FARMERS' PERCEPTION ON THE EFFECT OF IPM

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CERTIFICATE

This is to certify that the thesis entitled ***"Farmers' Perception on the Effect of IPM"*** submitted to Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension**, embodies the result of a piece of bona fide research work carried out by **G. M. Waliul Islam**, Registration No. **07-02560** 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.

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DEDICATED TO

MY

BELOVED PARENTS

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The Author

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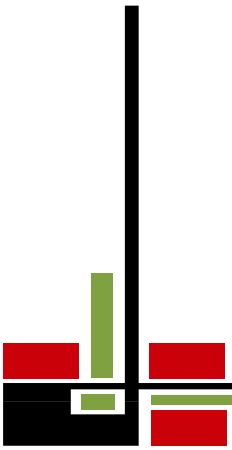
ABSTRACT

The main objectives of this study were to determine the farmers' perception on the effect of IPM and to explore the relationship between the selected characteristics of the farmers and their extent of perception on the effect of IPM. Besides, attempts were made to ascertain the problems faced by the farmers. The study was conducted with randomly selected 100 farmers in Amadi and Bagali union under Koyra upazila of Khulna district. A pre-tested interview schedule was used to collect data from the respondents during 12 May to 29 July, 2015. Farmers' perception on the effect of IPM was the dependent variable and the dependent variable was measured by 15 statements on 4-point scale and the ten selected characteristics of the respondents contributed the independent variables of the study. Majority (53 percent) of the respondents had medium perception while 24 percent and 23percent of them had respectively low and high perception on the effect of IPM. Seven characteristics of the respondents viz. Education, Annual family income, Farm size, Training received, Organizational participation, Knowledge on IPM practices and Awareness of farmer about environmental pollution had significant positive relationship with their perception on the effect of IPM but the constraints faced by the farmers in using IPM practices was negatively correlated with their perception. The remaining characteristics of the farmers, namely age and number of family member did not show any significant relationship with their perception. The major farmers' perceptions on the effect of IPM were using of Bio-fertilizer in crop production, using IPM for environment balance, increasing beneficial organisms by using organic fertilizer and using IPM for reducing health and environment hazard.



CHAPTER 1
INTRODUCTION

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INTRODUCTION

1.1 General Background

Bangladesh is basically an agricultural country. Agriculture plays the vital role in capital formation. The importance of agriculture in Bangladesh can never be emphasized. About 47.30 percent of the total population of this country is directly or indirectly involved in agricultural activities (Bangladesh Bureau of Statistics - BBS, 2015). Agriculture related sector contributes as much as 15.96 percent of the Gross Domestic Product (GDP) of the country (Bangladesh Economic Review, 2015). Thus, agriculture plays a vital role in ensuring food security, employment generation, poverty alleviation, and raising standard of living and increasing export earnings.

The farmers of Bangladesh are mostly dependent on pesticides in the endeavor to control the pests. At present different kinds of pesticides with thousands of trade names have been registered in Bangladesh and use of pesticides is not only expensive but also leads to negative environmental consequences and increased health hazards to the growers and consumers of crop products. It helps to develop pest resistance to insecticides, destroys beneficial insects and imbalances the natural position between the pests and their natural enemies leading to the increase in the population of the target pests and even creates new pest problems. To avoid such consequences and to increase the crop production at the same time, a viable alternative is needed to pest management. Integrated Pest Management (IPM) is the best alternative strategy for pest management.

IPM is not a new practice in Bangladesh and it was started in 1981 on a small scale basis. By inter country programme FAO gave same thrust on IPM in 1989. Based on the success of FAO's inter country programme, two Integrated Pest Management Project and Strengthening Plant Protection Services (SPPS)

project started in 1996 and I997 respectively. Both the projects were implemented by the Department of Agricultural Extension (DAE) (Roy, 2009). Agricultural development and sustainability are very much linked to maintaining a healthy agricultural environment, ecological balance, sound environment and sustainable agriculture should be maintained for the better future and to maintain sustainable agriculture IPM should be implemented with collaboration of other related organizations.

Integrated Pest Management (IPM) is a broad ecological approach to pest control using various pest control methods in a compatible manner; that is why IPM is a holistic approach to pest control keeping sound environment. To maintain ecological balance, sound human and animal health, increasing farm output and farmers' income on a sustainable basis IPM is the most important practices with minimal of ecological disruption.

The following elements can be used as components of an IPM system.

- Biological control : natural enemies and pathogenic micro-organisms
- Cultural control : good agronomic practices
- Use of pest tolerant or resistant crop varieties
- Mechanical control: for example hand picking, flooding to minimize the incidence of insect pest.
- Chemical control: selective based on economic thresholds. It is used as a last method but priority is given to botanical and bio-pesticides whenever possible.

IPM system, which embodies a combination of many environmental friendly techniques of managing the crops and the pests that will help to reduce crop losses due to pests and lead to sustainable agriculture. A sound IPM policy will facilitate the spread of the IPM knowledge on environmental awareness to the millions of farmers in Bangladesh. It is hardly possible to deal with all aspects

of IPM in a single study. For this reason, farmers' perception on the effect of IPM was taken under consideration.

1.2 Statement of the Problem

Agriculture and environment has a close relationship. We are dependent on the environment as well as agriculture and its increased production. In agricultural field, we use different pesticides. It has been found in different countries of the world that in addition to beneficial effects, the improved agricultural practices have tremendous influence on environmental pollution and Bangladesh is not exception to this (Sattar, 1994).

The rapid increase in the use of pesticides in agriculture in recent years creates bad impact on environment. Firstly, pesticide using can have adverse health effect for farm workers and others exposed to pesticides. Secondly, it might contaminate ground and surface water, harming down-stream users of the pesticide leached to the water sources have also been blamed for causing regular outbreaks of epidemic disease in fishes (Ziauddin, 1991).

Since the farmers have not enough perception about the types of adverse effect of the pesticides they are using them in a large scale and injudiciously. Such application of pesticides has been damaging our valuable natural resources such as land, fishes, beneficial insects, beneficial soil micro organisms and some beneficial plants. This is why the soil organic matter has been reduced. The use of sulfur pesticides increases the acidity of the soil. Farmers often don't use pesticides in accurate doses and thus resistance of insects grows to the insecticides in the pest population. This resistance creates serious harm of the crops. To control these resistant pests a higher dose of insecticides are needed and thereby cost of production increases and damages environmental balance as well (Conway and Pretty, 1991). So, it is essential to reduce the excess use of pesticide through popularizing practices of IPM.

If the farmers are to be motivated in using IPM for sustainable crop production they would require a sound perception regarding environmental agricultural

hazard caused due to excessive use of chemical fertilizers and pesticides. Their perception to chemicals needs to be changed and more favourable perception need to be developed towards the proper use of IPM for sustainable crop production. Without changing their perception from conventional pest control methods to alternative holistic methods (IPM) sustainable agriculture production and pollution free environment are not possible. Analyzing the issue from farmer's perspective, this study was specifically designed to find out the answer to the following questions:

i) What is the farmers' perception on the effect of IPM?

ii) How much knowledge have the farmers about IPM practices?

iii) How farmers' personal, social, economic and psychological characteristics are related with their perceptional behaviour?

iv) What are the farmers' selected characteristics that are related to their perception on the effect of IPM?

v) What are the Constraints faced by the farmers in using IPM practices?

vi) How much awareness have the farmer about environmental pollution?

In order to answer the above mentioned research questions the present study entitled "farmers' perception on the effect of IPM" was undertaken.

1.3 Specific Objectives

The following specific objectives were drawn in order to give proper direction to the study:

1. To find out farmers' perception on the effect of IPM.
2. To describe the selected characteristics of the farmers; the characteristics were as follows:

   (i) Age

   (ii) Education

   (iii) Family size

   (iv) Annual family income

   (v) Farm size

   (vi) Training received

   (vii) Organizational participation

   (viii) Knowledge on IPM practices

   (ix) Constraints faced by the farmers in using IPM practices

   (x) Farmers' awareness about environmental pollution

3. To explore the relationship between the selected characteristics of the farmers and their extent of perception on the effect of IPM.

4. To ascertain the problems faced by the farmers.

1.4 Justification of the Study

The main focus of the study was to assess the perception of the farmers on the effect of IPM. IPM is one of the key issues in the crop production of Bangladesh. Men depend on environment and agriculture. Integrated Pest Management that is less hazardous to the environment and economically beneficial is a suitable innovation for the farmers to control the pest. However, farmers of Bangladesh lack adequate knowledge on IPM. Most of the farmer use chemical fertilizer and pesticides indiscriminately. Lack of consciousness on environmental issues, are destroying our natural resources. The effect of following unscientific method leads many hazards to over all environment and the whole ecology. As a result we are facing scarcity of drinking water, distraction of natural enemies, deterioration of soil quality, increase of health hazard and also loss of biodiversity.

IPM educates the farmers to utilize the readily available source of tolerant genetic resource, modern cultivation practices, mechanical and biological measures of control, organic green manure and bio-fertilizer to improve the environment. Most of the farmers of Bangladesh are poor. They could hardly spare the money for buying expensive toxic pesticides. IPM helps them to utilize the readily available source of biological control agents. So there is an urgent need to understand the potentiality and limits of IPM so that appropriate development choices can be made.

For enhancing the dissemination of IPM knowledge to the end users both scientists and extension personnel should work hand to hand. Research generates new technologies appropriate for beneficiaries' use, which extension people make available to the beneficiaries. This can be done through IPM training. However, before designing IPM training it is necessary to take complete idea about the present status of IPM practices by the farmers.

There have been many studies conducted relating to knowledge and attitude of farmers on various aspects of agriculture. But very little research has been reported in home and abroad to determine the perception of farmer on the effect of IPM. So, this is an urgent need to undertake a study on this perspective. The investigator believes that the findings are likely to be helpful to develop at sound policy for the environment friendly agricultural research and extension system of the country.

