher” aquaculture. In the early 1960s, the government constructed a large number of coastal embankments to protect the agricultural land in the coastal area from tidal waves and saline water intrusion. This coastal embankment project implemented by Bangladesh Water Development Board (BWDB) made vast saline areas suitable for rice cultivation. These embankments brought an end to the “Gher” shrimp culture mainly due to its strong demands in international markets and its high price. Equally important was the fact that, by that time it was no more financially viable to cultivate rice in several polders because they had become water logged due to poor drainage. These two factors together provided a catalyst to the process of accelerated shrimp farming (Karim, 1989).

1.2 Importance of Fisheries Sector in the Economy of Bangladesh

Bangladesh is one of the world’s leading fish production countries with a total production of 42.77 lakh MT in FY 2017-2018, where aquaculture production contributes 56.24% of the total fish. The State of World Fisheries and Aquaculture 2018, Bangladesh ranked 3rd in inland open water capture production and 5thin world aquaculture production. Aquaculture shows a sturdy and consistent growth, average growth rate is almost 10 percent during the same timeframe. After 46 years of independence, Bangladesh becomes a self-sufficient country in fish production,

with a per capita fish consumption of 62.58 g/day agaist set target of 60 g/day. In 2017-18, this sector contributes 3.57% to the national GDP and more than one-fourth 25.30 % to the agricultural GDP. More than 11% of total population of Bangladesh is engaged in this sector on full time and part time basis for their livelihoods. (DoF. 2019)

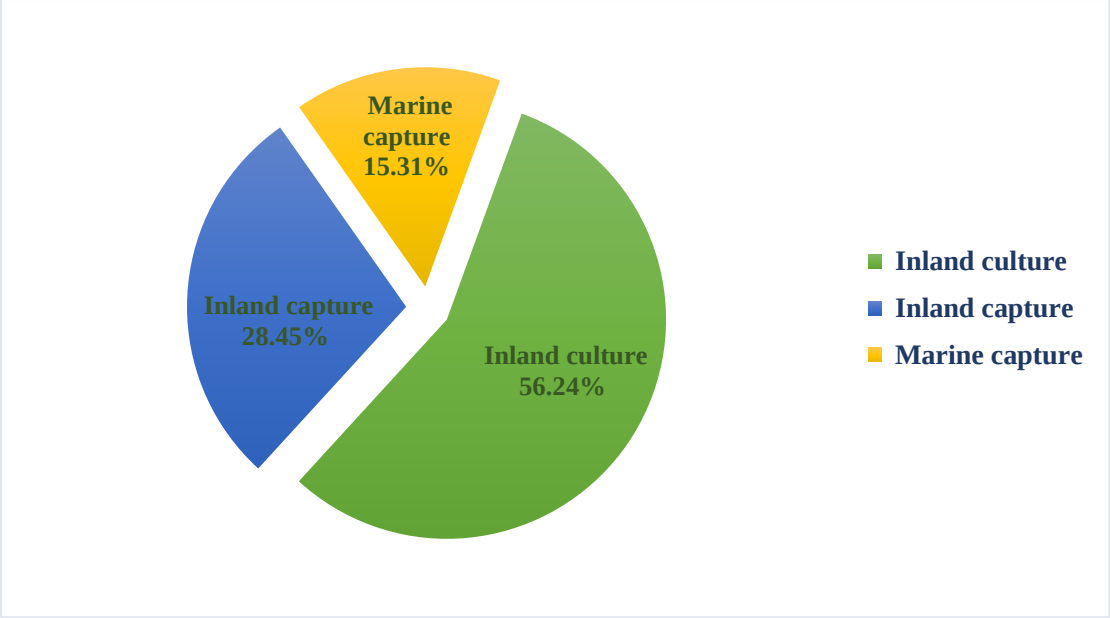
The diversified fisheries resources of the country are divided into three groups, i.e., inland capture, inland culture and marine capture. Inland fisheries comprise of rivers, ponds, estuaries, beels, floodplains, haors, baors, brackish water etc. There are 260 fish and 24 prawn species in inland fresh water in the country. In early sixties inland fisheries contributed about 90% of total fish production of the country. Fish production from aquaculture has increased to a great extent but open water fish production is in slow progress. The Bay of Bengal is situated in the South of Bangladesh. There is a total of 166,000 sq. km. water area including Exclusive Economic Zone (EEZ). Fishing is only confined within 200-meter depth. In the year 2017-18 total fish production from inland open water was 12.17 lac Metric Ton (MT), closed water was 24.05 Metric Ton (MT), marine source was 6.55 lac metric Ton (MT). In 2017-18 the total fish production is 42.77 lac Metric Ton (MT) and average annual growth rate of fish production in last 3 years is 5.10%. (Table 1.2) (DoF. 2019).

Table 1.2: Last 5 years fish production is shown in the following table

Year	Source-wise production (MT)			Total
	Inland open	Closed	Marine	
2017-2018	1216539	2405415	654687	4276614
2016-2017	1163606	2333352	637476	4134434
2015-2016	1048242	2203554	626528	3878324
2014-2015	1023991	2060408	599846	3684245
2013-2014	995805	1956925	595385	3548115

Source: DoF 2019

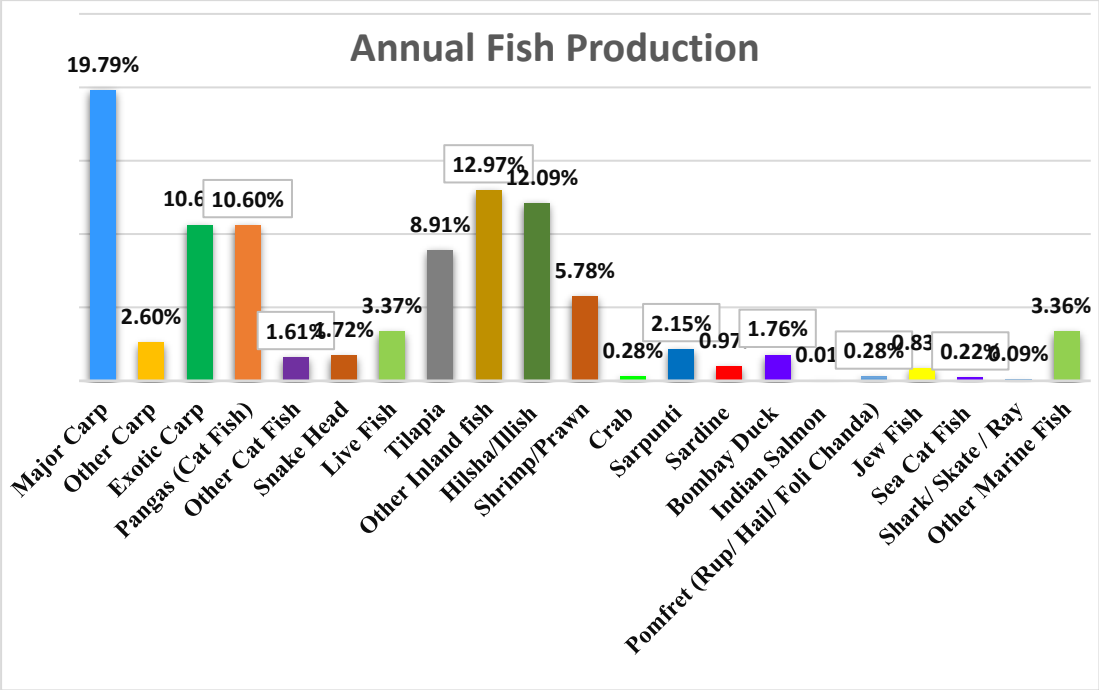
Inland culture includes mainly pond or ditch, baor, shrimp or prawn farm, seasonal cultured water-body, pen and cage culture etc. covering an area of about 7.97 lakh ha and produces about 56.24% of the total fish production. Bangladesh is blessed with huge open water resources with a wide range of aquatic diversity. Biodiversity is also enriched, comprising almost 260 freshwater fish species. But due to mainly decline and degradation of wetland resources, the share of inland capture fisheries has been reduced remarkably during recent past decades. In 2017-18, inland capture fisheries contribute only 28.45% to total fish production. Bangladesh possesses vast marine water resources. Despite the abundance of marine waters, only about 15.31% of country's total fish production is contributed by the marine sector. (Figure 1.1) (DoF. 2019).



Source: DoF. 2019

Figure 1.1: Fish Production in Different Resources 2017-18.

The fish production diversity of fisheries resources of inland open water fisheries of river, beel, floodplain and Kaptai lake in 2017-18 are 3.21 lakh MT, 0.99 lakh MT, 7.68 lakh MT and 0.10 lakh MT respectively. The production of Sundarbans fishery has increased, its production is 0.18 lakh M.T, its contribution is 0.43 percent to total production. The fish production (aquaculture) in 2017-18 of pond, seasonal cultured waterbody, baor, shrimp farm, pen culture and cage culture (inland closed waterbody-culture) are 19.00 lakh MT, 2.16 lakh MT, 0.08 lakh MT, 2.54 lakh MT, 0.10 lakh MT, 0.04 lakh MT respectively. Subsequently, the corresponding contributions to total production are 44.43, 5.06, 0.19, 5.95, 0.24 and 0.10 percent respectively. Annually various species of fish are produced from different sources. In 2017-18, species wise annually 5.78% of shrimp or prawn was produced from total fish production in Inland and Marine Fisheries (Figure1.2) (DoF 2019).



Source: DoF 2019.

Figure1.2: Species/Group-wise Annual Fish Production in Inland and Marine Fisheries, 2017-18

This sector has high potential for the perspective of economic development of the country. Bangladesh earns a considerable number of foreign currencies by exporting fish, shrimps and other fishery products. In 2017-18, the country earns BDT 430994.00 lakh by exporting almost 68.94 thousand MT of fish and fishery products (Table 1.3) (DoF. 2019).

There are100 fish processing plants in the country. Out of 100 plants European Commission has approved 76 plants. HACCP has already been introduced in fish processing establishments. Major importing countries are European countries, USA and Japan. About 98% of total fish products are exported to those countries. Remaining are exported to the countries in Southeast Asia and Middle East.

Table 1.3: Export of Fish & Fish Products

Year	Source-wise production		Other fish products		Total
	Quantity (MT)	Value (Crore Taka)	Quantity (MT)	Value (Crore Taka)	Value (Crore Taka)
20017-2018	36167.77	3527.07	32767.93	782.87	4309.94
2016-2017	39705.85	3682.26	28599.83	605.38	4287.64
2015-2016	40726	3598.67	34612	684.15	4282.82
2014-2015	44278	3937.60	39246	723	4660.60
2013-2014	47635	4118.80	29693	658.12	4776.92

Source: DoF 2019

1.3 Importance of Prawn in the Economy of Bangladesh

The freshwater prawn fishery plays an important role in the economy of Bangladesh. The fishery is mainly based on the culture of *M. resenbergii* (Golda Chingri). The culture fishery has been growing rapidly. Bangladesh has a vast network of freshwater ecosystems covering an estimated 4276614 ha. These freshwater ecosystems of Bangladesh provide a unique environment for enormous prawn production potential because of the favorable climate and availability of wild seed stock. In this estimated area 797851 ha of water area is inland close water which is used for cultured fish and it is estimated that 258681 ha of water area is used for Shrimp and Prawn farming where 122550 MT of shrimp and prawn is produced in FY 2017-2018 (Table 1.4) (DoF 2019).

Table 1.4: Species-wise Production of Shrimp/Prawn Farms, 2017-18

Sl. No.	Species	Total Production (MT)	%
1	Bagda ***(Penaeus monodon)***	61709	*23.19*
2	Galda ***(Macrobrachium rosenbergii)***	51571	*19.38*
3	Harina ***(Metapenaeus monoceros)***	3882	*1.46*
4	Chaka ***(Fenneropenaeus indicus)***	2029	*0.76*
5	Other Shrimp/Prawn	3359	*1.26*
	Shrimp/Prawn Total	**122550**	***46.04***
6	Rui	28244	*10.61*
7	Catla	21076	*7.92*
8	Mrigal	3663	*1.38*
9	Kalibaus	0	*0.00*
10	Bata	2538	*0.95*
11	Ghonia	187	*0.07*
12	Silver Carp	14185	*5.33*
13	Grass Carps	616	*0.23*
14	Mirror/Common Carp	580	*0.22*
15	Other Exotic Carp	0	*0.00*
16	Pangas	0	*0.00*
17	Boal/Air	0	*0.00*
18	Shol/ Gazar/Taki	0	*0.00*
19	Koi	0	*0.00*
20	Singi/ Magur	0	*0.00*
21	Tilapia/Nilotica	38465	*14.45*
22	Thai Sharpunti	15190	*5.71*
23	Other Fish	7073	*2.66*
	Fish Total	**131817**	***49.53***
24	Crab	**11787**	***4.43***
	Grand Total	**266154**	***100***

Source: DoF 2019

Total shrimp and prawn production including capture has been increased from 1.60 lakh MT in 2002-03 to 2.54 lakh MT in 2017-18. Total production of Shrimp and Prawn is 247213 MT in FY 2017-2018 which growth rate is 1.71% (Table 1.5) (DoF 2019).

Table 1.5. Sector-wise Annual Shrimp/Prawn Production, 2017-18

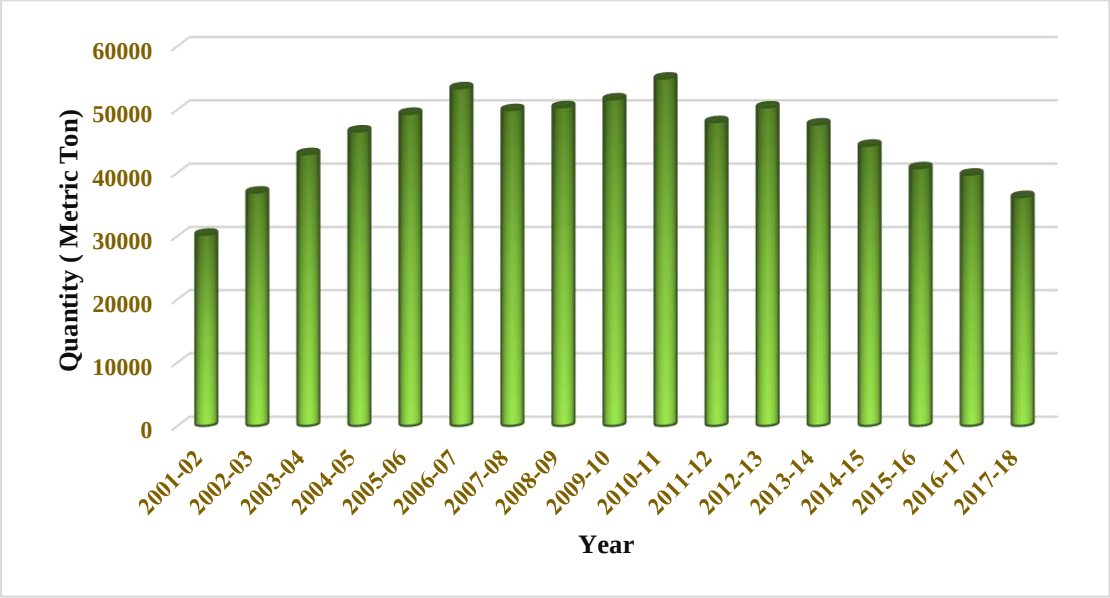
Sector of Fisheries	Galda	Bagda	Harina	Chaka	Other Shrimp/ Prawn	Total
River	5339	34	3135	56	9897	18461
Sundarbans	42	49	0	0	258	349
Beel	58	0	0	0	4081	4139
Kaptai Lake	0	0	0	0	11	11
Floodplain	1843	0	0	0	42642	44485
Pond	1871	0	0	0	4350	6221
Seasonal cultured water body	680	0	0	0	1067	1747
Baor	9	0	0	0	323	332
Shrimp/Prawn Farm	51571	61709	3882	2029	3359	122550
Pen Culture	0	0	0	0	71	71
Cage Culture	0	0	0	0	0	0
Inland Total	**61413**	**61792.02**	**7017**	**2085**	**66059**	**198366**
Marine Industrial	0	253	1715	54	1660	3682
Marine Artisanal	0	2300	3150	4500	35215	45165
Marine Total	0	2553	4865	4554	36875	48847
Country Total	**61413**	**64345.33**	**11881.86**	**6639**	**102934.11**	**247213**
Growth Rate (%)	**9.37**	**(-) 8.83**	**5.91**	**19.04**	**5.45**	**1.71**

Source: DoF 2019

Shrimp is the second largest export product in Bangladesh after ready-made garment commodities (e.g., garment products, textile items, and vegetable textiles/yarns) and has already become a multimillion-dollar industry. Three districts, Bagerhat, Satkhira, and Khulna, along with Rampal, a subdistrict of Bagerhat, are the significant coastal shrimp-farming districts of Bangladesh, making a major contribution to the national economy over the past two decades. These three southwestern districts contributed 75% of the total shrimp industry between 2002

and 2017. (Dynamics of Shrimp Farming in the Southwestern Coastal Districts of Bangladesh Using a Shrimp Yield Dataset (SYD) and Landsat Satellite Archives).

