PROBLEMS FACED BY THE FARMERS IN POND FISH FARMING

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Problems Faced By The Farmers In Pond Fish Farming

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This is to certify that the thesis entitled **"PROBLEMS FACED BY THE FARMERS IN POND FISH FARMING"** submitted to the department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e- Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka in partial fulfillment of the requirements for the degree of Master of Science (M.S.) in Agricultural Extension, embodies the result of a piece of bona fide research work carried out by **MD. FARIDUR RAHMAN, Registration No. 18-09255** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:

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DEDICATED TO
MY
BELOVED PARENTS

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS AND GLOSSARY

BOD	Biological Oxygen Demand
DoF	Department of Fisheries
DO	Dissolved Oxygen
et. al.	All Others
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
FSY	Fisheries Statistical Yearbook
PFI	Problem Faced Index
SPSS	Statistical Package for Social Science
UFO	Upazila Fisheries Officer

PROBLEMS FACED BY THE FARMERS IN POND FISH FARMING

MD. FARIDUR RAHMAN

ABSTRACT

The purpose of this study was to determine the extent of problems faced by the farmers in pond fish farming and to explore the relationships between the selected characteristics of the pond fish farmers and their problems faced. The study was conducted on 93 pond fish farmers of 3 unions of Dimla Upazila under Nilphamari district. An interview schedule was used for data collection during the period from 20th December, 2020 to 10th January, 2021. Descriptive statistics such as mean, standard deviation, percentage and Pearson's Product Moment Coefficient of Correlation (r) were used for data analysis. Majority (69.89 percent) of the farmers faced medium problems while 19.35 percent faced high problems and 10.75 percent faced low problems in pond fish farming. Farmers level of education, pond size, annual income from fish farming, training exposure on fish farming and practices in fish farming had negative significant relationship with their problems faced in pond fish farming. Age of the respondent, family size, experience in fish farming and extension media contact had non-significant relationship with their problems faced in pond fish farming. As per Problems Faced Index (PFI), "infection of fin and tail rot disease" ranked highest problem and "lack of transportation" was in last position. It was recommended that an effective step should be taken by the concern authority for strengthening the farmers capacity for reducing the problems faced by the farmers in pond fish farming.

Key words: Pond fish farming, Problem face index;

CHAPTER I

INTRODUCTION

1.1 General background

Aquaculture is the fastest-growing food-producing sector in the World. World Aquaculture is rising with an annual rate of 8.9–9.1% since the 1970s (Delgado, 2003). Global aquaculture has grown dramatically over the past 50 years to around 52.5 million tons and accounting for around 50 per cent of the world's fish food supply (FAO, 2016). Asia dominates aquaculture production of the world and contributes around 87% to the global cultured fin-fish production of 25.7 million tons in 2005 (De Silva *et al*., 2006). Aquaculture production in our country is gradually increasing over years since 1970, after 1995 it has been growing at a high rate (FSY 14).

Bangladesh, covering an area of 147,000 km2 with a population of 164 million, is one of the most densely populated countries in the world (Abdullah & Chowdhury, 2016). Vast riverine network and enormous floodplains makes the aquatic resources of this county highly potential and diversified. Fish, the main aquatic resource of Bangladesh, plays a very important role in the daily life of numerous segments of people in Bangladesh. Annually Bangladesh produces more than 4.2 million tons of fish mostly through inland capture fisheries and aquaculture (Bartley et al; 2015). Pond farming represents the backbone of aquaculture in Bangladesh, accounting for 85.8% of total recorded production and 57.7% of the area under farming (Abdullah & Chowdhury, 2016). Unlike gher culture and seasonal floodplain aquaculture which are limited to a few key districts, pond farming is commonly practiced in nearly every district of the country (Abdullah & Chowdhury, 2016). Fish farming in Bangladesh is playing an important role to the total national income. As a south Asian country there are hardly any areas in Bangladesh where river or any other water source is not available. In another word, Bangladesh is surrounded by rivers and various types of water sources like pond, stream, lake, etc. which has a profound contribution on the livelihood of the people of Bangladesh. A major part of the total population of this country is directly or indirectly involved with fish or fish related business.

Aquaculture in Bangladesh, as elsewhere in the South Asian region, has taken place on an ad hoc basis without giving sufficient thought to the maintenance of biodiversity of its affluent aquatic resources (Zafri & Ahmed, 1981). Bangladesh is deliberated one of the most compatible territory for fisheries in the world, with the world's largest flooded wetland and

the third largest aquatic biodiversity in Asia after China and India. The water bodies are parted into inland fisheries and marine fisheries and inland fisheries are parted into capture fisheries and culture fisheries (Shamsuzzaman *et al*., 2017). Bangladesh is one of the world's leading inland fisheries producers and has a huge water resource all over the country in the form of small ponds, ditches, lakes, canals, small and large rivers and estuaries covering about 4.34 million hectare (Ghose, 2014). Freshwater aquaculture involves pond aquaculture of native and exotic species. The country also has a coastal area of 2.30 million ha and a coastline of 714 km along the Bay of Bengal, which supports a large artisanal and coastal fisheries (Ghose, 2014).

Fisheries sector has been playing a vital role in mitigating protein scarcity, providing jobs for unemployed youth, earning foreign currencies and socio-economic development of Bangladesh. About 12.5 million people directly or indirectly involved on fisheries sector for their livelihood (Hossain, 2015). About 1.28 million fishermen live on fishing as their main profession in which 7.7 lac people are inland water fisherwomen (DoF, 2012, Shamsuzzaman *et al*., 2017). At the present time, Fish and Fisheries sector contributes about 3.00% of the total export earning, 3.5% to GDP and 25.72% to Agricultural Sector (DoF, 2018). Bangladesh has achieved 5th position in aquaculture production. Bangladesh is a small dense populated country where day by day protein requirement is rising due to population inflation. As a developing country fishes are the major sources of animal protein to most rural Bangladeshi's (DoF, 2012; Hossain *et al*., 2002).

Fisheries play a great role in fresh food security and livelihood and area source of income and social development in developing countries (Thilsted et al., 2016). Recently the sector attracted a great attention and its growing rapidly through the development of aquaculture (Kubecka et al., 2016). Fresh water aquaculture plays an important role in improving the economic status of the fish farmers in Bangladesh. The majority of aquaculture production of Bangladesh comes from rural fresh water aquaculture (Islam, 2001). Rural aquaculture is the extensive or improve extensive system, low-cost farming of aquatic organism by farming households or communities technology proper to their resource base (Edward & Demaine, 1997). The inland fisheries of Bangladesh are one of the most productive resources in the world (Islam & Dewan, 1986). There are about a total of 13 Lac ponds in Bangladesh which covers about 3.05 Lac ha and 2400 km long rivers which covers about 10.32 Lac ha. In our country aquaculture is mostly represented by pond culture. Fish

farming can be done in single specie ponds or composite fish culture system. Composite fish culture or polyculture is the production of two or more fish species within a particular aquaculture environment. Semi-intensive carp polyculture is an age-old popular method in south Asia, specifically in Bangladesh and India, where it is the major aquaculture production system (Miah *et al*., 1997; FAO, 1997; Reddy *et al*., 2002).).

Fish farming in Bangladesh faces several challenges, fish production is more volatile than any other agricultural biological production (Tveteras, 1998). Bio-physical factors such as disease, temperature, oxygen deficiency etc. make the production process risky. Production risk is higher for the smallest farm this is partly due to input use. Although, due to high profitability in fish farming compared to rice, farmers are converting land but sustainability of fish farming depends on various factors. Supplementary feed which is the main input of fish production is expensive. The success of a sustainable aquaculture system depends on the fish feed and fish nutrition. The fish farmers who are engaged in fish farming at the farm sites far away from the potential market, often face a problem of lacking of potential market. Low selling price of fish is another important issue regarding market related challenges. The fish farmers, when unable to secure sufficient loans, they are forced to borrow from unorganized money lenders at relatively higher rates of interest. Among these causes, a disease is the most serious constrain that cause damage to the livelihood of farmers, loss of job, cut income and food insecurity studies showed that almost fifty percent of production loss is because of diseases which are more severe. All these problems entangled with knowledge inadequacy among the rural farmer beget overall decrease of fish production. On the basis of this scenario, the study is designed to find out the outermost problems faced by the pond fish farmers and the possible implications.

