GOOD MANAGEMENT PRACTICES FOLLOWED BY FISH FARMERS IN RANGPUR DISTRICT

A Thesis

By

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CERTIFICATE

This is to certify that the thesis entitled **"Good Management practices Followed by Fish Farmers in Rangpur District"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Extension and information system, embodies the result of a piece of bona fide research work carried out bv Ismath Zahan Sarker, Registration No. 19-10370 under my supervision and guidance. To the best of my knowledge, no part of the thesis has been submitted for any other degree or diploma. I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated: December, 2021
Dhaka, Bangladesh

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Dedicated

to

My Beloved

Parents & Elder Sister

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ABBREVIATIONS

DAE	Department of Agricultural Extension
BBS	Bangladesh Bureau of Statistics
GDP	Gross Domestic Product
DoF	Department of Fisheries
GMP	Good Management Practices
Ha	Hectare
IPM	Integrated Pest Management
NGO	Non-Governmental Organization
RDRS	Rangpur Dinajpur Rural Service
UAO	Upazila Agriculture Officer
SAAO	Sub-Assistant Agriculture Officer
UFO	Upazila Fisheries Officer
SPSS	Statistical Package for Social Science

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ABSTRACT

The objectives of this study were to describe the selected characteristics of the farmers; to identify good management practices followed by the fish farmers and to explore the contribution of the selected characteristics of the farmers to their practices of GMP. The study was conducted in five villages (Namatari, Jharpara, Shikdarpara, Shongkorpur and Boirampur) of Badarganj union under Badarganj upazila of Rangpur district. Data were collected by using interview schedule from the randomly selected 100 respondents during 15 July to 25 August, 2021. Descriptive statistics and multiple regression were used for analysis. Majority (63.0 percent) of the respondents had moderate while 23.0 percent had low and 14.0 percent had high use of good management practices. Among ten selected farmers' characteristics, training, knowledge on good management practices and attitude toward fish farming had significant contribution to their use of Good Management Practices (GMP). The remaining characteristics of the farmers' such as age, level of education, farming experience, annual family income, farm size, number of labors and extension contact had no significant contribution to their use of good management practices. The findings of the study indicated that farmers' use of good management practices has scope to increase. It is concluded that use of good management practices by the farmers can be increased through increasing their level of training, knowledge on good management practices and attitude toward fish farming.

CHAPTER I

INTRODUCTION

1.1 General Background

Bangladesh is a densely populated country of South East Asia where more than 168 million people lives in 147,570 sq. km (56,977 sq. miles) area. The average per capita accessible land resources are limited for agricultural production (BBS,2020). A wide portion of land is covered by large international and cross boundary rivers such as Padma, Jamuna, Teesta, Meghna, Brahmaputra, and Surma. Besides, there are thousands of tributaries with a total length of about 24,140 km. These rivers follow in to the Bay of Bengal. Bangladesh is fortunate enough for being a riverine country having rich inland and capture fisheries with huge aquaculture potential. The suitable geographical location of Bangladesh in the region along with a large number of aquatic species offer excellent opportunities to support fisheries potential and resource management. Fisheries in Bangladesh is playing an important role as well as contributing a lot in the diverse sectors for meeting nutritional requirements, generating employment and earning foreign exchange by providing about 60% of the requirement for animal protein intake (DoF, 2008). Most of the peoples have been involved directly or indirectly in fisheries, which refer to as the direct employments of around 1.32 million people as well as an estimated 14.7 million people earn their livelihood from indirect employment (Hossen et al., 2020). The fisheries sector of the county has been playing a vital role in earning foreign currencies and improving socio-economic condition of Bangladesh. The sector contributes 3.65% to the national GDP and 23.81% to the total agricultural GDP (DoF, 2019).

There are three categories of major fisheries resources, these are- Inland Capture (34%), Inland Culture (48%), Marine Capture (18%). 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. The country has diversified marine fisheries resources viz finfish 475 species, shark, rays/skates, dolphin 21 species, shrimps 36 species, lobster 6 species, 36 species, crabs 16 species, sea turtle 3 species, crocodiles 3 species, squid and others fish 7 species, shellfish 350 species and sea weeds 165 species (DoF, 2016).

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. Now only about 34% of the total fish production comes from inland open water.

Good Management Practices (GMP) is an approach to farming which aims to balance production with economic and environmental considerations by means of a combination of measures including crop rotation, cultivations, appropriate crop varieties and careful use of inputs. GMP can be thought of as a concept defining ideals and goals which then have to be "translated" into definitions that can be implemented by farmers. Most of the farmers are not aware about recommended dose of fertilizers and pesticides. Moreover, they want to ignore to use some environmentally friendly practices. But these overdosed pesticides and fertilizers are toxic in nature and hazardous to environment and human health. In this context GMP is safe in nature and eco-friendly. On the basis of the findings of the present study specific recommendation would be made for realistic policy formulation which would help the farmers to become aware about using GMP practices instead of traditional practice. The adoption of good management practices (GMP) has been widely promoted from the point of view of improving the environmental performance of fish farms (Frimpong et al, 2014).

1.2 Statement of the Problem

Fish culture is increasing in Bangladesh day by day. A significant role for reducing protein deficiency and malnutrition, generating employment and earnings foreign exchange has already been observed by this sector in Bangladesh (Quddus & Sen, 2020).

GMP, which has an important role in sustainable fish culture, is described as the integrative use of all available production technologies to achieve the higher fish production. The purpose of the study was to determine the extent of use of best management practices and also to find out the contributions of the selected characteristics of the farmers with their use of good management practices. The present investigation is concerned to the use of good management practices which is a major concern in agricultural extension in general and fish farming in particular. Analyzing the issues from farmers of fish culture, the study was designed to find out the following

research questions regarding farmers' "Good Management Practices followed by fish farmers":

i. What are the selected socio-economic characteristics of the farmers?

ii. What is the extent of use of good management practices by the fish farmers?

iii. What are the contributions of the selected characteristics of the farmers to their use of good management practices?

1.3 Objectives of the Study

The following specific objectives have been formulated to carry out the study

i. To explore the selected socio-economic characteristics of the fish farmers in relation to their use of GMP in fish farming. The selected characteristics were:
   - Age
   - Education
   - Fisheries farming experience
   - Annual family income
   - Fish farm size
   - Training exposure
   - Knowledge of good management practices
   - Use of good management practices
   - Attitude toward fish farming
   - Extension contact

ii. To determine the extent of use of GMP by the fish farmers;

iii. To explore the contribution of the selected socio-economic characteristics of the fish farmers to their extent of use of good management practices;

1.4 Scope of the Study

The major focus of the study was to have an understanding on extent of use of GMP in fish farming. The over-riding goal of good management for fish farming is the long-term sustainable use of the fisheries resource. However, in order to make the study manageable and meaningful from the research point of view, it was necessary to impose certain scope of the study. 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 fish farming. But research shows that most of the ponds in Bangladesh are not cultured in a scientific manner. Considering the above scenarios, the researcher became interested to undertake a study to determine good management practices that followed by fish farmers of Bangladesh.

1.5 Limitation of the Study

Considering the time, money and other resources available to the researcher and to make the study manageable and meaningful, it became necessary to impose certain limitations as noted below:

i. The study was confined in only five randomly selected villages (Namatari, Shongkarpur, Shikdarpara, Jharpara, Boirampur) of Badarganj upazila of Rangpur district.

ii. Characteristics of farmers are many and varied but only twelve were selected for investigations in this study as stated in the objectives. This was done to complete the study within limited resources.

iii. The researcher relied on the data furnished by the fish farmers from their memory during interview.

iv. The study was confined mainly to farmers' use of good management practices.

v. Facts and figures were collected by the investigator applied to the present situation in the selected area.

1.6 Assumption of the Study

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

1. The selected respondents were competent enough to reply the queries made by the researcher.
2. The responses furnished by the respondents were valid.
3. The researcher was well adjusted to social environment condition of the study area. Since she hails from the same community. Hence, the data collected by her from the respondents were free from bias.
4. The responses furnished by the respondents were reliable. They expressed the truth about convictions and opinions.

5. Views and opinions furnished by the use of good management practices included in the sample were representative views and opinions of the whole population of the study area.
6. The findings of the study are expected to have general application to other parts of the country with similar personal, socio-economic and cultural conditions of the study area.

1.7 Definition of the Terms

The terms which have been frequently used throughout the thesis are defined and interpreted below:

Age

Age of a respondent was defined as the span of his/her life and was operationally measured by the number of years from his/her birth to the time of interview.

Education

Education is the processing of facilitating learning, or the acquisition of the knowledge, skills, values, morals, beliefs, habits and personal development. Educational methods include teaching, training, storytelling, discussion and directed research. It was operationalized by the formal education of the respondents by taking into account of he/she spent in formal educational institutions.

