FARMERS' SWITCHING BEHAVIOR FROM CROP TO FISH PRODUCTION: CAUSES AND CONSEQUENCES

A Thesis

By

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CERTIFICATE

This is to certify that the thesis entitled **"Farmers' Switching Behavior from Crop to Fish Production: Causes and Consequences"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension and Information System**, embodies the result of a piece of bona fide research work carried out by **Md. Samiul Alim** Registration No. **19-10028** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated: June, 2021

Dhaka, Bangladesh

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Dedicated
To
My respected
teachers

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The Author

CONTENTS

CONTENTS (Contd.)

CHAPTER III

CHAPTER IV

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

FARMERS' SWITCHING BEHAVIOR FROM CROP TO FISH PRODUCTION: CAUSES AND CONSEQUENCES

ABSTRACT

The major purposes of this research study were to: determine the extent of switching behavior of the farmers from crop to fish production, determine the causes and consequences of farmers' switching behavior and also to explore the relationships between each of fifteen selected characteristics of the farmers and their extent of switching from crop to fish production. Data were collected from randomly selected 74 farmers of 12 villages of Shyamnagar and Kaligonj upazila under Satkhira district by using an interview schedule during the period from August 20 to November 25, 2021. Finding revealed that majority proportion (78.4 percent) of the farmers' switched crop production to fish production into a lower amount of land compared to 13.5 percent of them switched from crop to fish production into a medium amount of land and 8.1 percent of the farmers switched from crop to fish production into a high amount of land. In practical situation, all the potential area of a farmer was not switched from crop to fish production. According to cause index for switching from crop to fish production "higher profit in fish production ranked first cause" followed by "salinity problem for crop production", "irrigation problem in kharip season", "less production in crop cultivation", "climatic hazard", "less physical attachment in fish production" and "lower diversity in local cropping pattern". For switching from crop to fish production farmer were facing some positive and negative consequences. According to consequences index in positive direction, "increasing economic return of the farmers" ranked first consequences followed by "increase pesticide free dyke vegetable cultivation" and "preservation of rain water for future use". Based on consequence index in negative direction, "decreasing crop production" ranked first consequences followed by "increasing soil salinity after shrimp cultivation" and "high risk of return from fish production". Out of fifteen selected characteristics of the farmers, BCR from fish production, extension contact, fish production knowledge, fish production practices of the farmers had significant positive relationship with their switching behavior from crop to fish production, while age of the farmers had significant negative relationship with their switching behavior. Rest ten characteristics i.e. education, farm size, family size, BCR from crop production, crop production knowledge, organizational participation, cosmopolitanism, training exposure, problem faced in crop cultivation, problem faced in fish production, had non-significant relationship with their switching behavior from crop to fish cultivation. Advisory service providers of crop and fisheries sector should take necessary actions to increase crop and fisheries productivity in a logical way in the study area for the betterment of the farmers and the country.

Chapter I

INTRODUCTION

1.1 General Background

Agriculture has been a way of life for people from long times back. Traditional farming systems which considered earth as a living being moved the way for modern agriculture. Switching of one practice to another was mainly because of the increased demand for basic needs which forced people to adopt modern techniques like the use of high yielding variety seeds, use of fertilizers etc. Modern agriculture practices are paving the way for sustainable agriculture. It is the type of farming which produces abundant food without depleting the resources of earth. As a consequence of globalization, local agriculture and alternative food systems continue to be a growing topic of discussion in both popular media and academic study (Betz & Farmer, 2016). Recent reports suggest that 'over one billion people experience the hardship that hunger imposes (FAO, 2009), a figure which continues to rise even amidst the advancements made in agricultural sciences in the 21st century. Engulfed within current population growth, economic instability and climate change, food security has become an urgent challenge for national and global governance. Arab agricultural lands are declining, due to drought, desertification, and water shortage' (FAO, 2008). Whilst future population growth will aggravate food insecurity, its significance is often exaggerated. Despite projections that global food production must rise by 70% by 2050 to meet the needs of the projected 40% growth in world population, the FAO has repeatedly expressed 'cautious optimism' that this demand can be met (FAO, 2009). Major shift is projected in the suitable climate space of many crops across the globe due to climate change (Seo and Mendelsohn, 2008; Wang et al., 2010; Rippke et al., 2016). This phenomenon is similar to the range-shift of plant species pole wards, or upwards for elevation-induced climate zones. Many species have recently shifted their ranges toward higher elevations and latitudes at a median rate of 11.0 m and 16.9 km per decade, respectively (Chen et al., 2011). To avoid or reduce the potential loss in profit due to shifts in suitable climate spaces, farmers need to make appropriate adjustments particularly crop switching. Global modeling studies suggest that

two-thirds of the potential damage from climate change in the agricultural sector can be avoided by effective crop switching (Costinot et al., 2016). In South and East Asia, the retreat of Himalayan glaciers threatens food security through disruption of the critical water cycle. One-fifth of the world's population lives in the five major river basins of the Himalayan water towers (Padma, 2010). Despite these warnings, climate negotiators are presenting a two degree temperature rise as an acceptable threshold, leaving poorer countries to adapt as best they can. National Adaptation Programs of Actions prepared by the Least Developed Countries focus on modest community-level initiatives, including the use of alternative seed varieties (Padma, 2008), improved soil management, maintenance of water management systems and reforestation. Cognitive factors are proximal and relate to learning and reasoning; they include farmers' perceptions of the relative benefits, costs and risks associated with a particular sustainable practice or whether they feel that they are skilled enough to adopt this practice. Studies in the past have examined the process of crop switching as an adaptation response and the factors that facilitate it. Most of these studies focused on revealing whether farmers are adapting by switching crops and what type of socio-economic and environmental factors influence the process (Maddison, 2007; Deressa et al., 2011; Gbetibouo, 2009; Bryan et al., 2013). These studies often consider crop switching just as one type of adaptation response without attempting to disentangle the specific types of switching decisions that are primarily motivated by climate change. This can be considered a key gap in the literature because certain types of switching decisions could be caused by non-climatic drivers such as price (Seo and Mendelsohn, 2008). Moreover, earlier studies do not give appropriate focus to non-climatic variables (Below et al., 2012; Fosu-Mensah et al., 2010; Gbetibouo et al., 2010). Crop switching, however, takes place in the context of different drivers such as markets dynamics, pest occurrence and land degradation. The consideration of such drivers is, therefore, vital to understand the relative importance of climate change in switching crops. Few studies partially addressed the common methodological gaps in the literature. Alauddin and Sarker (2014) identified the determinants of a specific category of crop switching decision (adopting water-saving non-rice and horticultural crops) in a study area in Bangladesh. This is a major improvement from previous studies as it singles out narrowly defined types of switching decisions as

adaptation strategies to climate change. The study, however, did not adequately clarify the basis for identifying the specific strategy as an adaptation response among others. Hence this study investigates the reasons behind why the farmers switch from conventional farming methods to fish cultivation. The identification of these factors will be helpful for the farmers to know the benefits of fish Production and also other related issues of conventional farming. In the North Bengal region farmers of Bangladesh has switched mostly within four years rice Production to different Production practices due to lower market price than the production cost of rice. Farmers of Rangpur were found switch to tobacco cultivation. Farmers from Bogura, Rajshahi and Naogan switching to vegetable and mango Production while many farmers of Sirajgonj largely switched to fish Production with an annual growth of 20-25 ponds each year (Prothom Alo, Dated 28th May, 2019). Prior studies often consider crop switching just as one type of adaptation response without attempting to disentangle the specific types of switching decisions that are primarily motivated by climate change. Increasing consumer awareness of local foods, renewed appreciation for taste and seasonality in produce, a growing willingness by farmers to produce, process and market higher value food products create a foundation for the switching behavior from crop to fish cultivation. Social factors relate to farmers' interactions with other individuals (e.g. other farmers or advisors) and include social norms and signaling motives. Social factors may be proximal or distal; for instance, injunctive norms (i.e. what farmers perceive others expect from them) may push farmers to adopt a particular practice or more sustainable practices in general. As switching result recently Bangladesh Government is focusing on import for feeding over growing population. As the country's food stock was at alarming low level earlier years' government decided to import rice from different countries. For less production than demand the price of rice increased in local market. Government to import 50000 tones' of rice from India. Besides this government importing onion, garlic, lentil, chick pea, sugar, salt, soya bean oil, palm oil, and spices like ginger, cinnamon, clove, cardamom, cumin and bay leaf to this year (The Daily Star, Dated 24th June,2021). Every year Bangladesh importing Wheat for meet up their demands. In 2021 Bangladesh government imported 500000 tones' wheat from Russia (The Daily Star, Dated 27th June 2021). Recent developments in international markets point to a dramatic food crisis all over

the world. The media today is repeatedly dominated by staggering reports on the global food crisis, soaring crop prices and demands for bio-fuels, raising fears of political instability. Since 2002, media reports have mostly highlighted the dramatic situation of food insecurity. The Arab region is most seriously affected by the global food crisis. This study is therefore expected to understand what factors worked behind this switch and what the consequences of switching is.

1.2 Statement of the Problem

In view of the above background and facts, the present study was undertaken with the title "Causes and Consequences of Farmers' Switching Behavior from Crop to Fish production". The study aimed at providing information regarding the following queries:

- What is the reasons of switching behavior from crop to fish production?
- What are the causes and consequences of farmers' switching behavior from crop to fish production?
- Is there any relationship between farmers' selected characteristics and their switching behavior from crop to fish production?

1.3 Objectives of the Study

The following objectives have been formulated to guide the research:

- To assess the extent of farmers' switching behavior from crop to fish production
- To find out the causes and consequences of farmers' switching behavior from crop to fish production
- To determine and describe some selected characteristics of the farmers
- To explore the relationships between each of the selected characteristics of the farmers and their extent of switching behavior from crop to fish production

1.4 Assumption of the Study

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

- The selected respondents were competent enough to reply the queries made by the researcher.
- The responses furnished by the respondents were valid and reliable.
- Information furnished by the respondents included in the sample was the representative opinion of the whole population of the study area.
- The researcher who acted as interviewer was well adjusted to social and environment condition of the study area. Hence, the data collected by him from the respondents were free from bias.
- All the data concerning the variables of the study were normally and independently distributed.

1.5 Limitation of the Study

In order to make the study manageable and meaningful from the point of view of research, it was necessary to impose some limitations as stated below:

- The study was confined to 5 selected union of Kaligonj and Shyamnagar upazila under Satkhira district.
- The characteristics of switching behavior of farmers in the study area were many and varied but only eight characteristics were selected for investigation in this study.
- The researcher relied on the data furnished by the switched farmers' from their memory during interview.
- For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target populations. However, the researcher tried to overcome the problem as far as possible with sufficient tact and skill.
- Reluctance of farmers to provide information was overcome by establishing proper rapport.
- Various problems in crop to fish Production are likely to be faced by the farmers. However, only seven problems have been considered for investigation in this study.