Actually in a country like Bangladesh where fish culture has a long practice, pond fish culture can be expected to play an important role in supplying ever-increasing fish needs of the people. It is very important to increase the production in pond fisheries with controlled water bodies like ponds and tanks through the launch of modern and intensive culture method. Department of Fisheries (DoF) is trying to proclaim fisheries innovation to the pond farmers. Therefore, attempts were taken to investigate the problems faced by the farmers in pond fish farming.

1.2 Statement of the Problem

Bangladesh is surrounded by rivers and various types of water sources like pond, stream, lake, etc. which has a profound contribution on the livelihood of the people of Bangladesh. A major part of the total population of this country is directly or indirectly involved with fish or fish related business. Pond farming represents the backbone of aquaculture in Bangladesh, accounting for 85.8% of total recorded production and 57.7% of the area under farming (Abdullah & Chowdhury, 2016). Fisheries sector has been playing a vital role in mitigating protein scarcity, providing jobs for unemployed youth, earning foreign currencies and socio-economic development of Bangladesh.

Analyzing the issues from farmers of pond fish culture, the study was designed to find out the following research questions of problems faced by the fish farmers regarding fish farming:

 i. What was the extent of problems faced by the farmers in pond fish farming?
 ii. What are the characteristics of the pond fish farmers?
iii. Is there any relationship of selected characteristics of the pond fish farmers with their problem faced in pond fish farming?

In order to get a clear view of the above questions the investigator undertook a study entitled Problems faced by farmers regarding fish farming. Such research information will be helpful to the pond owners, policy makers and government and non-government organizations dealing with fish production in this country.

1.3 Specific Objectives

 i. To determine the extent of problems faced by the farmers in pond fish farming
 ii. To assess and describe selected characteristics of the fish farmers
iii. To explore the relationship between each of the selected characteristics of the fish farmers and their extent of problems faced in pond fish farming
 iv. To compare the severity of problems faced by the farmers in pond fish farming

1.4 Justification of the Study

Problems regarding fish farming are a critical issue for the pond fish farmers. Due to the problems, pond fish farming is in tremendous situation all over Bangladesh. In this conditions, farmers check monetary misfortune with sadness. The present study was designed to have an understanding of the problems faced by the farmers regarding fish farming and to explore its relationship with their selected characteristics. Pond fish farming

should get adequate attention to meet the growing demand for fish for increased population of Bangladesh. Different government and non-government organizations (NGOs) are currently putting effort and allocating resources for production oriented research and also encouraging the rural people to undertake pond fish farming. But research shows that most of the ponds in Bangladesh are not cultured in a scientific manner. Considering the previously mentioned focuses, the researcher became intrigued to lead research entitled 'Problems Faced by the Farmers in pond Fish Farming'.

1.5 Assumption of the Study

The researcher had the following assumptions in mind while undertaking this study:

1. The respondents included in the sample were capable of furnishing proper responses to the questions included in the interview schedule.
2. The data collected by the researcher were free from any bias and they were normally distributed.
3. The responses furnished by the respondents were valid and reliable.
4. Data were normally and independently distributed with their means and standard deviation.
5. The researcher was well adjusted to himself with the social contiguous of the study area. Hence, the collected data from the respondents were free from favoritism.

1.6 Limitation of the Study

The study was undertaken with a view to having an understanding of the problems faced by the farmers regarding fish farming. However, from the research point of view, it was necessary to impose certain limitations as follows:

1. The study was confined to Dimla upazila under Nilphamari district.
2. Farmers have many varied characteristics but only 9 were selected to complete this study as stated in the objectives.
3. For information about the study, the researcher was depended on the data furnished by the selected respondents during data collection.
4. For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target populations. However, the researcher tried to overcome the problem as far as possible with sufficient tact and skill.

5. There were embarrassing situations at the time of data collection. So, the researcher had to manage proper rapport with the respondents to collect maximum proper information.

1.7 Definition of Terms

Farmers: The persons who were involved in farming activities are called farmers. They participated in different farm and community level activities like crops, livestock, fisheries, other farming activities etc. In this study, pond fishers were treated as farmers.

Age: Age of a farmer is defined as the period of time from his birth to the time of interview of the farmers.

Education: Education referred to the desirable change in knowledge, skill and attitude of an individual, through reading, writing and other related activities. It was measured in terms of years of schooling of an individual.

Family size: Family size of a farmer refers by the total number of members in the family including him/her, children and other dependents.

Pond size: It referred to the area of pond of the farmers. It was expressed in hectare.

Experience in fish farming: Experience in fish farming to the total number of years involved in fish farming by a fish farmers.

Annual income from pond fish farming: Annual income from fish farming refers to total financial return from fish farming in one year. It was expressed in Thousand Taka.

Training exposure: It referred to the total number of days that a respondent received training in his entire life from different organizations under different training programmes.

Practiced in fish farming: Practiced in fish farming refers to the measurement of practices by computing practice score on the basis of their nature of practices such as checking water quality parameter, use of fertilizers, use of lime, application of supplementary feed etc. in pond fish farming.

Problem faced: Problem faced referred to the degree of difficulties faced by concerned people in accomplishment of particular activities. In this study problem faced meant extent of problems faced by the farmers regarding fish farming.

Extension contact: It referred to an individual's (farmer) exposure to or contact with different communication media, source and personalities being used for dissemination of new technologies.

CHAPTER II

REVIEW OF LITERATURE

A literature review in any field is essential as it offers a comprehensive overview and recapitulation on the given research from past to present giving the reader a sense of focus as to which direction of new research is headed. Literature having relevance to the present study has been reviewed in three sections.

1. The first section deals with the literature on problems faced by the farmers in pond fish farming.
2. The second section deals with review of studies dealing with the relationship of selected characteristics with problem faced.
3. Finally last section of this chapter deals with the conceptual framework of the study.

2.1 Literature related to problems faced by the farmers in pond fish farming

Ahmed *et al*., (2014) studied were conducted to investigate the efficacy of inorganic and organic fertilizers on fish growth when applied individually or when combined with supplementary feed. These studied further exposed that administration of supplementary feed is mandatory for maximum yield though both fertilizers have been provided. Supplementary/artificial feed fulfills the nutrient deficiencies.

Bishwajit ghose (2014) stated that the fisheries sector is confronted with challenges posed by numerous natural and anthropogenic causes such as climate change, natural disasters, unbalanced urbanization and industrialization, overfishing and environmental pollution.

Das (2018) observer that the major areas were identified to improve the existing pond fish farming situation were access to low-interest loan, quality seed, supply of advanced technologies, need-based training, and marketing facilities. Along with improving the pond fish farming, community-based fisheries management and some aquaculture initiatives on private own seasonal floodplains should be taken on a priority basis to improve open water management and to flourish inland fish production in the study area.

Faruk et al. (2004) observed that a number of diseases like epizootic ulcerative syndrome, skin erosion, gill damage, tail and fin rot are common in farmed fishes of Bangladesh.

Ghose (2014) state that fish is a popular complement to rice in the national diet, giving rise to the adage Maache-Bhate Bangali ("a Bengali is made of fish and rice").

Hossain (2015) stated that two types of aquaculture practices are going on in Bangladesh such as, freshwater andaquaculture. Freshwater is mainly comprised of pond farming of carps (indigenous and exotic), Mekong pangasid catfish, tilapia, Mekong climbing perch, and a number of other domesticated fish, In Bangladesh, aquaculture production systems are mainly extensive and improved extensive, with some semi-intensive, and intensive systems, in very few cases.