1.5 Assumptions

An assumption has been defined as “the supposition that an apparent fact or principle is true in light of the available evidence” (Goode, 1945). An assumption is taken as a fact or belief to be true without proof. So the following assumptions were in mind of the researcher while carrying out this study:

i) The respondents included in the sample were capable of furnishing proper responses to the questions of the interview schedule.

ii) Views and opinions furnished by the respondents were the representative views and opinions of the whole population of the study.

iii) The responses furnished by the respondents were reliable and they truly expressed their opinions on the effect of IPM.

iv) The data collected by the researcher were free from bias.

v) The researcher who acted as the interviewer was well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished their correct opinions without any hesitation.

vi) The respondents had almost similar background and seemed to be homogenous to a great extent.

vii) The information sought by the researcher revealed the real situation to satisfy the objectives of the study.

viii) The items included in the questionnaire of awareness about environment pollution were adequate to reflect the environmental knowledge of the farmers on the use of IPM practices.

ix) The findings were useful in choosing the clients as well as for planning execution and evaluation the extension programme.

1.6 Scope and Limitations of the Study

The present study was undertaken to have an understanding of the perception of the farmers on the effect of IPM and to explore the relationships with selected characteristics of the farmers.

The findings of the study will help for application to the areas of Bangladesh where physical, socio-economic, cultural and geographic condition do not differ much from those of the study area. Thus, the findings are expected to be useful to students, researchers, extension workers, and particularly for planners in formulating and designing the procedures for maintaining the natural balance. The findings may also be helpful to the field workers of different nation building departments to improve strategies of action to conform environment friendly sustainable production to the rural people. Lastly, the researcher believes that the findings and recommendations of this study will definitely lead to minimize the cost of production and simultaneously reduce the risk of environmental damages. Considering the time, money and other necessary resources available to the researcher and to make the study manageable and meaningful from the point of view of research, it becomes necessary to impose certain limitations. The limitations were as follows:

i) The study was confined in two unions of Koyra upazila under Khulna district.

ii) The study was restricted within the farmers who had some cultivable land under their own cultivation.

iii) The population for the study was kept confined to the heads of the family who regularly cultivated their land.

iv) There were many characteristics of the farmers but in the study only twelve of them were selected for investigation.

v) For information about the study, the researcher depended on the data furnished by the selected respondents during their interview with him.

vi) Major information, facts and figures supplied by the respondents were applicable to the situation prevailing in the locality during the year 2015.

Thus, the findings are expected to be useful to students, researcher and extension workers, and particularly for the planners in formulating future plan.

1.6 Definition of the Key Terms

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

Age: Age of a farmer refers to the period of time from his/her birth to the time of interview.

Education: Education of an individual farmer was defined as the formal education received up to a certain level from an educational institute (e.g. school, college and university) at the time of interview.

Family Size: Family Size refers to the total number of members including the respondent himself/herself, spouse, children and other dependents, who live and eat together in a family unit.

Annual family income: It refers to the total annual earning of all the family members of a respondent from agricultural and other non-agricultural sources (Services, business, daily labour etc.) during a year. It was expressed in Taka.

Farm size: Farm size refers to the total area on which a farmer's family carries on farming operations, the area being estimated in terms of full benefit to the farmer's family.

Training received: It refers to the total number of days attended by the farmers in his/her life to the various agriculture related subject matter.

Organizational participation: Organization participation of an individual refers to his participation in various organizations as ordinary member, executive committee member or executive officer within a specified period of time.

Knowledge on IPM: Knowledge on IPM refers to the understanding of the respondents about different pest management.

Integrated Pest Management (IPM): IPM is the selection, integration and implementation of pest control based on predicted economic, ecological and sociological consequences.

Constraint: It means any different situation which requires some actions to minimize the gap between "what ought to be" and "what is". The term constraint refers to different difficulties faced by the farmers at the time of practicing using of integrated pest management in crop production.

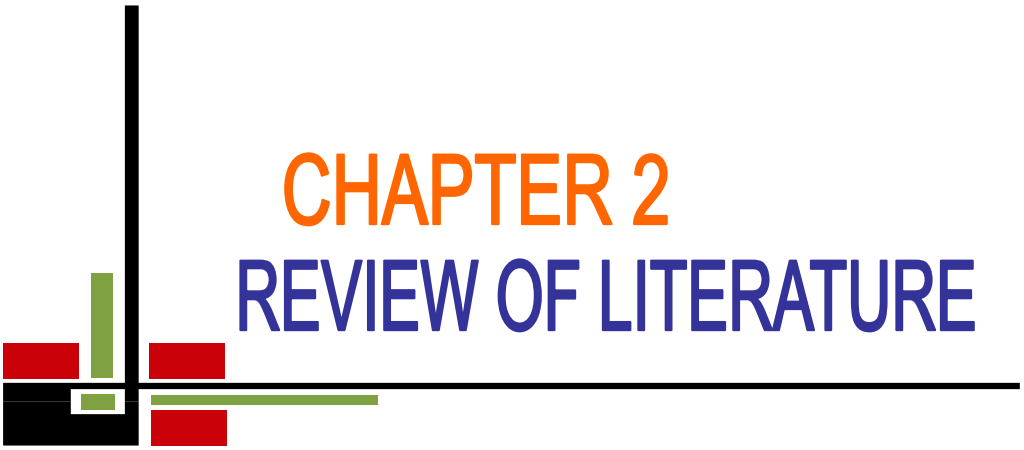
Pest: An animal causing damage or annoyance to man, his animals, crops or possessions such as insects, mites, nematodes, rodents and birds.

Resistant variety: It refers to those varieties of crops that are resistant to pests and diseases. Host resistance of pests is economically and environmentally sound for crop production component.

Sustainable Agriculture: Sustainable agriculture is one that over the long term enhances environmental quality and the resource based on which agriculture depends, provides for basic human food and fiber needs is economically viable and enhance the quality of life for farmers and society as a whole.

Environment: Environment is a system or organization which covers biological and Non-biological, manufactured and social aspects that affects and supports the growth of life individual or group of individuals including all kinds of flora and fauna.

Environment Friendly: The term ‘environmentally friendly’ means making choices that are better for the environment. Another term that we use to mean the same thing is ‘sustainability’. Since we live in our environment, sustainability or being environmentally friendly is about improving the quality of life for our families, our communities and generations to come.



CHAPTER 2
REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERATURE

The chapter deals with the past literature relevant to the objective of this study. The researcher made an elaborate search of available literature for this purpose. The researcher attempted to study the relationship of each of the variables. This Chapter is divided into three sections. The first section deals with the review of studies related to the extent of perception of different aspects; the second section deals with the relationships between farmers' characteristics and their perception on the effect of IPM and the third section deals with the conceptual framework of the study.

2.1 Review of literature on the extent of perception of different aspects

Kabir and Rainis (2012) conducted a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. The Results showed that an overwhelming majority (86.1 %) of the farmers had low to medium level of perception; while only 13.9% farmers had high perception regarding adverse effects of pesticides on environment.

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The Results showed that majority (85 %) of the farmers had low to medium level of perception; while only 15% farmers had high perception regarding environmental effects of pesticides use in vegetable production.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The Results showed that more than half (54 percent) of the farmers perceived that organic products are superior to inorganic one.

Roy (2009) conducted a study on farmers' perception of the effect of IPM for sustainable crop production. The Results showed that most of the respondents (55.0 percent) had favorable perception while 23.75 percent and 21.25 percent of them had low favorable and medium favorable perception respectively.

Majlish (2007) conducted a study on perception of participant women on social forestry program of BRAC. The findings revealed that most (59.0 percent) of the respondents had favorable perception while 30.0 percent and 11.0 percent of them had moderately favorable and unfavorable perception of social forestry program respectively.

Afique (2006) stated that majority (97.5 percent) of the respondent rural women had favorable perception while only 2.5 percent had moderately favorable perception of the benefits of agricultural model farm activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found in his study that 57.8 percent had high perception, 41.4 percent had moderate perception and only 0.8 percent had less perception about causes of monga. On the other hand, 91.4 percent of the respondents had high perception compared to 8.6 percent having moderate perception and none had less perception about remedies of monga in Kurigram district.

Sharmin (2005) conducted her study on rural women's perception of benefits of involvement in Income Generating Activities (IGAs) under a non government Organization (NGO) and she found that majority (91 percent) of the respondents had medium perception of benefit of involvement in IGAs under a NGO, while 9 percent had high perception of this issue.

Sayeed (2003) conducted a study on perception on farmer's benefits from using manure towards Integrated Nutrient Management (INM) for sustainable crop production. He found that 56.7 percent of the farmers had less favorable perception of benefit of using manure towards INM for sustainable crop production, while the rest 43.3 percent had favorable perception of this issue.

Chakraborty (2002) conducted a study on Sub Assistant Agriculture Officers' (former BS) perception of changes from mono rice culture to diversified crop cultivation. He reported that the highest proportion (68.0 percent) had high perception and 10.0 percent had low perception of changes.

Fardous (2002) showed that majority (95.5 percent) of the farmers perceived the forestry development activities moderately positive to highly positive effect of village and farm forestry program activities, while the rest 4.5 percent perceived in a less positive way.

Kabir (2002) observed that majority (65.0 percent) of the farmers had moderately favorable perception on the effect of Barind Integrated Area Development Project (BIADP) towards environmental upgradation where only 16.0 and 19.0 percent of them had low and highly favorable perception respectively on this issue.

2.2 Relationships between farmers' characteristics and their perception on the effect of IPM

2.2.1 Age and farmers' perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by the farmers in Ogbomoso, Nigeria. Adeola found that age had a significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. Pal found that age had no significant relationship with farmer's perception.

Roy (2009) stated that age had no significant relationship with farmer's perception.

Majlish (2007) conducted a study regarding perception of participant women on social forestry program of BRAC. The study revealed that the relationship between age and perception of social forestry program was negatively significant.

Afique (Z006) mentioned that there was no significant relationship between the age of the rural women and their perception of benefits of invovement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that age of the farmers had no significant relationship with their perception of causes und remedies of Monga in Kurigram district.

Sharmin (2005) stated that age of the rural women had no significant relationship with the perception of benefits of involvement in IGAs under a NGO.

Uddin (2004) conducted a study on perception of sustainable agriculture. The findings revealed that age of the respondents had negative significant relationship with their perception of sustainable agriculture.