1.6 Definition of Related Terms

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

Age

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

Education

Education referred to the development of desirable change in knowledge, skill, attitude and ability in an individual through reading, writing, working, observing and other related activities. It was operationalized by the formal education of switched farmers from crop to fish Production by taking into account of years he/she spent in formal educational institutions.

Family size

Family size indicates the number of person included in a family. Family size indicates according presence of the number attained in a family.

Farm size

Land possession referred to the cultivated area either owned by the farmer or obtained from others on borga system, the area being estimated in terms of full benefit and half benefit to the farmer respectively. The self-cultivated owned land and cultivated area taken as lease or mortgage from others was recognized as full benefit.

Knowledge

It referred to the extent of basic understanding of the farmers in different aspects of switching Production i.e. varieties, soil condition, seed rate, suitable time for cultivation, Urea, TSP, MP, diseases, insects, fungicides, harvesting time etc. Knowledge referred farmer skill about agricultural and fish Production activities. It indicates how expertize the farmer in crop and fish cultivation.

Benefit Cost Ratio (BCR)

Benefit Cost Ratio (BCR) is the percentage which indicates return percentage of investment.

BCR= Total income*100/Total Expenditure

Training exposure

It was used to refer to the completion of an activity by the farmers which were offered by the government, semi-govt. or non-government organization (s) to improve the knowledge and skills of farmers for better performing an agricultural job. It was measured by the number of days of training received by the respondent.

Extension contact

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

Problem faced in crop and fish cultivation

Problem referred to a difficult situation about which something to be done. It referred to the extent of problems faced by a respondent in switching in terms of social, technical, economical, marketing and psychological problems. It indicates hassle in Production of agricultural crop and fish rearing. Problem which can reduce production and increase production cost.

Switching

Switching is an act of changing to adopting one thing in place of another. There switching behavior of farmer indicates adopting fish farming practices instead crop production.

Causes

The definition of a cause is anyone or anything that brings about a result. An example of cause is a washing machine making clothes clean. Cause means to produce a result. An example of cause is putting one foot in front of the other moves a person forward. Causes indicates the reason for why farmer switched from crop to fish production.

Consequences

Consequence is a result or outcome, especially a result or outcome of an action or event that is negative or positive.

Chapter-II

REVIEW OF LITERATURE

In this chapter, reviews of the literature related to the study are presented. The researcher intensively searched internet, websites, available books, journals and printed materials from different sources of home and abroad. It may be relevant here to mention that a good number of research activities concerning farmers' knowledge and attitude have been made in many countries of the world. The researcher also reviewed the theses containing in the digital agricultural theses archival web portal of Bangladesh established by Ali (2012).

2.1 Concept and Past Studies of switching behavior

Switching is an act of changing to adopting one thing in place of another. There switching behavior of farmer indicates adopting fish farming practices instead crop cultivation.

According to Senge (1990), 'a mental model is a discipline that depicts on the mindset behind all decisions or actions. It can represent the real obstacles, in problem solving, especially if these obstacles are structural, ingrained in the mind over a long time. This creates tension, which could be creative in many instances'. Senge explained further that 'the problems with mental models arise when the models are tacit – when they exist below the level of awareness. It is built on-the-fly, from knowledge of prior experience, schema segments, perception, and problem-solving strategies'.

Alam, (2016). Said that Climate change affects countries, regions and communities in different ways and thus they differ in terms of their adaptation strategies. Brulle et al., (2012) said that the factors responsible for the variation in adaptive responses across regions are the agro-ecological system, socio-economics, climatic impact, and existing infrastructure and capacity.

Maddison, (2007). Find out that perception and adaptation strategies are the two key components of the adaptation process. Farmers first need to perceive the impact of changes in the climate to take appropriate adaptation strategies in order to mitigate their vulnerability and to enhance the overall resilience of the agro-ecological system. Much research has indicated the importance of understanding how climate variability is perceived by farmers

and what shapes their perception to elicit adaptive behaviors (Maddison, 2007). Adaptive capacity is influenced by many factors such as knowledge and perceptions about climate change, and access to appropriate technology, institutions and policies (Alam et al., 2016; Brulle et al., 2012; Haden et al., 2012; Hisali, 2011; Mertz et al., 2009; Adger et al., 2003). Alam, G.M., Alam, K., et al. (2017) states that adaptation strategies are crucial to help the local communities to cope with extreme weather conditions and associated climatic variations. The strategies are unlikely to be effective without an understanding of the farmers' perceptions of climate change. Adaptation strategies are context specific and change over time, from area to area and even within particular societies. Over the last decades, researchers have increasingly studied the factors that influence farmers' adoption of environmentally sustainable practices. Within this literature, there is a burgeoning stream investigating the role of behavioral factors. Previous academic attempts to take stock of the factors influencing farmers' adoption of sustainable practices (Kabii and Horwitz, 2006; Pannell et al., 2006; Knowler and Bradshaw, 2007; Prokopy et al., 2008; Baumgart-Getz, Prokopy and Floress, 2012) did not specifically focus on the role of behavioral factors, often resulting in an incomplete overview and limited theoretical understanding of how and why these factors affect decision-making (Prokopy et al., 2008). These reviews are fragmented across disciplines (Pannell et al., 2006) and, with the exception of Baumgart-Getz, Prokopy and Floress (2012), date back to more than a decade ago. There have been some efforts in policy circles to make an inventory of behavioral factors influencing farmers' adoption of sustainable practices (Dwyer et al., 2007; OECD, 2012), but their disciplinary scope was restricted to behavioral economics and communication sciences. F. J. Dessart et al.(2019) mentioned in research that Social factors relate to farmers' interactions with other individuals (e.g. other farmers or advisors) and include social norms and signaling motives. Social factors may be proximal or distal; for instance, injunctive norms (i.e. what farmers perceive others expect from them) may push farmers to adopt a particular practice or more sustainable practices in general. Cognitive factors are proximal and relate to learning and reasoning; they include farmers' perceptions of the relative benefits, costs and risks associated with a particular sustainable practice or whether they feel that they are skilled enough to adopt this practice.

Sheeder and Lynn (2009) indicates that non-financial considerations such as farmer value, attitudes and perception towards farming can play a role in the switching decision by farmers. Concerning cognitive factors, the areas that may deserve further attention are farmers' perceptions of the environmental and health-related costs of conventional practices, their beliefs about the market value of sustainable products (considering that farmers' clients are mostly intermediaries in the value chain rather than final consumers) and potential time discounting of the environmental benefits of sustainable practices (Weitzman, 1994) beyond financial benefits (Fisher and Krutilla, 1975). Sheeder and Lynn (2009) states that even while facing economic difficulties many agricultural producers have maintained an attitude and ethic that treats farming and related activities as a way of life than as a business or venture to maximize economic benefits.

Sheth & Parvatyiar (2000) states that human switching behavior is based on the wish to reduce risk, and different strategies are used to achieve this. One of the ways to reduce risk is to become loyal to a particular product, service, organization or brand by reducing choice as well. Becoming a loyal client reduces uncertainty costs.

Zikienė, K., Pilelienė, L., (2016) showed in their research that Decision to switch to another product/service provider always requires additional information, search and evaluation of this information. Customer invests his/her time and efforts in information gathering about the competing organizations, its evaluation and making the final decision.

Department of Agricultural Extension of Rajshahi district informed that For several years Government banned on digging pond but every year increase nearby 1000 (one thousand pond). So reducing the agricultural land and agricultural production (Radio Padma, 26/12/2019). Colgate et al. (1996) said that Psychological costs (customer's apathy, passiveness, inertia, behavior formed by habits, lack of motivation). These character features of customers build particular Psychological barriers that prevent switching behavior. Apathy, passiveness, and inertia are even considered to be characteristic features of loyal customers.

Thaler and Sunstein, (2008). Relative to these decision-making processes, farmers' decisions to adopt more sustainable practices are primarily business ones, occur less frequently, often

have long-term personal and economic consequences, may involve large investments and long-term commitment (e.g. participating in voluntary land conservation programs) and largely involve the provision of public goods.

2.2 Research Gap

Some literature were found to adopt new technologies and their extent of adoption. But no literature was found to investigate the causes and consequences of switching behavior of farmers from crop production to fish production.

2.3 The Conceptual Framework of the Study

This study is concerned with the farmers' switching behavior from crop to fish cultivation. Thus, the switching behavior were the main focus of the study and 15 selected characteristics of the farmers' were considered as those might have relationship with switching behavior. Farmers' switching behavior from crop to fish Production may be influenced and affected through interacting forces of many independent factors. It is not possible to deal with all the factors in a single study. Therefore, it was necessary to limit the factors, which included age, education, firm size, family size, BCR from crop production, BCR from fish production, crop production knowledge, fish production knowledge, training exposure, extension contact, cosmopolitanism, problem faced in crop cultivation, problem faced in fish Production and fish production practice. There are some causes of switching behavior of farmers from crop to fish production. Again there are some definite consequences at this switching activities. These are conceptually showing in the conceptual framework of the study (Figure.2.1)