Iqbal et al. (2001) stated that the growth of fish culture has also raised issues of fish health. Bacterial hemorrhagic septicemia, lernaeasis, saprolegniasis and anoxia are the most commonly occurring fish diseases in pond fishes in Punjab.

Islam at el. (2016) reported that fisheries can broadly be classified into three categories: inland capture fisheries, inland aquaculture and marine fisheries, of which the inland aquaculture sector is contributing more than 55% of the total production. Bangladesh was the 5th in world aquaculture production, which accounted for half of the country's total fish production

Mahbubur et al. (2015) observed that a highest number of pond fish farmers (61.67%) were out of training facilities and a good portion (23.33%) had no education.

Salam (2003) in his study identified constrains in adopting environmentally friendly farming practices. Top six identified constraints according to their rank order were: (i) low production due to limited use of fertilizer (ii) lack of organic matter in soil, (iii) lack of Govt. support for environmentally friendly farming practices, (iv) lack of capital and natural resources for integrated farming practices, (v) lack of knowledge on integrated farm management and (vi) unavailability of pest resistant varieties of crops.

Shamsuzzaman et al (2017) reported that fisheries sectors play a very important role in the national economy, contributing 3.69% to the Gross Domestic Product (GDP) of the country and 22.60% to the agricultural GDP. In 2014–2015, total fishery production of Bangladesh was 3,684,245 metric tons, of which 2,060,408 metric tons from inland aquaculture

Subasinghe et al. (2001) observed that current trend in aquaculture development is towards increased intensification and commercialization of aquatic production. Like other farming

sectors, the likelihood of major disease problems increases as aquaculture activities intensify and expand. Disease is considered as a primary constraint to the culture of many aquatic species, impeding both economic and social development in many countries.

2.2 Review concerning the relationship between selected characteristics of the farmers and problems faced

2.2.1 Age and problem faced

Anisuzzaman (2008) found that age had no noteworthy association with their problem faced in tuberose cultivation.

Akanda (1993) found that there was no relationship between age of farmers and their problem faced in using quality rice seed

Aziz (2006) found that age of the farmers had no significant relationship with their constraints faced in potato cultivation in Jhikargacha upazilla under Jessore district

Bashar (2006) found that age of the farmers had noteworthy negative association with their issue showdown in mashroom cultivation.

Huque (2006) found that age of the farmers had no noteworthy association with their problem facedin utilizing coordinated plant supplement administration.

Karim (1996) conducted a study and found that age had no significant relationship with problem faced.

Mansur (1989) found that age of the farmers had no significant relationship with the feeds and feeding problem confrontation.

Rahman (1995) conducted a study and found negative relationship between age of the cotton farmers and their problem faced.

2.2.2 Level of education and problem faced

Anisuzzaman (2008) found that education had negative huge associations with their problem faced in tuberose cultivation

Akanda (1993) in his study on problem confrontation of the farmers in respect of cultivating BR 11 rice found a significant negative relationship between education of the farmers and their problem faced.

Aziz (2006) found that education of the farmers had very high significant negative relationship with their constraints faced in potato cultivation in Jhicargachaupazilla under Jessore dis

Huque (2006) found that education of the farmers had profoundly noteworthy negative association with their problem faced in utilizing incorporated plant supplement administration.

Bashar (2006) found that education of the farmers had huge negative association with their problem faced in mashroom cultivation.

Huque (2006) found that education of the farmers had highly significant negative relationship with their problem faced in using integrated plant nutrient management.

Karim (1996) in his study found that education of the farmers had significant negative relationship with their problem faced

Rahman (1995) in his study on problem faced by the pineapple growers found a significant negative relationship between education of the farmers and their problem faced.

2.2.3 Family size and problem faced

Anisuzzaman (2008) found that family size had no huge association with their problem faced in tuberose cultivation.

Aziz (2006) found that family size of the farmers had high huge negative association with their requirements confronted in potato cultivation in Jhikargacha upazilla under Jessore locale.

Basher (2006) found that family size of the farmers had no significant relationship with their problem confrontation in mushroom cultivation.

Haque (2006) found that family size of the farmers had no significant relationship with their problem faced in using integrated plant nutrient management

Rahman (1995) found that there was no significant relationship between family size of the pineapple growers and their problem confrontation. He also found negative tendency between the concerned variables.

2.2.4 Pond size and problem faced

Roy (2007) in his study found no significant relationship between farm size under maize cultivation and constraints faced by farmers in maize cultivation.

Basher (2006) found that farm size of the farmers had significant negative relationship with their problem confrontation in mushroom cultivation

Huque (2006) found that farm size of the farmers had no significant relationship with their problem faced in using integrated plant nutrient management.

Rahman (2006) found that farm size of the farmers had no significant relationship with their constraints faced in Banana cultivation of SunargaonUpazilla under Narayangonjdistrct.

Rashid (2003) found that farm size of the rural youth had no relationship with problem confrontation in selected agricultural production activities.

2.2.5 Annual family income and problem faced

Anisuzzaman (2008) found that yearly family income had no huge association with their problem faced in tuberose cultivation.

Haque (2006) found that annual family income of the farmers had no significant relationship with their problem faced in using integrated plant nutrient management.

Bashar (2006) found that annual family income high significant negative relationship with problem confrontation in mushroom cultivation.

Hossain (1985) found an important association among income and problem faced of the land less laborers.

Islam (1987) reported that the relationship between income and artificial insemination problem confrontation was negatively significant.

Karim (1996) found that the annual income of the farmers had significant negative relationship with their problem confrontation.

2.2.6 Training exposure on fish farming and problem faced

Bashar (2006) found that training exposure of the farmers had high significant negative relationship with their problem confrontation in mushroom cultivation

Ahmed (2002) showed that training experience of the farmers had a significant negative relationship with their problem confrontation in jute seed production.

Ali (1999) found that training experience of the rural youth had no relationship with the problem confrontation in self-employment by undertaking selected agricultural income generating activities.

Nahid (2005) conducted a study and found that there was no significant relationship between training exposure of the sugarcane growers and their problem confrontation in sugarcane production.

Saha (1997) found that training experience of the youth had no relationship with their problem confrontation.

2.2.7 Extension contact and problem faced

Huque (2006) found that extension media contact of the farmers had high noteworthy negative association with their problem faced in utilizing coordinated plant supplement administration.

Akanda (2005) reported that there was significant positive relationship between communication exposure and technological gap in cultivating transplanted modern aman rice.

Bashar (2006) found that extension media contact of the farmers had noteworthy negative association with their issue showdown in mushroom cultivation.

Rahman (2006) found that extension media contact of the farmers had no significant relationship with their constraints faced in Banana cultivation of Sunargaon Upazilla under Narayangonj district.

2.3 Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. a focus variables and explanatory variables. A focus variable is that factor which appears, disappears or varies the researcher introduces, removes or varies as the explanatory variables. An explanatory variable is that factor which is manipulated by the researcher in this attempt to ascertain its relationship to an observed phenomenon. This study is concerned with the "problems faced by the farmers in pond fish farming". Thus, the problems faced by

the farmers in pond fish farming was the focus variable and 9 selected characteristics of the pond fish farmers were considered as the explanatory variable to the study.