Major export items of fish products are raw shrimp block frozen, IQF shrimp and white fish, PUD and P&D shrimp block frozen, consumer pack of raw frozen shrimp, chilled & frozen Hilsa, dry, salted and dehydrated fish, live fish, eel fish & crab and a little quantity of value-added fish and shrimp products. About 80 percent of the tiger shrimp comes from the south western region of Bangladesh i.e. greater Khulna region. The biology of these two species is mostly associated with the salinity of the environment. Khulna region is geographically situated in the mixed climatic condition between fresh, brackish and marine environment. Marine shrimp and fresh water prawn are both suitable culture in this ground.

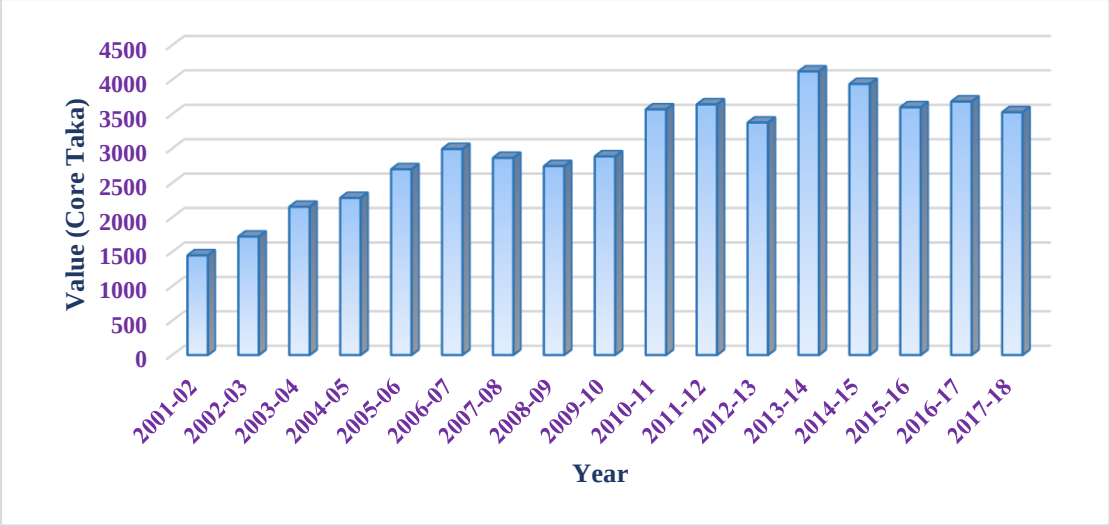


Source: EPB (Export Promotion Bureau)

Figure1.3: Year-wise Annual Export of Frozen Shrimp/ Prawn in quantity (2000-01to 2017-18)

The rapid expansion of shrimp farming over last decade and its contribution to foreign earnings has been quite remarkable. To ensure traceability of exported

fish and fishery products, 2,07000 shrimp farms and 9,651 commercial fish farms have been already registered (BER 2019). Total 36167.77 MT of shrimp and prawn is exported from Bangladesh and earned 3527.07 Core Taka (Figure 1.3 & Figure 1.4) (DoF 2019).



Source: DoF 2019

Figure 1.4: Value (in Core) of Exported Frozen Shrimp/ Prawn in 2017-18

Bangladesh earned 2720.44crore Tk. and 567.07crore Tk. by exporting 26325.87 MT bagda shrimp and 5848.48 galda shrimp in the year 2012-13 (Table 1.6).

Table 1.6: Exported Frozen Shrimp/ Prawn in 2017-18

	Quantity (MT)	**Core Taka**
Galda	5848.48	567.07
Bagda	26325.87	2720.44
Others	3993.42	239.56
Total	**36167.77**	**3527.07**

Source: DoF 2019

1.4 Area and Production of Prawn

Commercial shrimp production depends mainly on producing giant tiger shrimp or bagda shrimp and fresh water galda shrimp. In total 52,000 hectare of land was used for shrimp production in 1983 and at present it has increased to 2.58,681 hectare and shrimp production also increased to 1,22,550 MT.

Table 1.7: Annual Production of Shrimp/Prawn Farms, 2017-18

	Area (ha)	**Production. (MT)**	**Kg/Ha**
Species	**2017-18**	**2017-18**	**2017-18**
Bagda	184821	61709	334
Galda	73860	51571	698
Other Shrimp /Prawn	-	9270	36
Shrimp/Prawn Total	-	122550	474
Fish	-	131817	510
Total	258681	254367	983

Source: Report from Deputy Director, Shrimp, Dhaka and District Fisheries Offices.

- Total shrimp farm area- 2.58,681 hectare.
- Yearly shrimp production – 1,22,550 MT
- Per hectare shrimp production – 474 kg.
- Per hectare production (Total shrimp & fish) - 510 kg (Table 1.7) (DoF 2019).

- Other Shrimp/Prawn: Harina, Chaka and other small shrimp/prawn.
- No. of bagda hatcheries - 49.
- Bagda fry production (Post Larva) - 1412.04 crores.
- No. of galda hatcheires – 46 (27 are Government Organizaion)
- Galda fry production (Post Larva) – 5.21crores (Table 1.8) (DoF 2019).

Table 1.8. Annual PL (Post Larva) Production, 2018

Sector	Bagda (Tiger)	Harina (Brown)	Chaka (White)	Others	Total
Trawl Fishing	253.31	1714.86	53.72	1660.11	**3682**
Artisanal Fishing	2300	3150	4500	35215	**45165**
Total	**2553.31**	**4864.86**	**4553.72**	**36875.11**	**48847**

Source: DoF 2019.

Table1.9: Division Wise Annual Production of Shrimp/Prawn Farm in 2017-18.

Division	Area(Ha)			Shrimp/Prawn Production (MT)				Fish Production (MT)	Total Production (MT)
	Bagda	Galda	Total	Bagda	Galda	Other shrimp/ prawn	Total shrimp/ prawn		
Dhaka	0	1372.82	1372.82	0	816.34	0.60	816.94	1467.42	2284.36
Mymensingh	0	1.25	1.25	0	1.08	0	1.08	2.59	3.67
Khulna	140096.9	67989.7	9439.0	217525.588	50153	47518.78	6556.94	104228.72	228661.87
Barisal	875.7	3731.44	4667.80	694.97	2520.29	373.24	3588.5	5999.37	9762.49
Rajshahi	0	13.533	13.533	0	4.74	4.74	0	41.55	46.29
Rangpur	0	20.54	20.54	0	6.82	0.12	6.942	33.56	40.50
Chittagong	43848.5	728.08	44930.85	10861.05	701.42	2339.29	13901.76	10541.10	25349.355
Sylhet	0	2.60	2.6036	0	1.34	0	1.34	4.33	5.67
Total	184821	73860	268535	61709	51571	9270	122550	131817	266154
Percent	0%	12.73%	12.73%	0%	2.19%	0.12%	2.31%	19%	21.31%

Source: DoF 2019

1.5 Justification of the Study

Within the overall agro-based economy in Bangladesh, freshwater prawn (*Macrobrachium rosenbergii*) farming is one of the most important sectors of the national economy. During the last two decades, its development has attracted considerable attention for its export potential. Around three-quarters of prawn farms

are located in the southwest part of Bangladesh which has been identified as the most important and promising area for prawn culture, because of the availability of wild post larvae, favorable resources and climatic conditions, such as the availability of ponds, low lying agricultural land, warm climate, fertile soil, and cheap and abundant labor. Most farmers integrated prawn with fish and rice in their gher and followed extensive methods using low inputs.

This study will generate baseline information on socio-demographic characteristics of Prawn farmers, level of input use and its pricing, cost and returns, factors affecting productivity of shrimp farms, resource use efficiency, consequences and problems associated with Prawn farming. The present study was conducted in 2 villages of Satkhira Sadar upazila under Satkhira district. This study was expected to add some valuable information to the existing body of knowledge regarding prawn farming particularly with respect to the area under study. This study provides appropriate suggestion and policy recommendations which might help the development agencies and policy makers of the country for improving the livelihood of people who live in south-west part of our country.

1.6 Objectives of the Study

The specific objectives of the study are as follows-

a) To identify the socio-demographic profile of the prawn farmer.

b) To calculate the profitability of prawn farming.

c) To assess the resource use efficiency of prawn farming.

d) To address the problems and suggest some policy recommendations for the improvement of prawn farming.

1.7 Outline of the Study

This thesis contains a total of ten chapters which have been organized in the following sequence. Chapter 1 includes introduction. The review of literature is presented in Chapter 2. Methodology of the relevant study is discussed in Chapter 3. Chapter 4 contains the socio-demographic profile of the prawn producing farmers. Chapter 5 deals with the costs and returns of prawn farming. Chapter 6 describes the factors affecting returns of prawn farming. Chapter 7 presents problems and suggestions of prawn farming. Finally, Chapter 8 represents the summary, conclusion and policy recommendations to increase prawn production.

CHAPTER II

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

The review of literature in any research is necessary as it provides a new dimension for reviewing the stock of knowledge and information on prawn farming. This knowledge gives a guideline in furnishing the future research problem and validating the existing findings. The focus of this chapter is to provide a selective review of the past research works which are related to the present study. But review of literature was not only limited to works done in Bangladesh but also was extended to other countries for having a broader view. The important studies which were conducted in the recent past related to the present study are discussed below:

2.2 Prawn Farming Related Studies

Ito (2004) examined that changing agrarian institutions in southwestern Bangladesh where a large number of farmer, small and large, had switched from rice farming to export-oriented freshwater prawn farming within the last two decades. The local economy boomed until ecological and managerial problems began to threaten the sustainability of the farming activities. At the same time, the impact of global competition was forcing the industry to adopt so-called global standards concerning food safety. These demand reforming of the local supply chain at the bottom of which a significant number of small farmers were struggling to survive. It was argued that this restructuring was leading to small farmer's reduced access to

financial capital and possible to changes in ownership pattern of freshwater prawn farms.

Liao (1996) conducted "The production economics of freshwater prawn farming in southern Taiwan". Based on survey data, large farms were more profitable than small ones. It was found to be associated with lower production cost per hectare for large farms. A Cobb-Douglas production function was used to analyze the survey data. Farm size, capital and management were significant factors affecting production of freshwater prawn. The adoption of improved practices resulted in higher yields. The estimated production function provides estimates of marginal value products for farm size, labor, capital and management.

Rahman (2003) examined "An economic study of Galda shrimp farming in some selected areas of Jessore district". He found that under year-round Galda shrimp farming, per hectare production was higher than the compared to the production of shrimp under alternate Galda shrimp rice farming. The combined gross return from producing Galda shrimp and finfish was substantially higher than the combined return from Galda shrimp and rice production under alternate Galda shrimp rice farming. He clearly indicated that year-round Galda shrimp farming was highly profitable because farmers had to incur small amount of cost for producing Galda.

Uddin (1995) discribed "An economic study on shrimp farming in some selected areas of Khulna and Satkhira district". He found that most of the farmers in Satkhira district followed improved traditional method in shrimp farming which resulted in higher yield. Per hectare total cost of shrimp farming was Tk. 62613.26 in Satkhira district while it was Tk. 41815.69 in Khulna district. He also discovered that per

hectare net income in Satkhira District was Tk. 78374.60 and in Khulna district it was Tk. 32447.49 which means that net income in Satkhira district was 2.41 times higher than that of Khulna district. In all respect shrimp farming in Satkhira district was more profitable compared to Khulna district.

Ahmed (2005) conducted that 'The role of women in freshwater prawn farming in southwest Bangladesh'. In his study he found that the rural women of our country were discriminated in all sphere of their life. They did not have any right to make a decision in terms of their income generating activities. The rapid growth of the freshwater prawn industry provided employment opportunities for women. A project funded by the UK Department for International Development, 200 women who were directly or indirectly involved with prawn production were interviewed in 2003. The women were involved in various terms of prawn farming. Such as- prawn feeding, gher construction, gher supervision and management, prawn harvesting, post-harvest handling and all. The main constraints was the household work responsibilities, particularly for Muslim women, as they were facing religious confinements. The study showed that, active participation of women was underestimated. Prawn farming was enhancing the socio-economic condition of women although there were many obstacles.

Ahmed *et al.* (2008) stated that 'Freshwater prawn farming in Bangladesh: history, present status and future prospects. In Bangladesh, freshwater prawn farming is one of the most essential sectors of the national economy'. It is creating various livelihood opportunities for the rural people. This paper presented an overview of freshwater prawn farming in Bangladesh. Freshwater prawn farming is mainly

perfect for small-scale units, though to exploit markets, producer groups and marketing organizations are important. Prawns required special care during harvesting, processing and marketing. A range of public and private sector investments were needed to realize the significance for growth and expanding economic output from this sector. In Bangladesh, the issues of environmental sustainability of prawn cultivation, though clearly not as negative as those of marine shrimp culture, are nevertheless poorly understood. Thus, study would be required as quantitative as well as qualitative environmental impacts for sustainable prawn farming.

Ahmed *et al.* (2008) studied on 'An economic analysis of freshwater prawn, *Macrobrachium rosenbergi,* farming in Mymensingh, Bangladesh'. It deals with the production system, cost structure and profitability of freshwater prawn farming in Mymensingh district. In this research, the cost and return of extensive and semi-intensive prawn farming system are compared. According to the study, the annual net return per hectare of prawn farm averaged $US 874.91, $US609.39 in extensive farming and $US1140.37 in semi-intensive farming. Here the rate of income from extensive farming and semi-intensive farming ware found 36% and 42% respectively. The BCR of extensive and semi-intensive farming system were found 1.57 and 1.73 respectively. For ensuring the prawn farmers, in particular extensive farmers, can shift to the semi-intensive farming system, the government along with national banks should provide sufficient access to interest-free credit or credit at a lower interest rate.