Fisheries farming experience

Practical knowledge, skill, or practice derived from direct observation of or participation in events or in a particular activity in farm. No fisheries farming experience.

Annual family income

The term annual family income referred to the total earning of the respondent himself/herself from fisheries, agriculture, livestock and other accessible sources (service, business, others etc.) during a year. It was expressed in Thousand Taka.

Fish farm size

It referred to the area under fish farming of the farmers. It was expressed in hectare.

Training exposure

It was used to refer to the completion of an activity by the farmers which were offered by the government, semi-govt. or non-government organization (s) to improve the knowledge & skills of farmers for better performing an agricultural job. It refers to the total number of days attended by the farmers in his life to the training related on GMPs.

Knowledge of GMP

Knowledge is defined as what is learned, understood or aware of. It referred to the extent of basic understanding of the farmers in different aspects of fish cultures i.e., species, pond preparation, predatory fish, food availability, oxygen availability, natural food preparation, fish diseases and preventive measures, fish harvesting, marketing, etc. It includes the basic understanding of the use of different fish inputs and practices.

Extension contact

This term refers to one's becoming accessible to the influence of extension program through different extension teaching methods.

Use of GMP

It referred to the level of practices by the farmers in various aspects of fish cultures, such as applying supplementary feed, use of fertilizers, use of lime, application of cow dung, application of medicine, controlling weeds, treating the fingerlings, sorting and grading of fish, keeping record of income.

CHAPTER II

REVIEW OF LITERATURE

This Chapter deals with the reviews of past works that relate to this investigation directly or indirectly. Despite frantic search, the researcher found only a few studies which were indirectly related to the present study. The researcher intensively searched Internet, websites, available books, journals and printed materials from different sources of home and abroad. However, the literatures have been organized into following five sections to set the context of the study. This Chapter consists of five sections. The first section deals with the general use of fish management practices by the farmers; second section is dedicated to an observation on the findings related to the contribution between the selected characteristics of the GMP adopters and their trend of use and third section is approaching the conceptual framework of the study. A number of GMPs such as use of recommended doses of fertilizer, lime, medicine, use of appropriate doses of pesticide, use of organic manure, use of nature food, etc. are discussed in the following sections.

2.1 Review of Literature on General Context of Using Fish Management Practices

The findings of Samah and Kamaruddin (2015) has revealed that the level of good aquaculture practices among brackish-water pond farmer is satisfactory where almost 84 percent of farmer practicing good aquaculture practices.

Sakib *et al*. (2014) revealed that about half of the farmers (45.5) percent had low knowledge about good management practices on fish culture and more or less similar portion of them possessed high knowledge of good management practices category (42.70 percent), whereas only 11.80 percent of them showed medium category knowledge.

Ghimire and Kafle (2014) conducted a study on Integrated Pest Management Practice (IPM) and its use by the farmers in Nepal. The study revealed that about 53 percent of the farmers were satisfied with the practice.

Hossain (2009) conducted a study on use of integrated pest management practices by the farmers of Brahmanbaria district. The study revealed that 57 percent of the farmers were medium users, while 22 percent were low users and 21 percent were high users of GPM practices.

Salam (2003) found that an overwhelming majority (94 percent) of the respondents were found having high constraints in adopting environmentally friendly farming practices while 6 percent had medium constraints. No farmer was found having low constraint.

Karl Sweiby (2003) indicated that "Practice may be defined as a method, procedure, process, or rule used in a particular field or profession; a set of these regarded as standard."

Islam (2002) conducted a study on adoption of modern agricultural technologies by the farmers of Sandwip. The study revealed that 69 percent of the farmers had medium adoption while 13 percent had low adoption and 18 percent had high adoption of modern agricultural technologies.

Hossain (2004) studied adoption of selected modern boro rice cultivation technologies by the farmers of Homna Upazila in Comilla district. He found that, the highest proportion (60 %) of farmers fell under the medium adoption category, while 21 percent had high adoption and 19 percent had low adoption.

Sardar (2002) studied on "Use of IPM practices by the farmers under PETRRA Project of RDRS. He observed that majority (45.9 percent) of the farmers had medium, 38.3 percent had low and 15.8 percent had high adoption of IPM practices.

Rabbany (2003) showed that only 31.37 percent of the farmers were high users of integrated pest management (IPM) practices in crop, while 86.89 percent were medium and none was low users. Among 10 selected IPM practices "Agro-ecosystem Analysis (AESA) in every crop season" ranked first in the order while "collection and destroy of eggs and larvae by hand" ranked last.

Azad (2005) determined the impacts of Mymensingh Aquaculture Extension Project (MAEP) in relation to farmers' gain in knowledge, skill development on culture and

management of fish ponds in Melandaha and Islampur upazilla under Jamalpur district. The personal characteristics of the fish farmers such as education, experience, training and extension contact were positively correlated with farmers' acceptance of aquaculture training provided by MAEP was effective in enhancement and development of farmers' knowledge, skill and attitude on fish production under semi-intensive system of culture and management. After training, fish production of trained farmers was increased by 84 percent over their initial production of 6.83 kg/dec/yr. Fish production of the trained farmers increased to a level of 10.0-18.0 kg/dec/yr. averaging 12.55 kg/dec/yr. The selected farmers had favorable attitude towards semi-intensive aquaculture.

Islam (1996) carried out a study on farmer's use of indigenous technical knowledge (ITK) in the context of sustainable agricultural development. He found the extent use of ITK by individual farmers that, the highest proportion (42.73 percent) of the respondents belonged to the lower user category as compared to 41.82 percent in the moderate user category and 15.45 percent in the higher user category, respectively.

Sana (2003) studied farmers' knowledge of shrimp culture and showed that majority (61 percent) of them had medium level of knowledge, while 30 percent had low and rest 9 percent possessed high knowledge.

Haque (2003) found that the majority (47 %) of the maize growers had medium adoption of modern maize cultivation technologies while 28 percent had high adoption and 25 percent low adoption.

2.2 Contribution between Farmers' Characteristics to their Use of Agricultural Practices like GMP

2.2.1 Age and use of GMP

After reviewing the related literature, it was observed that some studies examined age had negative and some studies showed age had positive significant relationship with knowledge of GMP on fish farming or related matters, but some studies did not show any association.

Goswami *et al.* (2020) reported the information about the relationship nature between the independent and dependent variable where age had no significant relationship with the use of fish farming management practices of the farmer.

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the farmers of Pirojpur district and revealed that age of the farmers had no positive significant relationship with their use of ICM practices.

Alam *et al.* (2017) found that age of the farmers had no important relationship with farmers' fish farming knowledge.

Abdullah *et al.* (2015) found that age of the farmers had important positive contribution with their knowledge on pond fish farming.

Hossain (2009) observed that age had positive significant relationship with their use of Integrated Pest Management practices.

Rahman (2006) summarized that age of the farmers had significant and negative relationship with their knowledge and use of GMP on prawn culture.

Hossain (2006) conducted a study on use of Integrated Management Practices in Rice field by the farmers in Tapodhan union under Rangpur District. He examined that age of the farmers had no significant contribution with their use of IPM practices.

Akter (2003) observed that age had significant influence with their knowledge on agricultural activities.

Saha (2003) noticed that age of the farmers had no association with their knowledge on poultry production.

Aurangozeb (2002) observed that there was significant negative effect between age and use of integrated homestead farming technologies examined negative and significant contribution between age and use of GMP.

2.2.2 Education and use of GMP

It can be assumed from the studies that education has been one of the factors for spreading up knowledge on pond fish farming or related matters in most of the cases. It also showed a negative effect in some studies.

Goswami *et al.* (2020) informed that education of the farmers had no significant contribution with their management practice on fish farming.

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the Farmers of Pirojpur District and observed that education of the farmers had positive significant influence with their use of ICM practices.

Hossain (2017) showed that education of the farmers had positive and significant relationship to their knowledge in disseminating farm information.

Azad (2013) found that there was a positive useful relationship between farmers' level of education and knowledge.

Roy (2006), noticed that education of the farmers had positive and significantly related to their knowledge on Boro rice cultivation.

Rahman (2006) indicated that education of the farmers had significant and positive influence with their knowledge on prawn culture.

Saha (2003), Sana (2003), Sarker (2002), Saha (2001), Hossain (2000) found that education of the farmers was positively and significantly related to their knowledge in their research work's.

Alam and Balasubramanian (2000), Patil, Hague and Hasan (2001), Islam (2002) Okoro & Obibuaka, Khan and Kashem (2003), Hossain (2004) and Singh (2005) observed that there were significant and positive association between education of the farmers and their use of IPM Practices.