Based on this discussion and review of literatures the conceptual model of this study has been formulated and shown in the Figure 2.1

Explanatory variables	Focus variable
❖ Age ❖ Level of education ❖ Family size ❖ Pond size ❖ Experience in pond fish farming ❖ Annual income from pond fish farming ❖ Training exposure on fish farming ❖ Practiced in fish farming ❖ Extension contact	Problem faced in pond fish farming
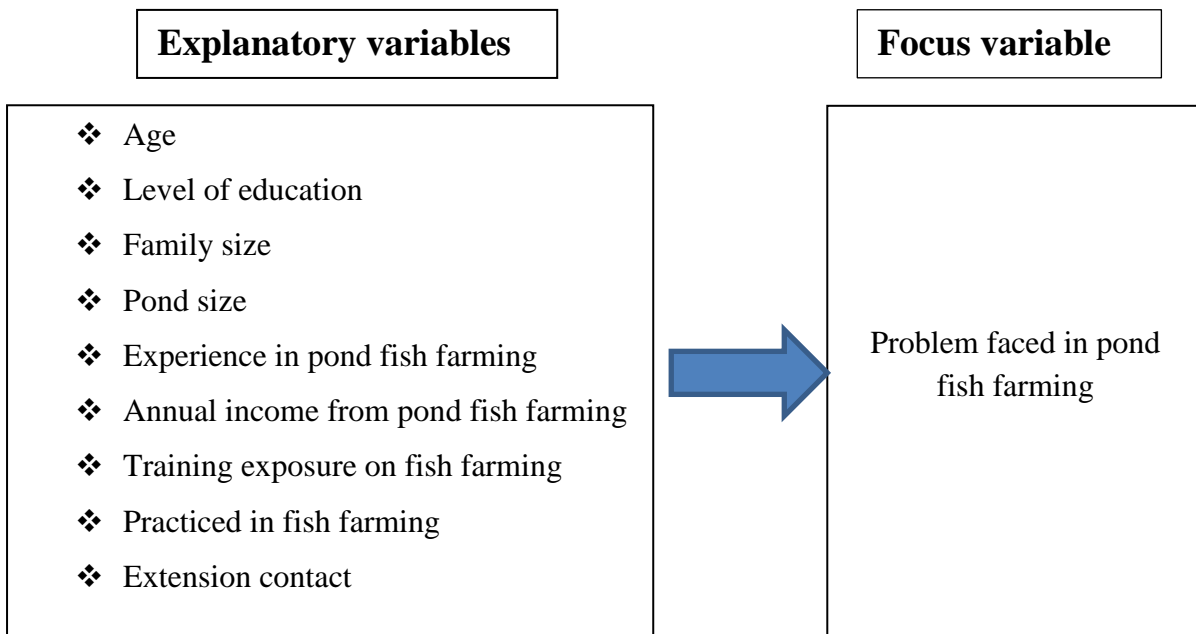
Table 2.1 A Conceptual Framework of the Study

CHAPTER III

MATERIALS AND METHODS

In conducting a research study, methodological issue is one of the prime considerations for yielding of valid and reliable findings. Appropriate methodology enables the researcher to collect valid and reliable information and to analyze the information properly in order to arrive at correct conclusions. According to Mingers (2001), research method is a structured set of guidelines or activities to generate valid and reliable research results. The methods and operational procedures followed in conducting the study e.g. selection of study area, sampling procedures, instrumentation, categorization of variables, collection of data, measurement of the variables and statistical measurements. A chronological description of the methodology followed in conducting this research work has been presented in this chapter.

3.1 The Locale of the Study

The study was conducted in the Dimla upazila under Nilphamari district. The area of Dimla upazila is 326.8 sq km, located in between 26°05' and 26°17' north latitudes and in between 88°52' and 89°06' east longitudes. It is bounded by West Bengal, India on the north, Jaldhaka upazila on the south, Hatibandha upazila on the east and Domar upazila on the west. There are 10 union parishads in this upazila. They are: Balapara, Dimla, Jhunagachh Chapani, Khalisha Chapani, Khogakharibari, Nautara, Paschim Chhatnay, Purba Chhatnay, Gayabari and Tepakhribari. Out of 10 unions, three were randomly selected as the locale of the study. The selected unions were Dimla, Nautara and Khalisha Chapani. A map of Dimla upazilla showing the study area is presented in Figure 3.1.

Figure 3.1 A map of Dimla upazilla showing the study area

3.2 Population

The pond owners of selected three (3) unions under Dimla upazilla of Nilphamari district were considered as the population of the study. Three list of pond owners this selected three unions who are currently rearing fish and fish fry in their pond was prepared with the help of Upazilla Fisheries Officer (UFO) and his field staffs. The number of pond owners of the selected three unions was 2409 which constituted the population of the study.

3.3 Determination of sample size

There are several methods for determining the sample size. In this study, Yamane's (1967) formula was used for determining sample size as follows

$$n = \frac{z^2 P(1-P)N}{z^2 P(1-P)+N(e)^2}$$

Where,

n = Sample size

N= Population size =2409

e = The level of precision = 10%

z = The value of the standard normal variable given the chosen confidence level (e.g.

z =1.96 with a confidence level of 95 %)

P = The proportion or degree of variability = 50%;

By using the formula, the sample size was determined as 93 for the study. Moreover, a reserved list of 9 pond owners was prepared by taking 3 for each union for use if the pond owners under sample were not available during data collection. These 93 pond fish farmers were selected by using proportionate random sampling from the population of three unions.

The distribution of the selected pond owners with reserve list of the selected unions is shown in the table 3.1.

Table 3.1 Distribution of the sample of pond fish farmers in the study area

Name of union	Total no. of pond fish farmers	Sample	Reserve list
Dimla	1341	37	3
Nautara	642	30	3
Khalisha Chapani	426	26	3
Total	2409	93	9

3.4 Measurement of Variables

The variable is a characteristic, which can assume varying or different values in successive individual cases. A research work usually contains at least two important variables viz. explanatory and focus variables. An explanatory variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A focus variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the explanatory variable (Townsend, 1953). In the scientific research, the selection and measurement of variable constitute a significant task. The various characteristics of the pond owners might have influence on their problem faced in pond fish farming. These characteristics were age, level of education, pond size, family size, experience in pond fish farming, annual income from pond fish farming, practice in fish farming, training exposure, extension contact. Problems faced by the farmers in pond fish farming were the main focus of the study.

The methods and procedures in measuring the variables of this study are presented below:

3.4.1 Measurement of explanatory variables

As mentioned earlier, nine selected characteristics of the farmers constituted the explanatory variables of this study. Procedures followed for measuring these variables are described below.

3.4.1.1 Age

The age of a pond owner was measured by counting the actual years from his/her birth to the time of interview. It was expressed in terms of complete years. Example, a man of 35 years old, obtained an age score of 35.

3.4.1.2 Level of Education

Education was measured by assigning score against successful years of schooling by a farmer. One score was given for passing each level from an educational institution (Rashid, 2014). If a pond owner didn't know how to read and write, his education score was zero, while a score of 0.5 was given to a pond owner who could sign his/her name only. If a pond owner did not go to school but studied at home or adult learning center, his education level was determined as the equivalent to a formal school student.

3.4.1.3 Family size

The family size was measured by the total number of members in the family of a respondent fish farmer. The family members included family head and other dependent members like husband/wife, children, etc. who lived and ate together. A unit score of 1 was assigned for each member of the family. If a respondent had five members in his/her family, his/her family size score was given as 5 (Khan, 2004).

3.4.1.4 Pond size

Pond size referred to the total area of pond, on which the farmer carried out fish farming operations. The pond size was estimated on consideration of full benefit of the pond owner in terms of hectare.

3.4.1.5 Experience in fish farming

Experience in pond fish farming of the farmers was determined by the total number of years involved in fish farming. A score of one (1) was assigned for each year of pond fish farming.

3.4.1.6 Annual income from fish farming

Annual income from fish farming refers to the total financial return from pond fish farming in one year. Annual income from pond fish farming was measured in Thousand Taka. One score was given for 1000 taka.

3.4.1.7 Fish farming practice

Practices in pond fish farming by a respondent were determined by providing score. Practices in fish farming by a farmer were measured by computing practice score on the basis of their nature of practices in pond fish farming with five selected practices. Each farmer was asked to indicate his/her nature of practices with five alternative responses, like always, very often, sometimes, rarely and never basis to each of the five- practice and score of four, three, two, one and zero were assigned for those alternative responses respectively. Practices in pond fish farming of the farmers were measured by adding the scores of five selected farming practice. Thus, practices in pond fish farming score of a farmer could range from 0 to 20, where zero indicated no practice and 20 indicated highest level of practices.