Yasmin *et al.* (2010) state that 'Economics of fresh water prawn farming in Southwest Region of Bangladesh'. This study was aimed to assess the profitability of freshwater prawn farming in gher systems in southwest Bangladesh. Four Upazilas such as-Bagerhat Sadar, Fakirhat, Mollahat and Chitalmari were selected from Bagerhat district. After the financial analyses, results indicate that investment in all the selected golda farming projects are profitable. Here, total cost of FPF was calculated Tk. 80,301.00 per hectare, average gross return per hectare per year stood at Tk. 216,400.00 and the gross margin per hectare per year was Tk. 205,278.00. The net return per hectare per year was calculated Tk. 136,099.00. As farmers in the study areas were facing different kinds of problems, it was concluded that the freshwater prawn farming is sustainable as well as did not have any harmful effect on environment. Lastly, based on the of the study, some recommendations were made for the better development of freshwater prawn farming in Bangladesh.

Banu and Christianus (2016) study on 'Giant freshwater prawn *Macrobrachium rosenbergii* farming: a review on its current status and prospective in Malaysia'. The present study showed that, the giant freshwater prawn *Macrobrachium rosenbergii* is an essential targeted species in Malaysia. The aquaculture production of *M. rosenbergii* increased from 318 tonnes in 2012 to 457 tonnes in 2013 but the total freshwater aquaculture production decreased in the year 2013, comparing with the previous year. In recent time, the production of giant freshwater fries raised from the three government as well as 21 private hatcheries in 2012 to the four government and 19 private hatcheries in 2013. Giant Freshwater prawn farming plays a very important role in Malaysian economy, which is contributing to increased food

production with earning valuable foreign exchange as well as diversifying the economy and enhanced employment opportunities. Besides several problems, prawn farming practice has offered opportunity for increasing incomes for farmers and allied groups. Public as well as private sector investments and involvements are needed for realizing the potential for development and expanding economic output from this sector. This study concluded that, freshwater prawn farming in Malaysia has an encouraging scenario for increasing demand and to prospects of an upgraded organization of the productive chain.

Begum *et al.* (2016) examined that 'Determinants of technical efficiency of freshwater prawn farming in southwestern Bangladesh'. This study examines the efficiency of shrimp and prawn farming in Bangladesh. The production data and several farm-specific data were collected from a sample of shrimp and prawn farmers and analyzed using a stochastic production frontier, including a model for the technical inefficiency effects. Primary data has been collected by using random sampling from 90 farmers of three villages in southwestern Bangladesh. She found that prawn farming presented much variability in technical efficiency ranging from 9.50% to 99.94% with mean technical efficiency of 65%, which suggested a substantial 35% of potential output can be recovered by removing inefficiency. For a land scarce country like Bangladesh this gain could help increase income and ensure better livelihood for the farmers. Based on the stochastic frontier production function specification, farmers could be made scale efficient by providing more input to produce more output. The results suggested that farmers' education and non-farm income significantly improve efficiency while farmers' training, farm

distance from the water canal and involvement in fish farm associations reduces efficiency. Hence, the study proposed strategies such as less involvement in farming-related associations and raising the effective training facilities of the farmers as beneficial adjustments to reduce inefficiency. Moreover, the key policy implication of the analysis is that investment in primary education would greatly improve technical efficiency.

Mahalder *et al.* (2018) conducted that 'The sustainable livelihoods approach of freshwater prawn production in South-western Bangladesh'. This study based on two villages of Dumuria upazila namely Ghona Mader Danga and Ramkrishnapur in Khulna district. 181 sample farmers were selected from the two villages. After analyzing the data, per hectare average yield of prawn, average cost of Gher operation and average net return was found 319 kg, Tk. 76,015 and Tk. 93,152 respectively. Here the study revealed that the farmers who had their own land were obtained higher net returns than the leaseholders. The study area showed that freshwater prawn brings economic as well as social benefits for the sample farmers. However, our country could undoubtedly have earned a huge amount of foreign exchange by exporting prawn if more areas could be brought under prawn cultivation in future.

Barmon and Osanami (2004) studied on "Problems and prospects of shrimp and rice-prawn gher farming system in Bangladesh". The findings indicated that the shrimp-gher farming system had a negative impact on the environment, ecology, land degradation, livestock, and water quality; on the other hand the rice-prawn gher farming system was found to be friendlier to environment, ecology, and water

quality and it's also helpful to alleviate poverty. The rice-prawn gher farming system had significant impacts on land for modern varieties (MV) paddy production. The yield of modern varieties paddy production under rice-prawn Gher farming system was almost the same as the yield in other parts of Bangladesh where the farmers usually produce only year-round MV paddy. The rice-prawn Gher farming system was found to provide a sufficient amount of rice, fish and vegetables to small, marginal and landless farmers which would not be possible under shrimp Gher farming. Case studies and secondary data were used for evaluate the result but primary data was not used. So, in this regard the present study will provide better analysis for shrimp farming in Bangladesh.

Rahman and Hossian (2013) conducted that "Present Status and Potentiality of Shrimp in Bangladesh". He mentioned that Shrimp and prawn together represent the second largest exportable items contributing to foreign exchange earnings of Bangladesh. Shrimp farming was found to have significant impact on environment and economy. The productivity of shrimp was very low compare to the other shrimp producing countries of the world. One of the major causes of poor productivity was the extensive or traditional method of farming, whereas developed countries brought their farms under intensive or semi-intensive methods of farming. The farmers of the study area practiced galda-cum-rice pattern. The productivity of galda and T. Aman rice was found 505 kg/ha and 3497 kg/ha, respectively. About 72% farmers of the study area were choose galda farming as the main occupation and shared 83.4% of their annual income whereas, rice shared 8.88% only. So, galda had significant importance to the socioeconomic and livelihood status of the

farmers. Data on shrimp farm management practices were mainly analyzed using descriptive statistics such as mean, median and percent and activity budget was used to analyze the profitability of shrimp/prawn farming. This study was not used the Cob-Douglas production function model which provides a clear explanation of the relationship between the input and output of shrimp farming. So, in this perspective this study will provide a clear explanation of the relationship between the input and output of shrimp farming based on the Cob-Douglas production function.

Karim *et al.* (2019) conducted on this study that "Dynamics of Shrimp Farming in the Southwestern Coastal Districts of Bangladesh Using a Shrimp Yield Dataset (SYD) and Landsat Satellite Archives". He found that the shrimp-farming area and shrimp yield are continuously changing in the southwestern coastal districts of Bangladesh. The livelihoods of the three significant shrimp-farming coastal districts of Bangladesh, Bagerhat, Satkhira, and Khulna, largely depend on shrimp-farming activities which contribute 75% of the total shrimp yield of Bangladesh. However, the shrimp yield and shrimp-farming area of Bagerhat district has decreased compared to Satkhira and Khulna districts in recent years because of introducing the Rampal thermal power plant of Rampal, Bagerhat district, in recent years. In this research, the differences in the shrimp yield were quantified using a shrimp yield dataset (SYD) and k-means classification. A supervised image classification approach was applied to quantify the spatiotemporal changes and identify the influencing factors behind the declining shrimp-farming area and yield in Rampal, Bagerhat district, using Landsat satellite archives. K-means classification reveals that, between 2015 and 2017, the shrimp yield in Bagerhat district declined

significantly compared to Satkhira and Khulna. It is also revealed that the shrimp-farming area of Rampal also decreased rapidly, from 21.82% in 2013 to 6.52% in 2018 and approximately 70% of the shrimp-farming area was lost in Rampal since December 2013. Hence, the findings of this research might motivate the responsible bodies to declare the shrimp-farming coastal area as a "shrimp zone" and implement an active policy to protect the vulnerable shrimp-farming industry and shrimp farmers, considering it is the second-largest export earning source in Bangladesh after ready-made garments.

Rahman-Al-Mamun *et al.* (2019) studied that "Impact of progressive shrimp farming on farmer's livelihood in southwestern region of Bangladesh." The study was carried out on 30 shrimp farmers of Shyamnagar upazilla in Satkhira district, situated in the southwestern coastal region of Bangladesh. The research was conducted to evaluate the livelihood analysis of the farmers based on progressive shrimp farming. It is showed that majority of the respondents (56.67%) were dependent on shrimp farming and others involved in some subsidiary occupations like business, agriculture, service etc. the farmer realized that shrimp culture was better than agriculture because maximum profit could be obtained by shrimp farming in minimum time and minimum cost although there were high risks in the culture system. They supported shrimp farming more because of higher availability of post-larval shrimp, lower feed cost, year round culture system, opportunity for self-employment etc. The annual incomes of major shrimp farmers (56.67%) were 50,000-2,00,000 BDT, 23.33% were 2,01,000-5,00,000 BDT and rest 20% were 5,01,000- 20,00,000 BDT, respectively. Livelihoods of all farmers in the study area

had improved by practicing extensive shrimp farming. Most of them uplifted their living status by ensuring some housing (50%), drinking (90%), electricity (73.33%), sanitary (56.67%), medical (100%) and banking (73.33%) facilities. In addition, majorities of them also increased their expenses on children's education (80%), health management (56.67%), and purchasing entertainment equipment (63.33%). In contrast, the expenses on buying cattle or other animals decreased (56.67%) showing their livelihood mainly depends on shrimp farming.

Ahmed *et al.* (2015) studied that "Coastal to inland: Expansion of prawn farming for adaptation to climate change in Bangladesh." This paper was conducted that the practice of prawn (*Macrobrachium rosenbergii*) farming is widespread in coastal Bangladesh due to favorable biophysical resources. However, export-oriented prawn farming is particularly vulnerable to climate change in coastal Bangladesh. This study identified different climatic variables, including salinity, coastal flooding, cyclone, sea-level rise, water temperature, drought, and rainfall have profound effects on prawn farming in the Bagerhat area of southwest Bangladesh. Considering extreme vulnerability to the effects of climate change on prawn production, one of the adaptation strategies is to translocate prawn culture from coastal to inland (i.e., Bagerhat–Gopalganj) that appear less vulnerable to climate change. Although the prospects for prawn–carp polyculture and integrated prawn–fish–rice farming are positive in Gopalganj, a number of challenges were identified for the expansion of prawn culture. So, it was suggested that institutional support would help to adopt prawn production.

2.3 Concluding Remarks

The above-mentioned review and discussion are certainly relevant to the objectives and methodologies of the present study. Most of the studies dealt with profitability and productivity of prawn. Some studies also determine the productivity as well as resource use efficiency. Some studies are related to technical efficiency of shrimp and prawn farming. It was helpful to re-construct the methodological aspects for overcoming the limitations of previous studies. From these studies the researcher felt the need of conducting the profitability of prawn culture and analyzing the resource use efficiency of prawn culture in Satkhira district of Bangladesh within the recent development context, which will help the policy makers for understanding the current situation and take initiatives to increase prawn production and improving the livelihood of coastal people in Bangladesh. In contrast, the researcher believed that the findings of this study would provide useful recent updated information, which would help the policy makers as well as researcher for further investigations.

CHAPTER III

METHODOLOGY

CHAPTER 3

METHODOLOGY

This chapter deals with the methodology of the study. Methodology in any systematic study deserves careful consideration. Scientific research depends on how a proper methodology to be followed in the research. Though it is a socioeconomic research, it involved farm level data collection. The primary data was collected depends upon the nature and objectives of the study as well as fund and time also. This chapter covers a detailed sequential steps of research work for instance, selection of study areas, selection of the samples and sampling techniques, sources of data, processing of data and analytical techniques etc.

3.1 Selection of the Study Area

In a farm management study, selection of the study area is an important step. For this study Satkhira district under Khulna division was selected as a prawn cultivation area. Data were collected from Satkhira Sadar upazilla for prawn production. For selection of the study area, a preliminary visit was made in the respective areas. Two villages namely Raypur and Ghorchala at Bolli union of Satkhira Sadar upazila in Satkhira district were selected which are the extensive prawn producing areas. Data collection was suitable from this region for the following reasons-

a) Availability of traditional Gher farming and prawn farmers,

b) Easy of access and good communication facilities in these areas and

c) The selected farmers will be so co-operative that was believed researcher and so on.

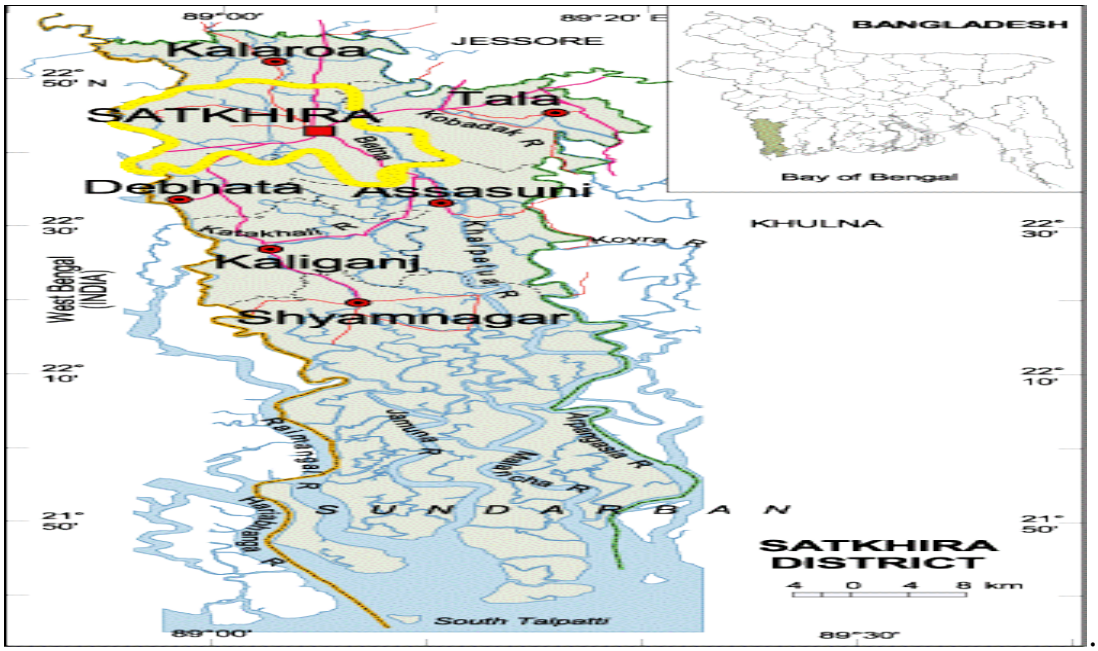


Figure 3.1: A Map of Satkhira District Showing the Study Area.

Satkhira Sadar is located at 22.7167°N 89.0750°E. It has 61839 households and total area 400.82 km^2.Satkhira Sadar Upazila is bounded by Kalaroa Upazila on the north, Tala Upazila on the east, Debhata and Assasuni upazilas on the south part of Bangladesh

3.2 Selection of the Samples and Sampling Technique

The respondent of primary sources of data for this study were prawn producing farmers. They were selected from the above selected areas as they represent the total farmers in terms of output and coverage. Simple random sampling technique was used to select samples and survey method was followed for collecting data from the respondent. The list of prawn farmers was prepared through a preliminary short survey with the help of Department of Fisheries (DoF) and Department of

Agricultural Extension (DAE) personnel. A total of 96 year-round prawn farmers were selected from the selected villages.

3.3 Preparation of the Survey Schedule

One of the most important part of this study was preparation of survey schedules. A comprehensive survey schedule was prepared to collect necessary information from the concerned respondent in such a way that all relevant information needed for prawn (galda) farming could be easily obtained within the shortest possible time. The interview schedule was pretested for judging their suitability. The final survey schedule was prepared on the basis of the results of the pre-test survey.