Alam (1997) observed that the level of education of the farmers had a positive and significant connection with the use of improve farm practices.

2.2.3 Fisheries farming experience and use of GMP

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the Farmers of Pirojpur District and found that time spent in farming of the farmers had no positive significant contribution with their use of ICM practices. Mamun (2018) conducted a study on farmers‟ knowledge gap on using agrochemicals in potato cultivation and no significant contribution of farmers‟ knowledge gap on using agrochemicals and time spent in potato farming.

Kabir and Rainis (2015) conducted a study on Adoption and Intensity of Integrated Pest Management (IPM) on Vegetable Farming in and observed that experience had positive significant effect with IPM.

Hoque and Hoque (2014) conducted a study on socio-economic factor influencing profitability of rice seed production in selected areas of Bangladesh and noticed that experience had no positive significant effect with IPM.

Sarkar (1997) found that farming experience of potato growers had no significant relationship with their adoption of improved potato cultivation practices.

Chowdhury (1996) conducted a study in Nowabgonj, Dhaka on the factor affecting adoption behavior of Boro rice growers. He reported that farming experience significantly influenced farmers in accepting production technology.

2.2.4 Annual family income and use of GMP

Goswami et al. (2020) informed that annual income from fish farming of the farmers had no significant effect with their use of fish farming practices.

It was observed by Chowdhury et al., (2016) that annual family income from fish farming of the farmers had positive significant contribution with their use of GMP on fish farming.

Abdullah (2013) summarized that annual income from fish farming of the farmers had no significant influence with their practice on pond fish farming.

Hossain (2003) observed that annual income of the farmers had significant positive association with their adoption of modem Boro rice cultivation practices

Hague and Hossain (2001), Khan and Hossain (2003) Rahman (2004) Singh (2005) found that income of the farmers was associated with the use of IPM practices**.**

Alam (1997) observed a positive and significant effect between annual income of the farmers and the use of improved farm practices in rice cultivation.

2.2.5 Farm size and use of GMP

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the Farmers of Pirojpur district and found that. farm size of the farmers had positive significant contribution with their use of ICM practices.

Abdullah et al. (2015) summarized that pond size of the farmers had positively significant influence with their knowledge and uses on fish farming.

Islam (2003) in his study found that there was a positive and significant association between farm size of the farmers and adoption of organic manures.

Sardar (2002) conducted a study on IPM practices by the farmers and found that the farm size of the farmers had significant positive effect with their use of IPM practices.

Islam (1993) in his study found that farm size had a significant positive contribution with adoption of improved practices.

2.2.6 Training and use of GMP

Prodhan and Khan (2018) reported that training exposure of the farmers and practices on scientific aquaculture management had positively significant influence at the 1% level of significance.

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the Farmers of Pirojpur District and found that training exposure of the farmers had positive significant effect with their use of ICM practices.

Hossain (2017) examined that a positively significant association was found between farmers training exposure and their knowledge in disseminating farm information.

Yeasmin et at., (2013) informed that use of management practices with IFF (Integrated Fish Farming) had positive contribution with their extent of training needs on IFF (Integrated Fish Farming).

Rahman (2010) found a strong positive influence between training experience of the farmers and attitude towards IPM practices.

Rahman (2006) summarized that training exposure of the farmers had positive significant effect with their use on Practice of prawn culture.

Haque (2003) found that training received of the respondent had positive significant association with their practices in farmers' adoption of modern maize cultivation technologies.

2.2.7 Knowledge of good management practices (GMP) and use of GMP

Pandya (1981) in his study conducted on transfer of plant protection technology found that those farmers who know about the effects of diseases and pests on their crops adopt

plant protection measures. The main cause of non-adoption was reported to be ignorance.

Nand *et al.* (1981) in a study at Haryana reported that farmers' ignorance about plant protection recommendations stood out as the most significant reason for non-adoption of plant protection measures.

2.2.8 Attitude toward fish farming and use of GPM practices

Akbar (2008) observed that more than half (63.3 percent) of the respondents had low perception of the harmful effects of pesticides compared to only 3.3 percent had high perception.

Dhaliwal *et al.* (1996) told that the insect pests are controlled with the use of chemicals, which have destructive influence on the useful fauna, anti-create environmental pollution.

Gani (1997) found that use of' pesticides kills beneficial creatures and insects that make the land fertile. Besides, the indiscriminate use of pesticides creates a resistance against insects and pests, which in turn creates an increased threat to the crops.

Islam (1994) noticed that use or different types of pesticides has been controlling to the evolution of "Super pests" that are immune to the chemicals. Resistant to pesticide has been developed in certain species of fungi as well as in weeds.

2.2.9 Extension contact and use of GMP

Mazumder (2018) conducted a study on use of Integrated Crop Management (ICM) Practices by the Farmers of Pirojpur District and found that extension media contact of the farmers had positive significant contribution with their use of ICM practices.

Alam *et al*. (2017) observed that extension media contact of the fish farmers had positive significant association with their use of GMP.

Hossain (2003) observed that extension media contact that communication exposure of the farmers bad significant positive effect with their adoption of modem Boro rice cultivation practices.

Halim (2000), Hague and Hossain (2001), Islam and Juliana *et al* (2002) Kaur (2003), Rahman (2004) and Singh (2005) observed that extension contact of the respondents had a significant and positive influence with the adoption of improved farm practices.

2.3 Conceptual Framework of the Study

This study is concerned with the farmers' knowledge and good management practices on fish farming. Thus, good management practices were the main focus of the study and 10 selected characteristics of the fish farmers were considered as those having relationship with use of GMP**.** Based on this above discussion and the review of literature, the conceptual framework of this study has been formulated and shown in Figure 2.1.