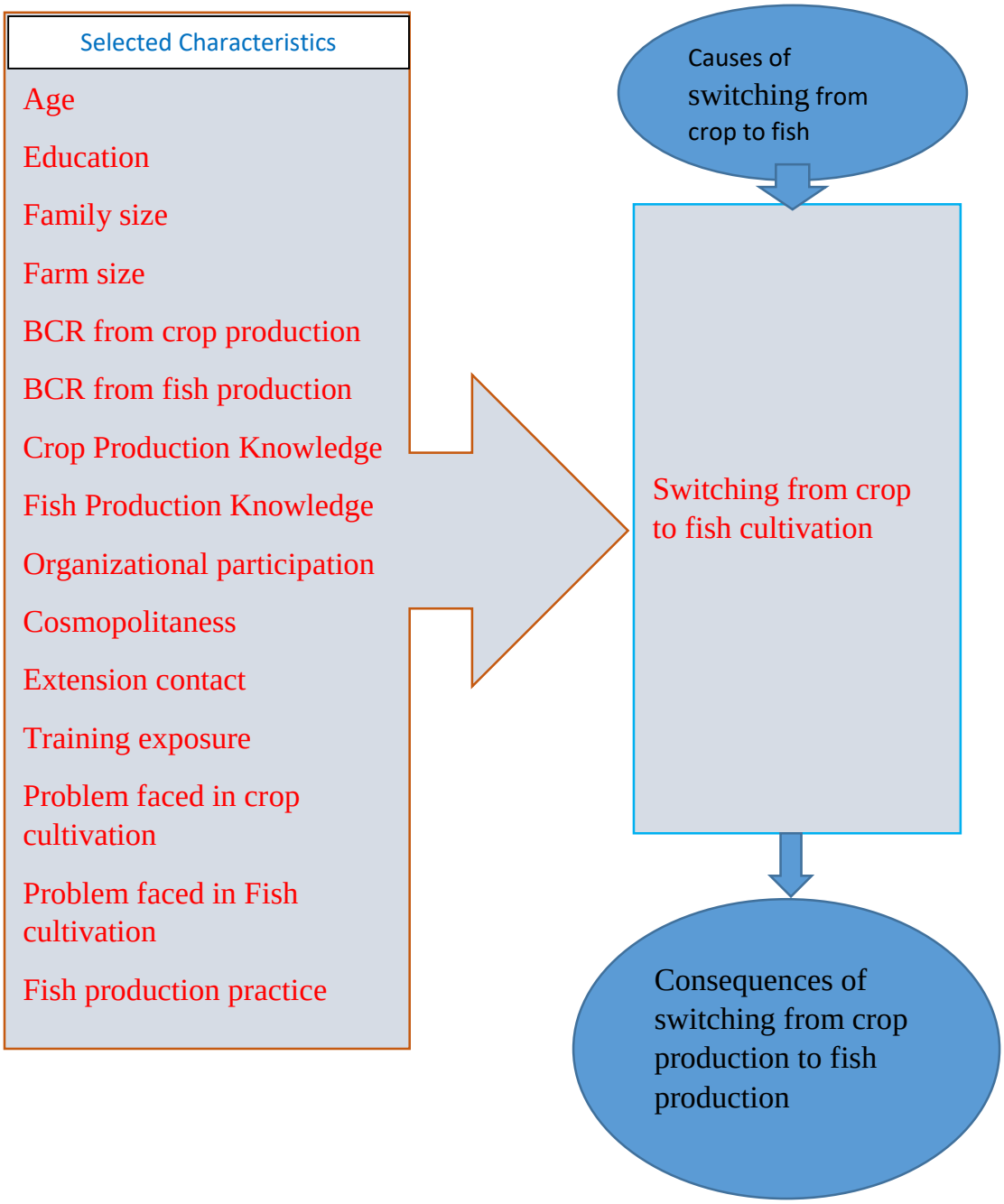

Fig. 2.1 The conceptual framework of the study

Chapter -III

MATERIALS AND METHODS

Methods and procedures used in conducting research need very careful consideration. Methodology enables the researcher to collect valid information's and to analyze the same properly to arrive at correct decisions. The methods and procedures followed in conducting this research are being described in this chapter.

3.1 The Locale of the Study

Kaliganj and Shyamnagar Upazila under Satkhira district was purposively selected as the locale of the study. Five unions namely Koikhali, Munshigonj, Kashimari, Romjannagar,and Krishnonagar were also purposively selected from the selected Upazillas. This twelve villages were also selected purposively where crop to fisheries switched farmers were available. These areas was considered as the locale of the study.constituted as the population of the study. A map of Shyamnagar Upazilla and map of Kaliganj Upazilla showing the study areas are presented in Figure 3.1 and 3.2 respectively.

3.2 Population

The crop to fish Production switched farmers under selected twelve villages were considered as the population of the study. Lists of switched farmers who are currently cultivating fish were prepared with the help of Upazilla Agriculture Officer, Fisheries Officer and their field staffs. The number of crop to fish Production switched farmers of the selected twelve villages was 298 which constituted the population of the study.

3.3 Sample

About 25 percent of the population was selected proportionally from the selected villages as the sample by following random sampling method. Thus, the total sample size stood at 74. The distribution of the selected crop to fish Production switched farmers of the selected villages is shown in the table 3.1.

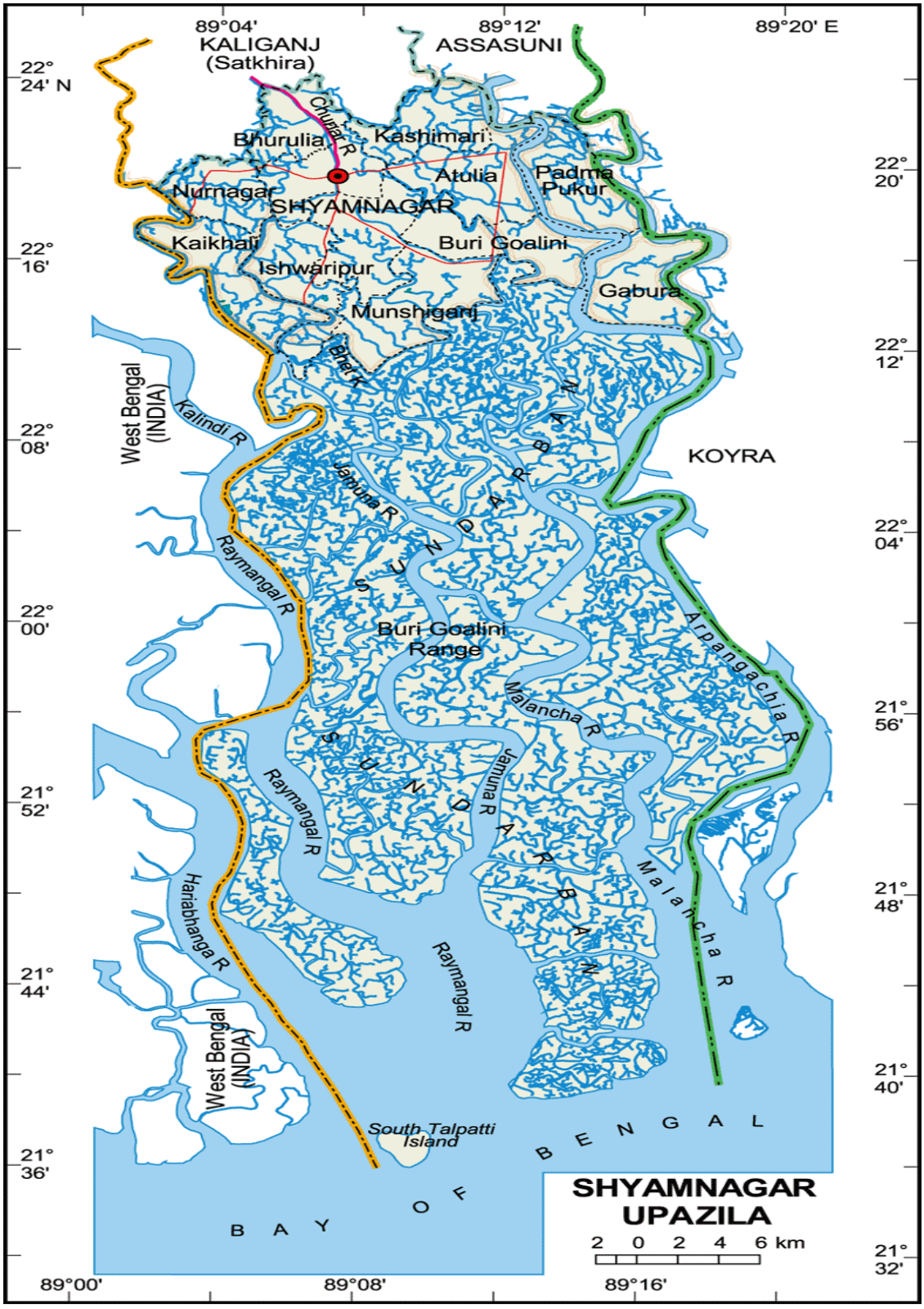

Figure: 3.1 A map of Shyamnagar Upazilla showing the study Unions

00Figure: 3.2 A map of Kaligonj Upazilla showing the study union

Table 3.1 Distribution of the sampled farmers in the study area

Upazilla	Union	Name of village	Total no. of crop to fish Production switched farmers	Sample
Shyamnagar	Munshigonj	Boishkhali	98	24
		Uttor Kodomtola	24	6
		Jelekhali	20	5
	Vetkhali	Kultoli	25	6
		Koikhali-Mollikpara	12	3
		Kalinagor	16	4
		Vetkhali	8	2
	Sonkorkati	Deoal	8	2
		Sonkorkati	31	8
Kaligonj	Kachiharania	Kachiharania	20	5
	Krishnonagar	Nengi	20	5
		Sota	16	4
		Total	298	74

3.4 Instruments for Data Collection

Data were collected using a structured interview schedule. Both open and closed form questions were included in the schedule based on the measurement procedures.

Before finalization, the interview schedule it was pre-tested with 10 switched farmers of the study area. On the basis of the pretest experiences necessary corrections, modifications and alterations were made before finalizing the interview schedule for final data collection. During modification of the schedule, valuable suggestions were received from the research supervisor, co-supervisor and relevant experts. The interview schedule was then printed in its final form and multiplied. A copy of interview schedule in English version are placed in Appendix A.

3.5 Measurement of Variables

The various characteristics of the crop to fish Production switched farmers might have influence on their switching behavior. These characteristics were age, education, firm size, family size, Benefit Cost Ratio (BCR) from crop production, BCR from fish production, crop production knowledge, fish production knowledge, training exposure, extension contact, cosmopolitanism, problem faced in crop cultivation, problem faced in Fish cultivation, fish production practices.

Measurement of all the selected characteristics of the switched farmers are discussed in the following sub sections:

3.5.1 Age

The age of a switched farmers was measured by counting the actual years from his/her birth to the time of interview. It was expressed in terms of complete years.

3.5.2 Education

The education of a crop to fish Production switched farmers was measured by the number of years of schooling completed in an educational institution. A score of one (1) was given for each year of schooling completed. If a switched farmers didn‟t t know how to read and write, his education score was zero, while a score of 0.5 was given to a switched farmers who could sign his name only. If a switched farmers did not go to school but studied at home or adult learning center, his education status was considered as the equivalent to a formal school student.

3.5.3 Family size

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent members like husband/wife, children, etc. who lived and ate together. A unit score of one was assigned for each member of the family. If a respondent had five members in his/her family, his/her family size score was given as 5 (Khan, 2004). Question regarding this variable appears in the item no. 5 in the interview schedule

3.5.4 Farm size

The farm size of a crop to fish Production switched farmer referred to the total area of land on which his/her family carried out farming operations for crop, livestock and fisheries production.

The farm size was measured in Decimals for each crop to fish Production switched farmers using the following formula:

$FA=A_1+A_2+A_3$

Where,

FA= Farm Area

A_l = Cropping farm area

A_2= Livestock farm area

A_3= Fisheries farm area

3.5.5 BCR from crop production

Benefit Total income of a switched farmers from crop Production was measured in Thousand Taka.

