ADOPTION OF CATFISH FARMING AT JASHORE SADAR UPAZILA UNDER JASHORE DISTRICT

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ADOPTION OF CATFISH FARMING AT JASHORE SADAR UPAZILA UNDER JASHORE DISTRICT

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This is to certify that the thesis entitled, **"Adoption of Catfish Farming at Jashore Sadar Upazila under Jeshore 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 (MS) in Agricultural Extension,** embodies the result of a piece of bona fide research work carried out by **Md. Shohel Shikder**, Registration No. 18-09165, under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or sources of information, as has been availed of during the course of investigation have been duly acknowledged.

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DEDICATION

DEDICATED TO MY BELOVED FATHER
AND RESPECTED GRAND MOTHER

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LIST OF ABBREVIATIONS AND GLOSSARY

BBS : Bangladesh Bureau of Statistics

DoF : Department of Fisheries

FY : Fiscal Year

GDP : Gross Domestic Products

GO : Government Organization

HA : Hectare

MT : Metric Ton

NGO : Non-Government Organization

SD : Standard Deviation

UFO : Upazila Fisheries Officer

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ABSTRACT

Catfish is a diverse group of fish. These fish species are significantly important because of its rapid growth and high economic value among the community people**.** This study is focused to determine the extent of adoption of catfish culture by the farmers in Jashore sadar upazila. Data were collected from 97 catfish farmer during October, 2020. Data regarding adoption status of catfish in the last three years were investigated. Descriptive statistics, multiple regression were used for analysis. Most of respondents 70.10% had medium level of adoption towards catfish farming while 15.46% and 14.44% of them had low and high level of adoption respectively. Among the influential variables, education, farming experience, attitude towards catfish culture, problems faced by the farmer during adoption of catfish farming were significant contributor. Most of the farmer of the study area culture Pangas, Shing, Pabda , Tengra and Magur. Adoption of catfish cultivation is increasing in the study area. High price of material inputs, diseases outbreak, broker problem, inbreeding in fish, unavailability of skilled manpower, flood or heavy raining, poor transportation systems were found constraints among farmers during catfish farming. For sustaining and enhancing catfish cultivation, farmers' need to provide with reasonable price of material input, need to provide natural and pure catfish breeder species, need government's continuous support, develop transportation system, ensure adequate training to create skill manpower.

Key words: Adoption, Catfish Farming, Innovation, Jashore

CHAPTER I

INTRODUCTION

1.1 General Background

Bangladesh is surrounded by rivers and various types of water sources like pond, stream, and lakes. Major parts of the total population of this country are directly or indirectly involved with fish or fish related business. It is blessed with huge open water resources with a wide range of aquatic diversity. Bangladesh ranked 3rd in inland open water capture production and 5th in world aquaculture production. Currently Bangladesh ranks 4th in tilapia production in the world and 3rd in Asia (DoF, 2020).

Fish and Fisheries sector play an immensely important role on the socio-economic development of Bangladesh from time immemorial and it is the part of our cultural heritage (Akter *et al*., 2015). It also plays an important role in nutrition, employment and export earnings in Bangladesh. This sector provides major (60.0%) share of animal protein. It contributes 3.57 percent to our national GDP and around one-fourth (25.3%) to the agricultural GDP. Bangladesh is one of the world's leading fish producing countries with a total production of 42.77 lac MT in which the production of catfish around 5.22 lakh MT in FY 2017-18, where aquaculture production contributes 56.24 percent of the total fish production. Average growth performance of this sector is 5.26 percent for last 10 years. Aquaculture shows a study and consistent growth; average growth rate is almost 10 percent during the same time frame. It is believed that if the increasing trend of fish production continues, it will be possible to achieve the projected production target of 45.52 lac MT by 2021. After 46 years of independence, Bangladesh becomes a self-sufficient country in fish production, with a per capita fish consumption of 62.58 g/day against set target of 60 g/day (DoF, 2020). There are two types of aquaculture practices are going on in Bangladesh - freshwater and coastal aquaculture. There is no marine aquaculture currently practiced in the country and no marine or coastal fin fishes are farmed.

Freshwater aquaculture comprises mainly pond farming of carps (indigenous and exotic), Mekong pangasid catfish, Tilapia, Mekong climbing perch and a number of other domesticated fish though in lesser scale (Hossain, 2014). Now a day's the demand of catfish become high for this reason commercial and small scale catfish farming business is gaining popularity. There are several catfish species available in Bangladesh. Among those species, some are very large in size and some species are smaller.

Catfish is a species-rich and exceptionally diverse group of fishes constituting the order Siluriformes. Fishes of this group are easy to identify because their body is usually naked (without scales) or covered with bony plates and the majority of them have barbels (whiskers) around their mouths (Talwar and Jhingran, 1991). This large group of fish is numerously represented in Bangladesh (Rahman, 2005) and all over the world (Lundberg and Friel, 2003). Because of their worldwide distribution and diversity, catfishes are of great interest to ecologists and evolutionary biologists, and are important in studies of biogeography from regional to global (Lundberg and Friel, 2003). Many catfishes around the world have huge economic value and are fished for human consumption and pet trade or recreation (Lundberg and Friel, 2003). After Cypriniformes and Perciformes, the two largest orders of fishes in terms of number of species, Siluriformes, i.e. the catfish group, is very prominent in the freshwater fish fauna of Bangladesh. At least 55 species of catfishes belonging to 35 genera have been recorded so far in Bangladesh (Rahman, 2005).

Catfish species of Bangladesh show a great diversity in size. Boal also called freshwater shark (Wallago attu), Ayre (*Sperata aor*), Baghair (*Bagarius bagarius*), Rita (*Rita rita*) and Pangas(*Pangasius pangasius*) are among the largest sized members of the catfish group, often attaining over one meter in length, whereas *Amblyceps mangois*, Hara hara, *Hara jerdoni* etc. are among the smallest, rarely exceeding 5 cm in length (Rahman, 2005). In Bangladesh Pabda (*Ompok Pabda*), Shing (*Heteropneustes fossilis*), Magur (*Clarias batrachus*), Tengra (*Mystus vittatus*) are also found.

The catfish species are widely distributed in the rivers, haors, baors, beels and floodplains of Bangladesh and generally they grow with natural care and most of the indigenous catfish production comes from these natural sources. In the present time catfish are highly available in the market and most of the people love this fish on their table. Although the number of catfish in the natural water bodies is reducing day by day due to overfishing, faulty management policy, and natural causes like siltation of water bodies etc. Nowadays siltation has threatened the existence of most of the river and many are gradually being turned into small canals through which the inland open water fisheries has declined significantly during the last 3 to 4 decades. Other reasons are uncontrolled use of chemicals, fertilizers and insecticides, destruction of natural breeding and feeding grounds, harvesting of wild brood fishes (Azher *et al.*, 2007). But now people are becoming interested in catfish farming and establishing large or small scale catfish farm commercially. In view of the foregoing discussion, the researcher undertook this study entitled "Adoption of Catfish Farming at Jashore Sadar Upazila under Jashore District".

1.2 Statement of the Problem

Adoption of catfish farming in different region of Bangladesh is increasing day by day. Catfish farming become very profitable for its higher consumer demand and higher market price. But there are also some factors which affect the catfish farming and cause fish farmer's economic losses. The development of a catfish farm has been influenced by production inputs, availability of water, fish diseases, and farmer's knowledge on catfish culture (Ahmed *et al*., 2007).The success of any technology depends on its dissemination among the potential users which ultimately is measured by the level of adoption of that technology. In view of the foregoing discussion, it is necessary to increase catfish cultivation in Bangladesh. It is assumed that notable improvements can takes place in fisheries sectors of Bangladesh. The purpose of the study was to assess the

adoption level of catfish and also its associated factors. Considering the above facts, the following research questions were put forward:

1. What is the extent of adoption level of catfish farming in Jashore sadar upazila?
2. What are the relationships between selected characteristics of the farmer and their adoption of catfish?
3. What are the constraints faced by the farmer during the culture period?

For getting a view of above questions, the researcher undertook a study entitled "Adoption of Catfish Farming at Jashore Sadar Upazila under Jashore District".

1.3 Objectives of the Study

Considering all the aspect, the research was conducted with the following objectives:

1. To investigate the present adoption status of catfish farming at the farm level;
2. To analyze the relationships between selected characteristics of the farmer and their adoption of catfish farming;

   The selected characteristics are:

   - Age
   - Education
   - Fish farming experience
   - Family size
   - Farm size
   - Annual family income
   - Extension media contact
   - Cosmopoliteness
   - Training on fish farming
   - Knowledge on catfish farming

- Attitude towards catfish farming
- Innovativeness
- Problems faced by the farmers in catfish farming

3. To find out the major problems faced by the catfish farmer during catfish farming.

1.4 Justification of the Study

The fisheries development is an important economic activity in Bangladesh. It is a powerful economic generator stimulating a number of subsidiaries, such as manufacture of fishing boats and fishing gear, construction of ice factories, cold storage plants, fish processing plants and other selected facilities.

In order to meet the shortage of fish and increasing demand resulting from population growth, it is essential to increase pond fish production in Bangladesh. Increased aquaculture production, mainly pond fish production in Bangladesh can help meet the increased domestic demand for fish. In order to meet the shortage of fish, the Department of Fisheries (DOF) of Bangladesh is encouraging people to increase fish production in their surrounding water areas such as ponds, haor, baor, beel etc. With this background in view, many NGOs, national and international organizations are working to develop the fisheries sector in Bangladesh. During the last decade, catfish culture has brought considerable increase in fish production. Production from ponds has increased dramatically. People are also experimenting with catfish monoculture, poly-culture with carp. When all these activities have gained remarkable popularity, the economic consequences of these activities are not properly known to the people. This study is expected to determine the adoption and profitability of catfish farming which may give proper guidance to the farmers for increasing income from pond fish production and which would in turn contribute to higher national product and income.

1.5 Assumptions of the Study

"An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence" (Goode and Hatt 1952). The researcher had the following assumptions in mind while undertaking this study.

1. The respondents included in the sample for this study were competent to furnish proper responses to the questions set up in the interview schedule.
2. Views and opinions furnished by the respondents included in the sample were the representative of the whole population of the study.
3. The responses furnished by the respondents were reliable.
4. The researcher who acted as interviewer was very well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished there correct opinions without any kind of hesitation.
5. The data collected by the researcher were free from bias and they were normally distributed.

1.6 Limitation of the Study

The present study provides some important information for producers, extension workers and decision makers regarding catfish farming. Almost all the research works have limitations in terms of time, money and personnel. The present study is not an exception to that. Some of the specific limitations of this study may be observed as follows:

1. Necessary data were collected from a limited area covering a small number of samples in Jashore sadar upazila under Jashore district. Results obtained from an observation of 97 samples producers may be inadequate to represent the actual situation.
2. Data collected from the farmers were furnished by them from their memory during interview.

3. For some cases, the researcher faced unexpected interference from the over interested side talkers while collecting data from the target respondents. However, the researcher tried to overcome the problems as per as possible with sufficient tact and skill.
4. In spite of the above limitations, some of the findings of the study may be helpful for decision-makers, fish producers, GO and NGO officials. It may also serve as guideline for further research.

1.7 Definition of Terms

For clarity of understanding, certain terms frequently used throughout the study are defined and interpreted as follows:

Catfish: Catfish are a diverse group of ray-finned fish and named for their prominent barbels, which resemble a cat's whiskers.