Sayeed (2003) found that age had negative relation with farmers' perception of benefit from using manure towards INM for sustainable crop production by the farmers. Ismail (1979), Chowdhury (2001) and Alom (2001) obtained similar type of findings in their respective studies.

Kabir (2002) studied perception of farmers on the effects of integrated area development project towards environmental upgradation. The study revealed that there was no significant relationship between age and perception of environmental upgradation. Similar finding was obtained by Fardous (2002) in his study.

Islam (2000) stated that age of farmers had no significant relationship with their perception of the harmful effect of agro-chemical with regard to environmental pollution. Hossain (2000) and Parveen (1995) obtained similar result in their studies.

2.2.2 Education and farmers' perception

Kabir and Rainis (2012) conducted a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They found that education had a significant influence on the farmers' perception.

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that education had a significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that education had a positive significant influence on the farmers' perception.

Roy (2009) stated that education had a negative significant relationship with farmer's perception.

Majlish (2007) found that the relationship between education of participant women and their perception of social forestry program of BRAC was positively significant.

Afique (2006) mentioned negatively significant relationship between personal education of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Snmity (SUS).

Sharmin (2005) found that personal education of the rural women had significant positive relationship with their perception of benefits of involvement of IGAs under a NGO.

Uddin(2004) concluded that the level education of the farmers had a significant positive relationship with their perception of sustainable agriculture.

Sayeed (2003) revealed that the education of the respondents had significant positive relationship with their perception from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Fardous (2002) found a significant positive relationship between education of the farmers' and their perception of the forestry development activities of Village and Farm Forestry Program (VFFP) towards sustainable forestry development.

Alom (2001) found that education of farmers 'had a significant and positive relationship with their perception of Binamoog-5 as a summer crop. Majydyan (1996) and Sarker (1999) and Islam (2001) found similar type of result. But, Kashem and Mikuni (1998) did not find any relationship between education of farmers and their perception about benefit of using Indigenous Technical Knowledge (ITK).

2.2.3 Family size and farmers' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that family size had no significant relationship with farmer's perception.

Roy (2009) stated that family size had a positive significant relationship with farmer's perception.

Majlish (2007) found that the relationship between family size of the participant women and perception of social forestry program of BRAC was non-significant and followed a negative trend.

Afique (2006) found no significant relationship between family size of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that family size of the farmers had no significant relationship with their perception of both causes and remedies of Monga in Kurigram district.

Sharmin (2005) in a study found that family size of the rural women had no significant relationship with their perception of benefits involvement of IGAs under a NGO.

Uddin (2004) found that the family size of the farmers had no relationship with their perception of sustainable agriculture.

Sayeed (2003) found that family size of farmers had no significant relationship with their perception of benefit from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Kabir (2002) in his study found that family size of farmers had negative relationship with their perception on the effects of BIADP towards environmental upgradation. Similar finding was also obtained by Alom (2001) in his study.

2.2.4 Annual family income and farmers' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study showed that annual family income had no significant relationship with farmer's perception.

Roy (2009) stated that annual family income had a positive significant relationship with farmer's perception.

Majlish (2007) found that the relationship between family income of participant women and perception of social forestry program of BRAC was non-significant but followed a negative trend.

Afique (2006) found no significant relationship between annual family income of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that annual income of the farmers had positive significant relationship with their perception regarding causes and remedies of Monga in Kurigram district. Uddin (2004) concluded that annual family income of the farmers had significant and positive relationship with their perception of sustainable agriculture.

Sayeed (2003) found that annual family income of the farmers had a significant relationship with their perception of benefit from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Kabir (2002) found that there was non-significant relationship between annual family income of the farmers and their perception of the effects of BIADP towards environmental upgradation.

2.2.5 Farm size and farmers' perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that household size had a non-significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that farm size had no significant relationship with farmer's perception.

Roy (2009) stated that farm size had negatively significant relationship with farmer's perception.

Majlish (2007) revealed from her study that the relationship between farm size of participant women and perception of social forestry program of BRAC was non-significant and followed a positive trend.

Afique (2006) stated that there was no significant relationship between family farm size of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that farm size of farmers had no significant relationship with their perception of both causes and remedies of Monga in Kurigram district.

Sharmin (2005) found in her study that farm size of the rural women had no significant relationship with their perception of benefits of involvement in IGAs under a NGO.

Uddin (2004) found that farm size of the farmers had significant and positive relationship with their perception of sustainable agriculture.

Sayeed (2003) observed that farm size of the farmers had a significant positive relationship with their perception of benefit from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Fardous (2002) found that there was no significant relationship between farm size of the farmers and their perception of Village and Farm Forestry Program (VFFP) towards sustainable forestry development. Hossain (2001), Hossain (1999) and Majydyan (1996) found similar findings in their respective studies.

2.2.6 Training received and farmers' perception on the effect of IPM practices

Kabir and Rainis (2012) conducted a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They found that training had a significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that training received had a positive significant influence on the farmers' perception.

Roy (2009) stated that training received had a positive significant relationship with farmer's perception.

Majlish (2007) found from her study that the relationship between training experience of participant women and perception of social forestry program of BRAC was positively significant.

Afique (2006) mentioned that there was no significant relationship between training exposure of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Sharmin (2005) reported from her study that training exposure of the rural women had no significant relationship with their perception of benefits of involvement in Income Generating Activities (IGAs) under a NGO.

Uddin (2004) from his study concluded that farmers' training exposure had a significant positive relationship with their perception of sustainable agriculture.

Kabir (2002) found that training experience of the farmers had a significant positive relationship with their perception of the effects of BIADP on environmental upgradation.

Fardous (2002) observed that training exposure of the farmers was significantly correlated with the perception of the respondents of VFFP towards sustainable forestry development.

2.2.7 Organizational participation and farmers' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that organizational participation had no significant relationship with farmer's perception.

Roy (2009) stated that organizational participation had no significant relationship with farmer's perception.

Uddin (2004) studied on fanners' perception of sustainable agriculture and concluded that organizational participation of the farmers had a significant positive relationship with their perception of sustainable agriculture.

Sayeed (2003) reported that organizational participation of the farmers had no significant effect on their perception of benefit from using manure towards INM for sustainable crop production.

Fardous (2002) found that organizational participation of the farmers had significant positive relationship with their perception of VFFP towards sustainable forestry development.

Chowdhury (2001) found a significant relationship between organizational participation and the impact of afforestation as perceived by the farmers.

Alom (2001) reported that organizational participation of the farmers had significant positive relationship with their perception of Binamoog-5 as a summer crop.

2.2.8 Knowledge on IPM practices and farmers' perception

Kabir and Rainis (2012) conducted a study on Farmers' Perception on the Adverse Effects of Pesticides on Environment: The Case of Bangladesh. They found that experience of farmers had a significant influence on the farmers' perception.

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that farming knowledge had a significant influence on the farmers' perception.

Roy (2009) stated that knowledge on IPM practices had a positive significant relationship with farmer's perception.

Majlish (2007) conducted her study regarding perception of participant women on social forestry program of BRAC. She found from her study that the relationship between knowledge on tree plantation and perception of social forestry program of BRAC was positively significant.

Uddin (2004) conducted his study on farmers' perception of sustainable agriculture. He found that knowledge of environment friendly farming had significant and positive relationship with their perception of sustainable agriculture. He further conduct environment friendly farming had higher perception of sustainable agriculture.

Furdous (2002) conducted a study and found that there was a significant positive relationship between knowledge of forestry of farmers and their perception of VFFP towards sustainable forestry development.

2.2.9 Constraints faced by the farmers in using IPM practices and farmers' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that several constraints in using organic fertilizer had a significant influence on the farmers' perception.

Roy (2009) stated that majority (98.75 percent) of the respondent had high problem while only 1.25 percent had medium problem in using IPM.

2.2.10 Farmers' awareness about environmental pollution and farmers' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that awareness of environmental degradation had a positive significant relationship with farmer's perception.

Majlish (2007) conducted her study regarding perception of participant women on social forestry program of BRAC. She found from her study that the relationship between knowledge on tree plantation and perception of social forestry program of BRAC was positively significant.

Uddin (2004) conducted his study on farmers' perception of sustainable agriculture. He found that knowledge of environment friendly faming had significant and positive relationship with their perception of sustainable agriculture. He further concluded that the respondents with higher knowledge of environment friendly farming had higher perception of sustainable agriculture.

2.3 Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. The hypothesis of a research while constructed properly contains at least two important elements *i.e.* “a dependent variable” and “an independent variable”. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variables (Townsend, 1953). An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationships to an observed phenomenon.

In view of the prime theme of the study, the researcher constructed a conceptual framework which is self explanatory and is presented in Figure 2.1.