BCR (Benefit Cost Ratio) = (B/C*100)

Where,
B= Benefit, i,e, yearly income for crop production
C= Cost, i,e, expenditure for producing the crop

3.5.6 Benefit –cost BCR from fish Production

Benefit Total income of a switched farmers from fish Production was measured in Thousand Taka.
BCR (Benefit Cost Ratio) = (B/C*100)

Where,
B= Benefit, i,e, yearly income for fish production
C= Cost, i,e, expenditure for producing the fisheries

3.5.7 Knowledge on crop production

After thorough consultation with relevant experts and reviewing of related literature, nine (9) question regarding crop Production were selected and those were asked to the respondent switched farmers to determine their knowledge on crop cultivation. Two (2) score was assigned for each correct answer and zero (0) for wrong or no answer. Partial score was also assigned for partially correct answer. Thus, the knowledge on crop Production score of the respondents could range from 0 to 18, where zero indicating very poor knowledge and 18 indicate the very high knowledge on crop cultivation.

3.5.8 Knowledge on fish production

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

3.5.9 Organizational participation

This variable was measured by computing an organizational participation score on the basis of a respondent's extent of organizational participation with six (6) selected organization as obtained in response to item no.14 of the interview schedule. Each respondent was asked to indicate his/her Extent of participation in (year) of his contact with different organization as 'None', 'General member', 'Executive member', 'Officer of the executive committee 'of the selected organization. Weights were assigned to these alternative responses as follows:

One (1) for one (1) year of General member

Two (2) for one (1) year of Executive member

Three (3) for one (1) year of Executive committee officer.

Finally, Organizational participation score of a respondent was determined by adding all the weights against all the organizations.

3.5.10 Cosmopolitaness

This variable was measured by computing a Cosmopolitanism score on the basis of a respondent's degree of visit with 4 selected places as obtained in response to item no.15 of the interview schedule. Each respondent was asked to indicate the frequency of his degree of visit with each of the selected places with four alternative responses as 'Often', 'Sometimes', 'Seldom' and 'never' basis and weights were assigned as 3, 2, 1 and 0 respectively.

The cosmopoliteness score of a respondent was determined by summing up his/her scores for visit at all the selected places. Thus possible cosmopoliteness score could vary from zero (0) to 12, where Zero indicated no cosmopoliteness and 12 indicated the highest level of cosmopoliteness.

3.5.11 Extension contact

This variable was measured by computing an extension contact score on the basis of a respondent's extent of contact with 8 selected media as obtained in response to item no.16 of the interview schedule. Each respondent was asked to indicate the nature of his contact with each of the selected media. With four alternative responses as 'regularly', 'Often', 'Sometimes', 'Seldom' and 'never' basis and weights were assigned as 4, 3, 2, 1 and 0 respectively. The extension contact score of a respondent was determined by summing up his/her scores for contact with all the selected media. Thus possible extension contact score could vary from zero (0) to 32, where Zero indicated no extension contact and 32 indicated the highest level of extension contact.

3.5.12 Training exposure

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

3.5.13 Problems faced in crop production

This variable was measured by computing the extent of various problems of the respondents with 13 selected problems as obtained in response to item no. 18 of the interview schedule. Each respondent was asked to indicate the extent of his/her problem as severe problem, moderate problem, low problem and not at all problem and score was assigned as 3, 2, 1 and 0 respectively.

The problem faced score of a respondent was determined by summing up his/her scores for all the problems. Thus, possible score could vary from 'zero' (0) to 39, where Zero indicated no problem and 39 indicated the highest level of problem.

3.5.14 Problem faced in fish production

This variable was measured by computing the extent of various faced problems in fish culture of the respondents with 9 selected problems as obtained in response to item no. 19 of the interview schedule. Each respondent was asked to indicate the extent of his/her problem as severe problem, moderate problem, Low problem and not at all problem and score was assigned as 3, 2, 1 and 0 respectively.

The problem faced score of a respondent was determined by summing up his/her scores for all the problems. Thus, possible score could vary from 'zero' (0) to 27, where Zero indicated no problem and 27 indicated the highest level of problem.

3.5.15 Fish production practices

This variable was measured by computing the extent of practices in fish culture of the respondents with 11 selected practices as obtained in response to item no. 20 of the interview schedule. Each respondent was asked to indicate the extent of his/her Fish production practices as "regularly", "Often", "Rare", and „never" basis and weights were assigned as 3, 2, 1 and 0 respectively.

The Fish production practices score of a respondent was determined by summing up his/her scores for all the problems. Thus, possible score could vary from zero (0) to 33, where Zero indicated no problem and 33 indicated the highest level of farmers Fish production practices.

3.5.16 Switching behavior

Switching behavior of farmers from crop to fish production was measured by using the following formulae:

$$S = (e/p \times 100)$$

Where,

S= Switching behavior of the farmer

e= effective area, i,e, Area of land which farmer have changed from crop production area to fish production area (effective area, e).

p= potential area, i,e, Area of land which might be changed from crop production area to fish production area (potential area, p).

3.6 Indexing causes of switching from crop to fish production

Farmers' were asked to indicate the causes for their switching from crop to fish production. The causes was listed down in a master sheet. Similar causes were merged together. Cause Index of switching from crop to fish was measured by using the following formulae:

$$\text{Cause Index} = \frac{\text{Number of citation of cause}}{\text{Total number of responden,i.e,74}} \times 100$$

Rank order was made based on the descending order of cause index.

3.7 Indexing consequences of switching from crop to fish production

Farmers' were asked to indicate the consequences for their switching from crop to fish production. The consequences was listed down in a master sheet. Similar causes were merged together. Consequences Index of switching from crop to fish was measured by using the following formulae:

$$\text{Consequences Index} = \frac{\text{Number of citation of consequences}}{\text{Total number of respondent, i.e,74}} \times 100$$

Rank order was made based on the descending order of consequences index.

3.8 Collection of Data

Data were collected personally by the researcher him through face to face interview. To familiarize with the study area and for getting local support, the researcher took help from the local leaders, NGO named as Nowabenki Gonomukhi Foundation and the field staffs of Upazila Agriculture Office and Upazilla Fisheries Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to interview and the objectives were clearly explained by using local language as far as possible. Data were collected during the period of August 20, 2021 to November 25, 2021.

3.9 Data Processing

After completion of field survey, all the data were coded, compiled and tabulated according to the objectives of the study. Local units were converted into standard units. All the individual responses to questions of the interview schedule were transferred into a master sheet to facilitate tabulation and categorization. In case of qualitative data, appropriate scoring technique was followed to convert the data into quantitative form.

3.10 Statistical Analysis

The data were analyzed in accordance with the objectives of the study. Qualitative data were converted into quantitative data by means of suitable scoring technique wherever necessary. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. Pearson's Product Moment Coefficient of Correlation (r) was used in order to explore the relationships between the concerned variables. Five percent (0.05) level of probability was the basis for rejecting any null hypothesis throughout the study. The SPSS computer package was used to perform all these process.

3.11 Statement of Hypothesis

As defined by Goode and Hatt (1952), "A hypothesis is a proposition, which can be put to a test to determine its validity." It may prove correct or incorrect of a proposition. In any event, however, it leads to an empirical test. Hypothesis are always in declarative sentence form

and they relate either generally of specifically variables to sentence form and they relate either generally or specifically variables to variables. Hypothesis may be broadly divided into two categories, namely, research hypothesis and null hypothesis.

3.11.1 Research hypothesis

Research hypothesis states a possible relationship between the variables being studied or a difference between experimental treatments that the researcher expects to emerge. The following research hypothesis was put forward to know the relationships between each of the 15 selected characteristics of the crop to fish switched farmers and their percent of switching behavior:

"Each of the 15 selected characteristics of the switched farmers will have significant relationship with their switching behavior towards crop to fish cultivation."

3.11.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables.
The following null hypothesis was undertaken for the present study:

"There is no relationship between the selected characteristics of switched farmers and their switching behavior towards crop to fish cultivation.

Chapter IV

RESULTS AND DISCUSSION

The findings of the study and interpretations of the results have been presented in this Chapter. These are presented in four sub-sections according to the objectives of the study. The first sub-section deals with the extent of farmers' switching behavior from crop to fish production, while the second sub-section deals with the causes and consequences of farmers' switching behavior from crop to fish production. The third sub-section deals with farmers' selected characteristics of the farmers. Fourth sub-section deals with the relationships between each of the selected characteristics of the farmers and their extent of switching behavior from crop to fish production.

4.1 Switching behavior of the farmers from crop to fish production

Switching behavior of the farmers from crop to fish production was calculated by dividing as Effective area,e (Area of land which have changed from crop production area to fish production area) by potential area,p (Area of land which might be changed from crop production area to fish production area) and multiple with 100 i,e, (e/p X 100) The observed Farmers' Switching behavior from crop to fish production scores ranged from 4.31 to 91.38 percent against the possible range from 1 to 100, the mean and standard deviation were 25.05 and 19.79 respectively. According to this score, the crop to fish switched farmers were classified into three categories: "Less switched" (up to 7), "Medium switched" (7 to 40) and "High Switched" (above 40). The distribution of the farmers according to their switching behavior from crop to fish production is shown in Table 4.1.

4.1 Distribution of the crop to fish switched farmers according to their Switching behavior

Categories according to Switching behavior from crop to fish production (scores)	Crop to fish switched farmers' (n=74)		Mean	Standard deviation (SD)
	Number	Percent		
Less switched (up to 33.33)	58	78.4	25.05	19.79
Medium switched (33.34 to 66.67)	11	13.5		
highest Switched" (above 40)	5	8.1		
Total	**74**	**100**		

Data in Table 4.1 revealed that majority proportion (78.4 percent) of the farmers' switched crop production to fish production into a low amount of land compared to 13.5 percent of them switched from crop to fish production into a medium amount of land and 8.1 percent of the farmers' switched from crop to fish production into a high amount of land. In practical situation, all the potential area of a farmer was not switched from crop to fish production. It may be the cause for this finding.