Adoption behavior: Adoption behavior referred to as a person's extent of adoption of an innovation.

Adoption: Adoption is the implementation of a decision to continue the use of an innovation. According to Rogers (1995) "Adoption a decision to make full use of an innovation as the best course of action and practices if the phenomenon is known as adoption".

Baor: Baor dead arm of a river in the moribund delta as in the case of the Ganges also called ox Bow Lake. It appears as a saucer shaped depression. The term baor is synonymous to BEEL, familiar in the southwestern part of Bangladesh.

Regression analysis: In statistical modeling, regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables.

Findings: The principal outcomes of a research project; what the project suggested, revealed or indicated. This usually refers to the totality of outcomes, rather than the conclusions or recommendations drawn from them.

Discussion: The purpose of the discussion is to interpret and describe the significance of your findings in light of what was already known about the research problem being investigated, and to explain any new understanding or insights about the problem after you've taken the findings into consideration.

Research methods: Research methods are a structured set of guidelines or activities to generate valid and reliable research results.

Value of R2: The value of R2 is a measure of how of the variability in the dependent variable is accounted for by the independent variables.

Adjusted R^2: The adjusted R^2 indicates the loss of predictive power or shrinkage. Therefore, the adjusted value tells us how much variance in Y (dependent variable) would be accounted if the model has been deprived from the populations from which the sample was taken.

F-ratio: The F ratio indicates that the regression model significantly improved the ability to predict the outcome variable.

CHAPTER II

REVIEW OF THE LITERATURE

The focus of this Chapter is to review the previous studies, which are related to the present one. An attempt has, therefore, been made here to review the most relevant studies from home and abroad the following heads.

2.1 Review of Literatures related to Adoption of Fish Farming

Prodhan and Khan (2018) studied Management practice adoption and productivity of commercial aquaculture farms in selected areas of Bangladesh Result revealed that average SAMP adoption level was 54% where 53% farmers were medium adopter. Training, experience, education and extension service had significant positive effect on level of adoption. Productivity was significantly higher for those farmers who adopted more SAMP. Adoption level, productivity and profitability of small farmers were higher than that of large farmers. The study suggests farmers for adopting scientific management practices in order to increase the aquaculture productivity and profitability.

Goswami *et al*. (2016) studied the adoption behavior of fish farmers in relation to scientific fish culture practices in West Bengal, focused on the factors influencing adoption behavior of fish farmers towards scientific fish culture practices. The findings revealed that majority (74%) of fish farmers belonged to medium to high adoption category. The adoption behavior of fish farmers towards scientific fish culture practices was positively and significantly influenced by the factors like, occupation, annual income, land holding, extent of weed infestation, social participation, mass media participation, extension agency contact, cosmopoliteness, innovative proneness, value orientation, risk orientation, economic motivation, knowledge about scientific fish culture practices and negatively by their age.

Sheheli *et al.* (2013) conducted a study in Trishal upazila of Mymensingh district to investigate the existing status and practices of fish farming and found that most

of the farmers (89%) made profit from fish production. The study confirmed that majority of the farmers have improved their socio-economic conditions through fish production which plays an important role in increasing income, food production and employment opportunities. Five major areas are identified to improve the existing fish farming situation, which are quality fry, credit facilities, low-cost quality feed, training, and marketing channel. The impact analysis of fish farming on livelihood of fish farmers shows that overall 64.0% fish farmers have increased overall livelihood from fish farming during the last four years (2010-2013). Access to micro-credit, provide good quality input such as fry, feed, vaccines, etc., market facilities, supply of improve technologies, and provide training all lead to increased fish production. The constraints index (CI) analysis shows that overall 74% fish farmers faced medium constraints for fish farming. A total of nine (9) main constraints identified hindering their fish farming, and major constraints are high production cost, lack of technical knowledge and inadequate supply of good quality fry.

Talukdar and Sontaki (2005) studied correlates of adoption of composite fish culture practices by fish farmers of Assam, India. The findings revealed that majority (63%) of fish farmers belonged to medium category of adoption. The adoption behavior of composite fish culture practices was positively influenced by the factors like extension participation, economic motivation, cosmopoliteness, scientific orientation and knowledge of fish farmers, and negatively by their age. In view of the above findings, the study recommends that efforts should be made by extension agencies through their various programs to highlight the economic benefits of composite fish farming to promote large-scale adoption of this technology. Study tours, exposure visits, participation in fairs and exhibitions could be the ideal methods for promoting adoption of composite fish culture.

Sultana (2001) found that the farmers of Trishal upazila, made profits from both poly-culture and carp nursery technologies. The study however, revealed that the carp nursery was more profitable (Tk 10,444 ha^{-1}) than the production of

polyculture (Tk 50,0 21 ha^{-1}). The study has also identified some major problems associated with economic, technical and social aspects that have currently been facing by the producers in adopting poly-culture and carp nursery technologies.

2.2 Review of Literatures related to General Issues on Adoption of Innovation

Hossain (2006) revealed that the highest proportion (49.0%) of farmers fell under medium adoption category, while 26.0 percent had high adoption and 25.0 percent had low adoption of selected high yielding rice.

Islam (2005) conducted a study on adoption of poshu pusti in cattle rearing at farmer's level. The study revealed that 71.0 percent of the farmers had medium adoption while 18.0 percent had high adoption and 11.0 percent had low adoption at poshu pusti in cattle rearing at farmers' level.

Hossain (2003) found that majority (67.0%) of the boro rice farmers had medium adoption, 17.0 percent had low adoption and 16.0 percent high adoption of modern boro rice cultivation practices.

Hasan (2003) found that majority (60.0%) of the farmers had medium adoption while 33.0 percent had low adoption and 7.0 percent had high adoption of recommended potato cultivation practices.

Islam (2002) conducted a study on adoption of modern agricultural technologies by the farmers of Sandwip. The study revealed that 69.0 percent of the farmers had medium adoption while 13.0 percent had low adoption and 18.0 percent had high adoption of modern agricultural technologies.

Rahman (2001) observed in his study that the highest proportion (75.0%) of farmers fell under medium adoption category while 18.0 percent had high adoption and 7.0 percent had low adoption of Aalok 6201 hybrid rice cultivation.

Hussen (2001) studied the farmers "Farmers' Knowledge and Adoption of Modern Sugarcane Cultivation Practices". He concluded that majority proportion (91.0%) of the growers had medium adoption while 7.0 percent had

low and only 2.0 percent had high adoption of modern sugarcane cultivation practices.

Hussen (2001) conducted an investigation on adoption of modem sugarcane cultivation practices by the farmers of Dewangonj upazila in Jamalpur district. He observed that there was a positive significant relationship between extension contact of the farmers and their adoption of modern sugarcane cultivation practices.

Hossain (1981) studied the relationships of selected characteristics of the jute growers with their adoption of improved practices of Jute cultivation. He found that more than half (54.0%) of the respondents had medium adoption of the improved practices compared to 31.0 percent having high adoption and 15.0 percent low.

2.3 Literatures that are related to Relationships between Respondents' Characteristics and Adoption

Available literature reviews relating to relationships between farmers' characteristics and adoption have been given below:

2.3.1 Age and adoption of catfish farming

Rahman (2001) conducted a study on knowledge, attitude and adoption of the farmers regarding Alok 6201 hybrid rice in sadar upazila of Mymensingh district. He found that age of the farmers had no significant relationship with their adoption regarding Alok 6201 hybrid rice.

Aurangozeb (2019) observed that there was significant negative relationship between age and adoption of integrated homestead farming technologies.

Sardar (2002) found that age of the farmer had significant positive relationship with their adoption of IPM practices.

Hassan (2004) found that there was no relationship between age and adoption of improved practice in pineapple cultivation.

Islam (2008) study revealed that the age of the farmers had no relationship with their adoption of IPNS by the small farmers towards sustainable crop production.

2.3.2 Education and adoption of catfish farming

Islam (2002) conducted a study on adoption of modern agricultural technologies by the farmers of Sandwip. He found that education of the farmers had a significant and positive relationship with their adoption of modern agricultural technologies.

Aurangozeb (2019) observed that there was positive relationship between education and adoption of integrated homestead farming technologies.

Sardar (2002) found that the education of the farmer had significant positive relationship with their adoption of IPM practices.

Miajy (2005) found that there was no significant relationship between education and adoption of hybrid varieties of maize.

Akhter (2007) observed that the education of the farmers had significant positive relationship with their adoption of improved potato varieties.

2.3.3 Fish farming experience and adoption of catfish farming

Hossain (2006) concluded that the farming experiences of the farmers had positive significant relationship with their adoption of selected HYV rice.

Haque (2003) concluded that farming experiences of the farmers had significant positive relationship with their adoption of modern maize cultivation technologies.

Hossain (2003) revealed that farming experiences of the farmers had a significant relationship with their adoption at modern Boro rice cultivation practices.

Aurangozeb (2002) conducted a study on adoption of integrated homestead farming technologies by the rural women in RDRS. He found that there was a positive significant relationship between farming experiences of the respondents and their adoption of integrated homestead farming technologies.

Rahman (2001) conducted a study on knowledge attitude and adoption of the farmers regarding Aalok 6201 hybrid rice in Sadar upazila of Mymensingh district. He found that farming experiences of the farmers had a significant and positive relationship with their adoption regarding Aalok 6201 hybrid rice.

Sarker (1997) conducted a study on correlates of selected characteristics of potato growers with their adoption of improved potato cultivation practices in five villages of Comilla district. He observed that farming experiences of the potato growers had significant relationship with their adoption of improved potato cultivation practices.

2.3.4 Family size and adoption of catfish farming

Hussen (2001) found that the family size had no significant relation with their adoption of modern sugarcane cultivation practices.

Aurangozeb (2019) observed that there was no relationship between family size and adoption of integrated homestead farming technologies.

Sardar (2002) found that the family size of the farmer had no significant relationship with their adoption of IPM practices.

Reza (2007) found that family size of the farmers had significant value with their adoption of modern maize cultivation technologies.

Islam (2008) revealed that the family size of the farmers had no relationship with their adoption of integrated plant nutrient system by the small famers.

2.3.5 Farm size and adoption of catfish farming

Hussen (2001) found that the farm size had positive significant relation with their adoption of modern sugarcane cultivation practices.

Sardar (2002) found that the farm size of the farmer's had significant positive relationship with their adoption of IPM practices.

Hossain (2003) revealed that farm size of the farmers had a significant and positive relationship with their adoption of modern boro rice cultivation practices.

Khan (2004) found that farm size of the farmer had significant positive relationship with their innovation-decision pattern and constraints faced in adopting system of rice intensification (SRI).

Mazumder (2006) observed that the farm size of the farmer had significant relationship with their adoption of improved practice in litchi cultivation.

Akhter (2007) found that the farm size of the farmer had significant relationship with their adoption of improved tomato varieties.

Islam (2008) revealed that the farm size of the farmers had significant relationship with their adoption of integrated plant nutrient system by the small famers.

2.3.6 Annual income and adoption of catfish farming

Sardar (2002) found that the farm size of the farmers had significant positive relationship with their adoption of IPM practices.

Hossain (2003) revealed that farm size of the farmers had a significant and positive relationship with their adoption of modern boro rice cultivation practices.

Miajy (2005) found that the annual income of the farmers had no significant relationship with their adoption of hybrid varieties of maize.