3.4.1.8 Training exposure

Training exposure of fish farmers was measured by the total number of days he participated in different training programmes. A score of one (1) was assigned for each day of training received.

3.4.1.9 Extension contact

It was defined as one's extent of exposure to different communication media related to farming activities. This variable was measured by computing an extension contact score on the basis of a respondent's extent of contact with 3 selected media as obtained in response. Each respondent was asked to indicate the frequency of his contact with each of the selected media. Each farmer was asked to indicate his nature of contact with five alternative responses like always, very often, sometimes, rarely and never basis and weights were assigned as 4, 3, 2, 1 and 0 respectively. Thus, extension contact in pod fish farming score of a respondent could range from 0 to 12 where 0 indicated no extension contact and 12 indicated highly extension contact in pond fish farming.

3.4.2 Measurement of problems faced in pond fish farming

Problem faced by the farmers in pond fish farming was the focus variables of the study. Problems faced in pond fish farming was measured on the basis of extent of problems faced by the farmers on 23 selected problems of fish farming. Each farmer was asked to indicate his nature of problems in fish farming with five alternative responses like highly severe, severe, moderate, low and not at all problem basis and weights were assigned as 4, 3, 2, 1 and 0 respectively. Thus, problems faced in pod fish farming score of a respondent could range from 0 to 92 where 0 indicated no problems and 92 indicated highly severe problems faced in pond fish farming.

Measuring problems faced index of the problem items

To ascertain the severity of item-wise problems faced by the farmers, Problem Faced Index (PFI) was computed for each problem. Problem Faced Index (PFI) was computed by using the formula:

$$PFI = f_{hs} \times 4 + f_{ms} \times 3 + f_m \times 2 + f_l \times 1 + f_n \times 0$$

Where, PFI = Problem Faced Index

f_{hs} = No. of respondents faced highly severe problem

f_{ms} = No. of respondents faced moderately severe problem

f_m = No. of respondents faced moderate problem

f_l = No. of respondents faced low problem

fn = No. of respondents faced no problem

Problem Faced Index (PFI) for each problem item could range from 0 to 372, where 0 indicating no problem and 372 indicating highest extent of problems faced by the farmers regarding pond fish farming.

3.5 Hypothesis of the study

According to Kerlinger (1973) a hypothesis is a conjectural statement of the relation between two or more variables. Hypothesis are always in declarative sentence form and they are related, either generally or specifically from variables to variables. In broad sense hypotheses are divided into two categories: (a) Research hypothesis and (b) Null hypothesis.

3.5.1 Research hypothesis

In the light of the objectives of the study and variables selected, the following research hypotheses were formulated to test them. The research hypotheses were stated in positive form, the hypotheses were as follows:

"Each of the selected characteristics of the farmers had relationship to their problem faced in pond fish farming".

3.5.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. In order to conduct statistical tests, the research hypotheses were converted to null form.

Hence, the null hypotheses were as follows:

"Each of the selected characteristics of the farmers had no relationship to their problem faced in pond fish farming".

3.6 Data Processing

After completion of field survey, all the data were coded, compiled and tabulated according to the objectives of the study. Initially, all collected data were carefully entered in Access, exported to Microsoft Excel. Exported data were checked randomly against original completed interview schedule. Errors were detected and necessary corrections were made accordingly after exporting. Finally, data were exported from the program Microsoft Excel to SPSS/windows version 22.0, which offered statistical tools applied to social sciences. Local units were converted into standard units. All the individual responses to questions of the interview schedule were transferred in to a master sheet to facilitate tabulation, categorization

and organization. In case of qualitative data, appropriate scoring technique was followed to convert the data into quantitative form.

3.7 Statistical Procedures

Data collected were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. The statistical measures such as range, mean, standard deviation, percentage etc. were used to describe the variables. Tables were also used in presenting data for clarity of understanding. To find out the relationship between each of the selected characteristics of the fish farmers with their problems faced in pond fish farming, Pearson's Product Moment Co-efficient of Correlation was used. Five percent (0.05) level of probability was the basis for rejecting any null hypothesis throughout the study.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this chapter is to describe the findings of the present study. Recorded observations were presented in line with the objective of the study and what was found was discussed with justifiable and relevant comments under this chapter. These are presented in four sections according to the objectives of the study. The first section deals with the selected characteristics of the farmers. The second section deals with the problems faced by the farmers in pond fish farming. Relationship between the selected characteristics of the farmers and their problem faced in pond fish farming has been discussed in the third section, while the fourth section deals with the comparative severity of the problems faced by the farmers in pond fish farming.

4.1 Characteristics of the farmers

A person's behavior is largely determined by one's personal characteristics. There were various characteristics of the farmers that might have consequence to face the problems of different issues. But in this study, nine of them were selected as explanatory variables. The selected characteristics included their age, level of education, family size, pond size, experience in fish farming, annual income from pond fish farming, training exposure, practiced in fish farming and extension media contact. These characteristics of the pond farmers are described in this section.

4.1.1 Age

The age of the farmers has been varied from 22 to 68 years with a mean and standard deviation of 39.37 and 10.61 respectively. Considering the recorded age, farmers are classified into three age groups namely "young", "middle aged" and "old". Their distribution according to the age of the farmers is shown in Table 4.1

Table 4.1 Distribution of the farmers according to their age

Category	Basis of categorization (age)	Observed range (age)	Pond Farmers		Mean	SD
			Number	Percent		
Young aged	up to 35		43	46.23		
Middle aged	36-50	22-68	37	39.78	39.37	10.61
Old aged	Above 50		13	13.97		
		Total	93	100		

The highest proportion (46.23 percent) of the fish farmers were young aged compared to 39.78 percent of them being middle aged and only 13.97 percent old aged. Data also indicates that the young and middle aged category constitute almost 86.01 percent of total farmers. The young and middle aged farmers were generally more involved in fish farming than the older.

4.1.2 Education

The mean and standard deviation of farmer's education scores was 7.15 and 5.80 respectively ranging from 0 to 18. Based on their education scores, the farmers were classified into five categories namely can't read and write 0), can sign only (0.5), primary education (1-5), secondary education (6-10) and above secondary education (above 10). The distribution of the farmers according to their education is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their level of education

Category	Basis of categorization (score)	Observed range (score)	Pond Farmers		Mean	SD
			Number	Percent		
Can't read and write	0		14	15.05		
Can sign only	0.5		19	20.43		
Primary education	1-5		7	7.52		
Secondary education	6-10	0-18	27	29.03	7.15	5.80
Above secondary	>10		26	27.95		
		Total	93	100		

Table 4.2 shows that farmers in the secondary education category have the highest proportion (29.03 percent), followed by above secondary education (27.95 percent) and primary

education category (7.52 percent). On the other hand, can sign only (20.43 percent) and 15.05 percent of respondents can't read and write. Thus the data revealed that 64.5 percent of pond farmers are literate.

4.1.3 Family size

Family size scores of the farmer ranged from 4 to 9 with an mean of 5.96 and standard deviation of 1.28. According to family size, the respondent farmers were classified into three categories as shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their family size

Category	Basis of categorization (members)	Observed range (members)	Pond Farmers		Mean	SD
			Number	Percent		
Small family	<4.68 <(Mean-SD)		16	17.20		
Medium family	4.68-7.24 (Mean ± SD)	4-9	64	68.81	5.96	1.28
Large family	>7.24 >(Mean+SD)		13	13.97		
		Total	93	100		

Table 4.3 indicates that the medium size family constitute the highest proportion (68.81 percent) followed by the small size family (17.20 percent). Only 13.97 percent farmers had large family size. Thus, about (86.01 percent) of the farmers had small to medium family.