3.4 Sources of Data and Collection of Data

Required data for the present study were collected from primary and secondary sources. Primary data was collected from the selected respondents by visiting each farm personally to satisfy the objectives of the study. Collecting data is very difficult because most of respondent does not keep records of their activities. Before going to an actual interview, a brief introduction of the aims and objectives of the study was given to each respondent. The question was asked systematically in a very simple manner and the information was recorded on the interview schedule. In order to minimize errors, data were collected in local units which were subsequently converted into appropriate standard unit. The period of data collection was 1st December 2019 to 31 December, 2019. The secondary data were obtained from various published sources such as Bangladesh Bureau of Statistics (BBS), Department of Fisheries (DoF), Bangladesh Economic Review (BER), journals, newspapers, articles, internet etc.

3.5 Editing and Tabulation of Data

After collecting the primary data, the filled schedules were edited for analysis. To eliminate possible errors as well as inconsistencies, these data were verified. All the collected data were summarized and examined carefully. The Microsoft Excel programs and SPSS programs was used for data entry and analysis. It might be observed here that information was collected initially in local units and after checking the collected data, it was converted into standard units. Finally, a few relevant tables were prepared according to necessity of analysis to meet the objectives of the study.

3.6 Analytical Techniques

Both descriptive and statistical analysis will be used for the analysis of the data with the purpose of fulfilling the objectives of the study.

3.6.1 Descriptive Analysis

Descriptive analysis was generally used to find the socio-economic status of the respondents. The tabular technique of analysis was used for determining the cost, returns and profitability of prawn farm enterprises and to assess and forecast the social tension. This technique is simple in calculation, widely used and easy to understand. It was used to get the simple measures- like average, percentage and ratio.

3.6.2 Functional Analysis

The production function represents the technological relationship between output and factor inputs. To estimate the production function, one requires development of

its properties leading to specification of an explicit functional form. One of the most widely used production function for empirical estimation is the Cobb Douglas production function. This function was used to analyze the input-output relationship in prawn cultivation. To determine the contribution of the most important variables in the production process of prawn cultivation, the following specification of the model will be used-

$$Y=aX_{1i}^{b1}X_{2i}^{b2}X_{3i}^{b3}X_{4i}^{b4}X_{5i}^{b5}X_{6i}^{b6}X_{7i}^{b7}Xe^{u_i} \ldots\ldots\ldots\ldots (3.1)$$

The Cobb-Douglas production function was transformed into following logarithmic form so that it could be solved through ordinary least squares (OLS) method.

$$lnY= lna + b_1 lnX_{1+} b_2 lnX_2 + b_3 lnX_3 + b_4 lnX_4 + b_5 lnX_5 + b_6 lnX_6 + b_7 lnX_7 + U_i \ldots\ldots. (3.2)$$

Where, Y= Gross income from year-round prawn (Tk/ha);

X_1= Cost of prawn fry (Tk./ha);

X_2= Cost of fin fingerlings (Tk /ha);

X_3= Cost of human labor (Tk /ha);

X_4= Cost of feed (Tk /ha);

X_5= Cost of fertilizer & manure (Tk /ha);

X_6= Cost of Lime (Tk/ha);

X_7 = Cost of water management

a= Intercept;

b_1…. b_6= Coefficient of the respective variable;

U_i= Error Term;

i= 1, 2…7.

3.7 Measurement of Resource Use Efficiency

For testing the efficiency, the ratio of Marginal Value Product (MVP) to the Marginal Factor Cost (MFC) for each input were computed and tested for its equality to 1. i.e., RUE = MVP/MFC = 1.

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional one unit of that resource, while other inputs are remained constant. When the marginal physical product (MPP) is multiplied by the product price per unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources (Xi) as well as gross return (Y) at their geometric means.

In this study the MPP and the corresponding values of MVP were obtained as follows:

Where, $MPP_{xi} * P_{yi} = MVP$,

But, $MPP = b_i*(Y/X_i)$

So, $MVP = b_i* (Y/X_i) P_{yi}$

Where, b_i = regression coefficient per resource,

Y = Mean output,

P_{xi}=the price per unit of resource input used

X_i = Mean value of inputs,

P_{yi} = price of output and

MFC = marginal factor of cost of input, P_{xi}

Thus, when resource-use efficiency (RUE) =1, resources are used at an optimum level,

When RUE <1, resources are over utilized,

When RUE >1, resources are underutilized.

3.8 Profitability Analysis

The primary and ultimate goal of a farm is profit maximization. Profit or net return is the difference between the total revenue (gross return) i.e. total value product (TVP) and the total factor cost (TFC). Cost and return analysis is the most common method of determining and comparing the profitability of different farm household. In the present study, the profitability of prawn farming is calculated by the following way-

3.8.1 Calculation of Gross Return

Per hectare gross return was calculated by multiplying the total amount of product and by-product by their respective per unit prices.

Gross Return (GR) = Quantity of the product × Average price of the product + Value of by-product.

3.8.2 Calculation of 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. Gross margin was calculated on total variable cost (TVC)

basis. Per hectare gross margin was obtained by subtracting variable costs from gross return. That is,

Gross margin (GM) = Gross return (GR) – Total variable cost (TVC).

3.8.3 Calculation of Net Return

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

Net return (NR) = Total return (TR) – Total production cost (TPC).

The following conventional profit equation was applied to examine farmer's profitability level of the prawn producing farms in the study areas.

Net profit, $\pi = \Sigma P_m Q_m + \Sigma P_f Q_f - \Sigma (P_{xi} X_i) - TFC$.

Where, π = Net profit/Net return from prawn farming (Tk/ha);

P_m = Per unit price of prawn (Tk/kg);

Q_m = Total quantity of the prawn production (kg/ha);

P_f = Per unit price of other relevant fish (Tk/kg);

Q_f = Total quantity of other relevant fish (kg/ha);

P_{xi} = Per unit price of i-th inputs (Tk);

X_i= Quantity of the i-th inputs (kg/ha);

TFC =Total fixed cost (Tk); and

i = 1, 2, 3, ..., n (number of inputs).

3.8.4 Undiscounted Benefit Cost Ratio (BCR)

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per hectare.

BCR= Total Return /Total Cost

3.9 Problem Faced in Collecting Data

During the period of data collection, the researcher faced the following problems.

- Most of the farmers felt disturbed to answer questions and had fear since they thought that the researcher might use the information against their interest. To earn the confidence of the farmers a great deal of time was spent.
- The farmers do not keep records of their activities and day to day expenses. Therefore, the author had to depend upon their memory.
- Most farmers initially hesitated to answer the questions since the author was unknown to them.
- The farmers were usually busy with their filed works. So, the researcher sometimes also had to pay extra visits to meet the farmer.

3.10 Limitations of the study

The study suffers from some limitations which are stated below:

- The sample size was limited due to the number of prawn farmers selected for this study shortage of adequate time and resource.
- The farmers provided necessary information form their memories. As a result, in some cases value judgment was employed to have necessary data.

CHAPTER IV
SOCIO-DEMOGRAPHIC PROFILE OF PRAWN PRODUCING FARMERS

CHAPTER 4

SOCIO-DEMOGRAPHIC PROFILE OF PRAWN PRODUCING FARMERS

4.1 Introduction

This chapter presents the prevailing demographic, social and economic profiles of the selected prawn farmers. Socioeconomic characteristics of the farmers directly or indirectly affect their production planning. To get more complete scenario of prawn fish culture, it is important to know the socioeconomic characteristics of farmer. In the present study 54 (56%) and 42 (43%) farmers were taken as respondent from the village Raypur and Ghorchala respectively. A socioeconomic aspect of the sample households was examined. These basic characteristics of the farmers were family size and composition, age distribution, occupation (main and subsidiary), level of education, consumption pattern, employment patterns, land ownership pattern etc. are emphasized. A brief discussion of these aspects is given below.

4.2 Age Distribution and Sex of the Sample Farmers

Age is very important in determining the potential or active farmers. It has an influence on the production as well as in the better management of the farming system. Some researchers think that older farmers are more experienced as well as more efficient in using resource. On the other hand, some researchers notice that younger farmers are eager to adopt upgraded technology than older. Besides man, woman also participate in prawn farming. In this study, out of total farmer 89 are

male and 7 are female. The relationship between age and sex of the study area is presenting in table 4.1. The table is given below-

Table 4.1: Age Distribution and Sex of the Respondents

Age group	Sex				Total	
	Male		Female		Number	Percentage
	Number	Percentage	Number	Percentage		
Less than 31	9	9.38	1	1.04	10	10.4
31 to 45	41	42.71	3	3.13	44	45.8
46 to 60	35	36.46	3	3.13	38	39.6
Above 60	4	4.17	0	0	4	4.2
Total	89	92.71	7	7.29	96	100

Source: Field survey, 2019

In the present study, all the farmers of the study area were classified into four age groups as presented in Table 4.1. The classified four age groups are less than 31 years, 31-45 years, 45-60 years and above 60. Out of the total sample farmers 10.4 percent belonged to the age group of less than 30 years where male is 9.38 percent and female is 1.04 percent. 45.8 percent belonged to the age group of 31-45 years, here male is 42.71 percent and female is 3.13 percent. 39.6 percent belonged to the group of 46-60 years where male is 36.46 percent and female is 3.13 percent and 4.2 belonged to the group of above 60 where male is 4.17 percent. In total 92.71 percent male and 7.29 percent female involve in various facets of prawn farming, including prawn feeding, Gher construction, Gher supervision and management, prawn harvesting and post-harvest handling. These data imply that majority of the prawn farmers fell in young aged and middle-aged group indicating that they were relatively younger in age and were in a position to put more physical and intellectual

efforts for prawn production. Farmers from this age group were supposed to have more risk bearing ability.

4.3. Family Size and Farming Experience of the Sample Farmers

Family size has a great contribution in farm management process. It is assumed that farm management is easy if a family consists more active member.

Table 4.2. Age Distribution, Family Size of the Respondents

Family size		Number of Farmers' family	Percent
Small Family	1-4	72	75.0
Medium family	5 - 6	23	24.0
Large family	>6	1	1.0
Total		96	100.0
Average family size		4.18	
Average male number		2	
Average female number		2.14	
Average farming experience of prawn farmer (in year)		12.72	

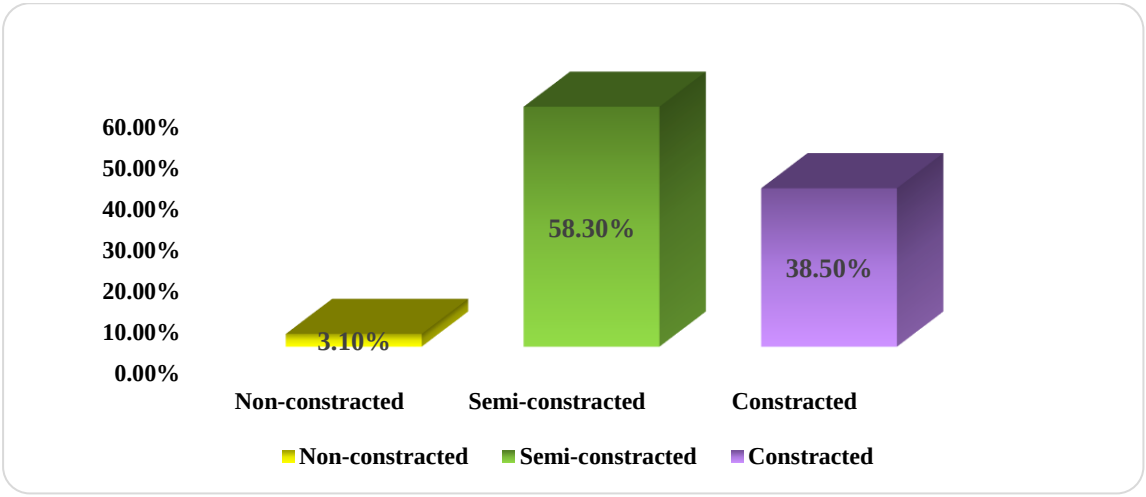
Source: Field survey, 2019

Family in the present study was defined as a group of individuals living together, taking meals together from the same kitchen and living under the administration of the same head of the family. It included husband, wife, son, daughter, brother, sister, parents. Family size was classified into three groups as: small, medium and large (Ahmed et al., 1992).

In this study 75 percent of family is small, 24 percent is medium and 1 percent is large. That shows maximum families are small in size within study area. The

average family size of Satkhira sadar upzilla was about 4.19 (BBS, 2011). The average family sizes of the prawn producing farmers was found to be 4.18 which was slight less than the average family member of the upzilla. Here, the average male member and average female member were 2 and 2.14 respectively found in prawn farming. Maximum farmers are experienced and average faming experience is 12.72 years.

4.4 Housing condition for farmer



Source: Field survey, 2019

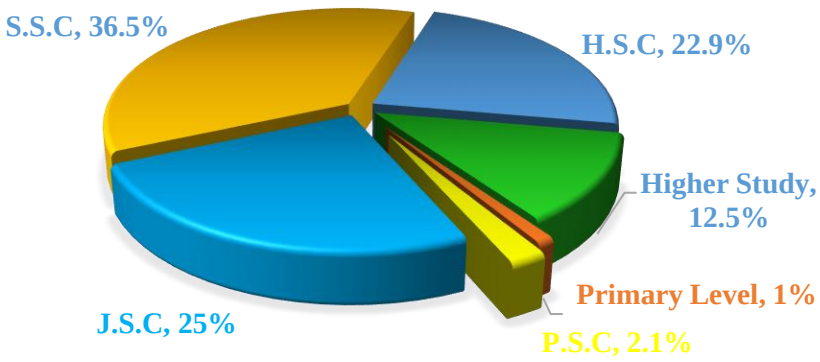
Figure 4.1: Housing condition of prawn farmers in study area.

In this study, the majority (38.5%) of the respondents had constructed house, 58.3% had semi-constructed or half building and 3.10% had non-constructed house (Figure 4.1).

4.5 Educational Status of the Respondents

Education is backbone of nation which generally regarded as an index of social improvement of community. It is also considered as an important measuring role for progressive altitude of the farm households in adopting modern technology. It

has its own merits and it contributes to economic and social development. It plays an important role in agricultural modernization. Education helps a person to have day-to-day information on the modern techniques together with technological scarce resources and maximizing profit. Figure 4.2 shows the educational status of different categories of farmers.