Reza (2007) found that the annual income of the farmers had significant relationship with their adoption of modern maize cultivation of technologies.

2.3.7 Extension media contact and adoption of catfish culture

Hussen (2001) found that he extension media contact had positive significant relationship with their adoption of modern sugarcane cultivation practices.

Aurangozeb (2019) observed that there was significant relationship between Contact with extension media and adoption of integrated homestead farming Technologies.

Sardar (2002) concluded that the extension contact had positive significant relationship with their adoption of IPM practices.

Hossain (2006) observed that the extension contact of the farmer had significant relationship with their adoption of improved practices in soybean cultivation.

Islam (2008) found that there was no significant relationship between extension contact and adoption of integrated nutrient system.

2.3.8 Training exposure and adoption of catfish farming

Hasib (2016) on his study found that training of growers had a positive and significant relationship with their adoption of improved practices in sugarcane cultivation.

Kassa (2014) conducted a study on Adoption and Impact of Agricultural Technologies on Farm Income. He found that there was a positive and significant relationship between training and adoption of agricultural technologies.

Mazvimavi and Twomlow (2009) found that extension access and NGO support (NGO) significantly influenced adoption of different components of conservation agriculture. Where government extension officers have been working closely with NGO staff in promoting the technology, they have become an important source of backup technical support.

Langyintuo (2005) found training shows a positive correlation with adoption and use intensity of crop rotation. This suggests that farmers with higher levels of education are more likely to adopt crop rotation.

2.3.9 Knowledge and adoption of catfish farming

Reddy et al. (1987) found the significant association between knowledge and use of improved package of practice in paddy production by participant and non-participant farmers.

Akther (2007) found that the agricultural knowledge of the farmers had significant relationship with their adoption of improved tomato varieties.

2.3.10 Cosmopoliteness and adoption of catfish farming

Hossain (2003) revealed that cosmopoliteness of the farmers had significant and positive relationship with their adoption of modern Boro rice cultivation practices.

Rahman (2003) found that cosmopoliteness of the farmers had significant positive relationship with their adoption of intercropping in pineapple cultivation.

Ghosh and Maitra (2008) reported that cosmopoliteness of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Singh (2010) found that cosmopoliteness of the farmers showed positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) revealed that cosmopoliteness of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Goswami (2012)found that cosmopoliteness of the farmers had positive and highly significant relationship with their adoption of scientific fish cultivation practices.

2.3.11 Attitude and adoption of catfish farming

Hossain (1981) conducted a study on relationships of selected characteristics of the Jute growers with their adoption of improved practices of Jute cultivation. He found that there is no relationship between attitude towards intensive Jute cultivations scheme of the Jute growers and their adoption of improved practices of jute cultivation.

Hasan (1996) conducted a study on adoption of some selected agricultural technologies among the farmers as perceived by the frontline GO and NGO workers. He found that there was strong positive relationship between attitude towards development and perceived adoption of selected technologies.

Podder (1999) conducted a study on the adoption of Mehersagar Banana by the farmers of Gazaria union under Sakhipur Thana of Tangail district. He found that there was no relationship between attitude towards technology of the growers and their adoption of mehersagar banana.

Islam (2002) revealed that the attitude towards technology of the farmers had a significant positive relationship with their adoption of modern agricultural technologies.

Ahmed (2006) found that the attitude toward wheat cultivation of the farmers had significant positive relationship with their adoption of selected wheat varieties.

2.3.12 Innovativeness and adoption of catfish farming

Hossain (1999) found a positive relationship between innovativeness of the farmers and their adoption of fertilizer and also observed no relationship with adoption of pesticides.

Aurangozeb (2002) observed that there was significant relationship between innovativeness and adoption of integrated homestead farming technologies.

Islam (2002) conducted a research study on adoption of modem agricultural technologies by the farmers of Sandwip. He found that innovativeness of farmers had significant and positive relationship with their adoption of modern agricultural technologies.

Ahmed (2006) found that the innovativeness of the farmers had significant positive relationship with their adoption of selected wheat varieties.

Hasan (2006) found that innovativeness of the growers showed significant relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) observed that innovativeness of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Ziauddin and Goswami (2010) reported that innovativeness of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Singh and Priyadarshi (2010) revealed that innovativeness of the farmers showed positive and highly significant relationship with their adoption of improved mango production practices.

Mehta and Sonawane (2012) found that innovativeness of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Rao and Singh (2014) reported that innovativeness of the farmers did not show any significant relationship with their adoption of pineapple cultivation practices.

2.3.13 Problems faced by the farmers during catfish culture and the adoption of catfish farming

Sarker (2010) found that the problems faced by the farmers in organic vegetable farming had negative relationship with their adoption of organic vegetable farming**.**

Kashem and Hossain (2012) in his study observed adoption behavior of sugarcane farmers. The study revealed a positive relationship between community problem awareness and adoption of sugarcane farmers.

Rahman (2005) in his study identified problems faced by farmers' in cotton cultivation. Non-availability of quality seed in time, unfavorable and high cost of fertilizer and insecticides, lack of operating capital, not getting fair weight and reasonable price according to grade, effects of cattle in cotton field, lack of technical knowledge, lack of storage facility, stealing from field at maturity stage, and late buying of raw cotton by Cotton Development Board were identified as major problems of cotton farmers in Mymensingh district.

2.4 Conceptual framework of the study

In scientific researches, selection and measurement of variables constituent is the important tasks. The hypothesis of a research while constructed properly contains at least two important elements i.e. a dependent variable and an independent variable. Various external driving forces influence the adoption behavior of the farmers. Considering the time and other resources available to the researcher, it is not possible to include all those driving forces. However, farmers' adoption of catfish farming is thought to have close relationships with their selected personal, socio-economic and psychological characteristics. Moreover, according to the Innovation-decision process as developed by Rogers (1995), a person's adoption of an innovation is also influenced by the innovations own characteristics as perceived by its potential users and the benefits it exerts for its adopters. Besides these, a number of problems as faced by the adopters of an innovations have also influence of the latter’s extent of adoption. All these above mentioned points mean that the ultimate adoption behavior of an individual is the outcomes of combination of many factors. All these factors are combined together to make the conceptual framework of the study which is self-explanatory as shown in Figure 1.

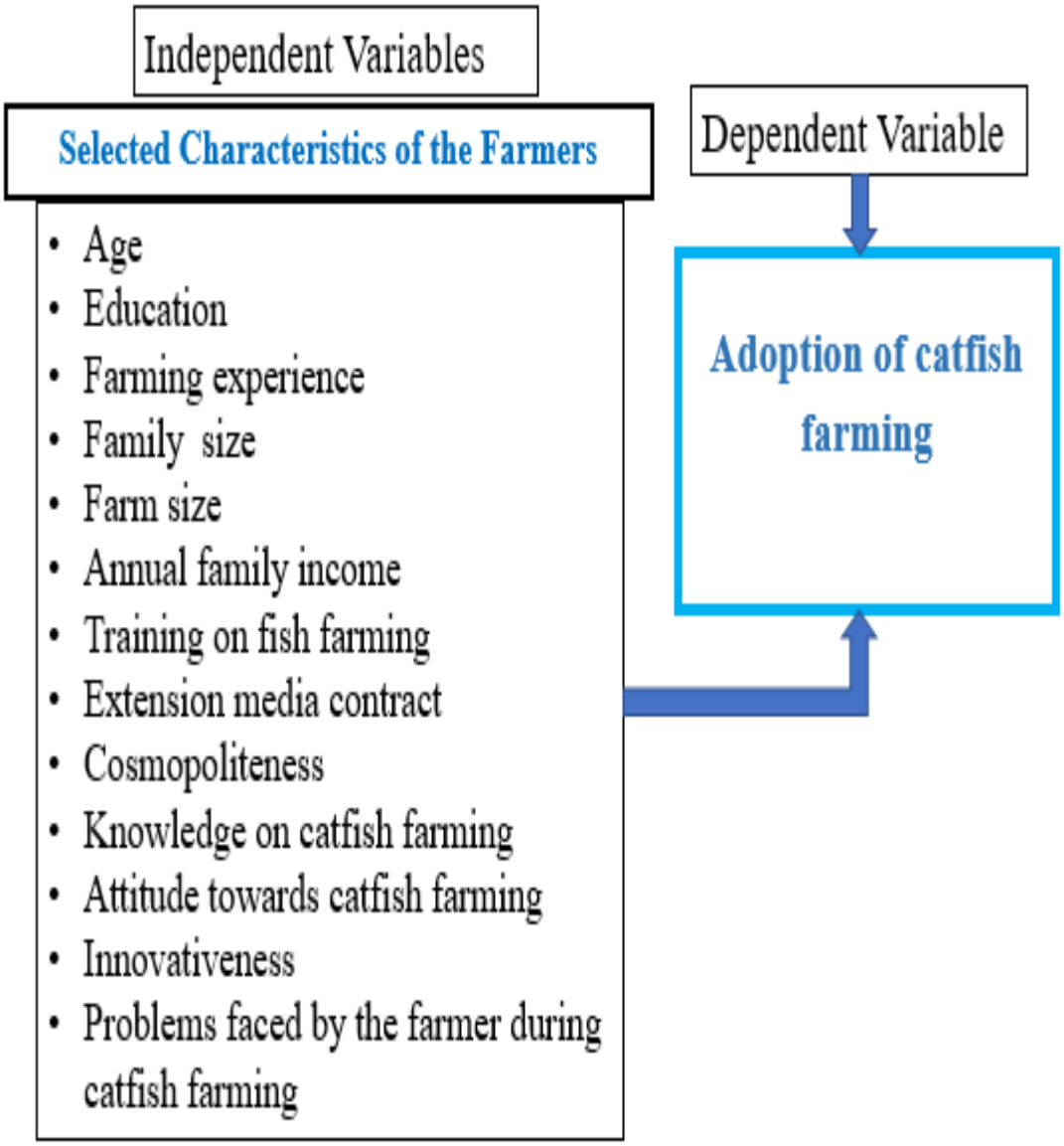

Figure 1 Conceptual framework of the study

CHAPTER III

METHEDOLOGY

Methodology is an important and integral part of research which regulates whether a scientific research will be prolific or not. It requires a very careful consideration to organize methodology to make the study systematic. A proper methodology helps researcher collecting valid and authentic data for arriving at prolific decisions. The methods and procedures followed in conducting this study has been described in this Chapter and are presented below in the following sections and sub-sections.

3.1 Locale of the Study

Selection of the study area for farm management investigation is an important step and largely depends upon objectives or purpose set for the study. The area in which a farm business survey is to be conducted "depends on the particular purpose of the survey and the possible co-operation from the farmers (Yang, 1965). Jashore sadar upazila was selected because of it is one of the most fish producing area of Jashore district. The locale of the study was four villages namely Brahammon Para and Sharapol of Chanchra union, Kazipur and Mobarak kathi of Ramnagar union of Jashore sadar upazilla in Jashore district.

The researcher showed interest to conduct the study on Jashore sadar upazila because:

- There were a large number of catfish farmer in that particular area.
- The locality has easy accessibility and communication facilities.
- And the friendly and cordial behavior of the people, which is very important to conduct a research mostly for a researcher who is conducting a research for the first time.