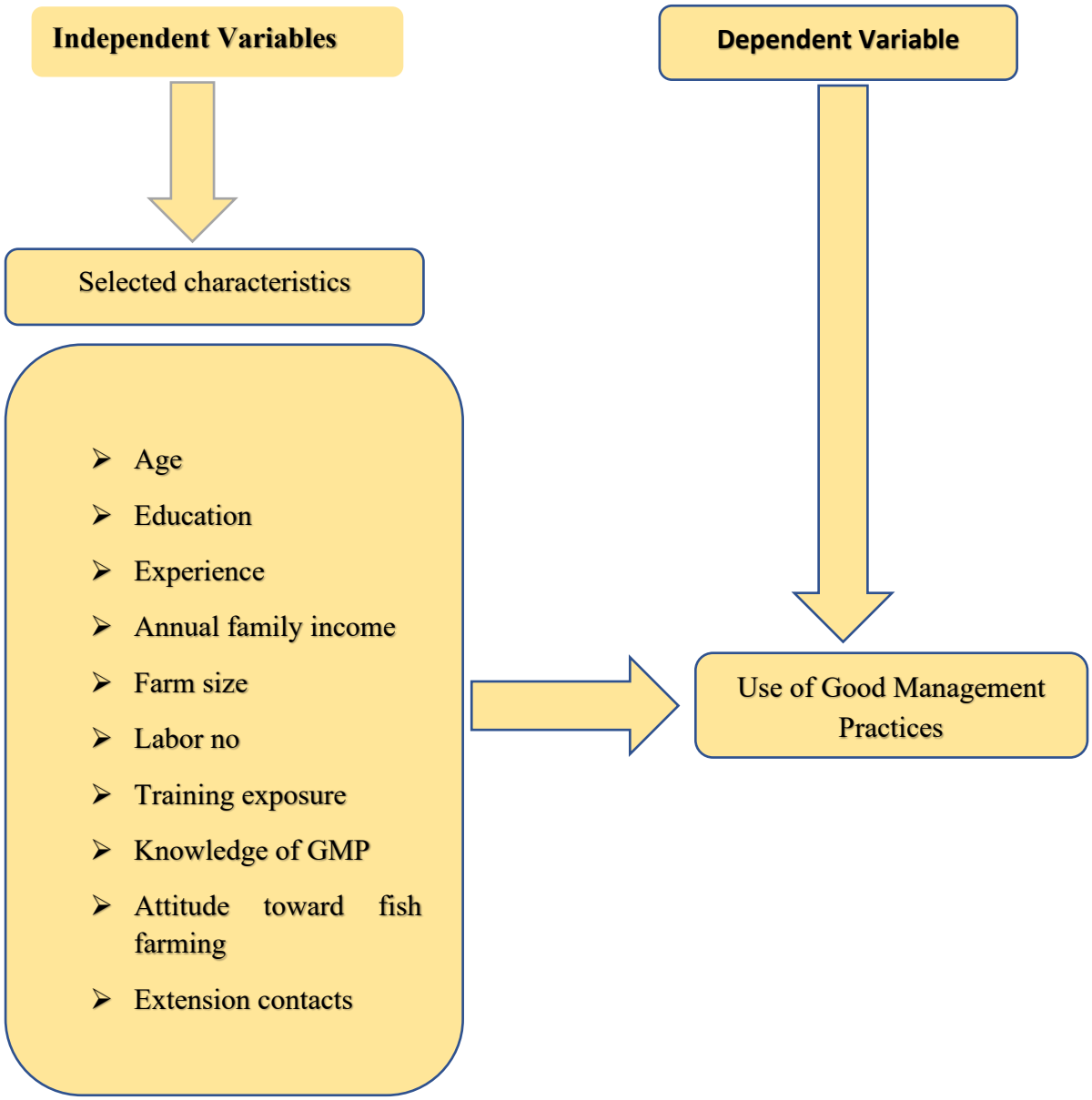

Fig: 2.1 Conceptual framework of the study

CHAPTER III

METHODOLOGY

Methods and procedures used for collection and analysis of data are very important in any scientific research. It requires a careful consideration before conducting a study. The role of the methodology is to carry on the research work in a scientific and valid manner (Singh, 2006). It involves such general activities as identifying problems, formulating, hypothesis, procedure, for testing hypotheses, measurement, data collection analysis of data, interpreting results and drawing conclusions. Appropriate methodology enables the researcher to collect valid and reliable information and to analyze the information properly in order to arrive at correct conclusions.

3.1 Local of the Study

Rangpur district was selected purposively as it is a potential district of Bangladesh for fisheries practices. There are eight upazilas in Rangpur district, among Badarganj upazila was selected purposively. The study was conducted in five villages namely Namatari, Jharpara, Shikdarpara, Shongkorpur Sarkerpara and Boirampur. These villages were selected purposively because farmers of thses areas are comparatively conventional method followers. Before selecting these villages, the researcher conducted a thorough discussion with the concerned GOs, NGO personnel and local elites to contact targeted farmers. Two maps showing the location and details of the study area are presented in 3.1 and 3.2.

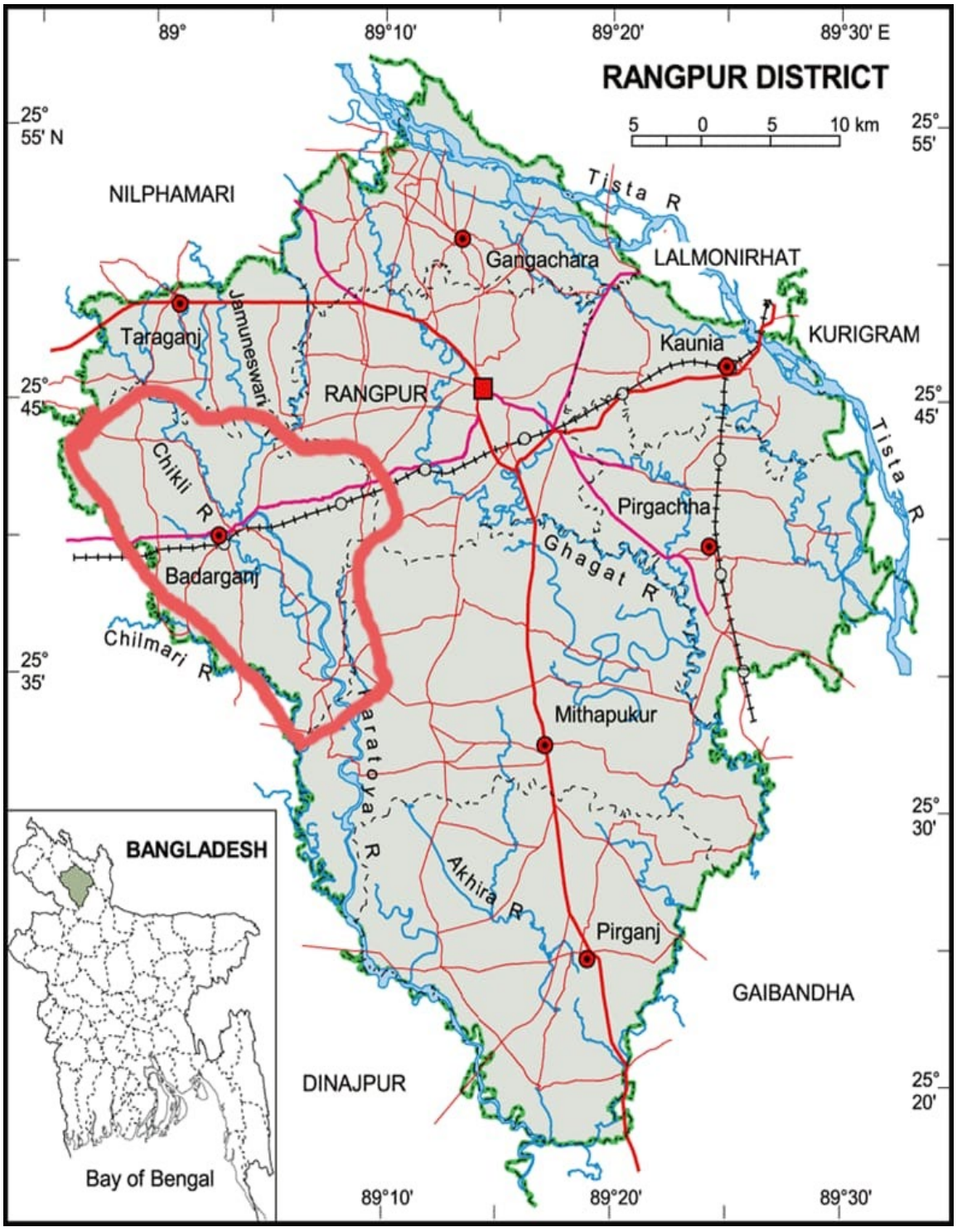

Fig: 3.1 Map of Rangpur district showing Badarganj upazila

Fig: 3.2 Map of Badarganj upazila showing Badarganj union

3.2 Population and Sample of the Study

The fish farmers of selected five villages of Badarganj union under Badarganj upazila of Rangpur district were considered as the population of the study. A list of farmers who are currently growing fish and fish fry in their aquatic resources was prepared with the help of Upazila Fisheries Officer (UFO) and their field staffs. There were 630 farmers in these villages which constitute the population of the study. Data were collected from the sample rather than the whole population due to time and fund constants. Fish farmers were selected randomly and proportionately from the villages. Thus, 100 fish farmers were selected as the sample for this study by using suveysystem.com at 95% level of confidence and confidence of interval of nine (9).

Table 3.1 Distribution of the population and sample of the study

Name of the villages	**Population**	**Sample size**	**Reserve list**
Namatari	128	20	2
Jharpara	64	10	1
Shikdarpara	100	16	2
Shongkorpur	192	30	3
Boirampur	146	24	2
Total	630	100	10

3.3 Selection of Dependent and Independent Variables

The extent of use of Good Management Practices (GPM) in fish culture by the farmers was the dependent variable of this study. As the use of GMP in fisheries by the farmers was the main focus of the study, so there are various factors which could influence this phenomenon. But it was not possible in a single study to deal with all the factors. So, discussing with the research supervisor, co-supervisor and members of the examination committee and considering the limitations of time, money and other resources, ten characteristics of the farmers were selected as the independent variables of this study. These variables were: age, education, fisheries farming experience, annual family

income, farm size, number of labors, training received in fish farming, knowledge of GMP, attitude toward fish farming, extension contact.

3.3.1 Measurement of Independent Variables

3.3.1.1 Age

The age of a respondent was measured in terms of years from his / her date of birth to interview time. A score of one (1) was assigned for each year age.

3.3.1.2 Education

Education of a respondent was measured in terms of years of schooling completed by an individual in educational institutions (school, college, university etc.). Education score was computed for a respondent by giving 1 score for each year of schooling completed. 0.5 score was given to a respondent who can only sign his/ her name. Person without any education i.e., unable even to sign his /her name was awarded 0 score.

3.3.1.3 Fisheries farming experience

Experience in farming of the respondent was measured by the number of years a respondent engaged in farming. The measurement included from the year of starting of first farming till the year of data collection. A score of one (1) was assigned for each year of experience (Appendix-A).

3.3.1.4 Annual family income

Annual income of a respondent was measured in taka on the basis of total yearly earnings of his/her family from agriculture and non-agricultural sources. For determining agricultural income of a respondent, first, annual production of different farm out puts like fisheries, agriculture, livestock etc. was ascertained. Then the total market prices of the above items were determined on the basis

of prevailing market price of the items at the time of interviewing. Income of the respondent and other members of his/her family from non–agriculture sources (services, business, others etc.) was also determined. Yearly earnings from agriculture and non-agriculture sources were added together to obtain the total income of the Respondents. Annual income of a respondent was measured in '000' BDT on the basis of total yearly earning from agricultural and non-agricultural sources by the respondent himself and other family members (Appendix-A).