4.1.4 Pond size

The pond size of the farmers ranged from 0.12 ha to 1.21 ha with a mean and standard deviation of 0.39 and 0.24, respectively. Based on pond area the pond owners were classified into three categories as small pond, medium pond and large pond. The distribution of the farmers according to their pond size is shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their pond size

Category	Basis of categorization (ha)	Observed range (ha)	Pond Farmers		Mean	SD
			Number	Percent		
Small pond	<0.14 <(Mean-SD)		9	9.67		
Medium pond	0.14-0.64 (Mean ± SD)	0.12-1.21	68	73.11	0.39	0.24
Large pond	>0.64 >(Mean+SD)		16	17.20		
		Total	93	100		

Data presented in Table 4.4 reveal that 73.11 percent of the pond farmers had medium ponds while 17.20 percent of them had large ponds and 9.67 percent had small ponds. Thus, overwhelming majority (82.78 percent) of the pond owners had small to medium size pond.

4.1.5 Experience of fish farming

The experience score of fish farmers for pond fish farming ranges from 4 to 25 with an average and standard deviation of 12.44 and 5.15 respectively. Based on the experience in fish farming scores, the respondent pond owners were classified into three categories as shown in Table 4.5.

Table 4.5 Distribution of the farmers according to their experience in fish farming

Category	Basis of categorization (years)	Observed range (years)	Pond Farmers		Mean	SD
			Number	Percent		
Low experience	<7.29 <(Mean-SD)		15	16.12		
Medium experience	7.29-17.59 (Mean ± SD)	4-25	57	61.29	12.44	5.15
High experience	>17.59 >(Mean+SD)		21	22.58		
		Total	93	100		

The results show that the majority (61.29 percent) of the farmers felt in the medium experience category, 22.58 percent in the high experience category and only 16.12 percent in the low experience category. Thus, above three fourth (77.41 percent) of the fish farmers had low to medium fish farming experience.

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4.1.6 Annual income from pond fish farming

Annual family income of the pond farmers ranged from Taka 20 thousand to 300 thousand with an average and standard deviation of 91.88 and 61.92 respectively. Based on the annual income from fish farming the respondents were classified into three categories as shown in Table 4.6.

Table 4.6 Distribution of the farmers according to their annual income from fish farming

Category	Basis of categorization ('000' Tk)	Observed range ('000' Tk)	Pond Farmers		Mean	SD
			Number	Percent		
Low income	<29.96 <(Mean-SD)		4	4.30		
Medium income	29.96-153.8 (Mean ± SD)	20-300	76	81.72	91.88	61.92
High income	>153.8 >(Mean+SD)		13	13.97		
		Total	93	100		

Data presented in Table 4.6 reveal that 81.72 percent of fish farmers had medium income, 13.97 had high income and 4.30 percent had low income from their farming. Thus, overwhelming majority (86.02 percent) of the fish farmers had low to medium income from their pond fish farming.

4.1.7 Training exposure

The score of training exposure of the fish farmers ranged from 0-3 days with an average and standard deviation of 1.03 and 1.01 respectively. On the basis of training exposure on fish farming, the respondents were categorized into two groups as shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their training exposure on fish farming

Category	Basis of categorization (days)	Observed ranged (days)	Pond Farmers		Mean	SD
			Number	Percent		
No training	0		37	39.78		
Low training	up to 3	0-3	56	60.22	1.03	1.01
		Total	93	100		

Data presented in the Table 4. 7 showed that majority (60.22 percent) of the farmers had low training exposure; while 39.78 percent of the farmers had no training exposure.

4.1.8 Practices on fish farming

Score of practices in fish farming of the farmers ranged from 9 to 16 against the possible range of 0-20 with an average and standard deviation of 12.92 and 1.34 respectively. On the basis of practices on fish farming scores, the farmers were classified into three categories namely low, medium and high practices in fish farming. The distribution of the farmers according to their practices in fish farming is shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their practices in fish farming

Category	Basis of categorization (score)	Observed range (score)	Pond Farmers		Mean	SD
			Number	Percent		
Low practice	<11.58 <(Mean-SD)		5	5.37		
Medium practice	11.58-14.26 (Mean ± SD)	9-16	75	80.64	12.92	1.34
High practice	>14.26 >(Mean+SD)		13	13.97		
		Total	93	100		

Table 4.8 reveals that the majority (80.64 percent) of the farmers were felt in medium practices in fish farming category, whereas 13.97 percent in high practices and 5.37 percent felt in low practices in fish farming category. Thus, overwhelming majority (86.01 percent) of the fish farmers had low to medium practices in fish farming.

4.1.9 Extension contact

Score of extension contact of the farmers ranged from 2 to 6 with an average and standard deviation of 4.33 and 0.83 respectively. Based on the score, the respondents were classified into three categories as shown in Table 4.9.

Table 4.9 Distribution of the farmers according to their extension contact

Category	Basis of categorization (score)	Observed range (score)	Pond Farmers		Mean	SD
			Number	Percent		
Very low extension contact	<3.5 <(Mean-SD)		12	12.90		
Low extension contact	3.5-5.16 (Mean ± SD)	2-6	74	79.56	4.33	0.83
Medium extension contact	>5.16 >(Mean+SD)		7	7.52		
		Total	93	100		

Table 4.9 shows that the highest proportion (79.56 percent) of the farmers had low extension contact, 12.90 percent had very low extension contact and the lowest 7.52 percent farmers had medium extension contact. Thus, overwhelming majority (92.46 percent) of the fish farmers had very low to low extension contact.

4.2 Problems faced by the farmers in pond fish farming

Problems faced by the farmers in pond fish farming scores ranged from 35 to 56 against the possible range of 0-92 with an average and standard deviation of 45.38 and 4.51 respectively. Based on the problems faced by the farmers in pond fish farming scores, the respondents were classified into three categories namely low, medium and high problems. The distribution of the farmers according to their problems faced in pond fish farming shown in Table 4.10

Table 4.10 Distribution of the farmers according to their problems faced in pond fish farming

Category	Basis of categorization (score)	Observed range (score)	Pond Farmers		Mean	SD
			Number	Percent		
Low problems	<40.87 <(Mean-SD)		10	10.75		
Medium problems	40.87-49.89 (Mean ± SD)	35-56	65	69.89	45.38	4.51
High problems	>49.89 >(Mean+SD)		18	19.35		
		Total	93	100		

Table 4.10 reveals that 69.89 percent of the farmers faced medium problems in fish farming where 19.35 percent farmers faced high problems in fish farming and 10.75 percent farmers faced low problems in fish farming. Thus, overwhelming majority (89.24 percent) of the farmers had medium to high problems in pond fish farming.

4.3 Relationship between the selected characteristics of the farmers and their problems faced in pond fish farming

The purpose of this section is to explore the relationship of each of the nine (9) selected characteristics of the pond fish farmers with their problem faced in pond fish farming. The explanatory variables were age, level of education, family size, pond size, experience in pond fish farming, annual income from fish farming, practices in pond fish farming, training exposure and extension contact. Problems faced by the farmers in pond fish farming was one of the focus variable.

Pearson's Product Moment Co-efficient of Correlation (r) was used to test the null hypothesis concerning the relationships between each of the selected characteristics of the farmers with their problems faced in pond fish farming. Five percent level of probability was used as the basis for rejection of a null hypothesis. The computed values of 'r' were compared with relevant tabulated values for 91degrees of freedom at the designated level of probability in order to determine whether the relationships between the concerned variables were significant or not. The results of correlation of coefficient (r) between the explanatory and focus variable have been shown in Table 4.11.