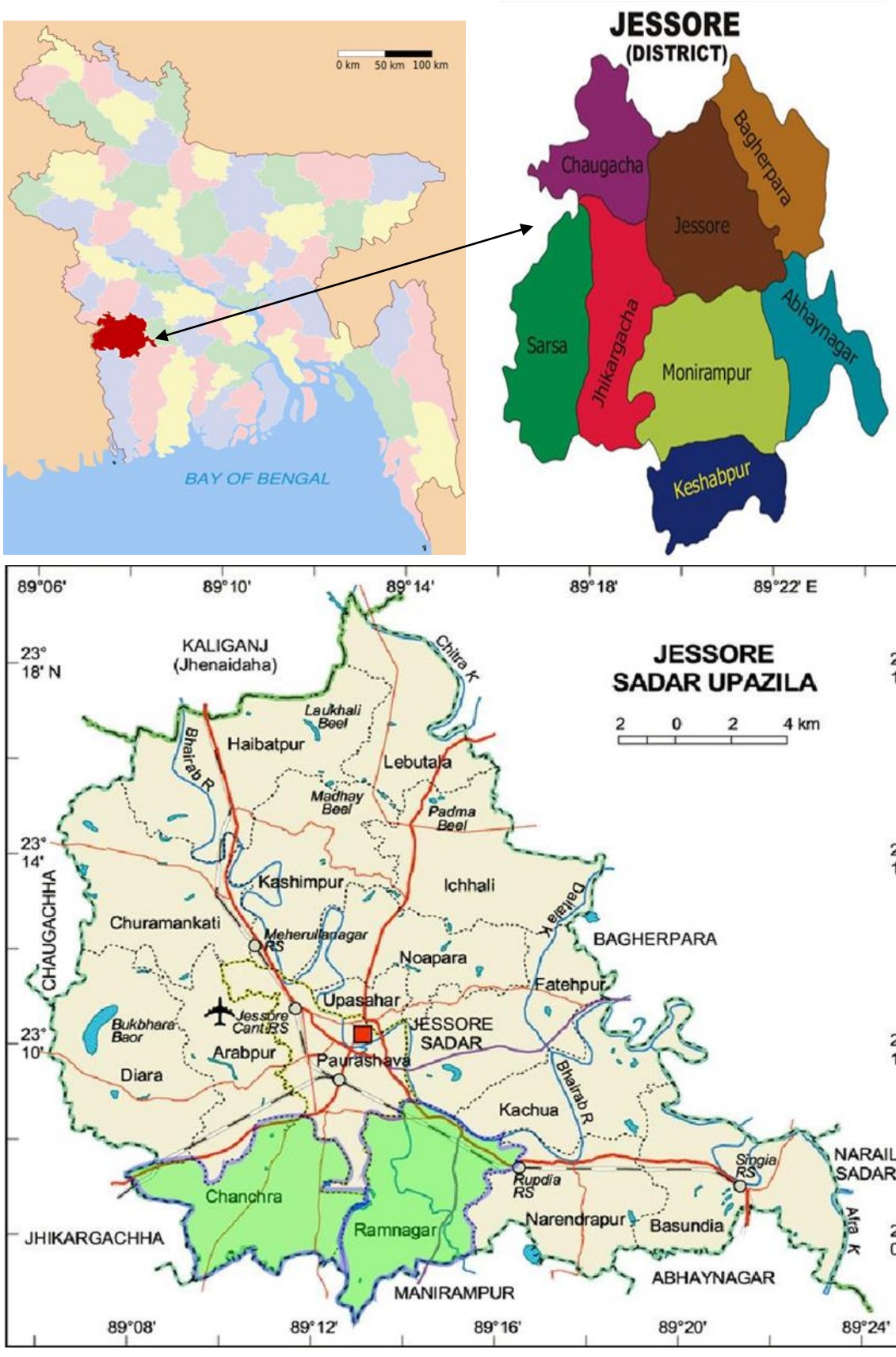

Figure 2 Map of Jashore sadar upazila showing the study area

3.2 Population and Sampling Design

Two upto date fisheries survey report of Jashore sadar upazila were collected from district fisheries office and Jashore sadar upazila fisheries Office of Jashore. The total number of listed fish farmers in Jashore sadar upazila is 1721, most of them are engaged in freshwater white fish culture.

Out of these 1721 fish farmers about 389 listed fish farmers of the selected 2 unions totally or partially related with catfish culture. From these 389 fish farmers of the selected 2 unions, 97 catfish farmers were selected as the sample of the study by using proportionate random sampling technique by taking 25% from each four villages (selected) of the two unions.

Besides, reserve list of catfish farmers was also prepared. Farmers of the reserve list were used only when a respondent included in the original list was not available during data collection. Distribution of the farmers constituting population, sample and reserve list are shown in Table 1.

Table1 Distributoin of the farmers constituting population, sample and reserve list

Upazila	Union	Village	Population	Sample	Reserved List
Jashore Sadar	Chanchra	Brahamon Para	198	49	5
		Sharapol	53	13	1
	Ramnagar	Kazipur	81	21	2
		Mobarak Kathi	57	14	1
Total			389	97	9

3.3 Selection of Variables

The researcher drew in better than average care in choosing the variables of the study. Considering individual, financial, social and mental components of the target group, time and assets accessibility to the researcher, checking on applicable writing and talking about with pertinent specialists, the researcher

chose the variables for the study entitled adoption of catfish farming by the farmers of Jashore district was the dependent variable of this study.

The researcher selected 13 characteristics of the respondents as their independent variables. These were: Age, education, farming experience, family size, farm size, annual family income, participation in training program, extension media contact, cosmopoliteness, knowledge on catfish farming, attitude towards catfish farming, innovativeness and problems faced by the farmers during catfish farming.

3.4 Research Instruments

In order to collect viable and authentic data from the respondents a structured interview schedule was outlined carefully keeping the objectives of the study in mind. Simple, easy and direct questions and different scales were used to obtain information from the respondents. Both open and closed form questions were included in the interview schedule. The schedule was checked by the Supervisory Committee. An English version of the interview schedule has been enclosed in the Appendix A.

3.5 Measurement of Variables

Measurement of independent and dependent variables have been shown in these sub sections:

3.5.1 Measurement of independent variables

Measurement of independent and dependent variables have been shown in these sub-sections:

3.5.1.1 Age

The age of a respondent was measured in terms of actual years from his birth to the time of interview on the basis of his response. A score of one (1) was assigned for each year of age. For the analysis purpose, age of the respondents was broken into 3 categories viz. young age (up to 30 years), middle age (31 to 45 years) and old age (above 45 years).

3.5.1.2 Education

Education was measured as the ability of the respondent to read and write or the formal education received up to a certain standard. A score of zero (0) was given to a respondent who are illiterate, a score of half (0.5) was given to the respondents who could sign his name only and a score of one (1) was given for each year of formal schooling completed by the respondent e.g. one (1) for completing class one, two (2) for class two and so on.

3.5.1.3 Farming experience

Each year of the respondent's experience was scored one (1). Such as if a respondent cultivate catfish for five years was assigned a score of '5'.

3.5.1.4 Family size

Family size refers to the total number of members including the respondent himself/herself, spouse, children and other permanent dependents who lived together as family unit. Family size was operationally measured by assigning a score of one (1) for each member of the family who jointly lived and ate together. Family size of a respondent was measured in terms of actual number of members in his family (including himself) during the interview period.

3.5.1.5 Farm size

Farm land is the most important capital of a farmer and the farm-size has influence on many personal characteristics of a farmer. Farm size of the farmer was measured by the land area possessed by him. Data obtained in response to questions under item No, 5 of the interview schedule formed the basis for determining the farm size of the respondent. Here, farm size was computed by using the following formula.

Farm size (FS) = A+B + (C+ D) ½ -E

Where,

A= Own land under own cultivation

B = Land taken from others on lease

C = Shared out to others

D = Shared in

E= Land leased out to others

The respondent has given information for their farm size in local measurement. Finally, it was converted into hectare and was considered as the farm size score of a respondent.

3.5.1.6 Annual family income

The annual family income of a respondent's family was measured on the basis of yearly total earnings from farming such as agriculture, fisheries (catfish and others), livestock, forestry, service, business and others (if any) by the members of the family. The earning from these sources were added together to obtain total annual income of a respondents.

3.5.1.7 Extension medias contact.

It was measured as one's extent of exposure with different information sources. It was assumed that the more contact an individual would have with different information sources, the more he becomes educated and knowledgeable. An extension contact score was computed for each respondent on his extent of contact with 13 selected media (item no. 7, Appendix-I). Each respondent was asked to mention the frequency of his contact with each of the 13 selected media. Here the score was assigned as 0 for no contact, 1 for rarely, 2 for occasionally, 3 for frequently and 4 for regularly of the contact respectively. Extension media contact score of the respondents could range from 0 to 52, where 0 indicating no extension media contact and 52 indicating very high extension media contact. Respondent's extension contact score was obtained by adding the weights for his responses to all the sources listed in the instrument

3.5.1.8 Cosmopoliteness

Cosmopoliteness of a respondent was measured in terms of his nature of visits to the seven different places external to his own social system and as shown in item number 8 in the interview schedule (Appendix-1). The respondents indicated

whether they visited those places regularly, often , occasionally, rarely and not at all. Weights assigned to these visits were 4. 3, 2,1 and 0 respectively. A respondent's cosmopoliteness score was obtained by adding the weights for his visits to all the places listed in the instrument. The cosmopoliteness score of the respondents could range from 0 to 28, where 0 indicating no cosmopoliteness and 28 indicating high cosmopoliteness.

3.5.1.9 Training experience

Training experience of a respondent was measured by the total number of days he/she received training on different subject matters during catfish farming from various organizations. A score of one (1) was assigned for each day of training participated by the respondent.

3.5.1.10 Knowledge on catfish farming

Knowledge of the respondents on catfish cultivation and related issues was measured by administrating a knowledge test containing 18 test items on different areas of knowledge viz. awareness knowledge, how to knowledge, and principle knowledge following Rogers (1995). Catfish farming knowledge of a respondent was measured by asking 18 questions related to different aspect of catfish farming. It was measured in score. The total assigned scores for all the questions were 36 by assigning 2 for each question. Full score for each question was assigned for each correct answer. Thus the score was 0-36. Where, 0 (zero) was assigned for very poor knowledge and 36 was assigned for sound knowledge.

3.5.1.11 Attitude towards catfish farming

six relevant statements were carefully constructed to develop attitude scale. Attitude towards catfish farming was measured through Likert (1932) type scale, in which assigned score were slightly modified. There were 3 positive and 3 negative statements in the scale. These statements were alternately arranged. A respondent was asked to indicate her/his degree of agreement about each of the statements along with a five-point scale as, strongly agree, agree, undecided,

disagree and strongly disagree. Scores were assigned to these five alternate responses as 4, 3, 2 ,1 and 0 respectively for each positive statement. In case of negative statement, the reverse scores were assigned. However, the score of a respondent was obtained by adding her/his scores for all the 6 statements. Thus, the attitude score of a respondent could range from 0 to 24, where, 0 indicates very low attitude towards catfish farming and 24 indicates very high attitude towards catfish farming.