3.3.1.5 Farm size

Farm size of a farmer is referred to the total area of land on which his/her family carried out farming operations, the area being in terms of full benefit to his/her family. The farm size was measured in hectares for each farmers using the following formula:

Farm size = A1 + A2 + ½ (A3 + A4) + A5

A1 = Homestead Area (A1)

A2 = Own Pond under own farming (A2)

A3 = pond given to others on borga (A3)

A4 = pond taken from others on borga (A4)

A5 = Pond taken from others on lease (A5)

The unit of measurement was hectares.

3.3.1.6 Number of labors

Number of labors of the farmer was measured by the total number of male/female/children (13-16years) in fish farming. A score of one (1) was assigned for each number of labors.

3.3.1.7 Training received in fish farming

Training exposure was measured by the total number of days a respondent received training in his/her life on farming practices related to GMP. A score of 1 (one) was given to a respondent for every day of training. A zero (0) score was assigned for no training exposure (Appendix-A).

3.3.1.8 Knowledge of GMP for fish farming

After thorough consultation with relevant experts and reviewing of related literature, 16 question regarding GMP practices were selected and those were asked to the respondent to determine their knowledge on GMP practices. Two (2) score was assigned for each correct answer and zero (0) for wrong or no answer. Partial score was also assigned for partially correct answer. Thus, the knowledge on GMP practices score of the respondents could range from 0 to 32, where 0 indicates very low knowledge and 32 indicates the very high knowledge on GMP.

3.3.1.9 Attitude toward fish farming

Attitude of a respondent towards fish farming was measured by developing an attitude scale. Five-point Likert method of summated ratings was used to find out the farmers‟ attitude towards fish farming. Four statements expressing positive and negative feelings towards fish farming were constructed. A statement was considered positive if it indicated a favorable attitude towards fish farming. If the case was reverse, it was considered as a negative statement. Scoring was done by assigning 5, 4, 3, 2 and 1 scores to the five alternative responses as "strongly agreed", "agreed", "neither agreed or disagreed", "disagreed", and "strongly disagreed", respectively in case of a positive statement. However, attitude towards fish farming of a farmer was obtained by summing up his scores for all the four statements in the interview schedule.

Attitude score, thus, obtained for a respondent could range from zero 5 to 20, where 5 indicates very unfavorable attitude, 13 indicates neutral and 18 indicates highest level of favorable attitude.

3.3.2 Measurement of dependent variable

Use of good management practices by the farmers was the dependent variable. Appropriate scale was used to measure the independent variables. First 10 good management practices (Applying supplementary feed in pond, using fertilizer in pond, using lime in the pond, applying cow dung or other organic manure, controlling weeds from pond, applying medicine if disease attack in the fish, treating the fingerlings before releasing in the pond, rating the undersized fish and remove predatory fish, sorting and grading of fish for better production and keeping record of income and expenditure for fish culture) were selected from different sources. Then, the farmers were asked how many numbers of good management practice was followed by the farmers. Each respondent was asked to indicate the extent of his use as regularly, often, occasionally, rarely and never use and score was assigned as 4, 3, 2, 1 and 0 respectively.

Thus, the range of good management practices score of a respondent could vary from 0 to 40. Where 0 indicates no use of practice and 40 indicates the highest use of good management practices.

3.4 Instruments for Data Collection

In order to collect relevant data from the respondents an interview schedule was prepared in Bangla keeping the objectives of the study in mind. Both open and closed form questions were included in the schedule based on the measurement procedures discussed earlier in section 3.3.

Before finalization, the interview schedule was pre-tested with 20 farmers of the study area. On the basis of the pre- test experiences necessary corrections, modifications and alterations were made before finalizing the interview schedule for final data collection. During modification of the schedule, valuable suggestions were received from the research supervisors and relevant experts. The interview schedule was then printed in its final form and multiplied. A copy of interview schedule in English version are placed in Appendix A.

3.5 Statement of the Hypothesis

As defined by Goode and Hatt (1952) a hypothesis is "a proposition which can be put to test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test."

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 in the present research investigation. The research hypotheses were stated in positive form, the hypotheses were as follows:

"There are relationships between the selected characteristics of the farmers and their use of GMP"

3.5.2 Null hypothesis

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 contribution to their good management practices."

3.6 Collection of Data

Data were collected personally by the researcher himself through face-to-face interview from the selected pond farmers. But to familiarize researcher with the study area and

for getting local support, the researcher took help from the local leaders and the field staff of Upazila Fisheries Office (UFO). Interviews were usually conducted with the respondent in their homes. While starting interview with any respondent the researcher took all possible care to establish rapport with him so that he did not hesitate to furnish proper responses to the questions and statements in the schedule. However, if any respondent failed to understand any question the researcher took care to explain the issue. He received excellent cooperation from the respondents and others concerned during the time of interview. The entire process of collecting data was completed within the period from 15 July to 25 August 2021.

3.7 Data Processing

3.7.1 Editing

The collected raw data were examined thoroughly to detect errors and omissions. As a matter of fact, the researcher made a careful scrutiny of the completed interview schedule to make sure that necessary data were entered as complete as possible and well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

3.7.2 Coding and tabulation

Having consulted with the research supervisor and co-supervisor, the investigator prepared a detailed coding plan. In case of qualitative data, suitable scoring techniques were followed by putting proper weight age against each of the traits to transform the data into quantitative forms. These were then tabulated in accordance with the objective of the study.

3.7.3 Categorization of data

For coding operation, the collected data were classified into various categories. These categories were developed for each of the variables based on their possible range (max and min). The procedure and categorization of a particular variables were further discussed in the Chapter IV in detail.

3.8 Method of Data Analysis

The data were analyzed in accordance with the objectives of the proposed research work. The statistical measures such as range, means, standard deviation, number and

percentage distribution were used to describe the variables. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Science) computer program, version 25. In order to estimate the contribution of the selected factors that might influence farmers in the use of GMP, linear regression analysis as used. Throughout the study the 0.01 and 0.05 levels of probability were used as the basis of rejection or accepting a null hypothesis. If the computed value was equal or greater than the designated level of significance (p), the null hypothesis was rejected and it was concluded that there was a significant contribution between the concerned variables. Whenever the computed value of be rejected. Hence, it was concluded that there was no contribution of the concerned variables.

CHAPTER IV

RESULTS AND DISCUSSION

In this Chapter, the findings of the study and interpretation of the results have been presented according to the objectives of the study. This Chapter has been divided into three sections. The first section deals with the selected individual characteristics of the farmers while the second section deals with the extent of use of good management practices in fish farming. The third section deals with the effect between the farmers selected characteristics and their extent of use of GMP.

4.1 Selected Characteristics of the Respondent Farmers

In this section the findings of the farmers' selected characteristics have been discussed. The selected characteristics are 1) age 2) education 3) fish farming experience 4) annual income 5) farm size 6) number of labors 7) training exposure 8) knowledge of GMP 9) attitude toward fish farming 10) extension contact. Measuring unit, range, mean and standard deviations of those characteristics of farmers were described in this section. Table 4.1 provides a summary profile of farmers' characteristics.

Table 4.1 Characteristics profile of the respondents

Characteristics	Unit of the measurement	Range		Mean	SD
		Possible	Observed		
Age	Year	Unknown	28-81	48.96	10.70
Education	Level of Schooling	Unknown	0.0-18	5.60	5.87
Fish Farming Experience	Years	Unknown	14-36	25.46	11.61
Annual Family Income	('000' BDT)	Unknown	150-300	988.76	371.93
Farm Size	Hectare	Unknown	<.02-3.0	.376	.13
Training exposure	Number of Days	Unknown	2-6	3.92	2.93
Number of labors	Number of persons	Unknown	4-7	4.24	2.12
Knowledge of GMP	Score	0-32	13-26	27.41	1.96
Attitude Toward Fish Farming	Score	0-20	13-18	15.96	2.41
Extension Contact	Score	0-48	23-31	27.24	3.75
Use of GMP	Score	0-40	26-34	30.20	4.28

4.1.1 Age

Age of the respondents varied from 28 to 81 years, the average being 48.96 years with the standard deviation of 10.70. According to their age, the respondents were classified into three categories as "young aged", "middle aged" and "old aged". The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Basis of categorization (Years)	Farmers	
		Number	Percentages
Young aged	up to 35	13	13.0
Middle aged	36-50	41	41.0
Old aged	Above 50	46	46.0
Total		100	100.0

Data represented in Table 4.2 indicate that the old-aged farmer comprised the highest proportion (46.0 percent) followed by middle aged category (41.0 percent) and the lowest proportion were made by the young aged category (13.0 percent). Data also indicates that the middle to old aged respondents constitute almost 87 percent of total respondents. The old and middle-aged respondents were generally more involved in good management practices than the young aged.