Table 4.11 Co-efficient of correlation between each of the selected characteristics of the farmers with their problems faced in pond fish farming (n=93)

Focus variables	Explanatory variables	Correlation co-efficient values (r)	Tabulated value of "r" with 91 df	
			0.05	0.01
Problems faced by the farmers in pond fish farming	Age	-0.048^{NS}	0.205	0.267
	Level of education	-0.258*		
	Family size	-0.090^{NS}		
	Pond size	-0.234*		
	Experience in fish farming	-0.146^{NS}		
	Annual income from fish farming	-0.225*		
	Training exposure	-0.316**		
	Practices in fish farming	-0.217*		
	Extension contact	-0.006^{NS}		

NS = Not significant
* Significant at 0.05 level of probability
** Significant at 0.01 level of probability

4.3.1 Relationships between age of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between age of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➤ The computed value of 'r' (-0.048) was found to be smaller than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.

➤ The null hypothesis could not be rejected.

➤ The relationship between the concerned variables was not significant.

Based on the above findings, it can be said that age of the farmers had no significant relationship with their problem faced in pond fish farming. This meant that age of the farmers was not an important factor for their problem faced in pond fish farming. It means that age of the farmers and their problems faced in pond fish farming were independent to each other.

4.3.2 Relationships between level of education of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between level of education of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.258) was found to be larger than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.

➢ The null hypothesis was rejected.

➢ The relationship between the concerned variables was significant and showed a negative trend.

Based on the above findings, it can be said that that level of education of the farmers had negative and significant relationship with their problem faced in pond fish farming. This meant that education of the farmers was an important factor for their problem faced in pond fish farming. It means that education of the farmers and their problems faced in pond fish farming were not independent to each other.

4.3.3 Relationships between family size of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between family size of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.090) was found to be smaller than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.

➢ The null hypothesis could not be rejected.

➢ The relationship between the concerned variables was not significant.

Based on the above findings, it can be said that that family size of the farmers had no significant relationship with their problem faced in pond fish farming. This meant that family size of the farmers was not an important factor for their problem faced in pond fish farming. It means that family size of the farmers and their problems faced in pond fish farming were independent to each other.

4.3.4 Relationships between pond size of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between pond size of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.234) was found to be larger than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.

➢ The null hypothesis was rejected.

➢ The relationship between the concerned variables was significant and showed a negative trend.

Based on the above findings, it can be said that that pond size of the farmers had negative and significant relationship with their problem faced in pond fish farming. This meant that pond size of the farmers was an important factor for their problem faced in pond fish farming. It means that pond size of the farmers and their problems faced in pond fish farming were not independent to each other.

4.3.5 Relationships between experience in fish farming of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between experience in fish farming of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.146) was found to be smaller than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.

➢ The null hypothesis could not be rejected.

➢ The relationship between the concerned variables was not significant

Based on the above findings, it can be said that that experience in fish farming of the farmers had no significant relationship with their problem faced in pond fish farming. This meant that experience of the farmers was not an important factor for their problem faced in pond fish farming. It means that experience of the farmers and their problems faced in pond fish farming were independent to each other.

4.3.6 Relationships between annual income from pond fish farming of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between annual income from pond fish farming of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.225) was found to be larger than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.
➢ The null hypothesis was rejected
➢ The relationship between the concerned variables was significant and showed a negative trend.

Based on the above findings, it can be said that that annual income of the farmers from pond fish farming had negative and significant relationship with their problem faced in pond fish farming. This meant that annual income of the farmers from pond fish farming was an important factor for their problem faced in pond fish farming. It means that annual income of the farmers from pond fish farming and their problems faced in pond fish farming were not independent to each other.

4.3.7 Relationships between training exposure on fish farming of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between training exposure on fish farming of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

➢ The computed value of 'r' (-0.316) was found to be larger than the tabulated value (0.267) with 91 degrees of freedom at 0.01 level of probability as shown in Table 4.11.
➢ The null hypothesis was rejected
➢ The relationship between the concerned variables was significant and showed a negative trend.

Based on the above findings, it can be said that that training exposure on fish farming of the farmers had negative and significant relationship with their problem faced in pond fish farming. This meant that training exposure of the farmers was an important factor for their

problem faced in pond fish farming. It means that training exposure of the farmers and their problems faced in pond fish farming were not independent to each other. This implies that farmers with higher training exposure on fish farming were likely to have lower level of problem faced in pond fish farming.

4.3.8 Relationships between practices in fish farming of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between practices in fish farming of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

- ➢ The computed value of 'r' (-0.217) was found to be larger than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.
- ➢ The null hypothesis was rejected
- ➢ The relationship between the concerned variables was significant and showed a negative trend.

Based on the above findings, it can be said that practices in fish farming of the farmers had negative and significant relationship with their problem faced in pond fish farming. This meant that practices in fish farming of the farmers was an important factor for their problem faced in pond fish farming. It means that practices in fish farming of the farmers and their problems faced in pond fish farming were not independent to each other. This implies that farmers adopt with higher practices in fish farming were likely to have lower level of problem faced in pond fish farming.

4.3.9 Relationships between extension contact of the farmers and their problems faced in pond fish farming

The following observations were recorded about relationship between extension contact of the farmers and their problems faced in pond fish farming on basis of correlation coefficient:

- ➢ The computed value of 'r' (-0.006) was found to be smaller than the tabulated value (0.205) with 91 degrees of freedom at 0.05 level of probability as shown in Table 4.11.
- ➢ The null hypothesis could not be rejected.
- ➢ The relationship between the concerned variables was not significant

Based on the above findings, it can be said that that extension contact of the farmers had no significant relationship with their problem faced in pond fish farming. This meant that extension contact of the farmers was not an important factor for their problem faced in pond fish farming. It means that extension contact of the farmers and their problems faced in pond fish farming were independent to each other.

4.4 Comparative severity of the problems faced by the farmers in pond fish farming

The purpose of this section was to have an understanding on comparative problems faced by the farmers in pond fish farming. To compare among the problems, a rank order was made based on Problem Faced Index (PFI). Problems faced index (PFI) of the farmers of the 23 problem items in fish farming ranged from 62 to 336 against a possible range of 0 to 372.

According to descending order of PFI, "infection of fin and tail rot disease" rank first problem followed by "infection of gill damage" and so on "diseases occurrence in winter season", "lack of training", "lack of assistance", "lack of knowledge", "high price of feed", "mortality of fish due to disease", "high production cost", "rubbing", "high price of fish fry", "mal nutrition", "jumping", "abnormal swim", "lack of quality of fish fry", "low production and lack of local market", "diseases occurrence in rainy season", "infection of argulosis", "unavailability of medicine", "unavailability of quality feed", "unavailability of fish fry in time", "diseases occurrence in summer season", "lack of transportation".

According to the descending order of the PFI, a rank order is shown in the Table 4.12.

Table 4.12 Rank order of problems faced by the farmers in pond fish farming

Sl. No.	Problems	PFI Score	Rank
1	Infection of Fin and tail rot disease	336	1st
2	Infection of Gill damage	330	2nd
3	Diseases occurrence in winter season	328	3rd
4	Lack of training	310	4th
5	Lack of assistance	301	5th
6	Lack of knowledge	260	6th
7	High price of feed	230	7th
8	Mortality of fish due to disease	185	8th
9	High production cost	181	9th

10	Rubbing	179	10th
11	High price of fish fry	171	11th
12	Mal nutrition	155	12th
13	Jumping	154	13th
14	Abnormal swim	146	14th
15	Lack of quality of fish fry	145	15th
16	Low production and lack of local market	138	16th
17	Diseases occurrence in rainy season	127	17th
18	Infection of Argulosis	115	18th
19	Unavailability of medicine	100	19th
20	Unavailability of quality feed	98	20th
21	Unavailability of fish fry in time	85	21th
22	Diseases occurrence in summer season	84	22th
23	Lack of transportation	62	23th

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

5.1.1 Selected characteristics of the farmers

Age: The highest proportion (46.23 percent) of the fish farmers were young aged. The young and middle aged farmers were generally more involved in fish farming than the older.

Level of Education: The highest proportion (64.5 percent) of the farmers were literate. Primary, secondary and above secondary level of literacy were found to be 7.52 percent, 29.03 percent and 27.95 percent respectively.