3.5.1.12 Innovativeness

Innovativeness is the degree to which an individual adopts an innovation relatively earlier than other members in a social system (Rogers, 1995). Hence, innovativeness of a respondent was measured on the basis of the period of adoption of 5 improved technologies in catfish farming from the period he first listened about the innovation. Scores were assigned on the basis of time required by an individual to adopt each of the technology in the following manner:

Period of adoption	Assigned score
Within 1st year of hearing	4
Within > 1 to 2 year of hearing	3
Within > 2 to 3 year of hearing	2
Within > 3 to 4 year of hearing	1
Not adopted at all	0

3.5.1.13 Measurement of Problems Faced by the Farmers during catfish farming

Farmers in the study area might have faced various types of problems in the way of adopting Catfish farming. But, the investigator gained an experience through personal contact regarding common problems faced by the respondents before collection of data. Besides, the researcher gained experience through consultation with experts, pre-testing experience and reviewing previous research findings. Finally, he prepared a list of eight possible problems in this

regard. A scale was prepared to indicate the extent to which each of the eight problems was applicable in the case of a respondent. The responses were obtained through a 5-point scale: Very High (4) High (3), Medium (2), Low (1), very low (0) (item no 14, Appendix-I). Thus, problems in adopting catfish farming score of a respondent could range from 0-32 where 0 indicating no problem and 32 indicated highest problems.

Measurement of Problem Faced Index (PFI):

In order to determine the comparative importance of the ten problems, A Problem Faced Index (PFI) was computed for each problem faced strategies by using the formula suggested by (Hossain, 2019):

$$PFI = PVH \times 4 + PH \times 3 + PM \times 2 + PL \times 1 + PVL \times 0$$

Where,

PVH = Very High extent of Problem

PH = High extent of Problem

PM = Medium extent of Problem

PL = Low extent of Problem

PNA = Very low of Problem

Problem Faced Index (PCI) for each problem faced strategies could range from 0 to 388, where 0 indicating lowest extent and 388 indicating highest extent of problem faced by catfish farmers.

3.5.2 Measurement of dependent variable

Adoption of Catfish farming

Adoption of Catfish farming was the main focus of this study. It was measured on the basis of the extent of adoption of Catfish farming by the farmer for a period of three (3) years such as 2017-2018, 2018-2019 and 2019-2020. Adoption of Catfish farming was measured by computing Adoption Quotient (AQ). It was calculated by asking the farmers, (i) area used for Catfish farming, (ii) potential area for Catfish farming, (iii) years of farming or farming. It was measured by Adoption Quotient as the following formula suggested by Bhuiyan (2005).

$$\mathrm{AQ} = \frac{(\mathrm{C1} + \mathrm{C2} + \mathrm{C3})}{3 \times \mathrm{P}} \times 100$$

C1=Area used for Catfish farming for the first year (2017-2018)

C2=Area used for Catfish farming for the second year (2018-2019)

C3=Area used for Catfish farming for the third year (2019-2020)

P= Potential area.

3.6 Validity of the Research Instruments and Ethical Considerations

3.6.1 Validity of the research instruments

The validity is how much a test measures what it is accepted to quantify. The validity of a test or other measuring instruments rely on upon the steadfastness with which it is measured whatever it indicates to gauge. The researcher experienced a few comparative research instruments judged from home and abroad, Besides, the examination instruments, particularly poll for the review were by the Supervisory Committee. By directing a seminar, the analyst changed and refined the substance and sizes of the examination instruments as indicated

by the recommendations of the specialists of the Department of Agricultural Extension and Information System, Sher-e-Bangla agricultural university.

3.6.2 Ethical consideration

Some basic ethical principles were maintained throughout the study and pointed out below.

- The researcher built up affinity with the respondents appropriately.
- The researcher treated the respondents with incredible regard.
- The reasons for the study were clarified before beginning meetings with the respondents.
- Autonomy, protection and non-judgmental perspectives were considered significantly amid making interviews with the respondents.
- Special care was taken to stay far from subjective judgments and miss interpretations amid accumulation and documentation of subjective information.

3.7 Data Collection

The researcher himself gathered information from the respondents with the assistance of interview schedule in face to face setting. The researcher collected data using pre-tested interview schedule and based on pre-test experiences necessary corrections, additions, modifications and alternations were made before finalizing the interview schedule for final data collection Meeting with the respondents was made ahead of time with the assistance of UFO of Gram unnayan prokolpo. In order to build up affinity with the respondents, the researcher took every possible precaution so that they did not err in reacting to the inquiries and explanations. At whatever point, any respondent faced any difficulty in seeing any question care was taken unmistakably to represent the same. The researcher was also aware of side-talking in the midst of knowledge accumulation and thoughtfully tried to stay away from that problem. Data accumulation occurred from October 2 to 20, 2020. Be that as it may, in the sense of knowledge accumulation, scientists did not face any real problems because

the study area's respondents and various villagers were especially helpful and friendly.

3.8 Data analysis

Data collected from the respondents were analyzed and interpreted in accordance with the objectives of the study. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Sciences) computer program, version 21. Statistical measures such as number, range, mean, standard deviation and percentage were used in describing the variables whenever applicable. In order to explore the contribution of the concerned variables, multiple regression analysis was used. Throughout the study, five percent (0.05) and one percent (0.01) level of significance was used as the basis for rejecting any null hypothesis.

Hypothesis of the Study

A hypothesis is an assumption, an idea that is proposed for the sake of argument so that it can be tested to see if it might be true. In the scientific method, the hypothesis is constructed before any applicable research has been done, apart from a basic background review. A hypothesis is usually tentative; it's an assumption or suggestion made strictly for the objective of being tested. In broad sense hypotheses are divided into two categories: (a) Research hypothesis and (b) Null hypothesis

3.8.1 Research hypothesis

Based on review of literature and development of conceptual framework, the following research hypothesis was formulated: “Each of the thirteen (13) selected characteristics (Age, education, family size, farm size, annual family income, extension media contact, cosmopoliteness, knowledge on catfish farming, attitude towards catfish farming, innovativeness and problems faced by the farmers during catfish farming has significant relationship to adoption extent of catfish farming. However, when are searcher tries to perform statistical tests, then it becomes necessary to formulate null hypothesis.

3.8.2 Null hypothesis

A null hypothesis states that there is no contribution between the concerned variables. The following null hypothesis used to be formulated to explore the contribution of the selected characteristics of farmers on their adoption extent of catfish farming. Hence, in order to conduct tests, the earlier research hypothesis was converted into null form as follows: “There is no contribution of the selected characteristics of the farmers to their adoption of catfish farming.”

3.9 Data processing

The collected raw data were analyzed thoroughly to detect errors and exclusions. Qualitative data were converted into quantitative data by means of suitable scoring whenever necessary. For this the collected data were given numerical coded values. The obtained data were then compiled on a master sheet and then tabulated and analyzed with keeping the objectives of the study in mind. A broad variety of related hypotheses and empirical studies have been compiled and reviewed. To create a specific research plan and to outline the research context, the researcher contacted numerous relevant outlets, such as books, journals, papers, theses, abstracts, and the internet.

CHAPTER IV

RESULTS AND DISCUSSION

The findings of the study are presented in this Chapter according to the objectives of the study. Necessary explanations and interpretations have also been made showing possible and logical basis of the findings whenever necessary. However, for convenience of the discussions, the findings of the study are systematically presented under the following sequence:

1) Age of the respondents
2) Education of the respondents
3) Farming experience
4) Family size of the respondents
5) Farm size of the respondents
6) Annual family income of the respondents
7) Extension media contact of the respondents
8) Cosmopolitness
9) Training experience of the respondents
10) Knowledge on catfish farming
11) Attitude towards catfish farming
12) Innovativeness
13) Problems faced by the farmer during adoption of catfish farming.

4.1 Selected Characteristics of the catfish Farmers

This section deals with the classification of the farmers according to their various characteristics. Behavior of an individual is largely determined by his characteristics. These characteristics of an individual contribute to a great extent in the matter of shaping of his/her behavior. In this section the finding on the farmers' selected characteristics have been discussed. The selected characteristics were (i) age, (ii) education, (iii)fish farming experience, (iv) family size, (v) farm size, (vi) annual income, (vii) extension media contact,

viii) cosmopoliteness (ix) training on catfish farming, (x) knowledge on catfish farming, (xi) attitude towards catfish farming (xii) innovativeness and (xiii) Problems faced by the farmers during catfish farming. Therefore; the major hypothesis of the study was that the adoption of catfish farming would also be influence by selected characteristics of the farmers. Range, mean and standard deviations of these characteristics of catfish farmer are also described in this section.

Table 2 The salient features of selected characteristics of catfish farmers

Categories	Measuring Unit	Range		Mean	S D
		possible	observed		
Age	Years	-	23-65	43.43	11.24
Education	Year of schooling	-	00-18	9.18	4.86
Farming experience	No of year		1-40	14.98	8.18
Family size	Number	-	3-9	5.25	1.70
Farm size	Hectare		.05-13.49	3.57	3.01
Annual family income	Thousand Taka	-	100-5500	1311.13	1253.15
Extension media contact	Score	0-52	8-44	26.18	8.74
Cosmopoliteness	Score	0-28	2-26	10.01	5.66
Training on fish farming	No of days	0-38	0-38	7.84	6.52
Knowledge on catfish farming	Score	0-36	9-34	23.97	6.13
Attitude Towards Catfish Cultivation	Score	0-24	4-20	11.68	4.17
Innovativeness	Score	0-20	3-19	10.39	3.81
Problems faced by the farmer during adoption of catfish farming	Score	0-32	8-25	18.63	2.64

4.1.1 Age of the respondents

The age of the respondent fish farmers ranged from 23 to 65 years with an average age of 43.43 years. The respondents were classified into following three categories and presented in Table 3.

Table 3 Distribution of the respondents according to their age

Categories	Farmers		Mean	SD
	Number	Percent		
Young aged (up to 35)	32	32.98	43.43	11.24
Middle-aged (36-50)	41	42.26		
Old (>50)	24	24.76		
Total	**97**	**100**		

Results presented in Table 3 indicate that the highest proportion (42.26%) of the respondents were in middle aged categories compared to 32.98 percent young and 24.76 percent old aged category. However, 74 percent of the farmers of the study area were young to middle aged**.** Farmers with middle age has the decision making power than other and young farmers have the higher trend to accept new technology. Islam (2014) also reported that most of the farmers in the same study area were young to middle aged.

4.1.2 Education of the respondents

Education is the process of developing mind of an individual and increases his/her power of observation, integration, understanding, decision-making and adjustment to new situation. It is assumed that the higher educated farmers will have high performance on the farming. On the basis of observed data, the respondents were classified into four categories according to Akanda (2017). The categories and distribution of the respondents are shown in Table 4.

Table 4 Distribution of the respondents according to their educational qualification

Categories	Farmers		Mean	SD
	Number	Percent		
Illiterate(0-0.5)	10	10.30	9.33	4.81
Primary level(1-5)	16	16.49		
Secondary level(6-10)	38	39.17		
Above secondary level(>10)	33	34.04		
Total	**97**	**100**		

Information present in table 4 indicate that most of the respondents (39.17%) fall in the secondary level category, 10.30 percent of farmers were illiterate, about 16.49 percent of the farmers had primary qualification and 34.04 percent had higher level of education. The findings reveal that more than two-third (74.11%) of the farmers had secondary to above secondary level of education. Therefore, it can be said that comparatively higher educated farmers were involved in catfish farming in the study area. (Islam, 2014) found that more than 65 percent respondents had secondary and higher secondary level education in the study area.

4.1.3 Farming experience

Catfish farming experience of the respondent farmers was ranged from 1 to 40 years. The average score was 15.07 years. On the basis of their catfish farming experience, the respondent farmers were classified into three categories as shown in Table 5.