Source: Field survey, 2019

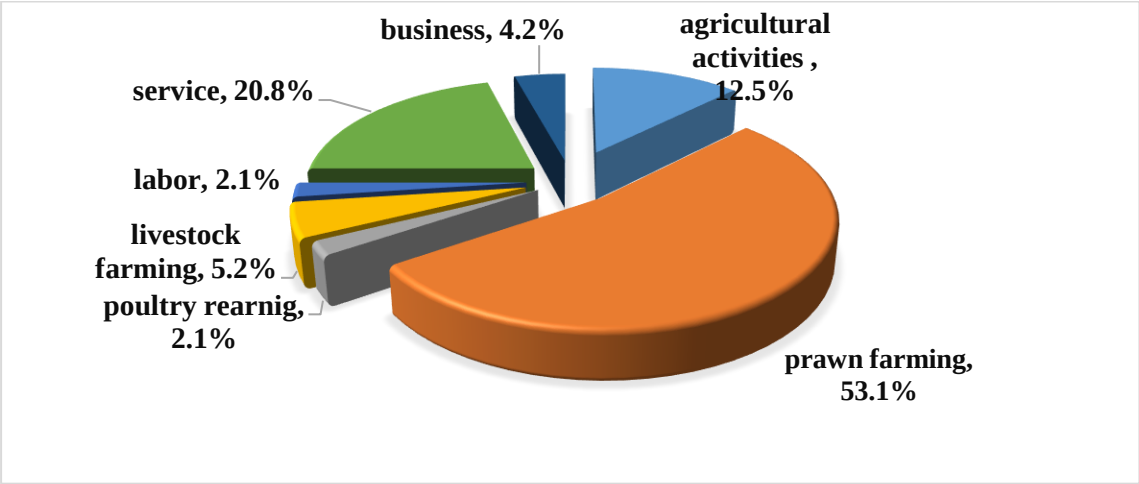
Figure 4.2: Educational Status of Prawn Farmers

It is evident from the figure 4.2 that most of the farmers had at least minimum level of education; 1% farmers get primary education, 2.1% farmers passed primary level (PSC) of education, 25% passed class eight (JSC), 36.5%, 22.9% and 12.5% farmers had SSC, HSC and graduate level of education respectively. (Figure 4.2)

4.6 Occupational Status of the Prawn Farmers

Any kind of activities in which a man is engaged more or less the whole year for earning a living can be considered as the occupation of the person. In our rural area people mainly choose agriculture as their occupation. Sometimes they involve in various agricultural and also non-agricultural sector at a time. In the present study, the selected farmers engaged in various types of occupation. It is observed that,

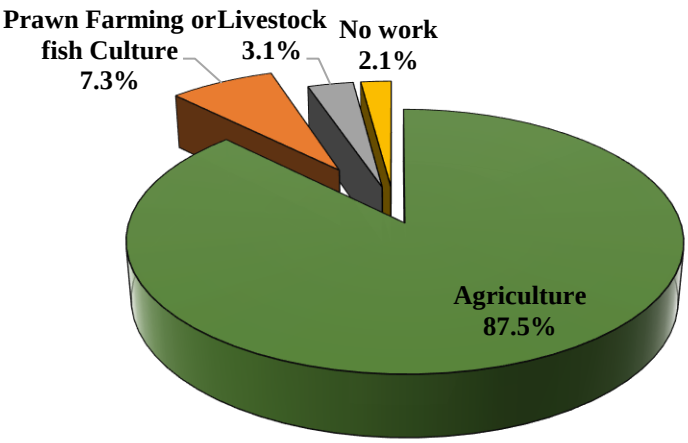
prawn farming was the main occupation of most of the farmers. Some of them were engaged in other activities. Main and subsidiary occupational status of the prawn farmers are shown in the following figure 4.3 and figure 4.4 respectively.



Source: Field survey, 2019

Figure 4.3: Main Occupation of the Prawn Farmers

From the figure 4.3, it is showed that 53.1 percent farmers involved in prawn farming as a main occupation. Besides this, 12.5 percent were doing agricultural activities, 20.8 percent were doing service in various sector, 5.2 percent involved in livestock farm, 4.2 percent were doing business, 2.1 percent were labor, 2.1 percent engaged in poultry rearing.



Source: Field survey, 2019

Figure 4.4: Subsidiary Occupation of the Prawn Farmers

By the evident of figure 4.4, 87.5 percent farmers involved in other agricultural activities, 7.3 percent are doing prawn farming as a subsidiary occupation. Besides this, 3.1 percent were doing livestock farming and 2.1 percent had no subsidiary occupation.

4.7 Ownership Pattern of Selected Sample Farmers

In our country most of the agricultural lands are divided and sub-divided into small plots mainly according to the law of inheritance. The ownership patterns of the prawn producing farmers were classified into three categories: single, double and multiple. Some of them leased a pond for prawn farming.

In prawn farming about 82.3 percent prawn farmers were single owner, 13.5 percent were belonged to double ownership and those of 4.2 percent is multiple ownership. Among them 17.7 percent leased in pond or gher for farming (Table- 4.3).

Table 4.3 Ownership Pattern of the Prawn Producing Farmers

Ownership Pattern	No.	Percent
Single owner	79	82.3
Double owner	13	13.5
Multiple owner	4	4.2
Total	96	100.0
Leased in pond or Gher		17.7

Source: Field survey, 2019

4.8 Size of Land Holdings of the Sample Farmers

In the present study the size of land holdings of the prawn producing farmers were classified into different categories. Size of land holdings includes homestead area, pond, own cultivable land, fellow land, leased in, leased out and mortgage in as reported by the sample farmers. It is evident from the table 4.4 that 4.44 percent, 4.32 percent, 68.95 percent, 5.91percent, 8.92 percent, 2.96 percent 1.89 percent, 2.62 percent areas were homestead area, pond area, cultivable land, fellow land, leased in, leased out, mortgage in and mortgage out area respectively hold by the sample farmers on an average.

Table 4.4 Size of Land Holdings of the Sample Farmers

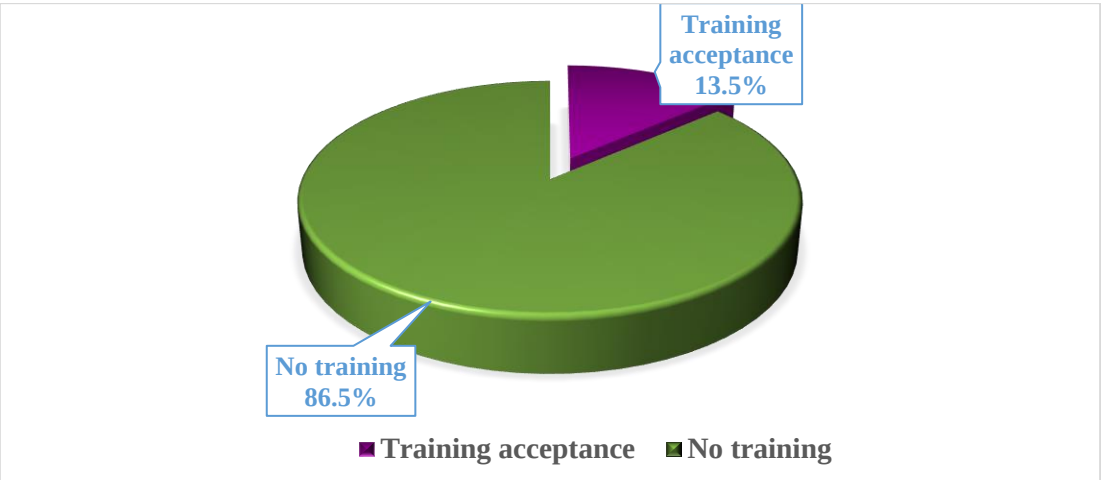
Type of land	Average of area (Decimal)	Percentage (%) of area
Homestead area	11.540	4.44
Pond area	11.2300	4.32
Cultivable land	179.150	68.95
Fellow land	15.350	5.91
Leased in	23.180	8.92
Leased out	7.680	2.96
Mortgage in	4.900	1.89
Mortgage out	6.800	2.62
Total	259.830	100

Source: Field survey, 2019

4.9Training Facilities of Sample Farmers

Training facilities is very important to enhance the skill and efficiency of the shrimp and prawn farmer. By learning from training, they can minimize their loss though correcting their fault which they had done before.

The present situation of training facilities in the study area are given below:



Source: Field survey, 2019

Figure 4.5: Training Facilities of Prawn Farmers

Here we can see that, training status is very poor among the prawn farmer. Among them 13.5 percent of farmers had training facilities while 86.5 percent of them had not (Figure: 4.5). All trained farmer was trained by government facilitate training.

4.10 Source of Income and Income Distribution of the Respondents

The yearly income of prawn farmers differs from one another. In the present study, the incomes of sample farmers were classified as mainly agricultural and non-agricultural sector. Agricultural sector categorized as follows: rice cultivation, prawn farming, poultry rearing, livestock rearing and other crop cultivation. On the other hand, business, service, foreign remittance and others are included in non-agricultural sector. In this study, 82.94% income is come from agricultural sector

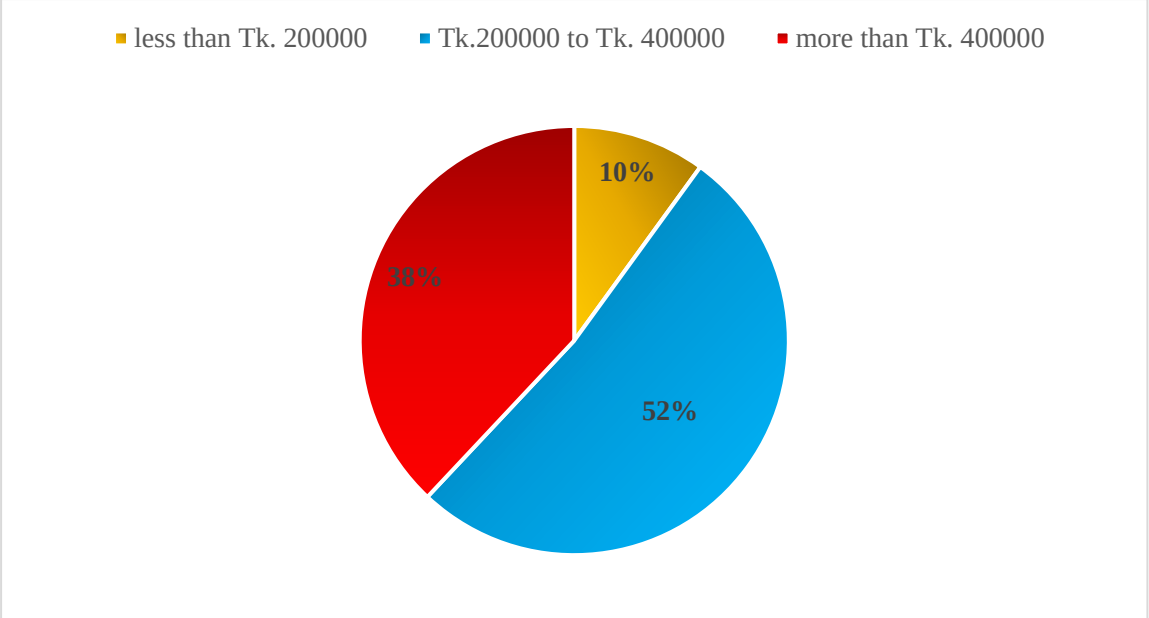
and 17.6% income is come from non-agricultural sector of the total income of sample farmers.

Table 4.5: Annual Income of the Respondents

Source of income	Average income (Tk)	Percent (%) of income
Agricultural sector		
Rice cultivation	113072.92	24.28
Prawn farming	235520.83	50.58
Poultry rearing	4302.08	0.92
Livestock	24739.58	5.31
Other crops/ Vegetable	8572.92	1.84
Total	**386208.33**	**82.94**
Non-agricultural sector		
Business	16666.67	3.58
Services	49458.33	10.62
Foreign remittance	9125.00	1.96
Other income source	4166.67	0.89
Total	**79416.67**	**17.06**
Total	**465625.00**	**100.00**

Source: Field survey, 2019

It is also evident from the figure 4.6 that most of the farmer's yearly income belonged to the category of Tk. 200000 to 400000. About 52 percent of the prawn producing farmers were earned Tk. 200000-400000 per year, 10 percent of the farmers were earned Tk. less than 200000 per year and 38 percent farmers were earned Tk. Above 400000 per year.



Source: Field survey, 2019

Figure 4.6: Income Distribution of the Farmers

4.11 Expenditure of the Respondents

The monthly expenditure of prawn farmers also differs from one another. In the present study, the expenditure of prawn farmers was categorized as follows: food, energy, medical purpose, education, clothing, transportation, festivals, house repair, cell phone expenditure, entertainments and others.

The table 4.6 represents the prawn producing farmer's expenditure. The table show that farmer expensed maximum for consumption. In this study, farmer expense monthly 52.40percent, 10.19 percent, 8.42 percent, 13.51 percent, 4.64 percent, 5.69 percent, 2.32 percent, 1.89 percent, 0.93 percent on food, energy, medical purpose, education, clothing, transportation, cell phone, entertainments and others respectively of the total monthly expenditure.

Table 4.6: Monthly Expenditure of the Respondents

Expenditure	Average expenditure	Percent (%) of expenditure
Food	8347.92	52.40
Energy	1622.92	10.19
Medical purpose	1341.67	8.42
Education	2153.13	13.51
Clothing	739.58	4.64
Transportation	907.29	5.69
Cell phone expenditure	370.21	2.32
Entertainments	300.79	1.89
Others	148.96	0.93
Total	15932.47	100

Source: Field survey, 2019

4.12 Sources of Credit Facilities and Indebtedness Status of the Respondent

For any kind of farming, available amount of farming is very necessary. The sources of credit facilities for the prawn producing farmers include Banks, NGOs, Relatives and others. In the study area different NGOs such as BRAC, ASA, CARE etc. are operating their services for providing loan to the poor farmers rate, so they can use this fund in the prawn farming business.

In study area about 92.71 percent borrowed from different source. And 7.29 percent farmers were used their own funding. From the table 4.7, it is fund that about 40.63 percent farmers were taken loan from Banks, 31.25 percent farmers were taken credit from NGOs and 11.46 percent farmers were taken loan from their relatives. 9.38 percent credit from others source as reported by the sample farmers (Table 4.7).

Table 4.7 Sources of Credit Facilities of the Sample Farmers

Items	No.	Percentage
Banks	39	40.63
NGOs	30	31.25
Relatives	11	11.46
Others	9	9.38
Own funding	7	7.29
Total	96	100

Source: Field survey, 2019

Most of the producers borrowed from banks. Table 4.8 shows the indebtedness of producers on the basis of borrow amount. Borrowed money was divided into four categories such as less than Tk. 50000, 50001-100000, 100001-150000, 150001-200000, more than 200000.

Table 4.8 Indebtedness of Sample Producers According to Amount of Borrowing

Amount borrowed (Tk)	Frequency	Percent
Less than 50000	27	31.8
50001-100000	28	32.9
100001-150000	6	7.1
150001-200000	14	16.5
More than 200000	10	11.8

Source: Field survey, 2019

It was observed from the table that 31.8 percent farmer borrowed less than Tk. 50000, 32.9 percent, 7.1 percent, 16.5 percent, 11.8 percent farmers borrowed Tk. 50001-100000, Tk. 100001-150000, Tk. 150001-200000 and more than 200000 respectively.

4.13 Concluding Remarks

This chapter considered the socio-economic attributes of the sample farmers of prawn farming. The findings of analysis clearly indicate the socio-economic characteristics from each other in respect of age distribution, education, occupation, farm size, culture technique, ownership pattern, training, income, expenditure etc. By the analysis of this study, the socio-economic status of the prawn farmers was overall similar.

CHAPTER V

COSTS AND RETURNS OF PRAWN FARMING

CHAPTER 5

COSTS AND RETURNS OF PRAWN FARMING

5.1 Introduction

Cost plays an important role to make right decision of the farmers in every production process. This chapter attempts to identify and pricing of cost items which are involved in prawn farming. Cost items of prawn farming were classified into two major categories as: variable cost and fixed cost. Labor, prawn fry, fin fingerling cost, feed, lime, urea, TSP, manure and miscellaneous costs were considered as variable cost. Cost and returns were calculated from farmer's point of view. Costs were calculated for all the family supplied and purchased inputs used in producing prawn. The market prices of concerned inputs and output of pond fish are discussed in this section.

In this chapter, in terms of prawn farming per hectare yield, gross return, gross margin, net return and undiscounted benefit-cost ratio (BCR) are revealed. All the returns were also accounted for the study period. A brief calculation is showing how the individual costs and returns were estimated in the present study is represented below.