4.1.2 Level of education

Education level of the respondents ranged from 0-18 in accordance with year of schooling. The average education score of the respondents was 5.59 with a standard deviation of 5.87. On the basis of their level of education, the farmers were classified into five categories as shown in Table 4.3

Table 4.3 Distribution of the farmers according to their level of education

Categories	Basis of Categorization (Schooling year)	Respondents	
		Number	Percentage
Illiterate	0	12	12.0
Can sign only	0.5	30	30.0
Primary level	1-5	22	22.0
Secondary level	6-10	12	12.0
Above secondary level	Above 10	24	24.0
Total		100	100.0

Data shown in Table 4.3 indicates that respondent of can sign only categories constitute the highest proportion (30.0 percent) followed by above secondary level (24.0 percent). On the other hand, the lowest proportion (12.0 percent) in illiterate category and secondary level followed by primary education category (22.0 percent). Education broadens the horizon of outlook of farmers and expands their capability to analyze any situation related to good management practices. An educated farmer is likely to be more responsive to the modern facts, ideas, technology and information of good management practices.

4.1.3 Fisheries farming experience

Computed scores of the farmers about experience in fish farming ranged from 14 to 36 years with a mean of 25.46 and standard deviation of 11.61. On the basis of farming experience, the respondents were classified into three categories as follows in Table 4.4.

Table 4.4 Distribution of the farmers according to their fisheries farming experience

Categories (year)	Basis of Categorization (years)	Respondents	
		Number	Percent
Short farming experience	Up to 14	21	21.0
Medium farming experience	14-36	61	61.0
Long farming experience	Above 36	18	18.0
Total		100	100.0

Data contained in Table 4.4 showing that 61.0 percent of the farmers had medium farming experience, where as 21.0 percent had short farming experience and 18.0 percent had long farming experience. Farming experience is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need.

4.1.4 Annual family income

Annual family income of the respondents ranged from 150 to 300 thousand taka. The mean was 988.77 thousand taka and standard deviation was 371.93. On the basis of annual family income, the respondents were categorized into three groups as shown in Table 4.5.

Table 4.5 Distribution of the farmer according to their annual family income

Categories	Basis of Categorization ('000' BDT)	Respondents	
		Number	Percent
Low income	Up to 150	3	3.0
Medium income	151-300	5	5.0
High income	Above 300	92	92.0
Total		100	100.0

Data shown in Table 4.5 presented that the highest proportion (92.0 percent) of the respondents had high family income while 3.0 and 5.0 percent of the respondents had low and medium annual family income respectively. The gross annual family income of a farmer is an important indicator of how much she/he can invest in his farming. Generally higher income encourages one's integrity to achieve better performance and to show his/her individual better status in the society. The higher income increases the risk-taking capacity of the farmers.

4.1.5 Farm size

Farm size of the respondents ranged from <.02 hectare to 3.0 hectares with the mean of .376 and standard deviation of .133. On the basis of their farm size, the farmers were classified into three categories followed by DAE (1999) as shown in Table 4.6.

Table 4.6 Distribution of the farmers according to their farm size

Categories	Basis of categorization (ha)	Respondents (N=100)	
		Number	Percent
Marginal	.02-.20	13	13.0
Small size farm	0.2 – 1.0	87	87.0
Medium size farm	1.01-3.0	0	0.0
Large size farm	Above 3.0	0	0.0
Total		100	100.0

Data presented in Table 4.6 showed that the farm size of the farmers in the study area varied from 0.1 to 3.0 ha. Majority (87 percent) of the respondents had small farm size compared to 13 percent respondents had marginal farm size. Findings show that maximum farmers of the study area had small farm size.

4.1.6 Training exposure

The score of training exposure of the farmers ranged from 2-6 days. The mean was 4.24 days and standard deviation was 2.12. On the basis of training, the respondents were categorized into three groups as shown in Table 4.7.

Table 4.7 Distribution of the farmer according to their training exposure

Categories	**Basis of categorization (Days)**	**Respondents**	
		Number	**Percent**
Low training	Up to 2	22	22.0
Medium training	3-6	51	51.0
High training	Above 6	27	27.0
Total		100	100.0

Data presented in Table 4.7 showed that about (51.0 percent) of the farmers had medium training exposure; while only 22.0 percent of the farmers low training exposure. Where, 27.0 percent farmers had high training. Training develops farmers‟ knowledge, skill, and attitude in positive manner.

4.1.7 Number of labors on GMP practices

The score of number of labors ranged from 4-7. The mean was 3.92 days and standard deviation was 2.93. On the basis of number of labors, the respondents were categorized into three groups as shown in Table 4.8

Table 4.8 Distribution of the farmer according to their number of labors

Categories	Basis of Categorization (score)	Respondents	
		Number	Percent
Low number	Up to 4	71	71.0
Medium number	5-7	12	12.0
High number	Above 7	17	17.0
Total		100	100.0

Data presented in Table 4.8 showed that about (71.0 percent) of the farmers had low number; while only 12.0 percent of the farmers had medium number of labors. Where, 17.0 percent farmers had high number of labors. Because most of the farmers were found who had small size farm. Small size farm doesn't need more labors. So, majority of the farmers had low number of labors.

4.1.8 Knowledge on GMP practices

The score of knowledge on GMP practices ranged from 13-26. The mean was 27.41 days and standard deviation was 1.96. On the basis of knowledge scores, the respondents were classified into three categories namely, "low knowledge", "medium knowledge" and "high knowledge". The distribution of the respondents according to their knowledge on GMP practices is given in Table 4.9.

Table 4.9 Distribution of the farmers according to their knowledge on GMP

Categories	Basis of Categorization (Score)	Respondents	
		Number	Percent
Low knowledge	Up to 12	0	0.0
Medium knowledge	14-26	30	30.0
High knowledge	Above 26	70	70.0
Total		100	100.0

Data in Table 4.9 showed that about (70.0 percent) of the farmers had high knowledge; while only 30.0 percent of the farmers had medium knowledge. Where, 0.0 percent farmers had low knowledge. It means that an overwhelming majority (70.0 percent) of the farmers had medium to high knowledge.

4.1.9 Attitude toward fish farming

The score of extent of attitude of the farmers toward GMP practices in farming ranged from 13-18 with an average of 15.96 and standard deviation of 2.41. The respondents were categorized into low attitude, medium and high attitude based on of attitude score. The distribution of the respondents according to their attitude toward fish farming is given in Table 4.10.

Table 4.10 Distribution of the farmers according to their attitude toward fish farming

Categories	**Basis of Categorization (Score)**	**Respondents**	
		Number	**Percent**
Low favorable attitude	Up to 13	17	17.0
Medium favorable attitude	14-18	65	65.0
High favorable attitude	Above 18	18	18.0
Total		100	100.0

Data presented in Table 4.10 indicates that (65.0 percent) of the respondents had medium favorable attitude towards fish farming out of which 17.0 percent low favorable attitude and 18.0 percent high favorable attitude. It was due to their high to medium knowledge on GMP.

4.1.10 Extension contact

The scores of the farmers regarding extension media contact ranged from 23-31 against with a mean of 27.24 and standard deviation of 3.75. On the basis of their extension contact scores, the farmers were classified into three categories (Table 4.11)

Table 4.11 Distribution of the farmers according to their extension contact

Categories	Basis of Categorization (score)	Respondents	
		Number	Percent
Low contact	Up to 23	16	16.0
Medium contact	24-31	75	75.0
High contact	Above 31	9	9.0
Total		100	100.0

Data presented in Table 4.11 showed that a proportion of 75.0 percent of the farmer had medium extension contact compared to 16.0 percent of them had low extension contact and 9.0 percent of the farmer had high contact. Thus, overwhelming majority (75.0 percent) of the farmer had medium to low extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies. The status of number or having high and medium contact might have significant impacts on use of good management practices.

4.2 Use of Good Management Practices

The scores of good management practices of the respondents ranged from 26 to 34 against the with an average of 30.20 and standard deviation of 4.28. Based on the observed scores of good management practices, the respondents were classified into the three categories i.e., Low practices, medium practices and High practices. The distribution has been shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their use GMP

Categories	**Basis of Categorization (Score)**	**Respondents**	
		Number	**Percent**
Low practices	Up to 26	23	23.0
Medium practices	27-34	63	63.0
High practices	Above 34	14	14.0
Total		100	100.0

Data of Table 4.12 show that among the respondents the highest (63.0 percent) farmers belong to the group of medium level of good management practices and the lowest (14.0 percent) in high level of good management practices followed by low level practices (23 percent) by the farmers. Among the farmers, most of the farmer (63.0 percent) had use of GMP were found to be medium to low.