Table 5 Distribution of the respondents according to their experience in fish farming

Categories	Farmers		Mean	SD
	Number	**Percent**		
Low experience (up to 6)	11	11.3	15.07	8.21
Medium experience (7-22)	75	77.3		
High experience (above 22)	11	11.3		
Total	**97**	**100**		

The highest proportion (77.3%) of the farmers had medium experience of fish farming that means they are cultivating fish from 7 to 22 years. The lower experienced farmers 11.3 percent and 11.3 percent had high experience about fish farming. As the average fish farming experience of the farmers in the studied area was 15.07 years and majority (88.6%) of the respondents had low to medium experience that indicates young generation involved in fish farming. Their experience influences them to take or use new technologies and in this way adoption status is increased indirectly. Islam (2014) found that 90 percent respondents had low to medium fish farming experiance that was almost similar to the present study.

4.1.4 Family size of the respondents

Family size referred to the total number of members including the respondent himself, spouse, children and other permanent dependents who lived together as family unit. Family size of a respondent was measured in terms of actual number (all dependents) of members in his family (including himself) during the interview period in Table 6 The families were divided into three categories according to Islam (2008).

Table 6 Distribution of the respondents according to their family size

Categories	**Farmers**		**Mean**	**SD**
	Number	Percent		
Small family (up to 3)	18	18.56	5.25	1.70
Medium family (4-7)	64	65.97		
Large family (above 7)	15	15.47		
Total	**97**	**100**		

Distribution of the respondents according to their family size in Table 6 indicate that 65.97 percent of the respondents belonged to medium family while 18.56 percent of them found under small family and 15.47 percent of them rested under large family with the average more than 5. Therefore, majority (84.53%) of the respondent fall under small to medium family categories. Abdulla-Al-Asif (2017) found that 76 percent of the respondent belongs to small to medium family .

4.1.5 Farm size of the respondents

The farm size in the study area varied from 0.05 ha to 13.49 ha with the average 3.57 ha which was found higher than the national average 0.8 ha (DAE, 2010) the reason behind the result may that most of the farmer in the study area leased in water body for fish farming. Based on farm size the respondents were classified into three categories according to BBS (2009) as presented in Table 7.

Table 7 Distribution of the respondents according to their farm size

Categories	**Farmers**		Mean	SD
	Number	Percent		
Marginal farm (up to 0.2 ha)	3	3.02	3.57	3.01
Small farm (0.21-1.0 ha)	17	17.52		
Medium farm (1.01-3.0 ha)	29	29.9		
Large farm (>3.01 ha)	48	49.48		
Total	**97**	**100**		

Findings presented in Table 5 indicate that, most of the respondents (49.48%) had large size on the other hand 29.9 percent respondents had medium farm size and 17.52 percent found in small farm size.

4.1.6 Annual family income of the respondents

The annual family income of the catfish farmers ranged from 100 to 5500 thousand taka with an average of 1311.13 and standard deviation of 1253.15. Based on their annual family income the respondents were classified into three categories as shown in Table 8

Table 8 Distribution of the respondents according to their annul family income

Categories	**Farmers**		**Mean**	**SD**
	Number	Percent		
Low income (Under 500)	29	29.89	1311.13	1253.15
Medium income (500-1500)	37	38.14		
High income(above1500)	31	31.97		
Total	**97**	**100**		

Information exhibited in the Table 8 demonstrate that the most elevated extent of the Catfish farmers (38.14%) had medium income, while 31.97 percent and 29.89 percent of them were high and low income classification, individually. The discoveries show that lion's share of the farmers (70.11%) had medium to high income. In this way, it was normal that the farmers of medium to high wage class would liable to take part in catfish farming development to a more noteworthy degree to expand their income. Islam (2014) found that most of the respondent in this area belongs to medium to high level income .

4.1.7 Extension media contact of the respondents

Extension media contact scores of the catfish farmers ranged from 8 to 44 against possible range of 0 to 52, with an average of 26.19 and standard deviation of 8.62. Based on their extension media contact, the respondents were classified into three categories as shown in Table 9.

Table 9 Distribution of the respondents according to their extension media contract

Categories (Scores)	**Farmers**		**Mean**	**SD**
	Number	**Percent**		
Low (up to 18)	19	19.58	26.19	8.62
Medium (19-34)	59	60.84		
High (above 34)	19	19.58		
Total	**97**	**100**		

Data in Table 9 uncover that the majority extents (60.84%) of the catfish farmers had medium extension media contact, where as 19.58 percent had high extension media contact, respectively. The findings also indicate that all the catfish farmers had medium to high extension media contact in the study area. The findings indicate that a great majority of the farmers under study had medium extension media contact. So, extension workers should concentrate their works with farmers to increase their contact with extension media.

4.1.8 Cosmopolitness

Cosmopoliteness scores of the respondents ranged from 2 to 26 with an average of 9.91 and a standard deviation of 5.26 against the possible range of 0 to 28. On the basis of their cosmopoliteness scores, the farmers were classified into three categories as shown in Table 10.

Table 10 Distribution of the farmers according to their cosmopoliteness

Categories	Farmers		Mean	SD
	Number	Percent		
Low Cosmopolite (1-5)	24	24.74	9.91	5.26
Medium Cosmopolite (6-14)	50	51.54		
High Cosmopolite (Above 14)	23	23.72		
Total	**97**	**100**		

The majority 51.54% of the farmers were "medium cosmopolite as compared to 24.74 percent of them being low cosmopolite and 23.72 percent highly cosmopolite. Thus, almost all three-fourth 76.28% of the farmers were low to medium categories in terms of their cosmopoliteness.

4.1.9 Training experience of the respondents

Training of the respondent farmers was ranged from 0 to 38 days with average 7.84 days. The training experience of the respondent's farmer showed in table 11.

Table 11 Distribution of the respondents according to their training experience

Categories (Scores)	Farmers		Mean	SD
	Number	Percent		
No training	14	14.43	7.84	6.52
Short duration training (up to 1)	2	2.06		
Medium duration training (2-14)	75	77.31		
Long duration training (above 14)	6	6.18		
Total	**97**	**100**		

Results contained in table 11 reveal that the majority (77.31%) of the respondents received medium duration training; while about 6.18 percent received long duration training 2.06 percent of the respondent farmers had short duration training experience and only 14.43 percent of them had no training. Higher experience is helpful for catfish farming. During the investigation it was observed that the respondents received training from different Government organization like Department of Fisheries (DoF), some NGO's and some medicine company.

4.1.10 Knowledge on catfish farming

The knowledge of the respondent farmers determines by scoring. There were 18 questions related to catfish farming and total score was 36. The knowledge score was varied from 9 to 33 with the mean 23.97 The knowledge of catfish farmer on catfish farming classified into 3 categories which is shown in Table 12.

Table 12 Distribution of the respondents according to their knowledge

Categories	**Farmers**		**Mean**	**SD**
	Number	**Percent**		
Low knowledge (up to 18)	18	18.55	23.97	6.13
Medium knowledge (19-30)	69	71.15		
High knowledge (>22)	10	10.3		
Total	**97**	**100**		

Result presented in the Table 12 reveal that majority of the respondents had medium (71.15%) knowledge on catfish farming compared to 10.3 percent high level knowledge and 18.55 percent of the respondent farmers had low level knowledge. Results indicate that majority of the respondent farmers had medium level knowledge on catfish farming, that indicates the farmer of this region more or less cultivate catfish.

4.1.11 Attitude towards catfish farming

The attitude towards catfish farming scores ranged from 4 to 20 against the possible scores 0 to 24 with an average of 11.58 and a standard deviation of 3.82. Based on the observed attitude towards catfish farming scores, the respondents were classified into three categories as shown in Table 13.

Table 13 Distribution of the respondents according to their attitude towards catfish farming

Categories (Scores)	**Farmers**		**Mean**	**SD**
	Number	**Percent**		
Low Favourable (Up To 7)	16	16.49	11.58	3.82
Medium Favourable (8-15)	63	64.94		
High Favourable (Above 15)	18	18.57		
Total	**97**	**100**		

Data presented in Table 13 shows that (64.94%) of the catfish farming belonged to medium favourable attitude towards catfish farming as compared to 16.49 percent had low favourable attitude and 18.57 percent had high favourable attitude. The findings also reveal that an overwhelming majority (83.51%) of the respondents had low to high favourable attitude towards catfish farming.

4.1.12 Innovativeness

The maximum innovativeness score of the respondents was 19 and the minimum was 3 against the possible range of 0 to 20. However, the average was 10.39 and the standard deviation was 3.81. Based on their innovativeness scores, the respondents were classified into three categories as shown in Table 14.

Table 14 Distribution of the respondents according to their innovativeness

Categories (Scores)	Farmers		Mean	SD
	Number	Percent		
Low innovativeness (up to 7)	26	26.80	10.29	3.83
Medium innovativeness (8-13)	59	60.82		
High innovativeness (above 13)	12	12.37		
Total	**97**	**100**		

Data contained in Table. 14 indicate that highest proportion (60.82%) of the farmers had medium innovativeness as compared to 12.37 percent high innovativeness and 26.80 percent low innovativeness.

4.1.13 Problems faced by the farmer during adoption of catfish farming

Problems faced by the farmer during adoption of catfish farming of the respondents was quantified by computing scores for their problems during catfish farming. The problems during catfish farming scores ranged from 8 to 25 against the possible scores 0 to 32 with an average of 18.63 and a standard deviation of 2.64. Based on the problems during towards catfish farming scores, the respondents were classified into three categories as shown in Table 15.

Table 15 Distribution of the respondents according to the problem faced during adoption of catfish farming

Categories (Scores)	Farmers		Mean	SD
	Number	Percent		
Low problems (up to 16)	10	10.30	18.63	2.64
Medium problems (17-20)	68	70.10		
High problems(above 20)	19	19.60		
Total	**97**	**100**		

Data presented in table 15 shows that (70.10%) of the catfish farming farmer faced medium problems during catfish farming as compared to 10.30 percent had low problems and 19.60 percent faced high problems. The findings also reveal that an overwhelming majority (89.70%) of the respondents faced medium to high level problems during catfish farming.

4.2 Extent of Adoption of Catfish Farming

Farmers' adoption of catfish farming has been considered as the major concern of this study. The extent of adoption in catfish farming is the depended variable of this study. Based on their adoption score, the respondents were classified into three categories. Low adoption (up to 31), medium adoption (32-65) and high adoption (above 65). The distribution of the respondents according to their overall adoption in catfish farming is shown in Table 16

Table 16 Distribution of the respondents according to their adoption of catfish farming

Categories	**Farmers**		**Mean**	**SD**
	Number	**Percent**		
Low adoption (up to 31)	15	15.46	48.36	17.55
Medium adoption (32-65)	68	70.10		
High (above 65)	14	14.44		
Total	**97**	**100**		

Results presented in Table 16 indicate that 70.10 percent of the respondents had medium adoption compared to 14.44 percent had higher adoption and none of them had low adoption on catfish farming. From Table 16 it is clear that 70.10 percent of the farmers have medium adoption about catfish farming. Due to the higher return from the catfish farming compared to the other fishes the farmers are becoming interested gradually to cultivate catfish. According to the Senior Upazila Fisheries Officer of the study area, Jashore sadar upazila is suitable for catfish farming. Farming of catfish is easier than the others cultivable fishes and growth rate is high (Faruk, 2008). Now a day's farmers of the study area

practicing poly-culture of catfish with other fishes like Indian major carps. In poly-culture farmers no need to provide extra feed or caring because fishes cultivate with catfish consume extra feed which are not consumed by catfish that ensure the proper utilization of feed and also ensure extra profit to the farmer. For these reasons farmers of the study area are become more interested day by day to cultivate catfish rather than other fishes.