For analysis, the cost items were classified under the following heads:

i. Human labor cost
ii. Prawn fry cost;
iii. Fin fish fingerling cost;
iv. Feed cost;
v. Fertilizer and Manure cost;
vi. Lime cost;

vii. Water management cost;

viii. Miscellaneous cost;

ix. Land use cost;

x. Construction of guard shed, office and other housing cost;

xi. Interest on operating capital (OC).

5.2 Variable Costs

5.2.1. Human labor cost

One of the most important variable inputs in the production process is human labor. From stocking to harvesting and marketing of fish, human labor was required in different operations and management such as- Gher preparation, Gher management and guard and feeding fish, grading and harvesting fish etc. Mainly human labor was classified into: (a) hired labor and (b) family labor. Hired labor costs is easy to calculate where the family labor costs are not so. To determine the cost of family labor, the opportunity cost concept was used.

In this study, the opportunity cost of family labor was assumed to be as wage rate per man i.e., the wage rate, which the 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). In this study, a man-day was considered to be 8 hours of work. For avoiding complexity, average rate has been taken into account. Labor wage rate varies with according to different seasons. In the study area, it varied from 200 to 350 Tk. per man-days. Thus, the computed average rate was Tk. 270 per man-days for prawn farming.

The number of Human labor and its relevant cost were shown in table 5.1. The per hectare labor cost was Tk. 31050 which constituted 5.62 percent of total variable cost.

5.2.2 Cost of Prawn Fry

Prawn fry is a key input of prawn farming in the study area. The farmers used purchased fingerling from different fry collectors and hatcheries. The price of per unit of fry is not same in everywhere. It is varied from location to location and as well as time to time. Here cost was calculated on the basis of which price is actually paid by the farmers. The average price of prawn fry was Tk. 2 per piece. Per hectare average 22235 number of prawn fries were used and the costs of prawn fry was estimated at Tk. 44470 which constituted 8.04 percent of total variable cost (Table 5.1).

5.2.3 Cost of Fin Fish Fingerlings

Prawn farmers produced some other fish side by side with prawn production. They used purchased fingerlings from hatchery. These included fingerlings are of Rui, Silver Carp, Mrigal, Katol, Grass Carp, Japanese Carp etc. The average price of per kg fin fingerling is calculated as Tk. 132. Average 979.37 kg fingerling was used per hector and the cost of it was about 129276.84 Tk. It was 23.39% pf total variable cost (Table 5.1).

5.2.4 Cost of Feed

Supplementary feed was applied for better growth and survival of prawn fry as well as the other fin fingerling in the Gher. Feed can complement nutritional deficiency. In the study area, it was observed that the prawn farm owners used different kinds

of supplementary feeds which were rice bran, wheat bran and oil cake etc. They also used some industrial feed like Mega feed, Ruposhi Bangla feed, Paragon feed, Quality feed etc.

The average cost of different types of feed was calculated at Tk. 30 per kg during the study period. Per hectare average costs of feed were calculated at Tk. 297873.9 which was found to be 53.89 percent of total variable cost (Table 5.1).

5.2.5 Cost of Fertilizer and Manure

Fertilizer is generally used in the Gher to create condition, which facilitates an increase in production of good quality natural fish feed, thereby increasing fish production. Fish farmers used Urea and TSP as fertilizer. These fertilizers prices were supposed to be same in all categories of farms. The price of per kg Urea and TSP was Tk. 16 and Tk. 22 respectively in the study area. The cost of fertilizer which is estimated is shown in table 5.1. It was showed that, prawn farmers incurred average per hector cost of Tk. 3557.92 for Urea and Tk. 4833.4 for TSP which constituted 0.64% and 0.87% respectively of total variable cost (Table 5.1).

Farmers mainly used cow dung as organic fertilizer or manure for producing prawn. They usually used purchased manure which was no fixed rate for buying in the study area. Cost of manure was computed at the prevailing market price, which was estimated to be Tk. 2 per kg during the study period. Per hectare cost of using manure was calculated at Tk. 347.4 for practicing prawn farming which accounted for 0.7 percent of total variable cost (Table 5.1).

5.2.6 Cost of Lime

Another common input which is used in prawn cultivation is lime. It is used mainly to neutralize acidity in soil and water of the Gher. This input assists in release of nutrient from the soil and promotes the bacterial breakdown of water material including green manure. Cost of lime was assumed at the price actually paid by the farmers. The average price of lime was estimated to be Tk. 25 per kg during the study period. There is a specific dose is required for lime application, but the farmers in the study area used 77.75 kg/ha for prawn production. Average per hectare costs of lime was calculated at Tk. 1943.75 which constituted 0.35 percent of total variable cost (Table 5.1).

5.2.7 Water management cost

Water supply is needed at the appropriate time for the proper growth of prawn and its survival. Without water fish cannot be cultivated. When water level become low, fish can't survive for deficiency of oxygen and other important elements. In the study area farmers used motor for water uplifting and supplying it to the Gher. So, cost of diesel was computed on the basis of prevailing market rate. The cost of diesel was calculated at Tk.78 per liter during the study period. Average per hectare costs of saline water uplifting were calculated at Tk. 10282.74 which was 1.86 percent of total variable cost (Table 5.1).

5.2.8 Miscellaneous Cost

Prawn farmers need to bear some other variable cost for purchasing different material, such as rope, light, umbrella, bamboo, boat, treatment of fish, transportation, netting, commission for caretaker, rent of motor etc. These

miscellaneous costs were accumulated on all incidental expenses paid by the farmers. In the study area, per hectare average miscellaneous costs for prawn farming was found to be Tk. 11244.33 which constituted 2.04 percent of total variable cost (Table 5.1).

Table 5.1: Per Hectare Variable Costs of Prawn Farming

Variable cost items		Units	Quantity	Price/Unit (Tk)	Cost (Tk)	% of total
Human labor		Man-days	115	270	31050	5.62
Prawn fry		Numbers	22235	2	44470	8.04
Fin fingerling		kg	979.37	132	129276.84	23.39
Feed		kg	9929.13	30	297873.90	53.89
Fertilizer and Manure	**Urea**	kg	222.37	16	3557.92	0.64
	TSP	kg	219.7	22	4833.40	0.87
	Manure	kg	173.7	3	347.40	0.07
Lime		kg	77.75	25	1943.75	0.35
Water Management (diesel)		Liter	131.83	78	10282.74	1.86
Miscellaneous Cost					11244.33	2.04
Interest on operating capital (OC)					17829.34	3.23
Total Variable Cost (TVC)					**552709.62**	**100**

Source: Field survey, 2019

5.2.9 Interest on Operating Capital (IOC)

Interest on operating capital (IOC) dictated on the basis of opportunity cost principle. This cost was incurred throughout the total production period; hence, at the rate of 10 percent per annum interest on operating capital for eight months was computed for prawn production. Interest on operating capital was calculated 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 10% per year during the study period.

In prawn farming, the interest on operating capital was estimated at Tk. 17829.34 which constituted 3.23 percent of total variable cost (Table 5.1).

5.2.10 Total Variable Cost

In the study area, the total variable costs diverse from year to year. It was revealed that the total per hectare variable cost for shrimp farming was Tk. 552709.62 which comprised of 87.12 percent of total cost (Table5.3).

5.3 Fixed Costs

5.3.1 Land Use Cost

The land as per the conditions of leasing arrangement are used by the farmers. The term leasing cost explains the cost which was needed for prawn farmers to take land lease which would be used for prawn production for a particular period of time.

Leasing cost varies from place to place. In the study area almost, all land was used for Gher system. Land use cost for prawn farming was estimated at the prevailing rental value per hectare in the study area. The rental value of prawn farming of per hectare land was estimated at Tk. 69464.26 which occupied 85.04 percent of total fixed cost (Table 5.2).

5.3.2 Others Cost (Pond Maintenance, Construction of Guard Shed)

Guard shed was constructed to protect prawn from thieves and dacoits. Pond or Gher maintenance is very important for cultivation of prawn. The per hectare of those cost were calculated at Tk. 12222.73 for prawn farming which shared 14.96 percent of total 40 fixed cost (Table 5.2).

Table 5.2 Per Hectare Fixed Costs of Prawn Farming

Cost items	Cost (Tk./ha)	% of TFC
Land use cost	69464.26	85.04
Others cost (pond maintenance, construction of guard shed)	12222.73	14.96
Total Fixed Cost	**81686.99**	**100**

Source: Field survey, 2019

5.3.3 Total Fixed Cost

In the study area, it was revealed that per hectare total fixed cost for year-round prawn farming was Tk. 81686.99 which comprised of 12.88 percent of total cost (Table 5.3).

5.4 Total Cost

The total costs were estimated by accumulated total variable cost and total fixed cost. In the study per hectare total cost of prawn farming was calculated at Tk. 634396.6149 (Table 5.3).

Table 5.3 Per Hectare Total Cost of Prawn Farming

Cost items	Cost (Tk./ha)	Percent of total cost (%)
Total variable cost	552709.62	87.12
Total fixed cost	81686.99	12.88
Total cost	**634396.61**	**100**

Source: Field survey, 2019

5.5 Returns of Prawn Farming

5.5.1 Gross Return

Gross return is the value of fish produced in money terms. This is calculated by multiplying the total amount of production by their respective market prices. In the study area, farmers did not cultivate not only prawn but also fin fish which brought a large amount of monetary value. Per hectare average yield of prawn was 682.49 kg and its monetary value was Tk. 558673.52. Prawn have a different grading system which is graded on the basis of size (weight). Here the grading was done on the basis of number of pieces of prawn which was forming one kg as reported by the farmer. For calculation, three types of grading system were followed -

- A-grade: 10-15 numbers of prawn is required to make 1kg weight.
- B-grade: 20-29 numbers of prawn is required to make 1kg weight.
- C-grade: 30+ numbers of prawn is required to make 1 kg weight.

A total of 682.49 kg of prawn were produced in per hector of pond land, whose financial value is about Tk. 558673.52. Individually, per hector production of Grade-A is 245.16 kg, Grade-B is 222.37 kg and Grade-C is 214.96 kg while their monetary value is Tk.265017.96, Tk.187680.28, Tk.105975.28 respectively. Percentages of gross return of Grade-A is 25.26%, Grade-B is 17.89%, Grade-C is 10.1% and return from fin fish was 46.75% (Table 5.4).

Table 5.4 Per Hectare Return of Prawn Farming

Items	Yield(kg/ha)	Price (Tk./kg)	Gross income (Tk./hectare)	Percent of gross income
a) Prawn				
A-grade	245.16	1081	265017.96	25.26
B-grade	222.37	844	187680.28	17.89
C-grade	214.96	493	105975.28	10.1
Subtotal	**682.49**		**558673.52**	**53.25**
(b) Fin fish				
Rui	569.61	224	127592.64	12.16
Silver carp	1443.09	129	186158.61	17.74
Mrigal	634.46	160	101513.6	9.68
Other fishes (Katol, Grass Carp, Japanese fish etc.)	464.04	162	75174.48	7.17
Subtotal	**3111.2**		**490439.33**	**46.75**
Gross return from prawn and fin fish			**1049112.85**	**100**

Source: Field survey, 2019

Apart from these, other species of fishes were also grown in prawn farms that are known as fin fish included Rui, Silver carp, Mrigal, Katol, Grass carp, Japanese carp etc. Per hectare average yield of fin fish was 3111.2 kg and its money value were Tk. 490439.33. Therefore, the gross return for one-year prawn farming was accounted for Tk 1049112.85.

5.5.2 Net Return

In general sense, net return is called as entrepreneur's income. For evaluate the profitability of prawn production, net return is an important aspect. Net return is the difference between gross return and total costs of production. In this study, per hectare net return for prawn production was estimated at Tk. 414264.3 (Table 5.5).

5.5.3 Gross Margin

Table 5.5 Gross Margin and Benefit Cost Ratio (Undiscounted) of Prawn Farming

Sl. No.	Items	Amount (Tk./hectare)
a)	**Gross returns (GR)**	1049112.85
b)	**Total variable costs (TVC)**	552709.62
c)	**Total fixed cost (TFC)**	81686.99
c)	**Total costs (TC=TVC+TFC)**	634396.61
d)	**Net return (GR-TC)**	414716.24
e)	**Gross margin (GR-TVC)**	496403.23
f)	**Benefit-cost ratio (BCR) = GR/TC**	1.65

Source: Field survey, 2019

All producer usually wants to achieve the maximum level of return over variable cost of production. Because the estimation of fixed cost of production is difficult to

determine. For that reason, the gross margin analysis has been taken into account to calculate the relative profitability of prawn farming. The gross margin of prawn farming was estimated at Tk. 496403.23 (Table 5.5).

5.5.4 Benefit Cost Ratio (Undiscounted)

Average return to each Taka spent in production is a vital criterion for measuring the profitability of growing any enterprise. In this study, BCR (undiscounted) is the ratio of gross return to gross cost. In the case of year-round golda farming BCR was 1.65. It is relative measure, used to compare benefit per unit of cost. Here BCR was used to see the profitability of production Benefit cost ratio was calculated by dividing gross return by gross cost or total cost. It implies return per taka invested. It helps to analyze financial efficiency of the farm. It was evident from the study that the benefit cost ratio of prawn farming was accounted for 1.65 implying that Tk. 1.65 would be earned by investing Tk. 1.00 for prawn production. So, the prawn farming was found to be profitable for farmers (Table 5.5).

5.6 Concluding Remarks

It was determined from the results that per hectare total variable cost for prawn farming were more than per hectare total fixed costs for prawn farming. Shrimp farming provides a good return to the farmers. Farmers are willing to cultivate prawn for its higher yield potentiality and high demand in the international market.

CHAPTER VI

FACTORS AFFECTING RETURNS OF PRAWN

CHAPTER 6

FACTORS AFFECTING RETURNS OF PRAWN FARMING

6.1 Introduction

This chapter mainly deals with estimating the effects of the major variables on prawn production process of year-round. Cobb-Douglas production function was chosen to determine the contribution of key variables on the production process of prawn farming.

6.2 Functional Analysis for Measuring Production Efficiency

Production function is a relation or a mathematical function specifying 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 prawn farming, seven explanatory variables were chosen to estimate the quantitative effect of inputs on output. Those foctors were prawn fry fin fingerlings, feed, fertilizer & manure, lime and human labour.

Management factor was excluded from the model because specification and measurement of management factor is almost impossible particularly in the present study, where a farm operator is both a labor and manager. Other independent variables like water quality, soil condition, time etc., which might have affected production of prawn farm, were also not included in the model on the basis of some preliminary estimation. A brief description is presented here about the explanatory

variables included in the model. The estimated values of the model are presented in Table 6.1.

6.3 Estimated Values of the Production Function Analysis

i. F-value was revealed 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 explanatory 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 calculateded 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 prawn production are shown in Table 6.1.

Table 6.1 Estimated Values of Coefficients and Related Statistics of Cobb-Douglas Production Function.

Explanatory variables	Coefficient	Standard Error	t value	P-value
Intercept	5.693***	1.179	4.830103	0.000
Cost of prawn fry (X_1)	0.075**	0.032716	2.301691	0.020
Cost of fin fingerlings (X_2)	0.175*	0.102108	1.713138	0.090
Cost of labor (X_3)	0.048***	0.016711	2.892843	0.005
Cost of feed (X_4)	0.375***	0.040883	9.170713	0.000
Cost of fertilizer & manure (X_5)	0.033^{NS}	0.03875	0.84739	0.399
Cost of lime (X_6)	0.028^{NS}	0.041902	0.668751	0.505
Cost of water management (X_7)	-0.054^{NS}	0.094475	-0.5734	0.568
R^2	0.721			
Adjusted R^2	0.699			
Return to scale	0.68			
F-value	32.448***			

Source: Field survey, 2019

Note: *** Significant at 1 percent level;

** Significant at 5 percent level;

*Significant at 10 percent level; and

. NS: Not Significant

6.4 Interpretations of Results

Cost of prawn fry (X_1): The estimated coefficient of prawn fry was 0.075 and significant at 5 percent level for prawn farming. It indicates that 1 percent increase in the cost of prawn fry, keeping other factors constant, would increase gross returns by 0.075 percent (Table 6.1).