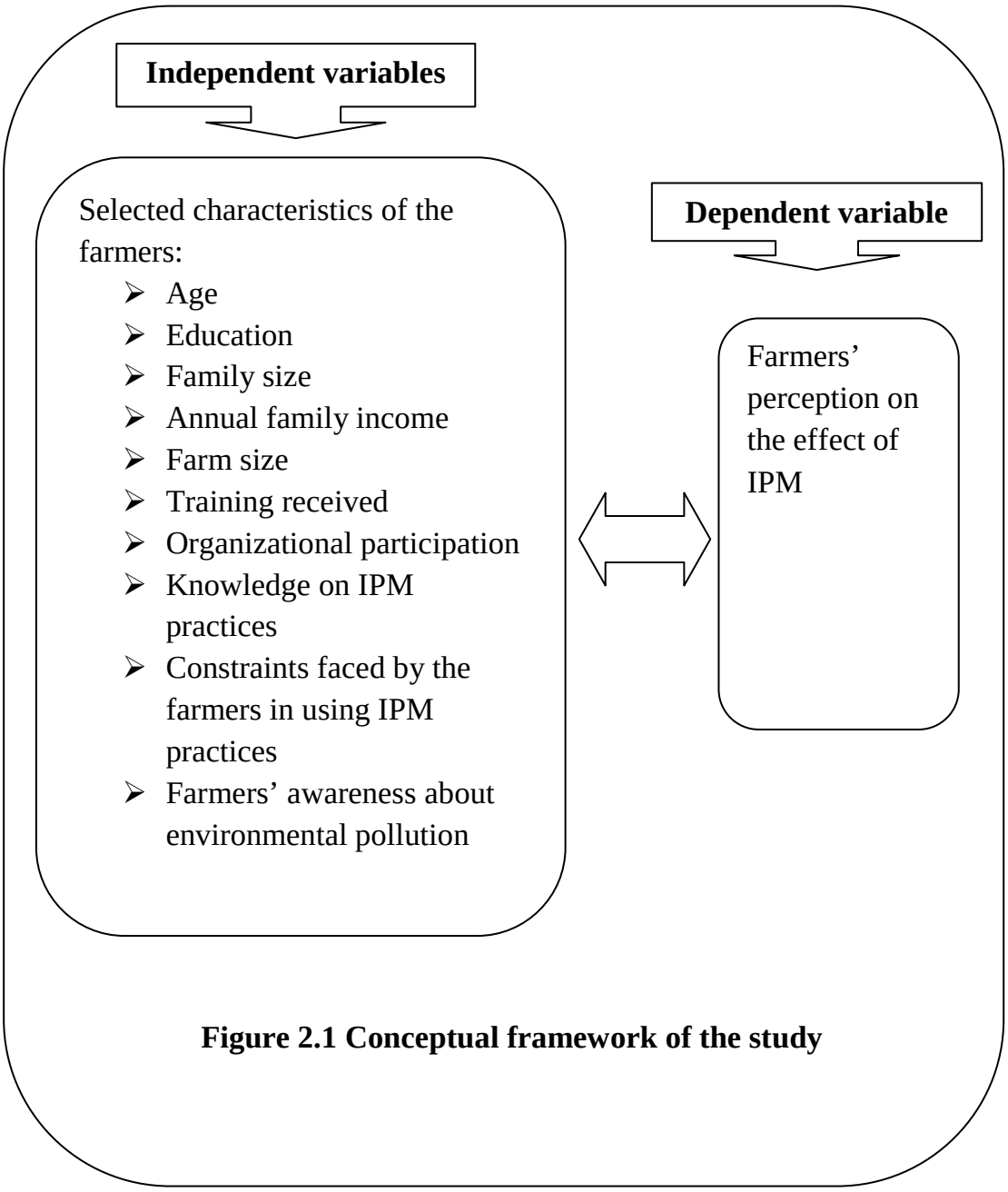
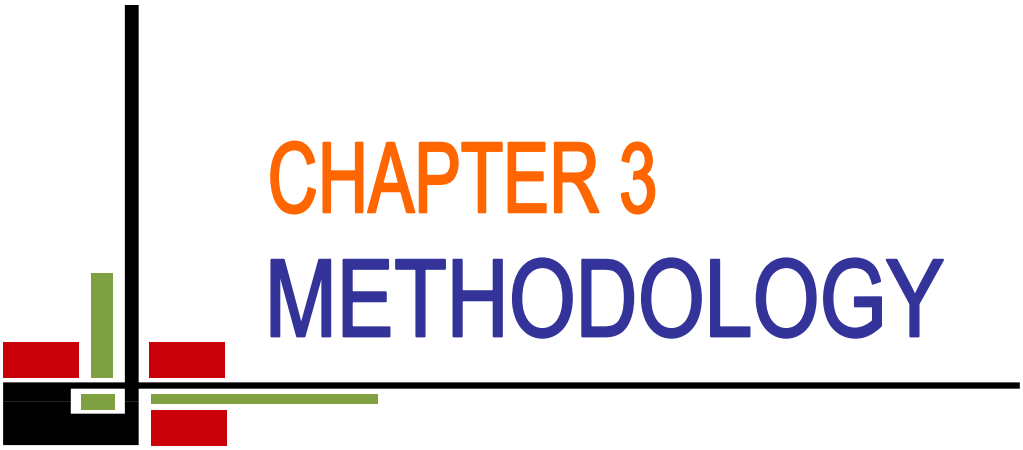


Figure 2.1 Conceptual framework of the study



CHAPTER 3
METHODOLOGY

CHAPTER 3

METHODOLOGY

In any scientific research, methodology plays an important role. Appropriate methodology helps the researcher to collect valid and reliable information and analyze the information properly in order to arrive at correct conclusions. The methods and procedures followed in conducting this study have been described in this chapter.

3.1 Locale of the study

The locale of the study included three selected villages namely Hatiar Danga, Jaigirmahal of Amadi Union and Islampur of Bagali Union of Koyra upazila under Khulna district. The villages are in the north of the upazila headquarters and about 23 kilometers far from the upazila headquarters. Again Koyra is situated in the south corner of Khulna district and about 78 kilometers from the district headquarters. In the study area, there are two youth clubs, six cultural organizations, four government primary schools, two non government primary schools, five NGOs, adult education schools, one high school, one madrasa, one college, two bazaars and so many others. Purposive sampling of the study area was done because it is closed to the researcher's own area. The study area has been shown in Figure 3.1(a-b).

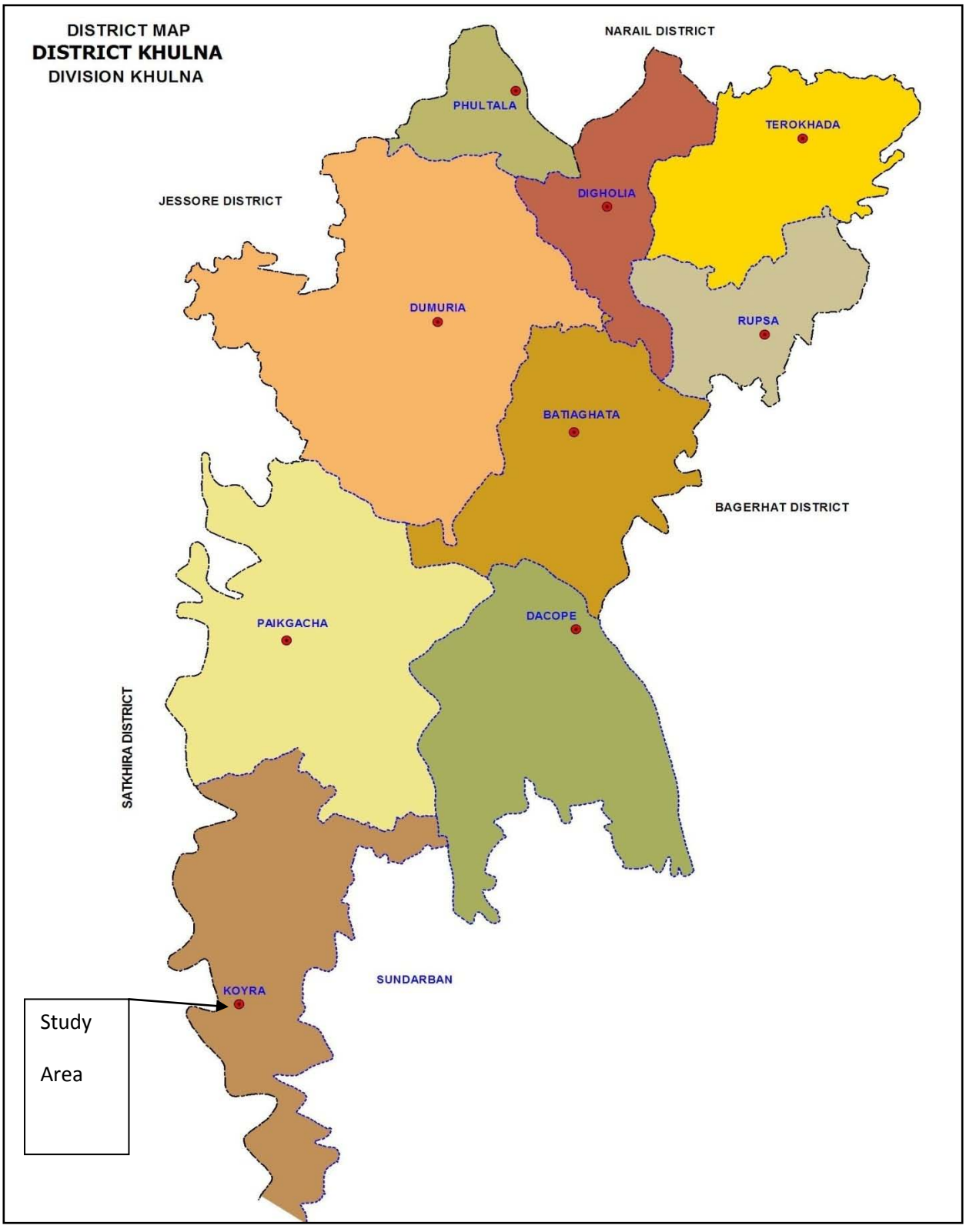


Figure 3.1(a): A map of Khulna district showing the study area

Figure 3.1(b): A map of Koyra upazila under Khulna district showing the locale of the study area

3.2 Population and Sample

The study location was in Koyra upazila. A list of farmers of the study area was prepared by the researcher with the help of Sub-Assistant Agriculture Officer (SAAO) of Koyra upazila agricultural office. The list comprised of 570 famers which served as population of the study. Among 570 farmers, 100 farmers were selected randomly as sample of the study. Thus the sample size was 100. A reserve list of 14 farmers were also prepared and used only when a respondent included in the original list was not available for interview during collection of data despite several attempts.

Table 3.l Distribution of population and sample of the study in different unions of Koyra Upazila

Name of the union	Name of the village	Number of the farm families (population)	Sample size	Reserve list
Amadi	Jaigirmahal	233	41	6
	Hatiar danga	165	29	4
Bagali	Islampur	172	30	4
Total		570	100	14

3.3 Instrument for Collection of Data

An interview schedule was used as the research instrument in order to collect relevant information from the respondents. The schedule was carefully designed and prepared in English, keeping the objectives of the study in view. It contained both open and closed form of questions. The questions were arranged systematically.