4.2 Causes and consequences of farmers' switching behavior from crop to fish production

4.2.1 Causes of farmers' switching behavior from crop to fish production

Farmers of Shyamnagar and Kaligonj Upazilla mostly cultivated shrimps, crab, saline tolerate different species of fishes like Vetki, Parse, Vangal and khorkullo and several types of crops. Recently they were switching there proportion of crop Production land into fish production land. Measuring Cause Index in this issue is described in chapter 3 Based on the descending order of rank order was made which is shown in Table 4.2

4.2 Causes of farmers' switching behavior from crop to fish production

SL.No.	Causes	Cause Index	Rank order
1	Higher profit in fish production	97	1
2	Salinity Problem for crop production	95	2
3	Irrigation Problem in Kharip Season	93	3
4	Less Production in crop production	51	4
5	Climatic hazard	47	5
6	Less physical attachment in fish production	46	6
7	Lower diversity in local cropping pattern	34	7

Based on cause index "Higher profit in fish production ranked first cause" followed by "Salinity Problem for crop production", "Irrigation Problem in Kharip Season", "Less Production in crop production", "Climatic hazard", "Less physical attachment in fish production", "Lower diversity in local cropping pattern".

4.2.2 Consequences of farmers' switching behavior from crop to fish production

Farmers mentioned some positive and negative consequences of switching from crop to fish production Measurement of Consequences Index is discussed in chapter 3 Based on descending order of Consequence Index rank order was made for positive and negative direction separately which are presented in Table 4.3.

4.3 Consequences index of farmers' for switching from crop to fish production

SL.No.	Consequences	Consequence Index	Rank order
	Positive Consequences		
1	Increasing economic return of the farmers	97	1
2	Increase pesticide free dyke Vegetable production	94	2
3	Preservation of rain water for future use	89	3
	Negative Consequences		
4	Decreasing crop production	91	1
5	Increasing soil salinity after shrimp production	82	2
6	High risk of return from fish production	41	3

Based on consequence index, "Increasing economic return of the farmers" ranked first consequences in positive direction followed by "Increase pesticide free dyke Vegetable production"and "Preservation of rain water for future use".

Based on Consequence Index, "Decreasing crop production" ranked first consequences in negative direction followed by "Increasing soil salinity after shrimp production" and "High risk of return from fish production"

4.3 Selected Characteristics of farmers

Fifteen characteristics of the switching behavior of farmers were selected to find out their relationships with their switching behavior from crop to fish production. The selected characteristics included their age, education, family size, firm size, benefit cost ratio from crop production, benefit cost ratio from fish production, crop production knowledge, fish production knowledge, organizational participation, training exposure, extension contact,

cosmopoliteness, problem faced in crop and fish production, fish production practices. Salient features of these selected characteristics of the farmers are described in Table 4.4.

Table 4.4 Salient features of the selected characteristics of the farmers (n=74)

Characteristics	Possible Range	Range	Mean	Std. Deviation
Age	Unknown	28-67	46.03	10.09
Education	Unknown	0-17	6.70	3.71
Family Size	Unknown	2-11	5.04	1.82
Farm Size	Unknown	63-1157	191.18	161.56
BCR from crop production	Unknown	1-3	1.90	0.391
BCR from Fish production	Unknown	1-5	2.51	0.693
Crop production knowledge	0-18	10-18	16.04	1.82
Fish production Knowledge	0-32	10-28	18.32	3.69
Organizational Participation	Unknown	0-27	12.22	6.39
Cosmopolitanism	0-12	0-9	5.57	2.08
Extension Media contact	0-32	2-22	10.49	3.70
Training	Unknown	0-8	0.77	1.42
Problem faced in Crop production	0-39	22-34	29.28	2.35
Problem faced in Fish production	0-27	16-24	20.26	2.07
Fish production practices	0-33	14-33	23.10	5.03
Valid N (list wise) =74				

4.3.1 Age

The age of the Crop to fish Switched farmers ranged from 28 to 67 year, the average being 46.03 years and the standard deviation was 10.09. On the basis of their age, the Crop to fish Switched farmers were classified into three categories: ‘young (up to 35)’, ‘middle aged (36-

50)' and 'old (above 50)'. The distribution of the crop to fish Switched farmers according to their age is shown in Table 4.5.

Table 4.5 Distribution of the Crop to fish Switched farmers according to their age

Categories according to age (years)	**Switched farmers** (n=74)	
	Number	**Percent**
Young (up to 35)	14	18.9
Middle aged (36-50)	31	41.9
Old (Above 50)	29	39.2
Total	**74**	**100**

The highest proportion (41.9 percent) of the crop to fish Switched farmers were middle aged compared to 39.2 percent of them being old and only 18.9 percent young. The overwhelming majority (81.1 percent) of the crop to fish Switched farmers were young to old aged. This means that crop to fish Switching behavior in the study area is being controlled by comparatively older farmers.

4.3.2 Education

The education score of the crop to fish Switched farmers ranged from (0-17), with an average of 6.70 and standard deviation of 3.71. Based on their education scores, the crop to fish switched farmers were classified into five categories namely illiterate (0), primary education (1-5), secondary education (6-10), Higher secondary (11- 12) and graduation (Above 12). The distribution of the Crop to fish Switched farmers according to their education is shown in Table 4.6.

Table.4.6. Distribution of the Crop to fish Switched farmers according to their education

Categories according to education (schooling years)	Crop to fish Switched farmers (n=74)	
	Number	Percent
Illiterate (0)	2	2.7
Primary level (1-5)	32	43.2
Secondary level (6-10)	30	40.6
Higher secondary level (11-12)	8	10.8
Graduation (Above 12)	2	2.7
Total	**74**	**100**

It is evident from the Table 4.6 that the highest proportion (43.2 percent) of the crop to fish switched farmers had education up to primary level of compared to 40.6 Secondary level education. About 2.7 percent of them had graduation level education and 2.7 percent farmers were illiterate. The proportion of crop to fish switched farmers having higher secondary level was 10.8 percent. Thus, the over whelming majority (97.3 percent) of the crop to fish switched farmers were literate ranging from primary to graduation level. The findings thus, indicate that the current literacy rate in the study area is higher than that of the national average of 63 percent (BBS, 2008).

4.3.3 Family Size

The Family size of the crop to fish Switched farmers ranged from 2 to 11 person, the average being 5.04 person and the standard deviation was 1.82. On the basis of their family size, the crop to fish Switched farmers were classified into three categories: ‘small family (2 to 4)’, ‘medium family (5- 7)’ and ‘Large family (above 7)’. The distribution of the crop to fish switched farmers according to their family size is shown in Table 4.7.

Table 4.7 Distribution of the Crop to fish Switched farmers according to their family size

Categories of farmers according to family size (person)	Crop to fish Switched farmers(n=74)	
	Number	Percent
Small family (Up to 4)	32	43.3
Medium family (5-7)	34	45.9
Large family (above 7)	8	10.8
Total	**74**	**100**

It is evident from the Table 4.7 that the highest proportion (45.9 percent) of the Crop to fish Switched farmers belong to the medium family compared to (43.3 percent) had small family and (10.8 percent) farmer had large family. Thus, overwhelming majority (89.1 percent) of the farmers had small to medium family size.

4.3.4 Farm size

The land possession of the crop to fish Switched farmers ranged from 63 to 1156 decimals and the mean was 191.17 decimals with standard deviation of 161.56. According to the farm size of the Crop to fish Switched farmers, they were classified into four categories as 'Small (63-100 decimals)', 'Medium (100-300 decimals)' and 'Large (>300)'.The distribution of the crop to fish Switched farmers according to their farm size is shown in Table 4.8.

Table 4.8 Distribution of the Crop to fish Switched farmers according to their farm size

Categories of farmers according to land possession (Decimal)	Crop to fish Switched farmers (n=74)	
	Number	Percent
Small (Up to 100)	18	24.3
Medium (100-300)	48	64.9
Large (Above 300)	8	10.8
Total	**74**	**100**

About two-third (64.9 percent) of the farmers had medium farm size where 24.3 percent had small farm size. It might be the farmers in the study area were facing land erosion due to tidal surges which resulting from cyclone, flood that was appeared comparatively every year in coastal area.

4.3.5 BCR from Crop production

The switched farmer get Benefit Cost Ratio (BCR) from crop Production ranged from 1 to 3, the average being 1.9 and the standard deviation was 0.39. On the basis of their BCR, the switched farmers were classified into three categories: 'Low BCR (Up to 1.5)', 'Medium" (1.51 to 2)' and 'High (Above 2)'BCR. The distribution of the switched farmers' BCR from crop Production according to their BCR on crop production is shown in Table 4.9.

Table 4.9 Distribution of the Crop to fish Switched farmers according to their BCR from crop production

Categories farmers according to BCR	Crop to fish Switched farmers(n=74)	
	Number	**Percent**
Low BCR (Up to 1.5)	11	14.9
Medium (1.51 to 2)	45	60.8
High (Above 2)	18	24.3
Total	**74**	**100**

The majority (60.8 percent) of the farmers got medium BCR from crop production. Compare to 24.3 percent of the farmer got high BCR and 14.9 percent farmers got low BCR from crop production. Lower BCR indicates that farmer get low return from crop production.

4.3.6 BCR from Fish production

The switched farmer get Benefit Cost Ratio (BCR) from fish Production ranged 1 to 5, the average being 2.51 and the standard deviation was 0.693. On the basis of their BCR, the switched farmers were classified into three categories: 'Low BCR (Up to 1.5)', 'Medium (1.51 to 2)' and 'High" (Above 2)' BCR. The distribution of the switched farmers' according to their BCR from fish production is shown in Table 4.10

Table 4.10 Distribution of the Crop to fish Switched farmers according to their BCR from fish production

Categories according to BCR	Crop to fish Switched farmers (n=74)	
	Number	**Percent**
Low BCR (Up to 1.5)	2	2.7
Medium (1.51 to 2)	10	13.5
High (Above 2)	62	83.8
Total	**74**	**100**

The majority of the farmers (83.8 percent) got high BCR from fish production. Compare to 13.5 percent farmers got medium BCR and farmers got low BCR from fish Production. Average BCR from fish production (2.5) was higher than average BCR from crop production (1.9) which might be the cause for switching the farmers from crop to fish production.

It was observed from Table 4.4, that the BCR (2.51) from fish production was higher than the BCR (1.90) from crop production. It might be the cause for switching of the farmers from crop to fish production.

4.3.7 Crop production knowledge

The switched farmers' crop production knowledge ranged from 10 to 18 against the possible range from 0 to 18.The average being 16.04 and the standard deviation was 1.82. On the basis of their crop production knowledge, the switched farmers were classified into three categories: 'Low (Up to 14)', 'Medium (14 to 17)' and 'High (Above 17)' knowledge. The distribution of the switched farmers according to their crop production knowledge is shown in Table 4.11

Table 4.11 Distribution of the Crop to fish Switched farmers according to their Knowledge in crop production

Categories according to Crop production knowledge	Crop to fish Switched farmers (n=74)	
	Number	Percent
Low (Up to 14)	16	21.6
Medium (15 to 17)	34	45.9
High (Above 17)	24	32.5
Total	**74**	**100**

The majority (45.9 percent) of the crop to fish switched farmers' have Medium knowledge compared to (32.5 percent) farmers have high knowledge and rest 21.6 percent farmers have low knowledge on crop production.