4.3 The Contribution of the Selected Characteristics of the Respondents to Their Adoption of Catfish Farming.

In order to estimate the adoption extent of adoption of catfish farming, multiple regression analysis was used which is shown in the Table 17.

Table 17 Multiple regression coefficient of the contributing variables related to their adoption of catfish farming

Dependent variable	Independent Variable	B	P	R^2	Adj. R^2	F
Adoption of Catfish Farming	Age	.005	.963	0.517	0.441	6.83
	Education	.247	.024*			
	Farming experience	.215	.047*			
	Family size	.006	.945			
	Farm size	-.130	.340			
	Annual family income	-.182	.179			
	Extension media contact	.019	.887			
	Cosmopoliteness	.027	.823			
	Training on fish farming	.029	.773			
	Knowledge on catfish farming	.029	.841			
	Attitude Towards Catfish farming	.321	.009**			
	Innovativeness	.031	.819			
	Problems faced by the farmer during adoption of catfish farming	-.327	.000**			

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

Table 17 shows that education, farming experience, attitude towards catfish farming and problems faced by the farmer during adoption of catfish farming of

the respondents had significant contribution with their adoption of catfish farming. Of these, attitude towards catfish farming and problems faced by the farmer during adoption of catfish farming were the most important contributing factors (significant at the 1% level of significant) and education and farming experience of the respondents were less important contributing factors (significant at 5% level of significant). Coefficients of other selected variables don't have any contribution on their adoption of catfish farming.

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 $R^2 = 0.517$ means that independent variables accounts for 51.7% of the variation with their adoption of catfish farming. The F ratio is 6.83 which is highly significant ($p<0$).

However, each predictor may explain some of the variance in respondents their adoption of catfish farming simply by chanced. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but value 0.441 is still show that variance is farmers their adoption of catfish farming can be attributed to the predictor variables rather than by chanced. In summary, the models suggest that the respective authority should be considers the farmers' education, farming experience, attitude towards catfish farming and problems faced by the farmer during adoption of catfish farming and in this connection some predictive importance has been discussed below:

4.3.1 Contribution of the Problems faced by the farmer during catfish farming to their adoption of catfish farming.

From the multiple regression, it was concluded that the Problems faced by the farmer during catfish farming to the farmers' adoption of catfish farming was measured by the testing the following null hypothesis;

"There is no contribution of the Problems faced by the farmer during catfish farming to the farmers' adoption of catfish farming".

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 Problems faced by the farmer during catfish farming was significant at 1% level (.000)
b. So, the null hypothesis could be rejected.
c. The direction between Problems faced by the farmer during catfish farming and adoption was negative.

The b-value of attitude towards catfish farming was (-0.327). So, it can be stated that as Problems faced by the farmer during catfish farming increased by one unit, farmers' adoption of catfish farming decreased by 0.321 units.

Based on the above finding, it can be said that farmers' had higher Problems faced

during catfish farming decreased the adoption of catfish farming. So, Problems faced by the farmer during catfish farming has high significantly contributed to the farmers' adoption.

4.3.2 Contribution of the attitude towards catfish farming to their adoption of catfish farming.

From the multiple regression, it was concluded that the attitude towards catfish farming to the farmers' adoption of catfish farming was measured by the testing the following null hypothesis;

"There is no contribution of the attitude towards catfish farming to the farmers' adoption of catfish farming".

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 attitude towards catfish farming was significant at 1% level (.009)
b. So, the null hypothesis could be rejected.
c. The direction between attitude towards catfish farming and adoption was positive.

The b-value of attitude towards catfish farming was (0.321). So, it can be stated that as attitude towards catfish farming increased by one unit, farmers' adoption of catfish farming increased by 0.321 units.

Based on the above finding, it can be said that farmers' had higher attitude towards catfish farming increased the adoption of catfish farming. So, attitude towards catfish farming has high significantly contributed to the farmers' adoption.

4.3.3 Contribution of the Education to their adoption of catfish farming.

The contribution of education to farmer's adoption of catfish farming was measured by the testing the following null hypothesis;

"There is no contribution of education to the farmers' adoption of catfish farming".

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 education was at 5% significance level (0.024).
b. So, the null hypothesis could be rejected.
c. The direction between education and adoption was positive.

The b-value of level education is (0.024). So, it can be stated that as education increased by one unit, farmers' adoption of catfish farming increased by 0.024 units.

Based on the above finding, it can be said that farmers' education increased the farmers' adoption of catfish farming. So, education has significantly contributed to the farmers' adoption of catfish farming. Education plays an important role to reduce problems in adoption of catfish farming in many cases. Education enhances knowledge on many aspects such as training, participation, extension contact and so on.

4.3.4 Contribution of the fish Farming experience to their adoption of catfish farming.

From the multiple regression, it was concluded that the contribution of experience in fish farming to the farmers' adoption of catfish farming was measured by the testing the following null hypothesis;

"There is no contribution of experience in fish farming to the farmers' on adoption of catfish farming".

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 experience in fish farming was significant at 5%level (.047)
b. So, the null hypothesis could be rejected.
c. The direction between experience in fish farming and adoption of catfish farming was positive.

The b-value of experience in fish farming (0.215). So, it can be stated that as experience in fish farming increased by one unit, farmers' adoption of catfish farming increased by 0.215 units.

Based on the above finding, it can be said that farmers' had more experience in fish farming increased farmers' adoption of catfish farming. So, experience in fish farming has high significantly contributed to the farmers' adoption increased. Experience in fish farming increase farmer's knowledge about various aspects which helps farmers make enough reduce their problem in catfish farming.

4.4 Rank order of problem faced by respondents by the farmer in catfish farming

Rank order of the eight strategies of problem faced by the respondents is presented in the following Table 18.

Table 18 Rank order of the problem faced by respondents during adoption of catfish farming

Statement on problems	Very high	High	Medium	Low	Very low	Computed score	Rank order
High price of material inputs	70	10	5	2	10	322	1st
Diseases outbreak	65	12	5	5	10	311	2nd
Broker problem	60	15	4	6	12	299	3rd
Inbreeding in fish	46	10	12	10	19	248	4th
Unavailability of skilled manpower	25	10	25	20	17	200	5th
Inadequate training facilities	22	15	10	15	35	168	6th
Flood or heavy raining	20	18	8	12	39	162	7th
Poor transportation systems	10	25	7	18	37	147	8th

As per Problem Faced Index (PFI), high price of material inputs positioned the 1st and poor transportation systems in last position. The problems faced by the catfish farmer during adoption of catfish farming according to descending order through the analysis of the received data from respondents are high price of material inputs, diseases outbreak, broker problem, inbreeding in fish, unavailability of skilled manpower, inadequate training facilities, flood or heavy raining and poor transportation systems respectively. Sheheli *et al.* (2013) found that major constraints are high production cost that means higher material input cost reduces profit of the farmer. Ahmed (2007) found that about 93.7 percent of the total cost constitutes the input cost where 71.8 percent cost for feeds. So it is matter of concern that total profit of catfish farming largely depends on inputs materials.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Summary of the Findings

5.1.1 Selected characteristics of the farmers (Independent variable)

The major findings of the study are summarized below:

Age: The age score of the farmers ranged from 23 to 65 with a mean and standard deviation of 43.43 and 11.24, respectively. The highest proportion 42.26 percent of the respondents fell in the middle age, while 24.76 and 32.98 percent belonged to old and young age categories respectively

Education: The level of education score of farmers ranged from 0 to 18 with a mean and standard deviation of 9.33 and 4.81, respectively. The majority 39.17 percent of the farmers are secondary level educated while 16.49 percent farmers had primary level of education, 10.30 percent farmers are illiterate or can sign only and 34.04 percent had above secondary level of education.

Farming experience: Catfish farming experience of the respondent farmers was ranged from 1 to 40 years. The mean score was 14.98 years and standard deviation 8.18. The highest proportion 77.3% of the farmers had medium experience in fish farming and 11.3 percent and 11.3 percent farmer low and high experience respectively about fish farming.

Family size: The score of family size of the farmers ranged from 3 to 9 with a mean and standard deviation of 5.25 and 1.70, respectively. The highest proportion 65.97 percent of the respondents belonged to medium size family, compared to having 15.47 percent had large and 18.56 percent having small size family respectively.

Farm size: The score farm size of the farmers ranged from 0.05 to 13.49 with a mean and standard deviation of 3.57 and 3.01, respectively. The highest proportion 49.48 percent of the respondents belonged to large farm size,

compared to having 29.9 percent had medium and 17.52 percent having small farm size respectively.

Annual income: The score of annual income by famers ranged from 100 to 5500 with a mean and standard deviation of 1311.13 and 1253.15, respectively. The highest proportion 38.14 percent of the respondents had medium annual income, while 29.89 percent had low income and 31.97 percent had high income.

Extension media contact: Extension media contact scores of the farmers ranged from 8-44 against the possible range of 0-52 having a mean of 26.19 with a standard deviation of 8.62. The highest proportion 60.84 percent of the respondents had medium extension media contact compared to 19.58 percent having low and 19.58 percent having high extension media contact.

Cosmopolitness: Cosmopoliteness scores of the respondents ranged from 2 to 26 with an average of 9.91 and a standard deviation of 5.26 against the possible range of 0 to 28. The majority 51.54% of the farmers were "medium cosmopolite" as compared to 24.74 percent of them being "low cosmopolite" and 23.72 percent "highly cosmopolite".

Training experience of the respondent: Training of the respondent farmers was ranged from 0 to 38 days with average 7.84 and standard deviation 6.52. the majority (77.31%) of the respondents received medium duration training; while about 6.18 percent received long duration training 2.06 percent of the respondent farmers had short duration training experience and only 14.43 percent of them had no training experience.

Knowledge on catfish farming: The knowledge score was varied from 9 to 33 with the mean 23.97 and standard deviation 6.13. Majority of the respondents had medium 71.15% knowledge on catfish farming compared to 10.3 percent high level knowledge and 18.55 percent of the respondent farmers had low level knowledge.

Attitude towards catfish farming: The attitude towards catfish farming scores ranged from 4 to 20 against the possible scores 0 to 24 with an average of 11.58 and a standard deviation of 3.82. About 64.94% of the catfish farming belonged to medium favourable attitude towards catfish farming as compared to 16.49 percent had low favourable attitude and 18.57 percent had high favourable attitude.

Innovativeness: The maximum innovativeness score of the respondents was 19 and the minimum was 3 against the possible range of 0 to 20. However, the average was 10.39 and the standard deviation was 3.83. The highest proportion (60.82%) of the farmers had medium innovativeness as compared to 12.37 percent high innovativeness and 26.80 percent low innovativeness.

Problems faced by the farmer during adoption of catfish farming: The problems during catfish farming scores ranged from 8 to 25 against the possible scores 0 to 32 with an average of 18.63 and a standard deviation of 2.64. About 70.10% of the catfish farming farmer faced medium problems during catfish farming as compared to 10.30 percent had low problems and 19.60 percent faced high problem.