Cost of fin fingerlings (X_2): The estimated coefficient of fin fingerlings was 0.175 and significant at 10 percent level for prawn farming. It implies that 1 percent increase in the cost of fin fingerlings, keeping other factors constant, would increase gross returns by 0.175 percent (Table 6.1).

Cost of labor (X_3): The regression coefficient of human labor was 0.048 and significant at 1 percent level for prawn farming. It implies that 1 percent increase in the quantity of human labor, keeping other factors constant, would increase gross production by 0.048 percent (Table 6.1)

Cost of feed (X_4): The estimated coefficient of feed cost was 0.375 which was positive and significant at 1 percent level for prawn farming. It indicates that 1 percent increase in the feed cost, keeping other factors constant, would increase gross returns by 0.375 percent (Table 6.1).

Cost of fertilizer & manure (X_5): The regression coefficient of fertilizer cost was 0.033 which was positive but insignificant at prawn farming. It revealed that other factors remaining constant,1 percent increase in the fertilizer cost would increase gross returns by 0.033percent (Table 6.1).

Cost of lime (X_6): The regression coefficient of lime cost was 0.028 which was positive but was not significant at prawn farming. It indicates that other factors remaining constant,1 percent increase in the lime cost would increase gross returns by 0.028 percent (Table 6.1).

Cost of water management (X_7): The regression coefficient of water management cost was -0.054 which was negative and was not also significant at prawn farming.

It states that other factors remaining constant,1 percent increase in the water management cost would decrease gross returns by 0.054 percent (Table 6.1).

6.5 Coefficient of multiple determinations ($R^{2)}$

The values of the coefficient of multiple determination of prawn farming was 0.72 which implied that about 72 percent of return from farm was explained by explanatory variables, which were include in the model and it is also revealed that excluded variables accounted for 28 percent of variation in prawn farming. We can be said that the goodness of fit of this regression model is better since R^2 states the goodness of fit of the regression model (Table 6.1).

6.6 Adjusted R^2

Here the term adjusted defines adjusted for the degrees of freedom. The adjusted R^2 for prawn farming was found to be 0.699 which indicated that about 69.9 percent of the variations of the output were explained by the explanatory variables included in the model (Table 6.1).

6.7 Returns to Scale in Prawn Production

Returns to scale reflect the degree to which a proportional change in all inputs caused change in the output. It can give three types of value-

1) Constant Return to scale (=1)
2) Increasing Return to scale (>1) and
3) Decreasing Return to scale (<1)

The analysis estimates the returns to scale directly. Returns to scale are the summation of all the production coefficients of accepted explanatory variables ($\sum b_i$). The sum total of all production coefficients (production elasticities) of the equation was 0.68. That indicates that production function for prawn farming exhibits diminishing return 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 0.68 percent (Table 6.1).

6.8 F-value

The F-statistic of the equation was computed to denote the overall goodness of fit of any fitted model. The F-value for the prawn farming was found 32.45 which were highly significant at 1 percent level. It implies that the explanatory variables included in the model were important for explaining the variation in prawn production. Thus, the inclusion of independent variables was reasonable. (Table 6.1).

6.10 Resource Use Efficiency in Prawn Production

Resource use efficiency is very important to measure how properly the resources are used achieving effective result of the production process. To attain the objectives of profit maximization for efficient allocation of resources, one should utilize more of the variable resource as long as the value of the added product is greater than the cost of the added amount of the resource used in producing it. Resource use efficiency was considered that a ratio equal to unity indicated the optimum use of that factor, a ratio more than unity indicated that the yield could be increased by using more of the resources. A value of less than unity indicated the unprofitable level of resource use, which should be decreased to minimize the losses because farmers over used this variable. The negative value of MVP indicates the indiscriminate and inefficient use of resource.

The ratio of MVP and MFC of prawn fry was 1.74 for prawn production which was positive and more than one. That indicated that in the study area prawn fry was under used (Table 6.2). So, farmers should increase the use of prawn fry to attain efficiency considerably.

The ratio of MVP and MFC of fin fingerling was also more than on which was 1.29. that implies that fin fingerling in the study area was underutilized. That means farmers should increase the use of fingerling of fin to achieve efficiency level.

It was evident from the table 6.2 that the ratio of MVP and MFC of human labor was 1.67 for prawn farming was positive and more than one, which means that in the study area use of human labor for prawn farming was under used. So, farmers should increase the use of human labor to attain efficiency in prawn production.

Table 6.2 showed that the ratio of MVP and MFC of feed was 1.24 for prawn farming was positive and more than one, which indicated that in the study area feed for prawn growth was under used. So, farmers could increase the use of prawn feed to attain efficiency level of production.

Table 6.2 Estimated Resource Use Efficiency in Prawn Production

Variables	GM	MVP	MFC	MVP/MFC	Comment
Prawn fry	20515.67	3.48	2	1.74	Under utilized
Fin fingerling	975.77	170.63	132	1.29	Under utilized
Labor	101.46	450.09	270	1.67	Under utilized
Feed	9563.63	37.31	30	1.24	Under utilized
Fertilizer &manure	602.07	52.15	13	4.01	Under utilized
Lime	75.68	352.01	25	14.08	Under utilized
Water management	131.32	-391.22	78	-5.02	Over utilized

Source: Field survey, 2019

Table 6.3 revealed that the ratios of MVP and MFC of fertilizer and manure used for prawn production was positive and more than one which was 4.01. It indicated that fertilizer and manure application was underutilized. So, farmers could increase the use of fertilizer and manure to attain efficiency in prawn production.

The ratio of MVP and MFC of lime was found to be 14.08 for prawn farming was positive and also more than one, which indicated that in the study area use of lime for prawn production was under used (Table 6.2). So, farmers should increase the use of lime for prawn production to attain efficiency considerably.

The ratio of MVP and MFC of water management -5.02 for prawn farming was negative and less than one, which indicated that in the study areas use of water for

prawn production was over used (Table 6.2). So, farmers should decrease the use of water to attain efficiency considerably.

6.11 Concluding Remarks

It is revealed from the Cobb-Douglas production function model, that the included key variables had significant and positive effect on prawn production except the negative and insignificant effect of cost of water management. Resource use efficiency indicated that all of the resources were under used for prawn production except overutilization of water. So, there is a positive effect of key factors in the production process of year-round prawn farming.

CHAPTER VII

PROBLEMS AND SUGGESTIONS OF PRAWN FARMING

CHAPTER 7

PROBLEMS AND SUGGESTIONS OF PRAWN FARMING

7.1 Introduction

In Bangladesh, fishery as a source of livelihood has been an age-old practice for thousands of fishermen. But fishermen are lag behind by socially, economically and educationally. The purpose of this chapter is to identify the major barriers in running the business of prawn farming. The problems and constraints faced by the producers were identified according to opinions given by them. Thereafter, the problems were ranked on the basis of their percentages.

7.2 Problems Faced by the Producers

The farmer of south zone of our country have been doing Gher cultivation system. By this system they cultivate prawn and shrimp mainly. In the study area, it was observed that the producers faced a lot of problem to get a satisfactory production of prawn. It is showed that they do not get the required quantity of fingerling, feed, technical support and finally expected price of their products. They were financially not so capable enough to invest the required fund due to their low capital base. For sake of easy comprehension these problems can be grouped into four general categories:

i. Economic problems
ii. Technical problems
iii. Social problems

iv. Marketing problems

7.2.1 Economic Problems

It was found that producers faced some economic problems relating to the production of prawn. The major economic problems were:

Lack of credit facilities: Non- availability of credit was limiting factor in producing of prawn**.** Most of the farmers were not economically solvent. They had to borrow money from local NGOs or bank at higher interest rate for continuing prawn production. About 30.21 percent of farmers reported that lack of sufficient fund was one of the major problems for them (Table 7.1). They pointed out that when they need loan for farming as per possible amount, they did not get that help from institutional sources due to complicated bureaucratic procedures. To eliminate this problem, immediate steps should be taken to simplify the lending procedures as early as possible.

High price of inputs: Some producers complained that non-availability of inputs was a barrier in the way of expanding the two categories of enterprise. About 36.46 percent of farmers reported that high price of input was one of the most important problems for prawn farming (Table 7.1). But at present high price of input is not a major problem for the farmers. Because the government is already given subsidy on fertilizer like urea and other inputs required for prawn farming.

7.2.2 Technical Problems

Technical problems were related with production techniques. Technical problems included lack of scientific knowledge and method, lack of extension service, lack of good seed and feed etc.

Lack of good quality prawn fry: Lack of good quality of prawn fry was one of the limiting factors o production of prawn in the study area. About 29.17 percent of farmers reported that. Producer depends largely upon timely availability of good and healthy prawn fry. To overcome the problem adequate number of prawn hatchery should be set up in the area.

Attack of disease infestation: About 38.54 percent of prawn producing farmers reported that attack of prawn disease hampered the production of prawn (Table 7.1). To overcome this problem, scientific use of chemicals should be ensured and supplementary supply of artificial irrigation should be arranged in dry season. Extension workers, Upazila Fisheries Officers (UFO) & FRI scientists may take initiatives to ensure scientific approach to overcome this problem. Water should be infected and necessary supervision should be done to protect the prawn from disease.

Natural hazard: About 7.29 percent of farmers said about the natural hazards but when any natural hazard come it impact a lot for an area. Farmers face a huge loss for those calamities like Sidr, Aila etc.

Lack of scientific knowledge: Scientific knowledge and skilled labor are essential for any farming. Among the respondent farmers, some farmers had basic knowledge of input use, but there were many farmers who had a lack of knowledge in farming of prawn. In the study area, about 16.67percent of farmers claimed that they had lack of scientific knowledge and technology (Table 7.1). Training including optimum application of fertilizers, feeds, fingerlings and lime should be given.

Research organizations and NGOs can play a vital role to provide scientific knowledge and technology to farmers**.**

Water problem according to season: Seasonal change create a great impact on any farming production. Uncertainties due to flooding during the heavy rains in rainy season, the fish farms become flooded and fish escape from one field to another. On the other hand, prawn producing farmers also mention that insufficient water in dry season hampered production of prawn. About 26.04 percent of prawn producing farmers reported such type of problem in the study area (Table 7.1). Flooding problem can be solved by making embankment, proper canal and drainage system. And to reduce the problem during rainy reason, government may keep the diesel price at a reasonable level so that farmers can supply sufficient water in the canal in dry season.

Lack of extension facilities: About 9.38 percent of farmers complained that they did not get extension services regarding the improved method of prawn production (Table 7.1). Farmers used traditional method of prawn cultivation. For these reasons, extension workers should pay an immediate attention to this matter for the improvement of this situation.

Unavailable of good quality feed: Good quality feed is the one of the major inputs in the farming system. But when food contains lack of nutritional elements then the fish grow become slow and farmer may face loss for production. About 18.75 percent farmer claimed that feed of prawn did not achieve the FCR (Feed conversion ratio) level.

Electricity problem in Gher: In the study area, there were no electricity facilities in the Gher which may help for thief and create problem to observation at night. About 17.71 percent farmer mentioned the problem (Table 7.1)

7.2.3 Social Problems:

Some producers complained about some social problems in producing prawn in Gher system. Social problem included thefts of fish from the farm, conflict for land in multiple ownership etc. These are discussed below:

Thefts of fish from farm: About 26.04 percent of prawn producing farmers reported that theft of prawn from farm was another vital problem. Farmers should look after their prawn farm at a regular basis. A guard could be appointed for the prawn farm. Though guard haired is costly, local government should provide the social security.

Multiple ownership problem: Though multiple ownership of farming is helpful but there have some barriers too. About 3.13 percent of prawn producing farmers reported that they were suffering from this problem (Table 7.1). Measures should be taken to resolve the land use conflict and profit distribution properly.

7.2.4 Marketing problems

Marketing problems are related to transportation, price instability, lack of marketing facilities. Those are briefly discussed here:

Table 7.1 Major Problems Faced by the Sample Farmers

Problems and Constraints	No. of producers reporting	Percent	Rank
Economic problems:			
Lack of credit facilities	29	30.21	3rd
High price of inputs	35	36.46	2nd
Technical problems:			
Lack of good quality prawn fry	28	29.17	4th
Attack of disease infestation	37	38.54	1st
Natural hazard	7	7.29	12th
Lack of scientific knowledge	16	16.67	10th
Water problem according to season	25	26.04	5th
Lack of extension facilities	9	9.38	11th
Unavailable of good quality feed	18	18.75	8th
Electricity problem in Gher	17	17.71	9th
Social Problems:			
Thefts of fish	25	26.04	5th
Multiple ownership problem	3	3.13	13th
Marketing problems			
Instable price of fish	22	22.92	6th
Lack of marketing facilities	17	17.71	9th
Lack of transport facilities	19	19.79	7th

Source: Field survey, 2019

Note: One Prawn farmer reported more than one problem, so addition of percentage will not necessarily equal to 100.

Instable price of fish: About 22.92 percent of farmer claimed that price fluctuation of fish creates a great problem for them. They had stared their farming with a general idea about the price of output but when price level become suddenly down at the time of their fish harvesting, the had to accept the low return. Government may fix a market price to overcome this situation (Table 7.1).

Lack of marketing facilities: there had lack of facilities for selling their output and as well as buying inputs. About 17.71 percent of farmer reported that there were inadequate marketing facilities such storage and high cost of transportation.

Lack of transport facilities: According to the farmers this was one of the major barriers of prawn farming. About 19.79 percent of prawn farmers complained about this problem. Local government should take necessary steps for solving the problem.

7.3 Suggestions of the Prawn Farmers

After analyzing the problems prawn farmers gave some suggestions which were easy procedure in obtaining loan, ensuring credit facilities at lower interest rate, supplying quality feed, development of transportation facilities, arrangement of training program, establishment of hatchery. The respondents thought that these suggestions could help them in prawn farming. The suggestions are listed below-

To maintain easy procedure in obtaining loan: The formality which should maintain to get a loan is not easy process. About 16.67 percent of the farmer suggested that the bank and the NGO should maintain easy procedure in obtaining loan.

Table7.2 Suggestions of the Prawn Farmers

Suggestion	No. of producers reporting	Percent	Rank
To maintain easy procedure in obtaining loan	16	16.67	6th
Ensuring credit facilities at lower interest rate	29	30.21	1st
Supplying quality feed	18	18.75	5th
Development of transportation facilities	19	19.79	4th
Arrangement of training program	16	16.67	6th
Establishment of hatchery	28	29.17	2nd
No idea	20	20.83	3rd

Source: Field survey, 2019

Note: One prawn farmer reported more than one suggestion, so addition of percentage will not necessarily equal to 100.

Ensuring credit facilities at lower interest rate: Farmers needed credit at lower interest rate for prawn farming. It could help them to enhance the production and also inspire the respondents. 30.21 percent of farmer mentioned to give them loan in a lower interest rate.

Supplying quality feed: Feed is very much important for the growth of prawn. For the better production good quality feed should be needed which was also told by 18.75 percent of farmer in the study area.