3.4 Pre- testing of the Interview Schedule

The interview schedule was pre-tested with 10 farmers and then final shape was given to the interview schedule according to the experience based on the

pre-test. The pre-testing facilitated the researcher to examine the suitability of different questions and status of the instrument in general. The final revised version of the instrument was prepared on the basis of suggestions and comments of the appropriate authority. An English version of the interview schedule is enclosed at *Appendix-I*.

3.5 Time and Procedure of Data Collection

Data were collected by the researcher himself during 12 May to 29 July, 2015. To get valid and pertinent information, the researcher made all possible efforts to explain the purpose of the study to the respondents. Interviews were conducted with the respondents in their houses. While starting interview with any respondent, the researcher took all possible care to establish rapport with them so that they did not feel hesitant to furnish proper responses to the questions and statements in the schedule. The questions were clearly explained wherever the respondent felt any difficulty in understanding properly. Before data collection Sub Assistant Agricultural Officer (SAAO) of Koyra upazila extended necessary help and cooperation in connection with data collection.

3.6 Compilation of Data

After completion of field survey, data from the interview schedule were compiled, tabulated and analyzed according to the objectives of the study. In this process, all the responses in the interview schedule were given numerical code values. Local units of measurement were converted into standard units. The responses to the questions in the interview schedule were transferred to master sheet to facilitate tabulation. As soon as the data were entered into the computer, these were analyzed in accordance with the objectives of the study.

3.7 Categorization of Data

For describing the independent and dependent variables, the respondents were classified into appropriate categories. In developing of categories, the investigator was guided by the nature of data and general considerations prevailing in the social system.

3.8 Variables and their Measurement

In a descriptive social research, the selection of variables constitutes an important task. In this connection, the investigator looked into the literature to widen his understanding about the nature and scope of the variables involved in the research study. A variable is any characteristic which can assume varying or different values in successive individual cases (Ezekiel and Fox, 1959). A well organized piece of research usually contains at least two important variables, *viz.* an independent and a dependent variable. An independent variable is that factor which is manipulated to ascertain the relationship to an observed phenomenon. A dependent variable varies as the experiment introduce, removes or varies with the independent variables (Townsend, 1953).

3.8.1 Measurement of independent variables

Ten characteristics of IPM trained farmers were selected as independent variables of this study namely age, education, number of family members, annual family income, farm size, training received, organizational participation, knowledge on IPM practices, constraints faced by the farmers in using IPM practices and farmer awareness about environmental pollution. Procedures for measuring the independent characteristics are briefly discussed below:

3.8.1.1 Age

Age of the respondents was measured in terms of actual years from their birth to the time of interview. For instance, if a farmer was born 30 years ago from the time of interview then his/her actual age was counted as 30 years old.

3.8.1.2 Education

Education was measured as the ability of an in individual respondent to read and write or the formal education received up to a certain standard. A score of one (1) was given for each year of successful schooling and zero (0) to that respondent who can sign his name only and did not know how to read and write because he/she had not a successful schooling. If a respondent passed the S.S.C examination, his education score was given as 10, if passed the final examination of class seven (VII), his education score was given as 7.

3.8.1.3 Family size

Family size of a farmer was determined on the basis of the total number of members in his/her family. The family members included farmer himself/herself, spouse, sons, daughter and other dependents. The scoring was made by the actual number of family members expressed by the respondents. For example, if a respondent had five members in his/her family, his/her score was given as 5.

3.8.1.4 Annual family income

This variable is measured by the total income by a respondent and other members of his/her family from agricultural and non-agricultural sources. Family income was measured in ‘taka’ on the basis of previous year.

3.8.1.5 Farm size

Farm size refers to the total cultivated area either owned by a farmer or obtained from others on share cropping system or taken from others as mortgage/borga where he/she used to do his/her farming operations during the period of this study.

The farm size of the respondent was computed by using the following formula:

$$F_s = A_1 + A_2 + 1/2\ (A_3 + A_4) + A_5$$

Where

F_s = Farm size

A_1 = Homestead area (Including pond)

A_2 = Own land under own cultivation

A_3 = Land given to others as borga

A_4 = Land taken from others as borga

A_5 = Fallow land

3.8.1.6 Training received

It was measured by the total number of days that a respondent has undertaken agricultural training in his/her entire life from different organizations under various agricultural training programmes. A score of one (1) was assigned for each day of training received. For example, if a respondent had five days training experience, his/her score was given as five (5).

3.8.1.7 Organizational participation

Organizational participation of a respondent was measured on the basis of the nature of his/her involvement and duration of participation in different organizations during the time of interview. Organizational participation score was computed in the following manner for participation in each organization.

Participation score was computed in the following manner:

Nature of participation	**Scores assigned**
No participation	0
Participation as ordinary member	1
Participation as executive committee member	2
Participation as executive committee officer	3

Organizational participation (OP) score of a respondent was computed by using the following formula:

$$OP = P_{OM}NY + P_{ECM}NY + P_{ECO}NY$$

Where,

OP = Organizational participation

P_{OM} = Participation as ordinary member

P_{ECM} = Participation as executive member

P_{ECO} = Participation as executive committee officer

N = Number of organization

Y = Duration of participation in year

3.8.1.8 Knowledge on IPM practices

Integrated Pest Management (IPM) knowledge of a respondent was measured by using 15 different kinds of questions in relation to various pest management strategies. It was measured in scores. A respondent was given full score for correct response. However, partial score was given for partially correct response and a 'zero' score was given for wrong or no answer. The summation of score obtained by a respondent was the knowledge score of the respondent. The IPM knowledge score could range from 0 to 30 where '0' indicating no IPM knowledge and '30' indicating the highest IPM knowledge.

3.8.1.9 Constraints faced by the farmers in using IPM practices

Constraints faced by the farmers in using IPM practices were measured on the basis of 13 possible common problems which the farmers faced in using IPM practices. On the basis of the main aspect, the researcher selected problems by visiting the study area, discussing with the farmers and local leaders at the time of collecting data. Besides, the researcher discussed with the Agriculture

Extension Officer, Sub Assistant Agriculture Officer (SAAO) and other related persons of the respective study area. Each farmer indicated the extent of constraints caused by each of the problems by checking any one of the following four responses. These were high, medium, low and not at all. Scores were assigned on the basis of the following manner:

Extent Of constraints	**Score assigned**
High	3
Medium	2
Low	1
Not at all	0

The scores for responses against all the 13 problems were added together to obtain one's constraint score. Therefore, constraint score of the respondents could range from 0 to 39 where '0' indicated no constraint facing and '39' indicated highest constraints facing.

Constraint Facing Index (CFI) was computed taking 13 selected constraints and by using the following formula:

Constraint Facing Index (CFI) = C_h x 3 + C_m x 2 + C_l x 1 + C_n x 0

Where,

C_h = Total number of responses indicating high constraint facing

C_m = Total number of responses indicating medium constraint facing

C_l = Total number of responses indicating low constraint facing

C_n = Total number of responses indicating no constraint facing

3.8.1.10 Farmers' awareness about environmental pollution

Farmers' awareness about environmental pollution was measured by checking 10 statements as true or false. A score of one (1) was given for each correct

response and a score of zero (0) was given for each incorrect response. Thus, total score of a respondent could vary from 0 to 10 where 0 indicated that the respondent was not aware about environmental pollution and 10 indicated that the respondent had good awareness about environmental pollution.

3.8.2 Measurement of dependent variable

Farmers' perception on the effect of IPM was the dependent variable of the study. On the basis of this main aspect, the researcher obtained knowledge by visiting the study area, discussing with the farmers and local leaders at the time of collecting data. Besides, the researcher discussed with the Agriculture Extension Officer, Sub Assistant Agriculture Officer (SAAO) and other related persons of the respective study area.

Farmers' perception on the effect of IPM was measured on the basis of l5 common perception statements which the farmers faced on environment friendly IPM practices. Each farmer indicated the extent of farmers' perception on the effect of IPM by checking any one of the following four responses.

These were strongly agree, agree, disagree and strongly disagree. Scores were assigned in the following manner:

Extent of farmers' perception	**Score assigned**
Strongly agree	4
Agree	3
Disagree	2
Strongly disagree	1

The scores for responses against all the 15 perceptions were added together to obtain one's perception score. Therefore, perception score of the respondents could range from 15 to 60.

Farmers' Perception Index (FPI) was computed taking 15 selected farmers' perception on environment friendly IPM practices by using the following formula:

Farmers' Perception Index (FPI) = P_{sa} x 4 + P_a x 3 + P_d x 2 + P_{sd} x 1

Where,

P_{sa} = Total number of responses indicating perception as strongly agree

P_a = Total number of responses indicating perception as agree

P_d = Total number of responses indicating perception as disagree

P_{sd} = Total number of responses indicating perception as strongly disagree

3.9 Statement of the Hypothesis

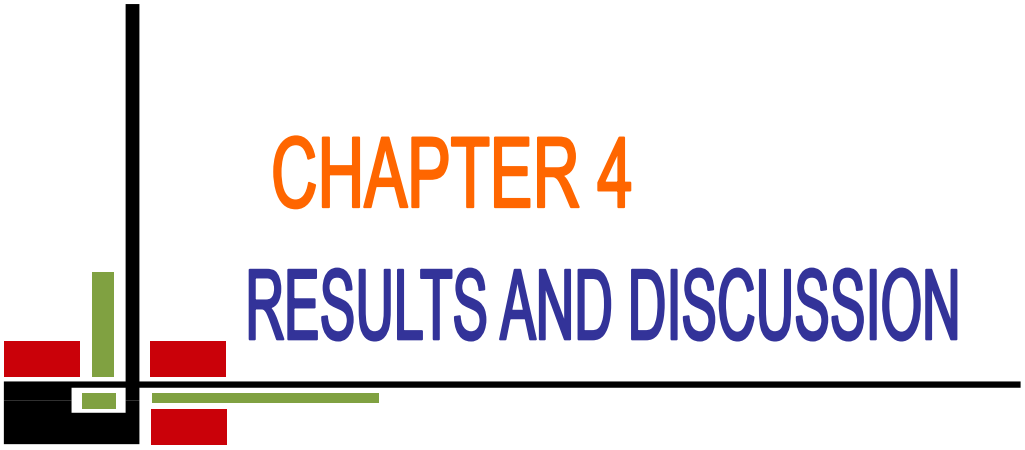
A hypothesis is a conjectural statement of the relations between two or more variables. Hypothesis is always in declarative sentence form and they relate either generally or specially, variables to variables. As defined by Goode and Hatt (1952) "A hypothesis is a proposition which can he put to a test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test." The following hypothesis was considered to explore the relationship between the dependent and independent variables. The major research hypothesis for the study was:

There was relationship between farmers' perception and their selected characteristics including age, education, number of family member, annual family income, farm size, training received, organizational participation, knowledge on IPM practices, constraints faced by the farmers in using IPM practices, awareness of farmer about environmental pollution. If a null hypothesis was rejected on the basis of statistical test, it was assumed that there

was a relationship between the concerned variables. And if the null hypothesis was not rejected, it was assumed that there was no relationship between the farmers' perception on the effect of IPM and their selected characteristics.