5.1.2 Adoption of Catfish farming

The extent of adoption in catfish farming is the depended variable of this study. Based on their adoption score, the respondents were classified into three categories. Low adoption (up to 31), medium adoption (32-65) and high adoption (above 65). About 70.10 percent of the respondents had medium adoption compared to 14.44 percent had higher adoption and none of them had low adoption on catfish farming. It is clear that cent percent of the farmers have medium adoption about catfish farming.

5.1.3 Rank order of problem faced by respondents

Rank order of the eight strategies of problem faced by the respondents was measured. As per Problem Faced Index (PFI), high price of material inputs positioned the 1st and poor transportation systems in last position.

5.1.4 Contribution of the selected characteristics of the catfish farmers to their adoption extent of catfish farming

Education, farming experience, attitude towards catfish farming and problems faced by the farmer during catfish farming in adoption of catfish farming had significant positive contribution to their adoption extent of Catfish farming. Characteristics of the farmers like age, family size, farm size, annual family income, extension media contact, cosmopoliteness, training on fish farming, knowledge on catfish farming and innovativeness had no contribution to their adoption of catfish farming.

5.2 Conclusions

It is important to make logical interpretation of the findings of the study and to draw a meaningful conclusion. However, on the basis of the major findings of the research and their logical interpretations, following conclusions have been drawn:

i. The popularity of catfish farming is increasing day by day. Farmers are converted to catfish farming from white fish farming due to its high profitability and good market value. Catfish farming found medium adopted in the study area. So, there is a scope for expanding catfish farming in the study area.

ii. Educated, experienced and young to middle aged farmers take challenge to use new technologies besides their traditional way of farming. Those technologies increasing their productivity that make a positive view about catfish farming. So, the involvement in catfish farming is increasing which rising the adoption level of catfish farming in the study area.

iii. The study found attitude towards catfish farming and problems faced by the farmer during catfish farming had high significant relationship with their adoption of catfish farming.

iv. There are some problems which are faced by farmer during catfish farming. Major problems found in study area during cultivating catfish were high price of material inputs, diseases outbreak, broker problems and inbreeding in fish.

v. Finally, it may be said that with the increase of education, farming experience, attitude towards catfish farming and through mitigating the problems faced by the catfish farmer, adoption of catfish farming will be increased.

5.2.1 Recommendations for policy implication

Based on the above analysis, findings and conclusions of the study, the following recommendations are formulated:

i. Catfish farming found medium adopted in the study area. So the Department of Fisheries (DoF) should strengthen the field level services by the field level extension personnel to provide proper information, suggestions and advices for sustaining higher adoption of catfish farming.

ii. As farmers' characteristics such as education, farming experience, attitude towards catfish farming and problems faced by the farmer during adoption of catfish farming showed significant relationships with their adoption of catfish farming hence, while selecting farmer for related training program these characteristics should be considered.

iii. Personnel involved with fisheries sector should monitor the fish marketing system and also the market of materials input. To create a suitable environment, broker problems should be maintained by fisheries related personnel.

iv. For sustaining and enhancing catfish cultivation, farmer's need to provide with reasonable price of material input, proper guidance for good management practice to remove disease outbreak, ensure adequate training, develop transportation system, and also for control inbreeding problem necessary steps should be taken by the concern authority

v. The study was conducted in Jashore sadar upazila under Jashore district. Similar study may be conducted in other district to find out the scenario to validate the findings.

5.2.2 Recommendations for further study

On the basis of scope and limitations of the present study and observation made by the researcher, the following recommendations are made for future study.

i. The present study was conducted in Jashore sadar upazila under Jashore district. Similar study may be conducted in other district to find out the scenario to validate the findings.
ii. This study investigated the contribution of thirteen characteristics of the respondents with their adoption of catfish farming as dependent variables. Therefore, it is recommended that further study should be conducted with other characteristics of the respondents with their adoption of catfish farming.
iii. The present study was concerned only with the extent of adoption of catfish farming It is suggested, future studies should be focused on the profitability and other problems that is not included in this study.

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APPENDIX-I

ENGLISH VERSION OF THE INTERVIEW SCHEDULE

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University

Dhaka-1207

Interview schedule for the data collection for the research on

Adoption of Catfish Farming at Jashore Sadar Upazila under Jashore District

Sl. no…… **Date:……**

Name of the respond: ……

Address:

Village: ……. Union: ----------

Contract no: .....

(Please provide following information. Your information will be kept confidential and will be used for research purpose only)

1. **Age: ……**

2. **Education of farmer:**

Please mention your educational status.

a. I don't know how to read and write.
b. I can sign only.
c. I have studied up to class……

3. **Fish farming experience (year):** ……

4. **Family size:** Please mention your family members including you…….

5. **Farm size:** Please mention your farm size.

Sl. No	Particulars	Local Unit (Hectare)
A	Own land under own cultivation	
B	Land taken from others on lease	
C	Shared out to others	
D	Shared in	
E	Land leased out to others	
	Total A+B+C+1/2 (D+E)	

6.**Annual family income:**

Please mention your annual family income.

Sl. No	Source of Income	Amount (Tk)/year
1.	Agriculture -Rice -Vegetable -wheat -others	
2.	Fisheries(Catfish & others fishes)	
3.	Livestock	
4.	Forestry	
5.	Business	
6.	Service	
7.	Others	
	Total	

7. Extension media contact: Please mention the extent of extension media contact**.**

Personal media contract						
Sl. No	**Name of the media**	**Extent of contact**				
		Regularly (4)	**Often (3)**	**Occasionally (2)**	**Rarely (1)**	**Not at all (0)**
1	**Neighbors and relatives**	7-8times/ month ()	56times/ month ( )	3-4 times/ month ( )	1-2 times /month ( )	0()
2	**Experienced farmer**	7-8times/ month ()	5-6times/ month ( )	3-4 times/ month ( )	1-2 times / month ( )	0()
3	**Upazila Fisheries Officer**	4-5 times/ month ()	4-3times/ month ( )	3-2 times/ month ( )	1-2 times / month ( )	0()
4	**NGO**	4-5 times/3 months ()	4-3times/ 3 months ( )	3-2 times/ 3 months ( )	1-2 times /3 months ( )	0()
5	**Others**	7-8times/ month ()	5-6times/ month ( )	3-4 times/ month ( )	1-2 times / month ( )	0()

Group media contract						
6	**Group discussion**	7-8times/ 4 months ()	5-6times/ 4 months ()	3-4 times/ 4 months ()	1-2 times/4 months ()	0()
7	**Field day**	7-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
8	**Result demonstration**	7-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
9	**Participation in fisheries. Training course**	7-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
Mass media contract						
10	**Internet**	7-8times/ week ()	5-6times/ week ( )	3-4 times/ week ( )	1-2 week/year ( )	0()
11	**Television**	7-8times/ week ()	5-6times/ week ()	3-4 times/ week ( )	1-2 times / week ()	0()
12	**Read Fisheries Related Book/Magazine**	7-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
13	**Fish Faire**	4 times/4 year ()	3times/4 year ( )	2 times/ 4 year ( )	1times /4 year ( )	0()

8. **Cosmopoliteness**

Sl. No	**Name of visit**	**Extent of contact**				
		Regularly (4)	**Often (3)**	**Occasionally (2)**	**Rarely (1)**	**Not at all (0)**
1	**Others village**	7-8times/ month ()	5-6times/ month ()	3-4 times/ month ()	1-2 times / month ()	0()
2	**Others union**	5-6times/ month ()	3-4times/ month ()	2 times/ month ()	1 times / month ()	0()

3	**Upazila sadar**	5-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
4	**Others upazila sadar**	5-6times/ year ()	4-5times/ year ( )	2-3 times/ year ( )	1-2 times /year ( )	0()
5	**Own district**	7-8times/ year ()	5-6times/ year ( )	3-4 times/ year ( )	1-2 times /year ( )	0()
6	**Others district**	4 times/ year ()	3 times/ year ( )	2 times/ year ( )	1 time /year ( )	0()
7	**Regional fisheries Research institute**	4 times/ year ()	3 times/ year ( )	2 times/ year ( )	1 time /year ( )	0()

9.**Training on fish farming:** Do you have any training on fish farming? Yes / No

If yes, please tell me about it.

SL. No	**Title**	**Duration(Days)**	**Conducted by**

10**. Knowledge on catfish farming:** Please answer the following questions**.**

SL. No	**Questions**	**Mark**	**Mark obtained**
1.	What is catfish?	2	
2.	Can you tell me at least three catfish species name?	2	
3.	Do you know the appropriate stocking density of catfish?	2	
4.	Do you know how to prepare pond before catfish culture?	2	
5.	What do mean by quality fry or fingerlings?	2	
6.	What is the best time for fry/ fingerlings release?	2	
7.	Do you know how to release fry or fingerlings in the pond?	2	
8.	What is the optimum feeding rate of catfish?	2	
9.	What is the feeding period of catfish?	2	
10.	What is artificial and natural feed?	2	

11.	How can you realize that enough food present in the water bodies?	2	
12.	What do you mean by fertilization in the ponds?	2	
13.	Mention at least three fertilizers name those are used in catfish cultivation.	2	
14.	What is the application of chemicals in the culture ponds?	2	
15.	Do you know about gulping of fish and why fish gulped?	2	
16.	Mention three disease names of catfish.	2	
17.	Do you know about disease management?	2	
18.	Mention the fishing gears and two chemicals used during harvesting of catfish.	2	

11. **Attitude Towards Catfish Cultivation**

Sl. No	**Statements**	**Extent of agreement/disagreement**				
		Strongly agreed (4)	**Agreed (3)**	**Undecided (2)**	**Disagreed (1)**	**Strongly disagreed (0)**
1 (+)	Catfish farming is profitable					
2 (+)	Catfish farming is easy					
3 (-)	It require high initial investment					
4 (-)	Modern catfish farming system is harmful for nature					
5 (-)	Catfish easily affected by diseases					
6 (+)	High yield catfish fingerlings is available					

12. **Innovativeness**

Please mention how many years after first hearing you use the following new technologies. Put (√) in appropriate place

Sl. No	**Name of Technology**	**Level of innovativeness**				
		Used within 1 years **(4)**	Used within 1- 2 years **(3)**	Used within 2- 3 years **(2)**	Used within 3- 4 year **(1)**	Do not use **(0)**
1	Use of RAS (Recirculating aquaculture system)					
2	Use of Bio floc					
3	Use of intensive aquaculture system					
4	Use of polyculture aquaculture system					
5	Use of high yielding fish seed					

13. **Adoption of Catfish Cultivation:**

i. Potential area for fish cultivation …… (Hectare)

ii. Adoption of different catfish

Name of Fishes	**Year of 1st Adoption**	**Ponds area in local unit with stocking (Hectare)**		
		2019-2020	**2018-2029**	**2017-2018**
Pangas				
Shing				
Pabda				
Tengra				
Magur				

14. **Problems faced by the farmer during adoption of catfish farming?**

Sl. NO	Problems	Level of problem				
		Very high (4)	High (3)	Medium (2)	Low (1)	Very low (0)
1	High price of material inputs					
2	Diseases outbreak					
3	Unavailability of skilled manpower					
4	Inadequate training facilities					
5	Flood or heavy raining					
6	Inbreeding in fish					
7	Poor transportation systems					
8	Broker problem					

.

15. **What suggestions do you offer for overcome those problem?**

Thank you for nice co-operation

Signature of the Interviewer…….

Date…….