Development of transportation facilities: About 19.79 percent of prawn farmers in the study suggested to develop the transportation facilities for transferring prawn from Gher to market or any other places. As prawn are perishable product, so quick transportation should be done. So, the respondents wanted this facility.

Arrangement of training program: Lack of training facilities was one of the major problems of prawn farming. So, about 16.67 percent of the respondents of prawn farming mention that it was highly needed training facilities for enhancing their knowledge and bring great productivity of prawn.

Establishment of hatchery: About 29.17 percent of Prawn farmer suggested that they need hatchery for prawn production. For out of season production and genetic improvement hatchery is needed by the prawn farmers.

No Idea: The farmers who gave no suggestion were 20.83 percent in prawn farming respectively.

7.4 Concluding Remarks

The above problems and constraints effect a lot in a farm. Of course, some of them are interrelated with one another, need to be removed comprehensively through an integrated program for the overall development of prawn (galda) farming. Problems faced by the farmers were ranked on the basis of corresponding percentages. Most of the farmers were reported that attack of disease infestation was the main constraint for their prawn production. And this problem occupies first position according to its ranking. I also agree with their answer. If proper vaccine were given and direct entry of water at the right time were provided then the production will be increased significantly and thus the farmers will be benefited.

The suggestions which were suggested by farmers should give more emphasize. Because farmers gave the suggestions by their field experience. So besides govt. initiatives these suggestions should also be implemented.

CHAPTER VIII

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

CHAPTER 8

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

8.1 Summary

Bangladesh is considered one of the most suitable regions for fisheries in the world. This sector is playing an important role in the economy of Bangladesh. This sector also plays an important role in nutrition, employment and foreign exchange earnings.

Agriculture sector contributes about 14.23 percent to the country`s Gross Domestic Product (GDP) in the FY 2017-18. In 2017-18, fisheries sub-sector contributed about 3.57 percent to the Gross Domestic Product (GDP). The production of fish in different kinds of water bodies are increasing day-by-day by using of modern technology. Fish production has increased to 42.8 lakh MT in 2017-18, which was 35.5 lakh MT in 2013-14. Bangladesh is gifted with vast water bodies. About 797851 ha of water area is inland close water is used for cultured fish and 258681 ha of water area is used for Shrimp and Prawn farming where 122550 MT of shrimp and prawn is produced in FY 2017-2018. The country earned about Tk. 4309.94 crore during the year 2017-18 by exporting fish, shrimp and prawn of contributes Tk. 3527.07 crore.

In this context, the specific objectives of the study were formulated to determine relative profitability and to assess the resource use efficiency of prawn farming in selected areas of Satkhira district. The specific objectives were as follows:

a) To identify the socio-demographic profile of the farmers.

b) To calculate the profitability of prawn farming.

c) To assess the resource use efficiency of prawn farming.

d) To address the problems and suggest some policy recommendations for the improvement of prawn farming.

The study was mainly built on primary data, which were collected by the researcher herself through interviewing the sample farmers. A total of 96 year-round prawn farmers were selected from two villages namely, Raypur and Ghorchala under Bolli union at Satkhira Sadar upazila in Satkhira district. Survey method was followed to collect production related data while, simple random sampling technique was used to select the prawn farmers. Tabular as well as statistical technique was followed to fulfill the objectives of the study.

With respect to socioeconomic features of the sample farmers, this was revealed that the young to meddle aged farmer of the prawn farm were included. The classified four age groups were less than 31 years, 31-45 years, 45-60 years and above 60. Out of the total sample farmers 10.4 percent belonged to the age group of less than 30 years, 45.8 percent belonged to the age group of 31-45 years, 39.6 percent belonged to the group of 46-60 years and 4.2 belonged to the group of above 60. The average family sizes of the prawn producing farmers was found to be 4.18. In this study most of the farmers had at least minimum level of education; 1%

farmers get primary education, 2.1% farmers passed primary level (PSC) of education, 25% passed class eight (JSC), 36.5%, 22.9% and 12.5% farmers had SSC, HSC and graduate level of education respectively. About 53.1 percent farmers involved in prawn farming as a main occupation. In those prawn farming about 82.3 percent prawn farmers were single owner, 13.5 percent were belonged to double ownership and those of 4.2 percent is multiple ownership. In this study about 4.4 percent, 4.32 percent, 68.95 percent, 5.91percent, 8.92 percent, 2.96 percent 1.89 percent, 2.62 percent areas were homestead area, pond area, cultivable land, fellow land, leased in, leased out, mortgage in and mortgage out area respectively hold by the sample farmers on an average. Among them 13.5 percent of farmers had training facilities while 86.5 percent of them had not. Most of the farmer's yearly income belonged to the category of Tk. 200000 to Tk. 400000. About 52 percent of the prawn producing farmers were earned Tk. 200000-400000 per year, 10 percent of the farmers were earned Tk. less than 200000 per year and 38 percent farmers were earned Tk. Above 400000 per year. In this study, farmer expense monthly 52.40percent, 10.19 percent, 8.42 percent, 13.51 percent, 4.64 percent, 5.69 percent, 2.32 percent, 1.89 percent, 0.93 percent on food, energy, medical purpose, education, clothing, transportation, cell phone, entertainments and others respectively of the total monthly expenditure. Farmers were taken loan from Banks; 31.25 percent farmers were taken credit from NGOs and 11.46 percent farmers were taken loan from their relatives. 9.38 percent credit from others source. Fertilizers namely urea and TSP were commonly used by the sample farmers in producing prawn.

To determine the profitability of prawn farming both the inputs and outputs were valued at market price during the study period. For analytical advantages, the cost of items was identified as human labor, prawn fry, fin fingerling, urea, TSP, manure, feed, lime, water management cost, land use cost, construction of guard shed, office and other housing cost, miscellaneous cost and interest on operating capital. Cost and returns were worked out to estimate profitability of prawn production. Per hectare total cost, gross return, net return and gross margin were Tk. 634396.61, Tk. 1049112.85, Tk. 414716.24 and Tk. 496403.23 respectively.

In this study, Cobb-Douglas production function model was used to determine the effects of key variable inputs. The most important seven explanatory variables were included in the model to explain the gross income or return of prawn farming. Most of the variables in the production function were significant in explaining the gross return except the negative and insignificant effect of water management cost. The coefficient with expected sign indicates the selected inputs contributed positively to the gross return. The values of the R^2 of multiple determination of prawn farming was 0.72 which implied that about 72 percent of the total variation in the gross return could be explained by the included explanatory variables of the model. Production function for prawn farming exhibits increasing returns to scale (0.68). This means that, if all the variables specified in the model were increased by 1 percent, gross return would be also increased by 0.68 percent. The F-value for the farming was 32.45 which were highly significant at 1 percent level. Resource use efficiency indicated that all of the resources were under used for prawn production except

overutilization of water. So, there was a positive effect of key factors in the production process of year-round prawn farming.

This study also identified some of the problems and constraints associated with prawn farming. These were categorized into economical, technical, social and markting problems. The findings revealed that high price of input, lack of sufficient fund, lack of marketing facilities, low price of output, lack of scientific knowledge and technology, seasonal impact, attack of prawn diseases, lack of extension services, theft of prawn from farm, multiple ownerships etc. were the major obstacle which stand in the way of Galda shrimp farming in the study area.

8.2 Conclusion and Policy Recommendations

It may be said that prawn farming is profitable. If good quality input and modern production technology can be made available to farmers in time, yield and production will be increased which can help farmers to increase income and improve livelihood standards. It can help in improving the nutritional status of rural people. The results however, clearly showed that per hectare yield of prawn farming are still low among other prawn producing Asian countries. There is an ample opportunity to improve per hectare yield of year-round prawn production. To enhance the productivity, efficiency and effectiveness of prawn farming, the following recommendations are made as a part of present study which acts as a formulating strategy for enhancing prawn production in Satkhira district.

i. Availability of water is an important factor for prawn production. Government can solve this problem by keeping the diesel price at a

reasonable level so that farmers can supply sufficient water in the prawn farm in dry season.

ii. Though the government is already given subsidy on fertilizer like urea and other inputs required for prawn farming but fair prices of inputs should be ensured so that the farmers can get the inputs at a reasonable price.

iii. Physiological and soil related research should be conducted to identify the real causes of prawn viral diseases and its outbreak. To overcome this problem, scientific use of chemicals should be ensured and supplementary supply of artificial irrigation should be arranged in dry season.

iv. Bank loan and institutional credit should be made available on easy term and conditions to the prawn farmers.

v. Scientific method of cultivation should be introduced to increase production. The farmers should be provided with training, adequate services, information and necessary facilities to cope with new and changed situation.

vi. Application of feed and fertilizer in relation to stocking density needed to increase the production of prawn. Fair prices of outputs should be ensured.

vii. Attention should be given to improve transportation and marketing facilities of the study area.

viii. Law and order enforcing agencies should be vigilant in the study area to minimize the social tension and improve the situation of prawn farming areas.

8.3 Limitations of the Study

There is no study without some limitations. The study I have made is of great importance and require me huge work and time. During preparing this paper, I have tried to my best. But while conducting this study I faced a number of problems. The problems were-

- The information was collected mostly through the memories of the respondents which were not always correct.
- Most of the data collected through interview of the farmers so sometimes they were not well-cooperated with the interviewer.
- Lack of experience and time hampered the in-depth of the study.
- Secondary data are extremely difficult to collect and may be contradictory. All the information is not based on valid data.

8.4 Avenues for Further Research

The limitation of study indicated some new avenues of research which might be undertaken in the context of Bangladesh. These are discussed here-

i. Similar study considering a large number of samples could be taken.

ii. As the present study covered only Satkhira sadar upazila under Satkhira district, a similar study could be conducted covering various geographical regions of the country and made a cross country comparisons of prawn farming.

iii. In the present study resource use efficiency of prawn farming was assessed. So, there is an ample opportunity to conduct study on technical efficiency of prawn farming.

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APPENDICES

PROFITABILITY AND RESOURCE USE EFFICIENCY OF PRAWN FARMING IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

Questionnaire

1) Respondent no:

1. Respondent's information:

a) Name: .....

b) Village: ……. ……..

c) Upazilla: …….....

Age	Education (Years of Schooling)	Occupation		Family member	Type of Household	Sex	Year of experience at prawn farming	Marital Status
		Primary	Secondary					

N.B: Type of Household: 1= Non-constructed, 2= Semi-constructed, 3= Constructed

2) Family information

SI. NO.	Relation with H.H	Age	Education (Years of Schooling)	Occupation		sex	Marital status	Annual Income
				Primary	Secondary			
1.								
2.								
3.								
4.								
5.								

N.B. Sex code: (Male=1, Female=2). Marital status Code: (married=1, unmarried=2), Occupation Code: No work= 0, Prawn Farming or fish Culture=1, Agriculture=2, Poultry rearing=3, Livestock =4, Labor=5, Service=6, student=7, business=8, Driver=9, other=10, home maker= 11

Relation code: Husband= 0, Wife= 1, Son=2, Daughter=3, Father=4, Mother=5, Brother=6, Sister=7.

3) Information of farm

(The area of your gher/ pond)

Category	Home Land	Own land	Own Cultivable Land	Own Non-Cultivable Land	Leased in	Leased out	Rented in	Rent out	Mortgage in	Mortgage out

4) Farmer's income source

a) agricultural income

SI. No.	Income Sources	Amount of income (in TK.)/yearly
1.	Prawn Farming	
2.	Rice cultivation	
3.	Poultry rearing	
4.	Fish culture	
5.	Livestock	
6.	Other crops / vegetables	
Total		

b) Non-Agricultural sources

SI. No.	Income sources	Amount of income (in Take /yearly)
1.	Business	
2.	Services	
3.	Foreign Remittance	
4.	Labor	
5.	Rickshaw puller	
6.	Auto Driver	
7.	Other income source	
Total		

5) Farmers Expenditure

(Please mention your monthly expenditure in following source)

SI. No.	Items	Monthly Expenditure (Taka)
1.	Food	
2.	Energy(petrol, Gas, Electricity)	
3.	Health Care	
4.	Education	
5.	Clothing	
6.	Transportation	
7.	Cell Phone expense	
8.	Entertainments	
9.	Others (…….)	

6) Prawn farming information

a) Pond size (Bigha):
b) Depth of water in pond: Summer……. Winter: ……
c) Owner of the farm- i) single owner ii) double owner iii) multiple owner
d) Rented in ……
e) Rented out……...
f) Mortgage in……..……...
g) Mortgage out …….
h) Leased in……
i) Leased out……..
j) Duration of Pond ……...
k) Depth of pond
l) Type of water--- 1.clean 2. Messy 3. dense
m) Type of soil: 1. loamy soil 2. Clay soil 3. Sandy Soil
n) Colour of water: 1. Green 2. Clean 3. Messy 4. Brown
o) Changing Water: 1. Yes 2. No
p) Presence of weed: 1. Yes 2. No…….
q) Presence of Plankton: 1. Yes 2. No

7) Size and Quantity of Frying

a) Prawn Frying

Time	Amount		Size (inch)	Price of each Kg Frying	Total price	Type of Hatchery
	Number	Weight				
1st time						
2nd time						
3rd time						
Total						

b) fish fingerlings

Time	Amount		Size (inch)	Price of each Kg Frying	Total price	Type of Hatchery
	Number	Weight				
1st time						
2nd time						
3rd time						
Total						

N.B: Type of hatchery: Own Hatchery=1, Government Hatchery=2, Own Nursery=3, Non-government Nursery=4

8) Cost and Return

a) Human Labor Requirement (man/day)
(Please mention of your Human Labor requirement)

Name of items	Prawn Farming				
	No. of Labor		day	Taka/ Labor	Total
	Own	Hired			
Pond Preparation					
Construction of guard shed, office and other housing cost					
Guard &Fish Growing					
Collection the fish					
Others					
Total					

b) Amount and cost of feed

Name of feed	Amount (kg)	Price of each kg feed (taka/kg)	Price (Taka)
1.			
2.			
3.			
4.			
5.			
Total			

c) Amount and Price of Fertilizer

Fertilizer and Chemical	Amount (kg)	Price of each kg (Taka/ Kg)	Price (Taka)
Urea			
TSP			
MP			
Potash			
Total			

d) Amount and Price of Chemical

Fertilizer and Chemical	Amount (kg)	Price of each kg (Taka/ Kg)	Price (Taka)
Chalk			
Pesticide			
Salt			
Total			

e) Amount and Price of Manure

Nature fertilizer	Amount (kg)	Price of each kg (Taka/ Kg)	Price (Taka)
Cow dunk			
Mixed Manure			
Total			

f) Other cost

Items	**Taka**
Electricity	
Water management cost	
Tools/ Accessories / Transport	
Total	

9) Amount of Production and disposal/Restore

a) Prawn Production and disposal/Restore

Grade	Amount		Price	Total Taka
	Number	Kg		
A (Big Size)				
B (Medium Size)				
C (Small Size)				
Total				

N.B: Code no.: Grade A=1, Grade B=2, Grade C=3

b) Carp Production and disposal/ restore

Name	Amount		Price	Total Taka
	Number	Kg		
Total				

10) Loan facility

Source of loan	Amount (taka)
Bank	
NGO	
Relatives	
Others	
Total	

10) Do you have any training? 1. Yes 2. No

11) Please mention the Problem faced by you in farming-

a)
b)
c)
d)
e)

12) What are your suggestions to overcome the above problem?

a)
b)
c)
d)
e)

Thank you for your kind co-operation _____

Date…….. Signature of the interviewer