3.10 Statistical Treatment

The data after collection were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures such as range, mean, percentage, standard deviation were used in categorizing and describing the selected personal characteristics of the respondents. For clarity of understanding tables were used for presentation of data. Coefficient of correlation (r) test was used to explore the relationships between independent and dependent variables. Throughout the study five percent (0.05) level of probability and one percent (0.01) level of probability were used to reject any null hypothesis.



CHAPTER 4

RESULTS AND DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter, the findings of the study and interpretation of the results have been presented according to the objectives of the study. This chapter has been divided into four sections. The first section deals with the selected individual characteristics of the farmers while the second section deals with the extent of farmers' perception on the effect of IPM. The third section deals with the constraints faced by the farmers in using IPM practices. Finally, in the fourth section, the relationships between the farmers' selected characteristics and their extent of perception on the effect of IPM has been discussed.

4.1 Selected Characteristics of the Farmers (Independent variables)

In this section the findings of the farmers' selected characteristics have been discussed. The selected characteristics are i) Age ii) Education iii) Family size iv) Annual family income v) Farm size vi) Training received vii) Organizational participation viii) Knowledge on IPM practices ix) Constraints faced by the farmers in using IPM practices x) Farmers' awareness about environmental pollution. The salient features of the characteristics of the farmers were shown in Table 4.1.

Table 4.1 Salient features of the characteristics of farmers (N = 100)

Sl. No.	Selected characteristics	Scoring system	Range		Categories	Respondent		Mean	SD
			Possible score	Observed score		Number	Percent (%)		
i	Age	Actual years		20-65	Young (up to 35) Middle (36 to 50) Old (> 50)	37 48 15	37 48 15	40.67	10.73
ii	Education	Years of schooling		0-12	Illiterate (0) Primary level (1 to 5) Secondary level (6 to 10) Higher secondary (11-12)	4 72 22 2	4 72 22 2	4.34	2.71
iii	Family size	No. of members		3-11	Small (up to 4) Medium (5 to 7) Large (> 7)	45 46 9	45 46 9	5.09	1.62
iv	Annual family income	Tk		45000-250000	Low (up to 60000) Medium (60001-140000) High (> 140000)	10 75 15	10 75 15	97930.0	40413.3
v	Farm size	Hectre		0.067–3.80	Small (0.2 to 1.0) Medium (1.01 to 3.0) Large (> 3.0)	57 39 4	57 39 4	1.02	0.76
vi	Training received	Days		0-16	No training Very low (up to 5) Low (6 to 11) Medium (> 11)	56 7 18 19	56 7 18 19	4.64	5.98
vii	Organizational participation	Rated score		1-8	Low (up to 3) Medium (4 to 8)	31 69	31 69	3.79	1.05
viii	Knowledge on IPM practices	Rated score	0-30	13-28	Low (up to 18) Medium (19 to 23) High (> 23)	17 43 40	17 43 40	21.42	3.00
ix	Constraints faced by the farmers in using IPM practices	Rated score	0-39	16-36	Low (up to 22) Medium (23 to 29) High (> 29)	44 43 13	44 43 13	23.84	4.70
x	Farmers' awareness about environmental pollution	Rated score	0-10	6-10	Medium (6 to 8) High (> 8)	66 34	66 34	8.12	1.04

4.1.1 Age

Age of the respondent farmers was found to range from 20 to 65 years. The average age was 40.67 years with the standard deviation of 10.73. Based on their age, the farmers were classified into three categories namely “young”, “middle” and “old” aged as shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Respondents		Mean	SD
	Number	Percent		
Young (up to 35)	37	37	40.67	10.73
Middle aged (36 to 50)	48	48		
Old (> 50)	15	15		
Total	100	100		

Data furnished in Table 4.2 indicate that the highest proportion (48 percent) of the respondents fell in the middle age, while 37 percent and 15 percent belonged to young and old age categories respectively.

However, data also revealed that 85 percent of the respondents in the study area were young to middle aged. Young people are generally receptive to new ideas and things. Again they are very conscious about environment problem. However, they might have valuable opinion in regard to the extent of perception on the effect of IPM.

4.1.2 Education

The education score of the respondents ranged from 0 to 12 with the average of 4.34 and the standard deviation was 2.71. Based on their educational score, the farmers were classified into four categories namely “illiterate”, “primary level”, “secondary level” and “higher secondary level” as shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their education

Categories	Respondents		Mean	SD
	Number	Percent		
Illiterate (0)	4	4	4.34	2.71
Primary level (1 to 5)	72	72		
Secondary level (6 to 10)	22	22		
Higher secondary level (11-12)	2	2		
Total	100	100		

The data indicate that the majority (72 percent) of the farmers had primary level of education while 22 percent farmers had secondary level of education, 4 percent illiterate and 2 percent higher secondary level of education. At present the literacy rate of the country is 62.3 percent (Bangladesh Economic Review-2015). Thus the findings revealed that the literacy rate in the study area seems to be higher than the national average.

The study revealed that most of the farmers of the study area were educated at primary level but they could not take higher education. The main reason behind that in that study area there were many primary schools but there was no higher educational institute in the past. So after completing primary education most of them gave up education and earned their livelihood. Again lack of awareness and unfriendly teaching environment dropped out off them from education so that they couldn't take higher education.

The result also showed that if the farmer had more educational status then he/she had a more positive and favourable perception about environment friendly IPM practices. Educated farmers of this locality gave priority for production of crops without using chemical fertilizer which was harmful for both health and environment. They frequently used cowdung, animal and plant residues as organic fertilizer for their crop production. Finally education

develops mental and psychological ability of a person to understand, decide and adopt new practices and ideas. Hence, it is expected that education is one of the important factors in determining the extent of farmers' perception on the effect of IPM.

4.1.3 Family size

The family size ranged from 3 to 11 with the average of 5.09 and the standard deviation was 1.62. Based on the family size score the respondents were classified into three categories namely "small family", "medium family", and "large family" as shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their family size

Categories	Respondents		Mean	SD
	Number	Percent		
Small family (up to 4)	45	45	5.09	1.62
Medium family (5 to 7)	46	46		
Large family (> 7)	9	9		
Total	100	100		

The data in Table 4.4 indicate that majority (46 percent) of the respondents fell into medium family size category, while 45 and 9 percent had small and large family size respectively. However, 91 percent of the respondents had small to medium family size.

The data of this study also indicate that the average family size (5.09 persons) in the study area was higher than the national average of 4.85 persons (BBS, 2015). This may be due to the prevalence of joint family system in the study area. The study showed that the study area was in a remote village where family bonding was very common and they wanted to live together so that their

family size was bigger. But at present their families become smaller for taking family planning and modern education.

4.1.4 Annual family income

Annual family income score of the respondents ranged from Tk. 45000 to Tk. 250000 with the average of Tk. 97930.0 and the standard deviation was Tk. 40413.3. On the basis of the annual income, the respondents were classified into three categories namely “low income”, “medium income”, and “high income” as shown on Table 4.5.

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

Categories	Respondents		Mean	SD
	Number	Percent		
Low income (up to 60000)	10	10	97930.0	40413.3
Medium income (60001-140000)	75	75		
High income (> 140000)	15	15		
Total	100	100		

Data presented in Table 4.5 indicate that the highest proportion (75 percent) of the respondents had medium annual income, while 10 percent had low income and 15 percent had high income. As a result, the most (90 percent) of the respondents in the study area were medium to high income earners.

The average income of the respondents in the study area was less than the average per capita income of the country i.e. 1314 U.S. dollar (Bangladesh Annual Budget, 2015-2016). This might be due to the fact that the study area was badly affected by natural calamities named Sidor and Ayla in 2007 and 2009 respectively. The study area had low agricultural land for crop cultivation because it was the southern coastal part of the country and salinity was the big

problem there. Generally the farmers of that locality earned their livelihood by farming along with other business but that was not so profitable and their annual income was lower than the average per capita income of the country.

However, higher annual income of the respondents allow them to invest more in farming operations which ultimately leads them to come in contact with media. Therefore, it can be inferred that more the annual income possessed by the respondent, higher would be favourable extent of perception on the effect of IPM.

4.1.5 Farm size

The farm size of the farmers in the study area varied from 0.067-3.80 hectares (ha.). The average farm size was 1.02 ha and the standard deviation was 0.76. This farm size average was higher than the national average of 0.91 hectare (BBS, 2013). Based on the farm size, the respondents were classified into three categories (according to DAE, 1999) namely “small farm size”, “medium farm size” and “high farm size” as shown in Table 4.6.

Table 4.6 Distribution of the farmers according to their farm size

Categories	Respondents		Mean	SD
	Number	Percent		
Small farm size (0.2 to 1.0 ha)	57	57	1.02	0.76
Medium farm size (1.01 to 3.0 ha)	39	39		
Large farm size (> 3.0 ha)	4	4		
Total	100	100		

The Table 4.6 shows that the highest proportion (57 percent) of the respondents belonged to small farm size, while 39 percent belonged to medium farm size

and 4 percent belonged to large farm size. Thus most (96percent) of the farmers were in the categories of small to medium farm size.