Family Size: The medium size family constitute the highest proportion (68.81 percent) followed by the small size family (17.20 percent). Thus, about (86.01 percent) of the farmers had small to medium family.

Pond size: 73.11 percent of the pond farmers had medium ponds while 17.20 percent of them had large ponds and 9.67 percent had small ponds.

Experience in fish farming: Majority (61.29 percent) of the farmers fell in the medium experience and only 16.12 percent in the low experience category.

Annual income from pond fish farming: The medium annual income from fish farming constituted the highest proportion (81.72 percent) and the lowest 4.3 percent farmers had low annual income from fish farming.

Training exposure: Majority (60.22 percent) of the farmers had low training exposure; while 39.78 percent of the farmers had no training exposure.

Practices in fish farming: Majority (80.64 percent) of the farmers were felt in medium practices in fish farming and 5.37 percent felt in low practices in fish farming category.

Extension contact: The highest proportion (79.56 percent) of the farmers had low extension contact, very low extension contact had 12.90 percent and the lowest 7.52 percent farmers had medium extension contact.

5.1.2 Problems faced by the farmers in pond fish farming

69.89 percent of the farmers faced medium problems, 19.35 percent farmers faced high problems and 10.75 percent farmers faced low problems in pond fish farming.

5.1.3 Relationship between selected characteristics and problem faced

Farmer's Level of education, Pond size, Annual income from fish farming, Training exposure on fish farming, Practices in fish farming had significant negative relationship with the problems faced by the farmers in pond fish farming. Farmer's Age, Family size, Experience in fish farming, Extension contact had no significant relationship with the problems faced by the farmers in pond fish farming.

5.2 Conclusions

Conclusion is the final decision or judgment, which is placed through contention at the end or termination of a research work. The results of the research work and the relevant facts prompted the researcher to draw the following conclusions.

- ➢ The majority (89.24 percent) of the farmers faced medium to high problems in pond fish farming. It is concluded that most of the farmers faced problems in pond fish farming which needs to minimize for sustainable pond fish farming.
- ➢ Farmer's Level of education, Pond size, Annual income from fish farming, Training exposure on fish farming and Practices in fish farming had significant negative relationship with the problems faced by the farmers in pond fish farming.
- ➢ "Infection of fin and tail rot diseases" ranked first problem followed by "infection of gill damage", "diseases occurrence in winter season", "lack of training", "lack of assistance", "lack of knowledge", "high price of feed", "mortality of fish due to disease", "high production cost", "rubbing", "high price of fish fry", "mal nutrition", "jumping", "abnormal swim", "lack of quality of fish fry", "low production and lack of local market", "diseases occurrence in rainy season", "infection of argulosis", "unavailability of medicine", "unavailability of quality feed", "unavailability of fish fry in time", "diseases occurrence in summer season" and "lack of transportation". Therefore, it may be concluded that these severe problem might be reduced for increasing pond fish farming.

5.3 Recommendations

The following recommendations are made from the results of the study based on the observations and conclusions:

5.3.1 Recommendation for policy implication

i. Majority (89.24 percent) of the farmers faced medium to high problems in pond fish farming. It is recommended that an effective step should be taken by the Department of Fisheries (DoF) and Non-Government Organizations (NGOs) for strengthening the farmers fish farming capacity for reducing the problems faced by them in pond fish farming.

ii. There remain a negative significant relationship between education of the fish farmers and their problem faced in pond fish farming. Thus, it may be recommended that suitable steps might be taken to increase the education level of the farmers by establishing adult learning centers to reduce fish farming problems.

iii. Massive and relevant training programs should be conducted for fish farmers to upgrade their knowledge, practice, skills and ability. The concerned authorities should be involved in the conduction of training programmes for the fish farmers.

iv. To increase the annual family income of the farmers, they need to invest money to use quality fry, feed etc. in times. So, it may be recommended that GOs, NGOs and Concern authority should supply credit so that they can overcome the problems.

5.3.2 Recommendations for further study

Based on the scope and limitations of the current study and observation made by the researcher, the following recommendations will be made for future study.

i. The present study was conducted in Dimla upazila under Nilphamari district. It is recommended that similar studies should be conducted in other parts of Bangladesh.

ii. Relationships of nine characteristics of the fish farmers with their problems faced in pond fish farming have been investigated in this study. Therefore, it is recommended that further study should be conducted with other characteristics of the farmers with their problems faced in pond fish farming

iii. It is difficult to explore all the problems faced by the farmers in pond fish farming. Measurement of problems of the farmers is not free from questions. More reliable measurement of the concerned variable is necessary for further study.

iv. In the present study farmer's age, family size, experience in fish farming, extension contact had no significant relationship with their problem faced in pond fish farming. In this connection, further verification is necessary.

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Department of Agricultural Extension & Information System
Sher-e-Bangla Agricultural University
Interview Schedule

(Confidentiality will be maintained and all information will be used only for study purpose)

Problems faced by the farmers in pond fish farming

Serial No:…………………………………..

Name of the respondent:…………………....... Contact No:………………………………

Village:……………………………………….. Union:…………………………………….

Thana:…………………………………….... District:…………………………………..

(Please answer the following questions. Give tick (✓) marks in the appropriate place)

1. Age
How old are you? …………………years.

2. Level of Education

Please mention your level of education.

a) I can't read and write
b) I can sign only
c) I read up to class…………………
d) I have passed……………….….class.

3. Experience in fish Culture
How many years have you been engaged with fish Culture? ………………years

4. Family size
How many members are there in your household including you? ....

5. Area under Fish culture

Please indicate the area of lands under fish culture

Sl. No.	Types of resources	Area (dec)
1	Ponds	
2	Others	
	Total Area	

6. Annual Income from Fish Culture

Please state the income from fish culture

Sl. No.	Name of species	Annual Income (tk)
1	Carp	
2	Pangas	
3	Shing	
4	Shol	
5	Others	
	Total income	

7. Organizational Participation

Sl. No.	Name of organization	Name of participation		
		Ordinary member	Executive committee member	Executive committee officer
1	Fish farmers cooperative committee			
2	NGO committee			
3	Union parishad			
4	Mosque/Madrashah/Mondir committee			

8. Training Exposure

Do you have participated in any training relative to fish Culture?

1. Yes
2. No

Sl. No.	Subject of Training	Duration of Training (Days)

48

9. Fish Farming Practiced

Pleasae state the extent of the following information

Sl. No.	Statement	Extent of practice				
		Always	Very often	Sometimes	Rarely	Never
1	Checking water quality parameter					
2	Using lime in pond					
3	Using fertilizer in pond					
4	Applying supplementary feed in pond					
5	Frequency of feed					

10. Extension Contact

Pleasae state the extent of the following information

Sl. No.	Extension contact	Extent of contact				
		Always	Very often	Sometimes	Rarely	Never
1	GO					
2	NGO					
3	Extension worker					

11. Problems faced by the farmers regarding fish farming

Pleasae state the extent of the following problems

Sl. No.	Types of Problems	Extent of Problems				
		Highly severe problem	Severe problem	Moderate problem	Low problem	Not at all problem
1	High price of fish fry					
2	Lack of quality of fish fry					
3	Unavailability of fish fry in time					
4	Rubbing					
5	Jumping					
6	Abnormal swim					

7	Fin and tail rot					
8	Argulosis					
9	Gill damage					
10	Mal nutrition					
11	Diseases occurrence in winter season					
12	Diseases occurrence in rainy season					
13	Diseases occurrence in summer season					
14	Mortality of fish due to disease					
15	High price of feed					
16	Unavailability of quality feed					
17	Lack of assistance					
18	Lack of knowledge					
19	Lack of training					
20	Unavailability of medicine					
21	High production cost					
22	Lack of transportation					
23	Low production and lack of local market					

Thank you for your kind co-operation in data collection.