4.3 The Contribution of the selected characteristics of the respondents on their Use of GMP by the Farmers

In order to estimate the farmers use of good management practices, the multiple regression analysis was used which is shown in the Table 4.13.

Table 4.13 Multiple regression coefficients of the contributing variables related to use of good management practices

Dependable Variables	Independent Variables	β	P	R^2	Adj. R^2	F
Use of Good Management Practices by the Farmers	Age	.197	.138	.536	.484	10.292
	Education	.141	.210			
	Farming experience	.027	.856			
	Annual family income	-.140	.275			
	Farm size	.099	.325			
	Number of labors	.056	.643			
	Training exposure	.204	**.018***			
	Knowledge of GMP	.276	**.006****			
	Attitude toward fish farming	.218	**.036***			
	Extension contacts	.178	.138			

** Significant at p<0.01; *Significant at p<0.05

Table 4.13 showed that training exposure, knowledge on GMP and attitude toward fish farming had significant positive contribution with their use of good management practices. Of these, knowledge on GMP was the most important contributing factor

(significant at the 1% level of significant) and training exposure and extension contact were less important contributing factors (significant at 5% level of significant). Coefficients of other selected variables don't have any contribution on their use of good management practices. In this area farmers had good communication among them. So, their contact with extension workers was less frequent.

The value of R^2 is a measure of how of the variability in the dependent variable is accounted by the independent variables. So, the value of R^2 = 0.536 means that independent variables account for 53% of the variation with their use of good management practices. The F ratio is 10.292 which is highly significant ($p<0$).

However, each predictor may explain some of the variance in respondents their use of good management practices simply by chanced. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but value 0.484 is still show that variance is farmers their use of good management practices can be attributed to the predictor variables rather than by chanced (Table 4.13). In summary, the models suggest that the respective authority should be considered the farmers ‟ training exposure, knowledge on GMP and attitude toward fish farming on their use of good management practices and in this connection some predictive importance has been discussed below:

4.3.1 Significant contribution of training exposure on the farmers' use of good management practices

From the multiple regression, it was concluded that the contribution of training to the farmers' use of good management practices was measured by the testing the following null hypothesis.

"There is no contribution of training to the farmers' use of good management practices".

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a) The contribution of the training was significant at 5% level (0.018)

b) So, the null hypothesis could be rejected.

c) The direction between training exposure and use of good management practices was positive.

The β-value of training was (0.204). So, it can be stated that as training increased by one unit, farmers' use of good management practices increases by 0.204 units.

Based on the above finding, it can be said that farmers had more training increased the use of good management practices. So, training has high significantly contributed to the farmers' use of good management practices. Training helps farmers to gather more knowledge on use of good management practices which ultimately helps farmers gather more knowledge.

4.3.2 Significant contribution of knowledge of the farmers' use of good management practices

From the multiple regression, it was concluded that the contribution of knowledge of the farmers' use of good management practices was measured by the testing the following null hypothesis;

"There is no contribution of knowledge of the farmers' use of good management practices".

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a) The contribution of knowledge was significant at 1% level (0.006)

b) So, the null hypothesis could be rejected.

c) The direction between knowledge and use of good management practices was positive.

The β-value of knowledge was (0.276). So, it can be stated that as knowledge increased by one unit, farmers‟ use of good management practices increase by 0.276 units.

Based on the above findings, the researcher concluded that knowledge on GMP of the farmers had significant and positive relationship with their use of good management practices. This implies that farmers with higher knowledge on GMP were likely to have higher use of good management practices.

4.3.3 Significant contribution of attitude toward fish farming‟ use of good management practices

From the multiple regression, it was concluded that the contribution of attitude toward fish farming ‟ use of good management practices was measured by the testing the following null hypothesis;

“There is no contribution of attitude toward fish farming’ use of good management practices”.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a) The contribution of attitude toward fish farming was significant at 5% level (0.218)

b) So, the null hypothesis could be rejected.

c) The direction between of attitude toward fish farming and use of good management practices was positive.

The β-value of attitude toward fish farming was (0.218). So, it can be stated that as attitude toward fish farming increased by one unit, farmers’ use of good management practices increases by 0.218 units.

Based on the above findings, the researcher concluded that attitude toward GMP of the farmers had significant and positive relationship with their use of good management practices. This indicated that attitude toward fish farming of the farmers was an important factor for their use of GMP.

CHAPTER V
SUMMERY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This Chapter presents the summery of findings, conclusions and recommendations of the study. The study was conducted in the Badarganj union of Badarganj upazila under Rangpur district to find out use of good management practices by the farmers. Total 630 farmers were selected from the study area as the population and proportionate random sample techniques was used to comprised of 100 constituted the sample of the study. A well-structured interview schedule was developed based on objectives of the study for collecting information. The independent variables were: age, education, farming experience, annual family income, farm size, knowledge of GMP, attitude toward fish farming, extension Contact. Various statistical measures such as frequency counts, percentage distribution, mean and standard deviation were used in describing data. In order to estimate the contribution of the selected characteristics of the respondents to their good management practices by the farmers, multiple regression analysis was used. The major findings of the study are summarized below:

5.1 Summary of Findings

The major findings of the study are summarized below:

5.1.1 Selected characteristics of the farmers

Findings in respect of the ten selected characteristics of the farmers summarized below:

Age

The highest proportion (46.0 percent) of the farmers was old aged while 13.0 percent was young and 41.0 percent was middle aged.

Education

The highest proportion (30.0 percent) of the respondent can sign only category, while 22.0 percent had primary level of education, 24 percent had above secondary level of education, percent had secondary level of education and 12.0 percent had illiterate

Fisheries farming experience

The observed experience scores of the farmers ranged from 14 to 37 with the mean of 25.46. The highest proportion (61.0 percent) of the farmers had medium experience; while 21.0 percent had low and 18.0 percent farmers had high experience in farming.

Annual family income

Annual family income of the farmers ranged from 150 to 300 thousand Tk. with the mean of 988.76. The highest proportion (92.0 percent) of the farmers had high annual family income compared with 5.0 percent and 3.0 percent medium and low annual family income respectively.

Farm size

The farm size of the farmers in the study area varied from <.02 to 3.0 ha. Majority (87.0 percent) of the respondents had small size farm compared to 13.0 percent marginal size farm.

Training exposure

Training exposure of the farmers ranged from 2 to 6. Majority (51.0 percent) of the farmers had medium training exposure; while only 27.0 percent of the farmers had high training exposure. Where, 22.0 percent farmers had low training.

Number of labors

Number of labors of the farmers ranged from 4 to 7. Majority (71.0 percent) of the farmers had low number; while only 12.0 percent of the farmers had medium number of labors. Where, 17.0% farmers had high number of labors.

Knowledge of good management practices

The score of knowledge on GMP practices ranged from 13-26. The mean was 27.41 days and standard deviation was 1.96. Majority 70.0 percent of the farmers had high knowledge; while only 30.0 percent of the farmers had medium knowledge. Where, 0.0 percent farmers had low knowledge

Attitude toward fish farming

The score of extent of attitude of the farmers towards GMP practices in fish farming ranged from 13-18 with an average of 15.96 and standard deviation of 2.41. Majority

(65.0 percent) of the respondents had medium favorable attitude towards fish farming out of which 17.0 percent low and 18.0 percent high attitude.

5.1.2 Use of Good Management Practices by the framers

The good management practices scores of the farmers ranged from 26 to 34 with an average of 30.20 and the standard deviation 4.28. The highest proportion 63.0 percent of the farmers fell under medium good management practices category while 23.0 percent had low practices and 14.0 percent had high good management practices.

5.1.3 Contribution of the selected characteristics on use of good management practices

Training, knowledge of good management practices and attitude toward fish farming had significant contribution the good management practices scores of the farmers ranged from 26 to 34 with an average of 30.20 and the standard deviation 4.28. The highest proportion 63.0 percent of the farmers fell under medium good management practices category while 23.0 percent had low practices and 14.0 percent had high good management practices. Characteristics of the farmers like age, education, farming experience, annual family income, farm size, number of labors and extension contacts had no significant contribution with their use of good management practices.