4.3.8 Fish Production Knowledge

The switched farmers' fish Production knowledge ranged from 10 to 28 against the possible range from 0 to 36. The average being 16.04 and the standard deviation was 1.82. On the basis of their fish Production knowledge, the switched farmers were classified into three categories: 'Low (Up to 16)', 'Medium (17 to 22)' and 'High (Above 22)' knowledge. The distribution of the switched farmers according to their fish production knowledge is shown in Table 4.12

Table 4.12 Distribution of the Crop to fish Switched farmers according to their Knowledge in fish production

Categories according to fish production knowledge	Crop to fish Switched farmers (n=74)	
	Number	Percent
Low (Up to 16)	16	21.6
Medium (17 to 22)	48	64.9
High (Above 22)	10	13.5
Total	**74**	**100**

The majority (64.9 percent) of the crop to fish switched farmers' had Medium knowledge in fish production. Compared to (13.5 percent) farmers had high fish production knowledge and (21.6 percent) farmers' had low knowledge on fish production.

4.3.9 Organizational participation

The switched farmers' organizational participation ranged from 0 to 27. The average being 12.21 and the standard deviation was 6.39. On the basis of their organizational participation, the switched farmers were classified into three categories: 'Low (Up to 6)', 'Medium (7 to 18)' and 'High (Above 18)' Organizational participation. The distribution of the switched farmers' according to their organizational participation is shown in Table 4.13

Table 4.13 Distribution of the Crop to fish Switched farmers according to their Organizational participation

Categories according to their Organizational participation	Crop to fish Switched farmers (n=74)	
	Number	Percent
Low (Up to 6)	15	20.3
Medium (7 to 18)	47	63.5
High (Above 18)	12	16.2
Total	**74**	**100**

The majority (63.5 percent) of the crop to fish switched farmers' had Medium organizational participation compared to 16.2 farmers had high organizational participation and rest 20.3 percent have low organizational participation.

4.3.10 Cosmopoliteness

The cosmopoliteness score of the switched farmers ranged from 0 to 9 against the possible range of 0 to 12 with the mean of 5.56 and standard deviation of 2.08. Based on cosmopoliteness switched farmers were classified into three categories: 'Low (Up to 4)', 'Medium (5 to 8)' and 'High (Above 8)'. The distribution of the crop to fish switched farmers' according to their cosmopoliteness is presented in Table 4.14.

Table 4.14 Distribution of the crop to fish switched farmers' according to their cosmopoliteness

Categories according to their Cosmopoliteness	Crop to fish Switched farmers (n=74)	
	Number	**Percent**
Low (Up to 4)	24	32.4
Medium (5 to 8)	42	56.8
High (Above 8)	8	10.8
Total	**74**	**100**

Majority proportion (56.8 percent) of the crop to fish switched farmers had medium cosmopoliteness compared to 32.4 percent and 10.8 percent had low and high cosmopoliteness respectively.

4.3.11 Extension contact

The observed extension contact scores of the crop to fish switched farmers' ranged from 2 to 22 against the possible range from 0 to 22, the mean and standard deviation were 10.48 and 3.70 respectively. According to this score, the crop to fish switched farmers' were classified into three categories: 'low extension contact (up to 7)', 'medium extension contact (8 to 14)' and 'high extension contact (above 14)'. The distribution of the farmers according to their extension contact is shown in Table 4.15.

4.15 Distribution of the crop to fish switched farmers' according to their extension contact.

Categories of farmers according to extension contact (scores)	Crop to fish switched farmers' (n=74)	
	Number	**Percent**
Low extension contact (up to 7)	22	29.7
Medium extension contact (8 to 14)	47	63.5
High extension contact (above 14)	5	6.8
Total	**74**	**100**

Majority proportion (63.5 percent) of the crop to fish switched farmers had medium extension contact compared to 29.7 percent of them had low extension contact. Only 6.8 percent of them had high contact.

Thus, overwhelming majority (93.2 percent) of the crop to fish switched farmers had low to medium extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies.

4.3.12 Training exposure

The training exposure score of the switched farmers ranged from 0 to 8 with a mean of 0.77 and standard deviation of 1.42. Based on the training exposure scores, the crop to fish switched farmers were classified into three categories: 'Non trained farmer (0 days)', 'Medium training (0 to 2 days)', 'Highest training (above 2 days)'. The distribution of the crop to fish switched farmers' according to their training exposure is presented in Table 4.16.

Table 4.16 Distribution of the crop to fish switched farmers' according to their training exposure

Categories according to training exposure (no. of days)	crop to fish switched farmers' (n=74)	
	Number	Percent
Non trained (0 day)	52	70.3
Medium training (0-2 days)	18	24.3
Highest training " (above 2 days)	4	5.4
Total	**74**	**100**

Majority proportion (70.3 percent) of the crop to fish switched farmers do not receive any training while the rest 29.79 percent of them received low to medium duration training.

4.3.13 Problem faced in crop production

Problem faced in crop production scores of the crop to fish switched farmers ranged from 22 to 34 against the possible range from 0 to 39, the mean and standard deviation were 29.28 and 2.35 respectively. According to this score, the crop to fish switched farmers were classified into three categories: 'Less problem (up to 26)', 'medium (27 to 30)' and 'highest (above 30)' problem faced. The distribution of the farmers according to their problem faced in crop production is shown in Table 4.17.

Table 4.17 Distribution of the crop to fish switched farmers' according to their Problem faced in crop production

Categories according to Problem faced in crop production (scores)	Crop to fish switched farmers' (n=74)	
	Number	Percent
Less problem (up to 26)	6	8.1
Medium problem (27 to 30)	51	68.9
Highest (above 30)	17	23
Total	**74**	**100**

More than two third (68.9 percent) of the farmers faced medium problem in crop production compared to 23 percent farmers and (8.1 percent farmer) faced high problem in crop production.

4.3.14 Problem faced in Fish production

Problem faced in fish production scores of the crop to fish switched farmers ranged from 16 to 24 against the possible range from 0 to 27, the mean and standard deviation were 20.25 and 2.07 respectively. According to this score, the crop to fish switched farmers were classified into three categories: 'Less problem (up to 18)', 'medium (19 to 22)' and 'highest (above 22)'. The distribution of the pond farmers according to their problem faced in fish production is shown in Table 4.18.

Table 4.18 Distribution of the crop to fish switched farmers' according to their Problem faced in fish production

Categories according to Problem faced in Fish production (scores)	Crop to fish switched farmers' (n=74)	
	Number	Percent
Less problem (up to 18)	17	23
Medium problem (19 to 22)	47	63.5
Highest (above 22)	10	13.5
Total	**74**	**100**

Majority (63.5 percent) farmer faced medium problem compared to 23 percent farmers faced less problem and rest 13.5 percent farmers faced highest problem in fish production.

From the Table 4.4, it was found that the mean problems faced by the farmers in crop production was 29.28 against the highest possible problem score of 39, i.e., the farmers faced problems in crop production as 75.01%. Again, the mean problems faced by the farmers in fish production was 20.26 against the highest possible score of 27, i.e., the farmers faced problems in fish production as 75.05%. It means that the extent of farmers' problem in crop and fish production was similar. But the BCR from fish production was higher than the BCR from crop production, which leaded the farmers to motivate them to switch from crop to fish production.

4.3.15 Fish production practices

The observed fish production practices scores of the crop to fish switched farmers ranged from 14 to 33 against the possible range from 0 to 33, the mean and standard deviation were 23.09 and 5.03 respectively. According to this score, the crop to fish switched farmers' were classified into three categories: 'low practice (up to 18)', 'Medium practice' (19 to 28)' and 'highest practice (above 28)'. The distribution of the farmers according to their fish production practices is shown in Table 4.19.

Table 4.19 Distribution of the crop to fish switched farmers' according to their participated practices in fish production

Categories according to participated practices (scores)	Crop to fish switched farmers' (n=74)	
	Number	Percent
Low practice" (up to 18)	14	18.9
Medium practice" (19 to 28)	47	63.5
highest practice" (above 28)	5	17.6
Total	**74**	**100**

Majority proportion (63.5 percent) of the crop to fish switched farmers had medium fish production practices compared to 18.9 percent of them had low fish production practice. Only 17.6 percent of the farmers had high fish production practices.

4.4 Relationship of the selected characteristics of the farmers with their switching behavior from crop to fish production

To explore the relationships between the selected characteristics of farmers and other switching behavior from crop to fish production, "Pearson's Product-Moment correlation co-efficient 'r' has been used. A hypothesis was rejected when the observed ('r') value was greater than the tabulated value of ('r') at 0.05 level of probability.

As mentioned earlier, the fifteen selected characteristics of the farmers were considered for the study. The variables were age, education, firm size, family size, BCR from crop production, BCR from fish production, crop production knowledge, fish production knowledge, Cosmopoliteness, extension contact, training exposure, problem faced in crop production, problem faced in fish production, fish production practice, switching behavior from crop to fish Production were the main focus variable of the study.

The results of the correlation analysis between each of the selected characteristics of the farmer with their percent of switching behavior from crop to fish Production are shown in Table 4.20. In a bid to achieve the said inter-correlations, the correlation coefficients among all the variables are showing in co-relation matrix (Appendix-B).

Table 4.20 Co-efficient of correlation (r) of selected characteristics of the Crop to fish Production switched farmers' with their percent of switching from crop to fish Production(n=74)

Characteristics of the Farmers	Correlation of co-efficient (r) with percent of switching from crop to fish production
Age	-0.285*
Education	0.018NS
Family Size	0.083 NS
Farm Size	0.134 NS
BCR from crop production	-0.033NS
BCR from Fish production	0.528**
Crop production knowledge	0.153NS
Fish production Knowledge	0.290*
Organizational Participation	-0.036 NS
Cosmopolitanism	-0.104 NS
Extension media contact	0.410**
Training	-0.033 NS
Problem faced in Crop production	-0.086 NS
Problem faced in Fish production	-0.089 NS
Farmer participated practices	0.535**

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

Age and switching behavior of farmers from crop to fish production

The computed value of 'r'(-0.285) was greater than the tabulated value (r=0.282) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis was rejected. The findings indicated that age of the farmers had significant negative relationship with their switching behavior from crop to fish production.

Education and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.018) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis could not be rejected. The findings indicated that education of the farmers had non-significant relationship with their switching behavior from crop to fish production.

Family size and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.083) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis could not be rejected. The findings indicated that family size of the farmers had no significant relationship with their switching behavior from crop to fish production.