The study revealed that most of the farmers of the study area were poor and they had a little land for crop production. They preferred environment friendly IPM practices as they didn't sell their crops at market rather they consumed it by themselves. They were very conscious about their health. As they knew chemical fertilizer causes health hazard as well as environment hazard they frequently used organic fertilizer for their crop production.

4.1.6 Training received

Training received scores of the respondents were found to be varying from 0 to 16 days with the average of 4.64 and the standard deviation was 5.98. The farmers on the basis of their training received score were classified into three categories namely "no training received", "very low training received", "low training received", "medium training received" as shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their training received

Categories	Respondents		Mean	SD
	Number	Percent		
No training received (0)	56	56	4.64	5.98
Very low training received (1 to 5)	7	7		
Low training received (6 to 11)	18	18		
Medium training received (> 11)	19	19		
Total	100	100		

The Table 4.7 shows that the highest proportion (56 percent) of the respondents belonged to no training received, while 18 percent belonged to low training received and 19 percent belonged to medium training received category.

The study revealed that most of the farmers of that locality remained busy in different activities of earning and they didn't take proper training for agricultural crop production. Generally the farmers sent their wives in the training center so that their wives took training and cultivated crops in their homestead area by IPM practices.

However, training received helps the respondents in different farming activities. Thus, training received can be considered as important factors in increasing the extent of farmers' perception on the effect of IPM.

4.1.7 Organizational participation

The observed organizational participation score of the respondents ranged from 1 to 8. The mean score was 3.79 with the standard deviation 1.05. Based on the organizational participation scores, the respondents were classified into two categories namely "low organizational participation" and "medium organizational participation" as shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their organizational participation

Categories	Respondents		Mean	SD
	Number	Percent		
Low organizational participation (up to 3)	31	31	3.79	1.05
Medium organizational participation (4 to 8)	69	69		
Total	100	100		

Data contained in Table 4.8 revealed that the highest proportion (69 percent) of the respondents had medium organizational participation and 31 percent of the respondents had low organizational participation.

Organizational participation helps an individual to find out solutions to their own problems as well as other social issues. A great majority of the farmers in the study area had less organizational participation. The study revealed that farmers felt less interest in organizational participation. Again their education level was not so high and they felt hesitate in organizational participation. They were busy in earning their livelihood, so most of the farmers were indifferent in organizational participation. More organizational participation could create coordinated capability and capacity to adopt environmental friendly IPM practices.

4.1.8 Knowledge on IPM practices

Scores of knowledge on IPM practices of the respondents could range from 0 to 30 while the observed scores ranged from 13 to 28. The mean score was 21.42 with the standard deviation 3.00 as shown in Table 4.9. Based on their knowledge on IPM practices, the respondents were classified into three categories namely “low knowledge”, “medium knowledge” and “high knowledge” as shown in Table 4.9.

Table 4.9 Categories of farmers based on the knowledge on IPM practices

Possible range	Observed range	Categories	Farmer		Mean	SD
			Number	Percent		
0-30	13-28	Low (up to 18)	17	17	21.42	3.00
		Medium (19 to 23)	43	43		
		High (above 23)	40	40		
		Total	100	100		

Data contained in the table 4.9 indicate that the highest proportion (43 percent) of the farmers had medium knowledge while 40 percent had high knowledge and 17 percent had low IPM knowledge. Findings showed that majority (83

percent) of the farmers possessed medium to high level of knowledge on various aspects of IPM.

The study showed that most of the farmer of the study area was more or less had some educational quality and they were very conscious about environment problem. Many NGO and other government organizations gave different environment knowledge after the natural calamities as the study area was badly affected and infected by natural calamities named Sidor and Ayla in 2007 and 2009 respectively. Again most of the farmers of the study area were poor and they had little land for crop production. They preferred environment friendly IPM practices as they didn't sell their crops at market rather they consumed it by themselves. They were very conscious about their health. As they knew chemical fertilizer causes health hazard as well as environmental hazard they frequently used organic fertilizer for their crop production. Finally different mass media as well as training received from the training center increased their IPM knowledge for crop production.

4.1.9 Constraints faced by the farmers in using IPM practices

Scores of constraints faced by the farmers in using IPM practices of the respondents could range from 0 to 39 while the observed scores ranged from 16 to 36. The mean score was 23.84 with the standard deviation 4.70 as shown in Table 4.10. Based on constraints faced by the farmers in using IPM practices, the respondents were classified into three categories namely "low constraints faced", "medium constraints faced" and "high constraints faced" as shown in Table 4.10.

Table 4.10 Categories based on the constraints faced by the farmers in using IPM practices

Possible range	Observed range	Categories	Farmers		Mean	SD
			Number	Percent		
0-39	16-36	Low (up to 22)	44	44	23.84	4.70
		Medium (23 to 29)	43	43		
		High (above 29)	13	13		
		Total	100	100		

Data contained in the table 4.10 indicate that the highest proportion (44 percent) of the farmers faced low constraints while 43 percent faced medium constraints and 13 percent faced high constraints in using IPM practices. Findings show that most (87 percent) of the farmers were in the categories of low to medium constraints in using IPM practices.

The study showed that most of the farm families had livestock as well as forest resources in their homestead area. So there was a huge availability of organic material for their crop production. Generally they grew crops in their homestead area so they could take proper care of their crops. Again training facility, credit facility, availability of leaflets, booklets etc. about IPM increased their IPM knowledge and as a result farmers faced less constraints in IPM practices.

4.1.10 Farmers' awareness about environmental pollution

Scores of farmers' awareness about environmental pollution could range from 0 to 10 while the observed scores ranged from 6 to 10. The mean score was 8.12 with the standard deviation 1.04 as shown in Table 4.11. Based on farmers' awareness about environmental pollution, the respondents were classified into two categories namely "medium awareness", and "high awareness" as shown in Table 4.11.

Table 4.11 Categories of farmers based on the farmers' awareness about environmental pollution

Possible range	Observed range	Categories	Farmer		Mean	SD
			Number	Percent		
0-10	6-10	Medium (6 to 8)	66	66	8.12	1.04
		High (above 8)	34	34		
		Total	100	100		

Data contained in the table 4.11 indicate that the highest proportion (66 percent) of the farmers had medium awareness about environmental pollution while 43 percent had high awareness about environmental pollution.

The study showed that most of the farmers of the study area were poor and they had a little land for crop production. They preferred environment friendly IPM practices as they didn't sell their crops at market rather they consumed it by themselves. They were very conscious about their health. As they knew chemical fertilizer causes health hazard as well as environment hazard they frequently used organic fertilizer for their crop production. Besides that different mass media and training facility increased their awareness about environment friendly sustainable production.

4.2 Farmers' perception on the effect of IPM

Farmers' perception on the effect of IPM is measured by computing a perception score which could range from 15 to 60. However, the observed scores ranged from 34 to 58 with an average of 46.33 and the standard deviation was 5.59. Based on their observed perception score the respondents are classified into three categories namely "low perception", "medium perception" and "high perception" as shown in Table 4.12.

Table 4.12 Categories of farmers based on their perception

Possible range	Observed range	Categories	Farmer		Mean	SD
			Number	Percent		
15-60	34-58	Low perception (up to 42)	24	24	46.33	5.59
		Medium perception (43-50)	53	53		
		High perception (above 51)	23	23		
		Total	100	100		

Data contained in the table 4.12 indicate that the majority (53 percent) of the respondents had medium favourable perception while 24 percent of them had low favourable perception and 23 percent of them had high favourable perception towards the effect of IPM. Since most (94 percent) of the farmers of the study area had primary level education and secondary level education. So their observation and experience gave them such type of perception of the topic. The study conducted by Sayeed (2002) and Islam (2000) supported this study.

Farmers' perception on the effect of IPM was investigated in this research. The extent of agreement against each statement as perceived by the farmers was assessed in this regard. Perception score for each statement was calculated by using perception index (PI) and it has been arranged in rank order according to their extent of agreement which appears in Table 4.13. Perception index (Pl) was found to vary from 260 to 369.

Table 4.13 Statement-wise farmers' perception on the effect of IPM

Sl no.	Statements	Extent of perception				FPI	Rank Order
		Strongly agree	Agree	disagree	Strongly disagree		
i	Environment friendly IPM practices are very essential because persistent of toxic pesticides like DDT, Heptachlor etc. in the environment for many years causes health hazard and environment pollution.	33	67	0	0	333	5
ii	Pesticides applied in crop fields being washed to pond, canals and rivers cause environment pollution.	9	85	6	0	303	8
iii	Organic fertilizer is essential because continuous pesticides application in crop fields increase resistance to insect-pest which is harmful for agricultural environment.	39	61	0	0	339	4
iv	Application of pesticides in crop fields causes death of beneficial and pollinating insects like spider, wasp, bees etc. which is very harmful for agricultural environment.	11	81	7	1	302	9
v	Use of organic fertilizer in crop fields increases beneficial organisms like earthworms, frogs, snakes etc. which is essential for agricultural environment.	45	55	0	0	345	3
vi	Avoid of insecticides application is necessary because most of the insecticides cause death and health hazards to the domestic animals and poultry birds if applied carelessly in homestead vegetable gardens and crop fields which is ultimately harmful for agricultural environment.	5	57	31	7	260	15

vii	Application of toxic pesticides in rice-fish culture fields causes death of fish species which is harmful for agricultural environment.	13	82	5	0	308	7
viii	Application of toxic pesticides two or three days before harvesting of vegetables may cause death hazards of the consumers which is harmful For public health and environment.	14	71	15	0	299	10
ix	Environment friendly IPM practices is very essential because some pesticides and residues can exist in human body and work as slow poison likes pops polio.	7	81	10	2	293	11
x	Application of toxic insecticides in irrigated crop fields cause water pollution which ultimately cause pollution in canals, ponds, rivers etc.	6	62	22	10	264	13
xi	Use of Bio-fertilizer in crop production is useful for soil environment internally which makes the soil productive.	70	29	1	0	369	1
xii	Inhalation of toxic insecticides causes cancer and other diseases to human being which is harmful for public health and environment.	19	75	6	0	313	6
xiii	Indiscriminate use of toxic insecticides causes the reduction of some bird species which is harmful for environment due to break down of ecological balance.	7	78	14	1	291	12
xiv	Environment friendly IPM practices can reduce many fatal diseases like cancer, skin diseases, eye irritation, breathing trouble, diarrhoeal disease etc. and make pollution free environment.	2	73	11	14	263	14
xv	IPM practices increase the crop yield if applied timely which is useful for safe environment.	56	44	0	0	356	2

Data contained in Table 4.13 show that “use of Bio-fertilizer in crop production is useful for soil environment internally which makes the soil productive” got the 1st rank among the statements. It was found that 70 percent of the respondents were strongly agreed and 29 percent of the respondents were agreed with the total PI 369.