5.2 Conclusions

Results of the study and the logical interpretations of their meanings in the light of other relevant facts prompted the researcher to draw the following conclusions:

- Majority (63.0 percent) of the respondents had medium level of good management practices. So, these is a need to take initiative for increasing farmers' use of GMP for betterment of fish farming.
- The findings of the study revealed that vast majority of the farmers (70.0 percent) had high knowledge on GMP. Knowledge of the farmers had significant positive relationship with their education, land possession, annual family income and extension contact. Therefore, it may be concluded that it would be a brilliant thinking to improve the overall situation of knowledge by taking care of the factors related to the increase of knowledge among the farmers.

- ❖ A proportion of (65.0 percent) of the farmers had medium to high attitude towards various aspects of fish farming. It may be concluded use of good management practices will not be possible to improve to a significant extent unless the concerned authorities take proper steps to improve farmers attitude toward fish farming.
- ❖ The results indicate that two thirds (75.0 percent) of the respondents had medium extension contact. Moreover, it was significant contributor on using GMP. So, there is a need to take initiative to improve the extension contact of the farmers with various organization for increasing the use of GMP.

5.3 Recommendations

5.3.1 Recommendations for policy implications

- ❖ Majority (63.0 percent) of the farmers of the study area were found to have medium level of good management practices. So, DAE should take initiative to influence farmers to use good management practices.
- ❖ It is observed that 70.0 percent of the farmers had high knowledge on GMP. But there was gap with knowledge in practicing of GMP. So that DoF should take initiative to popularize good management practices.
- ❖ It is observed that 65.0 percent farmers showed medium to high and low favorable attitude towards fish farming. So, the concerned GOs and NGO should take necessary steps to increase positive attitude towards fish farming.
- ❖ The study indicated that majority (75.0 percent) of the farmers had medium level of extension contact but only 16% had low level of extension contacts. So, in order to increase extension contacts of farmers, cultural activities, food programme, monetary facility etc. should be done.

5.3.2 Recommendations for the future study

The following recommendations are made for the future study:

- ➢ The present study conducted on the population of the farmers of five villages of one union under Badarganj upazila of Rangpur district. The findings of the study need to be varied by undertaking similar research in other zones of the country.

- The study investigated the contributions of the ten selected characteristics of the farmers with their use of good management practices. But farmers use of good management practices might be affected by other various personal, social, psychological, cultural and situational factors of the farmers. It is, therefore, recommended that further study should be conducted involving other characteristics in this regard.
- In addition to their use of good management practices by the farmers also faced other problems such as social, economic, housing, sanitation, nutrition and domestic etc. Therefore, it may be recommended that research should be conducted contribution to other use of good management practices.
- The research was conducted to find out their use of good management practices by the fish farmers. Further research should be taken related to other issues.

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APPENDIX-A

ENGLISH VERSION OF THE INTERVIEW SCHEDULE

Department of Agricultural Extension & Information System

Sher-r-Bangla Agricultural University

Dhaka-1207

An Interview Schedule for data collection for the Research on

"Good Management Practices Followed by Fish Farmers in Rangpur District"

(This interview schedule is entitled to a research study, collected data will only be used for research purpose and will be published aggregately)

Serial No.:

Name of the respondent: ……

Father/Spouse name: ……

Village: ……

Union::……

Upazila: …… ..

District:……

Please answer the following questions

Personal Information

1. Age: …… years **2. Gender:** Male/ Female

3. Education: Please mention your level of education.

a) I cannot read or write ……

b) I can sign only……

c) I have studied up to class……..

d) Others (specify)…….

4. Fisheries farming experience:

How long have you engaged in fish farming? Ans: …… years

5. Annual Family Income: Please mention your family income in taka from each of the following sources for the last one year

Income from agricultural sources: (A)			
SL No.	**Sources**	**Total taka**	
		Production	**Income(*000*Tk)**
1.	Fish		
2.	Agriculture		
3.	Livestock		
Subtotal (A)			
Income from non-agricultural sources: (B)			
4.	Service		
5.	Business		
6.	Others (pls specify……)		
Subtotal: (B)			
Total (A+B):			

6. Fish farm size: Please mention your farm size

Sl. No.	**Use of Land**	**Measuring unit**	
		Local unit	**Hectare**
1.	Homestead pond (A1)		
2.	Own pond under own farming (A2)		
3.	Pond given to others on borga (A3)		
4.	Pond taken to others on borga (A4)		
5.	Pond taken to others on lease (A5)		

Total farm size=A1 + A2 + ½ (A3+A4) + A5

6.Number of labors:

Labor	**No**
Male	
Female	
Children (13-16years)	

7.Training exposure received in fish farming:

Have you received any training on fish farming? Ans: (yes) (No)

If yes, please give the following information

Sl. No	Name of the training	Sponsoring organization	Duration (Days)
1.			
2.			
3.			
Total			

8. Knowledge of good management practices for fish farming: Please answer the following question regarding good management.

Sl. No.	Questions	Full marks		Obtained marks
	A. Remembering			
1	Mention two methods of removal of aquatic weeds.	2		
2	Name two predatory fish.	2		
3	Mention the dose of lime application in the pond per decimal.	2		
4	Mention two ways of identifying good quality fish fry.	2		
5	Mention two natural fish feed.	2		
7	Mention two fish diseases.	2		
8	What is the suitable time for fish harvesting?	2		
	B. Understanding			
1	Do you know why pond drying in the winter season hamper for fish farming?	2		
2	Mention the necessity of using lime in the pond.	2		
3	Mention the advantages of applying cow dung in the pond.	2		
	C. Applying			
1	How to prepare a pond for fish farming?	2		

2	How will you examine if there is enough natural food and plankton in the water?	2		
	D. Analyzing			
1	What are meaning of such (Abnormal skin color, Swollen abdomen) fish behavior?	2		
2	How will you understand that there is lack of oxygen in water?	2		
	E. Evaluating			
1	What preventive measures are required be taken against fish disease?	2		
2	Mention what matters are to be kept in mind while marketing fishes.	2		
Total		**32**		

9. Attitude toward fish farming: Please indicate your agreement or disagreement with the following statements.

Statements	**Extent of agreement**				
	Strongly Agree (5)	**Agree (4)**	**Neither Agree or Disagree (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Fish is important source of protein and nutrition to people					
Socio-economic condition of the villagers is changing through fish farming					
Fish farming is more profitable than other business or other cultivation					
Farming cost is comparatively less in fish than other business					

10. Extension contact: Please indicate your extent of contact with following media.

Sl. No	Communication media	Extent of communication				
		Regularly (4)	**Often (3)**	**Occasionally (2)**	**Rarely (1)**	**Not at all (0)**
A. Personal Contact						
1.	Friend/Neighbor fish farmers	Multiple times/week	Once a week	Multiple times/month	Once a month	0
2.	Fisheries extension officer	4-5 times/month	2-3 times/ month	Once a month	1-2 times/3 months	0
3.	Upazila Fisheries Officer/Agriculture Extension Officer	4-5 times/month	2-3 times/ month	Once a month	1-2 times/3 months	0
4.	NGO Worker(s)	4-5 times/month	2-3 times/ month	Once a month	1-2 times/3 months	0
5.	Local leader	4-5 times/month	2-3 times/ month	Once a month	1-2 times/3 months	0
6.	Fisheries input dealer(s)	4-5 times/month	2-3 times/ month	Once a month	1-2 times/3 months	0
B. Group Contact						
7.	Participation in group discussion	Multiple times/month	Once a month	Once in 6 months	Once in year	0
8.	Participation in Field Day/Farmers Rally	Multiple times/month	Once a month	Once in 6 months	Once in year	0
9.	Observing agricultural/fish fair	Multiple times/month	Once a month	Once in 6 months	Once in year	
C. Mass Contact						
10.	Listening agricultural program in Radio	Daily	2-3 times in a week	Once a week	Once a month	0
11.	Watching fisheries program in TV	Daily	2-3 times in a week	Once a week	Once a month	0

12.	Reading agricultural magazine (Krishi Katha/leaflet/booklets etc.)	Daily	2-3 times in a week	Once a week	Once a month	0
Total (A+B+C)						

11. Use of GMP for fish farming: Mention the extent of use of following GMP for fish farming.

Sl. No.	**Statement**	**Extent of use**				
		Regularly (4)	**Often (3)**	**Occasionally (2)**	**Rarely (1)**	**Never (0)**
1	Applying supplementary feed in pond.					
2	Using fertilizer in pond.					
3	Using lime in the pond.					
4	Applying cow dung or other organic manure.					
5	Controlling weeds from pond.					
6	Applying medicine if disease attack in the fish.					
7	Treating the fingerlings before releasing in the pond.					
8	Rating the undersized fish and remove predatory fish.					
9	Sorting and grading of fish for better production.					
10	Keeping record of income and expenditure for fish culture.					

Thank you for your co-operation.

Date: …… **Signature of Interviewer**