Farm size and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.134) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis could not be rejected. The findings indicated that farm size of the farmers had no significant relationship with their switching behavior from crop to fish production.

BCR from crop production and switching behavior of farmers from crop to fish production

The computed value of 'r'(-.033) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated that BCR from crop production of the farmers had no significant relationship with their switching behavior from crop to fish production.

BCR from fish production and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.528) was greater than the tabulated value (r=0.282) with 72 degrees of freedom at 0.01 level of probability as shown in Table 4.20. Hence, the concerned

null hypothesis rejected. The findings indicated that BCR from fish production of the farmers had significant relationship with their switching behavior from crop to fish production.

Crop production knowledge and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.153) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis could not be rejected. The findings indicated that crop production knowledge of the farmers had no significant relationship with their switching behavior from crop to fish production.

Fish production knowledge and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.290) was greater than the tabulated value (r=0.282) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis rejected. The findings indicated that fish production knowledge of the farmers had significant relationship with their switching behavior from crop to fish production.

Organizational participation and switching behavior of farmers from crop to fish production

The computed value of 'r'(-0.036) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated that organizational participation of the farmers had no significant relationship with their switching behavior from crop to fish production.

Cosmopolitanism and switching behavior of farmers from crop to fish production

The computed value of 'r'(-0.104) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated

that cosmopolitanism of the farmers had no significant relationship with their switching behavior from crop to fish production.

Extension contact and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.410) was greater than the tabulated value (r=0.282) with 72 degrees of freedom at 0.01 level of probability as shown in Table 4.20. Hence, the concerned null hypothesis rejected. The findings indicated that Extension media contact of the farmers had significant relationship with their switching behavior from crop to fish production.

Training exposure and switching behavior of farmers from crop to fish production

The computed value of 'r'(-.033) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated that training exposure of the farmers had no significant relationship with their switching behavior from crop to fish production.

Problem faced in crop production and switching behavior of farmers from crop to fish production

The computed value of 'r'(-.083) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated that problem faced in crop production of the farmers had no significant relationship with their switching behavior from crop to fish production.

Problem faced in fish Production and switching behavior of farmers from crop to fish production

The computed value of 'r'(-.086) was smaller than the tabulated value (r=0.217) with 72 degrees of freedom at 0.05 level of probability as shown in Table 4.20. With a negative trend. Hence, the concerned null hypothesis could not be rejected. The findings indicated

that problem faced in fish Production of the farmers had no significant relationship with their switching behavior from crop to fish production.

Fish production practices and switching behavior of farmers from crop to fish production

The computed value of 'r'(0.535) was greater than the tabulated value (r=0.282) with 72 degrees of freedom at 0.01 level of probability as shown in Table 4.18. Hence, the concerned null hypothesis rejected. The findings indicated that participated practices of the farmers had significant relationship with their switching behavior from crop to fish production.

Chapter V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

5.1.1 Switching behavior of the farmers

Finding revealed that majority proportion (78.4 percent) of the farmers' switched crop production to fish production into a low amount of land compared to 13.5 percent of them switched from crop to fish production into a medium amount of land and 8.1 percent of the farmers' switched from crop to fish production into a high amount of land. In practical situation, all the potential area of a farmer was not switched from crop to fish production. About 97.2 percent farmer medium to highest Percent switching area of land from crop to fish production.

5.1.2 Causes and Consequences of farmers switching from crop to fish production

5.1.2.1 Causes of farmers switching from crop to fish production

According to cause index for switching from crop to fish production "Higher profit in fish production ranked first cause" followed by "Salinity Problem for crop production", "Irrigation Problem in Kharip Season", "Less Production in crop cultivation", "Climatic hazard", "Less physical attachment in fish production", "Lower diversity in local cropping pattern".

5.1.2.2 Consequences of farmers from switching crop to fish production

For switching from crop to fish production farmer were facing some positive and negative consequences. According to consequences index "increasing economic return of the farmers" ranked first consequences in positive direction followed by "Increase pesticide free dyke Vegetable production" and "Preservation of rain water for future use".

Based on consequence index, "Decreasing crop production" ranked first consequences in negative direction followed by "Increasing soil salinity after shrimp Cultivation" and "High risk of return from fish production"

5.1.3 Selected characteristics of the switched farmers from crop to fish cultivation

Age: Vast majority (81.1 percent) of the farmers were middle aged to old aged. This seems that switched farmers from crop to fish Productionin the study area is being managed by comparatively older farmers.

Education: The overwhelming majority (83.8 percent) of the farmers had education ranging from primary to secondary level.

Family size: majority (89.2 percent) switched farmers from crop to fish Productionbelong to the small family to medium family.

Farm size: Three – fourth (64.9 percent) of the farmers had medium land possession.

BCR from Crop cultivation: Above Half of the farmers got above 2 times BCR (high) in crop cultivation. But (14.9 percent) farmer got very low BCR from crop cultivation.

BCR from Fish cultivation: The majority farmer (83.8 percent) got high BCR (1.51 to 2) from fish cultivation. On the other hand farmer (16.2 percent) got low to medium BCR in fish cultivation.

Knowledge in Crop production: The majority of the crop to fish switched farmers' (45.9 percent) have Medium (15 to 17) knowledge.

Knowledge in Fish cultivation: The majority of the crop to fish switched farmers' (70.3 percent) 52 farmer have Medium (17 to 22) knowledge in fish cultivation.

Organizational participation: The majority of the crop to fish switched farmers' (63.5 percent) 47 farmer participated in Medium label. Only (20.3 percent) 15 farmers' have low organizational participation.

Cosmopolitanism: About 64.5 percent of the crop to fish switched farmers' have cosmopolitanism while equally low and high Cosmopolitanism 13 percent.

Extension contact: A proportion of 63.5 percent of the Crop to fish switched farmers' had medium extension contact compared to 29.7 percent of them having low extension contact. Thus, overwhelming majority (93.2 percent) of the Crop to fish switched farmers' had low to medium extension contact.

Training exposure: About 70.3 percent of the crop to fish switched farmers' do not receive training while the rest 29.79 percent of them received training.

Problem faced in crop production: The majority (91.9 percent) farmer mentioned that they faced medium to highest problem in crop cultivation.

Problem faced in Fish cultivation: After switching in fish Production (63.5 percent) farmer faced Medium problem. Nearby one –fourth farmer (23 percent) farmer faced less problem.

Farmers participated practices: About 81.1 percent farmers participated practices medium to highest practices.

5.1.4 Relationship of the selected characteristics of the farmers with their switching behavior

Out of fifteen selected characteristics of the farmers, BCR from fish production, extension contact, fish production knowledge, fish production practices of the farmers had significant positive relationship with their switching behavior from crop Production to fish production, while age of the farmers had significant negative relationship with their switching behavior. Rest ten characteristics i.e. education, farm size, family size, BCR from crop production, crop production knowledge, organizational participation, cosmopolitanism, training exposure, problem faced in crop cultivation, problem faced in fish production, had non-significant relationship with their switching behavior from crop to fish cultivation.

5.2 Conclusions

Findings of the study and the logical interpretations in the light of relevant facts prompted the researcher to draw the following conclusions:

1. Finding revealed that overwhelming majority (91.9 percent) of the farmers switched from crop production to fish production into a lower to medium amount of land with the mean switched area of 25.05%. It may be concluded that all the potential area of a farmer was not switched from crop to fish production.

2. According to cause index for switching from crop to fish production "higher profit in fish production ranked first cause" followed by "salinity problem for crop production", "Irrigation problem in kharip season", "less production in crop cultivation", "climatic hazard", "less physical attachment in fish production" and "Lower diversity in local cropping pattern". Therefore, it may be concluded that farmers were switched from crop to fish production due to theses causes.

3. According to consequences index in positive direction, "increasing economic return of the farmers" ranked first consequences followed by "Increase pesticide free dyke Vegetable cultivation" and "preservation of rain water for future use". It is therefore, concluded that switching from crop to fish production had some positive consequences, i.e. farmers were getting benefits from this switching behaviour.

4. According to consequences index in negative direction, "Decreasing crop production" ranked first consequences followed by "Increasing soil salinity after shrimp cultivation" and "high risk of return from fish production". It is therefore, concluded that switching from crop to fish production had some negative consequences, i.e. farmers faced some problems for this issue.

5. Age of the farmers had negative significant relationship with their switching behavior from crop to fish production. It is therefore, concluded that younger farmers mostly switched their portion of land from crop to fish production.

6. BCR from fish production, extension contact, fish production knowledge and fish production practices of the farmers had positive significant relationship with their switching from crop to fish production. It is therefore, it may be concluded that farmers getting more BCR from fish production, more extension contact, more fish production knowledge, adopted more fish production practices mostly switched their portion of land from crop to fish production.

5.3 Recommendations

Based on the findings and conclusions of the study, the following recommendations were made.

5.3.1 Recommendations for policy implication

Overwhelming majority (91.9 percent) of the farmers switched their portion of crop production are to fish production area. Younger farmers mostly switched their portion of land from crop to fish production. There were some causes of switching from crop to fish production. There were both negative and positive consequences of switching from crop to fish production. Again, farmers getting more BCR from fish production, more extension contact, more fish production knowledge, adopted more fish production practices mostly switched their portion of land from crop to fish production. Therefore, it may be recommended that:

- Crop related extension service providing organizations (specially DAE) should take necessary action to increase crop productivity of the area.
- Fisheries extension service providing organizations (specially DOF) should take necessary action to increase fisheries productivity of the area.
- Both crop and fisheries extension service providing organization should sit together to increase farmers' knowledge and mitigate their problems for crop and fisheries production to increase BCR fro both.
- There must be a limit for land use for crop and fisheries production for environmental balance.

5.3.2 Recommendations for further study

- The study was conducted at Shyamnagar and Kaligonj upazila of Satkhira district. Findings of this study need to be verify by similar research in other parts of the country.
- Relationships of fifteen characteristics of the switched farmers and their switching behavior have been investigated in this study. Further research should be conducted to explore relationships of other characteristics of the farmers with their switching behavior.
- BCR from fish production, extension contact, Fish Production Knowledge, Fish production practice were significant related and age of the farmers had significant negative relationship with their switching behavior from crop to fish cultivation. So, further investigation may be undertaken to verify the result.
- Farmers' switching causes and consequences has been investigated in this study. It is necessary to study for determining the logical limit of land using area for crop and fish production for future betterment of the farmers and the country

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APPENDICES

Appendix - A

(English version of the interview schedule)
Department of Agricultural Extension and Information System
Sher-e-Bangla Agriculrural University, Dhaka-1207

Interview schedule
(English Version of the Interview Schedule)
Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University, Dhaka-1207
An interview schedule for a research study on

"Farmers' Switching Behavior from Crop to Fish production: Causes and consequences"

Serial No…….

Respondent's name ……

Address:

Village	
Union	
Upazila	
District	
Contact No.	

(Please answer the following questions. Your answer will be kept restricted and those will be used only for research purpose.)

1. Age

What is your age? ……..Years

2. Education:
Mention your educational qualification by putting tick ( ) mark in appropriate place.

SI.NO	**Qualifications**	
a)	Cannot read and write	
02	Can sign only	
03	Passed class ----------	
04	Don't read in educational institution, but level of education is equivalent to class	

3. Family size:

Mention the number of your family Members.

Male: ……., Female: ……., Children: …….
Total: ……..

4. Farm size:

Mention the land size of your agricultural farms.

Farm description		**Land area Decimals**
A	Crop farm	
B	Livestock farm	
C	Fisheries farm	
D	Others (…….)	
	Total (A+B+C+D)	

5. Switching area of land from crop to fish production
Please mention the area of land which you had changed from crop to fish production.

Description	Area (Decimals)
a) Area of land which might be changed from crop production area to fish production area (potential area, p)	
b) Area of land which you have changed from crop production area to fish production area (effective area, e)	
c) Percent Switched area of land from crop to fish production (e/p X 100)	

6. Causes of switching from crop to fish production

Please mention the causes for which you have changed your crop production area to fish production area.

Sl. No.	Items of causes	Order of importance
1		
2		
3		
4		
5		
6		

7. Consequences of switching from crop to fish production

Please mention the consequences after switching from crop production to fish production.

Sl. No.	Items of consequences	Order of importance
1		
2		
3		
4		
5		
6		

8. Benefit- Cost Ratio (BCR) from crop production

Please mention your income, expenditure and BCR of different crop production.

Name of Crops	Production Quantity	Unit price	Total Benefit (B)	Total Cost (C)
Total				

$$BCR = \frac{\text{Total Benefit}}{\text{Total Cost}} \times 100$$

9. Benefit- Cost Ratio (BCR) from fish production

Please mention your income, expenditure and BCR of different fish production.

Name of fishes	Production Quantity	Unit price	Total Benefit (B)	Total Cost (C)
Total				

$$BCR = \frac{\text{Total Benefit}}{\text{Total Cost}} \times 100$$

10. Crop production knowledge (Please answer the following questions.)

SL.NO.	Question	Full mark	Obtained mark
01	Name two modern varieties of fruits		
02	Mention two characteristics of good seed		
03	Mention two measures for controlling insect without insecticides		
04	Mention methods of irrigation on field crops		
05	Name two vegetables which is available in year round		
06	Name two harmful insect of vegetables		
07	Name two quick growing vegetables/ species		
08	Name two summer season vegetables		
09	Name three fungicides		

11. Fish production Knowledge (Please answer the following questions.)

Sl. No.	Questions	Full marks	Marks obtained
1	Mention two ways of identifying good quality fish fry	2	
2	What is the suitable time for releasing fry in ponds/ gher?	2	
3	Mention the necessity of using lime in the pond/ gher.	2	
4	Mention two natural fish feed	2	
5	Mention the harmful effects for releasing too many fry without proper estimation	2	
6	What are the main advantages of polyculture in ponds/ gher?	2	
7	Mention two of the harmful effects of weeds in the field	2	
8	Name two predatory fish.	2	
9	Mention 2 ingredients for preparing feed	2	
10	How will you understand that gas has formed at the bottom of the ponds/ gher?	2	
11	How will you understand that there is lack of oxygen in gher water?	2	
12	Mention two fish diseases?	2	
13	Why disease occurs in fish?	2	
14	Mention two means of identifying diseased fish?	2	
15	What preventive measures are required be taken against fish disease?	2	
16	What curative measures are required be taken against fish disease?	2	
	Total		

12. Organizational participation:

Please mention your organizational participation on the following.

SI.No.	Name of the organization	Extent of participation (year)			
		None	General member	Executive member	Officer of the executive committee
01	Krishak Somobai Samity				
02	Co-operative Society				
03	School/Madrasa Committee				
04	Market/Bazar Committee				
05	Local Union Parishad				
06	NGO organized society				

13. Cosmopolitanism

Please mention your degree of visit to the following places

Places	Degree of visit			
	Never (0)	Seldom (1)	Sometimes (2)	often (3)
Other village	0 ( )	1 times/week ( )	2 times/week ( )	3 times/week ( )
Upazila HQ	0 ( )	1 times/month ( )	2 times/month ( )	3 times/month ( )
District HQ	0 ( )	1 times/2month ( )	2 times/2 month ( )	3 times/2 month ( )
Capital city	0 ( )	1 times/6 month ( )	2 times/6 month ( )	3 times/6 month ( )

14. Extension contact

Mention your extent of contact with the following extension media

SI. NO	Name of the extension media	Extension contact				
		Never (0)	**Seldom (1)**	**Sometimes (2)**	**Often (3)**	**Regularly (4)**
01	Peer group contact	Not even once in a month	1-3 times/ month	4-6 times/ month	7-9 times/ month	>9 times/ month
02	DAE officers(eg.SAAO)	Not even once in a month	1-2 times/ month	3-4 times/ month	5-6 times/ month	6 times/ month
03	Neighbor/relatives	Not even once in a month	1-3 times/ month	4-6 times/ month	7-9 times/ month	>9 times/ month
04	Radio (agricultural program)	Not even once in a week	1-2 times/ week	3-4 times/ week	5-6 times/ week	>6 times/ week
05	T.V. (agricultural program)	Not even once in a week	1-2 times/ week	3-4 times/ week	5-6 times/ week	6 times/ week
06	Newspaper	Not even once in a week	1-2 times/ week	3-4 times/ week	5-6 times/ week	6 times/ week
07	Agricultural related books (e.g., Krishikatha)	Not even once in a month	1-2 times/ month	3-4 times/ month	5-6 times/ month	6 times/ month
08	Extension agent (NGO)	Not even once in a month ( )	1-2 times/ ( )	3-4 times/ month ( )	5-6 times/ month ( )	6 times/ month ( )

15. Training exposure (Please mention your training exposure as follows.)

Name of the Training course(s)	Duration of the courses (days)

16. Problem Faced in Crop production

Please state the extent of the following problems faced by you in crop production

Sl. No.	Problem	Extent of problem			
		Severe (3)	**Moderate (2)**	**Low (1)**	**Not at all (0)**
1	Lack of proper marketing facilities				
2	Poor communication system				
3	Low price of crop in pick period				
4	Natural calamities				
5	Insufficient credit				
6	High price of fertilizer				
7	High price of Agricultural machineries				
8	High cost of labor				
9	Problem in irrigation or drainage				
10	Facing Salinity problem for Agricultural practices				
11	Decreasing of soil fertility due to intensive cultivation				
12	Decreasing of soil productivity due to intensive cultivation				
13	Complexity in applying new technology				

17. Problem Faced in fish production

Please state the extent of problems faced by you in fish production

Sl. No.	Problem	Extent of problem			
		Severe (3)	**Moderate (2)**	**Low (1)**	**Not at all (0)**
1	Lack of proper marketing facilities				
2	Poor communication system				
3	Low price of fish in pick period				
4	Natural calamities				
5	Shortage of pond water in dry season				
6	Insufficient credit				
7	High price of inputs				
8	Complexity in applying new technology				
9	High cost in Labour				

18. Fish production Practices

Please mention your extent of practices of the following.

Sl. No.	Statement	Extent of practice				Obtained score
		R (3)	O (2)	Ra (1)	N (0)	
1	Counting the fingerlings before releasing in the pond/gher.					
2	Applying cow dung in pond/ gher					
3	Using lime in pond/ gher.					
4	Using fertilizer in pond/ gher					
5	Applying supplementary feed in pond/ gher.					
6	Eliminating the undesired and predatory fish from pond/ gher					
7	Controlling weeds from pond/ gher					
8	Treating the fingerlings before releasing in the pond/ gher					
9	Sorting and grading of fish for better production					
10	Applying medicine if diseases attack in the fish					
11	Keeping record of income and expenditure for fish culture					
Total						

*R=Regularly, O= Occasional, Ra= Rare, N= Never

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

Signature of interviewer

Date:

.....

APPENDIX B

Correlation Matrix of the dependent and independent variables (N = 74)

Variable	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	Y
X_1	-															
X_2	-0.377**	-														
X_3	0.079	0.042	-													
X_4	0.223	-0.039	0.159	-												
X_5	0.046	0.141	0.142	0.095	-											
X_6	-0.139	0.069	-0.027	0.150	0.048	-										
X_7	0.018	0.062	0.197	0.089	0.050	-0.103	-									
X_8	0.018	0.029	-0.063	0.288*	0.061	0.264*	0.126	-								
X_9	0.484**	-0.244*	-0.063	0.146	-0.028	0.090	-0.030	0.068	-							
X_{10}	-0.159	0.093	-0.035	0.114	-0.016	-0.302**	0.382**	-0.234*	-0.231*	-						
X_{11}	-0.405**	0.345**	0.190	0.170	0.133	0.165	0.399**	0.078	-0.215	0.441**	-					
X_{12}	-0.029	-0.052	-0.186	-0.220	-0.140	-0.007	-0.091	-0.097	0.106	-0.227	-0.162	-				
X_{13}	0.036	-0.045	-0.003	-0.056	0.160	0.011	-0.051	0.213	-0.075	0.034	-0.109	-0.058	-			
X_{14}	0.212	0.015	0.052	0.097	0.037	-0.080	0.030	0.093	-0.094	0.247*	0.057	-0.280*	0.271*	-		
X_{15}	-0.110	-0.115	0.246*	0.177	0.144	0.460**	-0.069	0.150	-0.007	-0.34**	0.083	0.041	-0.105	-0.023	-	
Y	-0.285*	0.018	0.083	0.134	-0.033	0.528**	0.153	0.290*	-0.036	-0.104	0.410**	-0.033	-0.086	-0.089	0.535**	-

* = Correlation is significant at 0.05 level of probability

** = Correlation is significant at 0.01 level of probability

X_1 = Age

X_2 = Education

X_3 = Family Size

X_4 = Farm Size

X_5 = BCR from crop production

X_6 = BCR from fish production

X_7 = Crop production knowledge

X_8 = Fish production knowledge

X_9 = Organizational participation

X_{10} = Cosmopoliteness

X_{11} = Extension media contact

X_{12} = Training exposure

X_{13} = Problem faced in crop production

X_{14} = Problem faced in fish production

X_{15} = Fish production practices

Y = Switching behavior