“IPM practices increase the crop yield if applied timely which is useful for safe environment” got the second highest score and thus stood second in the rank order among the statements. It was found that 56 percent of the respondents were strongly agreed and 44 percent of the respondents were agreed with the total PI 356.

“Use of organic fertilizer in crop fields increases beneficial organisms like earthworms, frogs, snakes etc. which is essential for agricultural environment” got the third highest score and thus stood third in the rank order among the statements. It was found that 45 percent of the respondents were strongly agreed and 55 percent of the respondents were agreed with the total PI 345.

“Avoid of insecticides application is necessary because most of the insecticides cause death and health hazards to the domestic animals and poultry birds if applied carelessly in homestead vegetable gardens and crop fields which is ultimately harmful for agricultural environment” got the least score and thus stood last in the rank order among the statements. It was found that 5 percent of the respondents were strongly agreed, 57 percent of the respondents were agreed, 31 percent of the respondents were disagreed and 7 percent of the respondents were strongly disagreed with the total PI 260.

4.3 Constraints faced by the farmers in using IPM practices

Constraints faced by the farmers in using IPM practices were investigated in this piece of research. Thirteen constraints were selected with the consultation of concerned personnel. The constraints score ranged from 16 to 36 against the possible range of 0 to 39. The average was 23.84 and standard deviation was 4.70 as shown in Table 4.10.

Data presented is Table 4.10 indicates that the majority (44 percent) of the farmers had low constraints while 43 percent had medium constraints and 13 percent faced high constraints.

In order to ascertain the extent of severity of constraints faced by the farmers in using IPM practices, Constraints Facing Index was computed. The Constraints Facing Index of any constraint could range from 0 to 390, where 0 indicated no constraint and 390 indicated the highest constraint. However, the computed Constraints Facing Index of the 13 problems ranged from 119 to 250 and has been arranged in rank order according to their constraint indices which appears in Table 4.14.

Table 4.14 Extent of constraints faced by the farmers in using IPM practice with their rank order

Sl no.	Constraints of farmers	Extent of Constraints				CFI	Rank Order
		High	Medium	Low	Not at all		
i	Lack of printed materials like leaflets, booklets etc. about IPM	3	41	55	1	146	11
ii	Lack of knowledge in using IPM	4	55	41		163	8
iii	Doubt about the effectiveness of IPM practices	6	45	49		157	10
iv	Expensive in using IPM practices	2	32	65	1	135	12
v	Absence of sufficient demonstration plots on IPM	6	65	29		177	6
vi	Lack of credit facilities for preparing IPM	5	62	33		172	7
vii	Time consuming in mechanical control of pest	39	60	1		238	2
viii	IPM practice requires regular monitoring	39	59	2		237	3
ix	Unavailability of organic fertilizer		23	73	4	119	13
x	Lack of training facility of IPM practices	35	64	1		234	4
xi	Biased selection for training	4	52	43	1	159	9
xii	Lack of experienced trainer	52	46	2		250	1
xiii	Training program was not organized in suitable time	11	74	15		196	5

Data in Table 4.14 show that “Lack of experienced trainer” got the highest score and hence it was considered as the 1st ranked constraint among the statements. It was found that 52 percent of the respondents faced high constraints with the total CFI 250. This is due to lack of training facility in that area.

“Time consuming in mechanical control of pest” got the second highest score and thus stood second in the rank order among the statements. It was found that 39 percent of the respondents faced high constraints with the total CFI 238. Farmer seemed IPM as a intensive care production method as it required more time to control pest from the crop field. On the other hand, farmer seemed that chemical pesticide works very rapidly and takes less time to control pest. Hence they found constraint to control of pest mechanically.

“IPM practice requires regular monitoring” got the third highest score and thus stood third in the rank order among the statements. It was found that 39 percent of the respondents faced high constraints with the total CFI 238. Farmer found that IPM was a labourious method because it required more labour to monitor the crop field regularly. Thus it created more production cost and they seemed it was a major constraint for IPM practices.

“Unavailability of organic fertilizer” got the least score and thus stood last in the rank order among the statements. It was found that 23 percent of the respondents faced medium constraints where 73 percent of the respondents faced low constraints and 4 percent of the respondents faced no constraints with the total CFI 119. Farmer found it was the least problem because organic fertilizer was available in village. Organic fertilizer as plant and animal residues are available in village and it is less costly in comparison with the chemical fertilizer. Moreover it is beneficial for sound health and does not create any environment hazard and it keeps environment balance.

4.4 Relationships between the farmers selected characteristics and their extent of perception on the effect of IPM

This section deals with the results exploring the relationship between the selected independent and dependent variables of the study. The independent variables were age, education, family size, annual family income, farm size, training received, organizational participation, knowledge on IPM practices, constraints faced by the farmers in using IPM practices, farmers' awareness about environmental pollution. And the dependent variable was the farmers' perception on the effect of IPM.

Pearson's product moment correlation co-efficient 'r' has been used to test the hypotheses concerning the relationships between the dependent and independent variables. Five percent (0.05) and one percent (0.01) level of probability were used as the basis for acceptance or rejection of a hypothesis. The result of co-efficient of correlation between the independent and dependent variables were presented in the table 4.15.

Table 4.15 Correlation between dependent and independent variables

(N = 100)

Dependent variable	Independent variables	Correlation co-efficient (r) with farmers' perception (N=100)
Farmers' perception on the effect of IPM	1. Age	0.069^{NS}
	2. Education	0.413^{**}
	3. Family size	0.058^{NS}
	4. Annual family income	0.227^{*}
	5. Farm size	0.367^{**}
	6. Training received	0.666^{**}
	7. Organizational participation	0.422^{**}
	8. Knowledge on IPM practices	0.771^{**}
	9. Constraints faced by the farmers in using IPM practices	-0.788^{**}
	10. Farmers' awareness about environmental pollution	0.787^{**}

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

Tabulated value of 0.05 level = 0.164
Tabulated value of 0.01 level = 0.254
Df = 98

Statistically significant and insignificant relationships were observed when the computed values of 'r' were higher and lower than the tabulated value respectively. However, the results of inter relationships among different independent and dependent variables are presented in *Appendix-II*.

4.4.1 Age and farmers' perception

The correlation coefficient between age of the farmers and their perception on the effect of IPM was "0.069" as shown in Table 4.15. The correlation coefficient between age and their perception on the effect of IPM was smaller than the tabulated values at 5 percent level of probability (Table 4.15). So the null hypothesis could not be rejected. Therefore, there was no relationship between age of the farmers and their perception on the effect of IPM. The respondents were well distributed among the age categories such as young, middle-aged and old that means farmers from all age categories and their perceptions on the effect of IPM were more or less equal. Thus, non-significant correlation was obtained in the present study. Similar relationships were revealed by Sarker (2007), Sayeed (2003), Chowdhury (2001), Islam (2000) and Hossain (2000).

4.4.2 Education and farmers' perception

The correlation coefficient between education of the farmers and their perception on the effect of IPM was "0.413" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between education and perception on the effect of IPM. Actually more educated farmers have more positive perception for environment friendly IPM practices which is less to the illiterate farmers. Therefore, farmers' perception on the effect of IPM was varied positively with the educational level of the farmers. Alam (2008), Sayeed (2003), Ferdous (2002) and Hossain (1999) also observed similar findings in their respective studies.

4.4.3 Family size and farmers' perception

The correlation coefficient between family size and their perception on the effect of IPM was "0.058" as shown in Table 4.15. The correlation coefficients

between family size and their perception on the effect of IPM was smaller than the tabulated values at 5 percent level of probability (Table 4.15). So the null hypothesis could not be rejected. Therefore, there was no relationship between family size and their perception on the effect of IPM. Sarker (2007), Afique (2006), Islam (2005), Uddin (2004), Sayeed (2003), Chowdhury (2001), Islam (2000) and Hossain (2000) also found that there was no relationship between family size of the farmers and their perception.

4.4.4 Annual family income and farmers' perception

The correlation coefficient between annual family income and their perception on the effect of IPM was "0.227" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.05 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between annual family income and their perception on the effect of IPM. So it could be said that family income played an important role in their perception. The farmers with more family income were likely to have more positive perception. The study conducted by Sayeed (2003) and Chintawar (1997) also observed similar findings in their respective studies.

4.4.5 Farm size and farmers' perception

The correlation coefficient between farm size of the farmers and their perception on the effect of IPM was "0.367" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between farm size and perception on the effect of IPM. This means the farmers with large farm size had more positive perception than the farmers with small farm size. Sarker (2007) and Uddin (2004) also observed similar findings in their respective studies.

4.4.6 Training received and farmers' perception

The correlation coefficient between training received of the farmers and their perception on the effect of IPM was "0.666" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between training received and their perception on the effect of IPM. This means that with the increase of training of the farmers, their perception on the effect of IPM was noticeably increased. Majlish (2007), Sarker (2007), Sana (2003), Kabir (2002), Fardous (2002) and Chowdhury (2001) also found similar relationships in their respective studies.

4.4.7 Organizational participation and farmers' perception

The correlation coefficient between organizational participation of the farmers and their perception on the effect of IPM was "0.422" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between organizational participation and perception on the effect of IPM. Higher the participation in different organization higher is the scope of exchanging information that leads to higher the level of perception on the effect of IPM. Rowsan (2004) also found similar relationships in his respective studies.

4.4.8 Knowledge on IPM practices and farmers' perception

The correlation coefficient between knowledge on IPM practices of the farmers and their perception on the effect of IPM was "0.771" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship

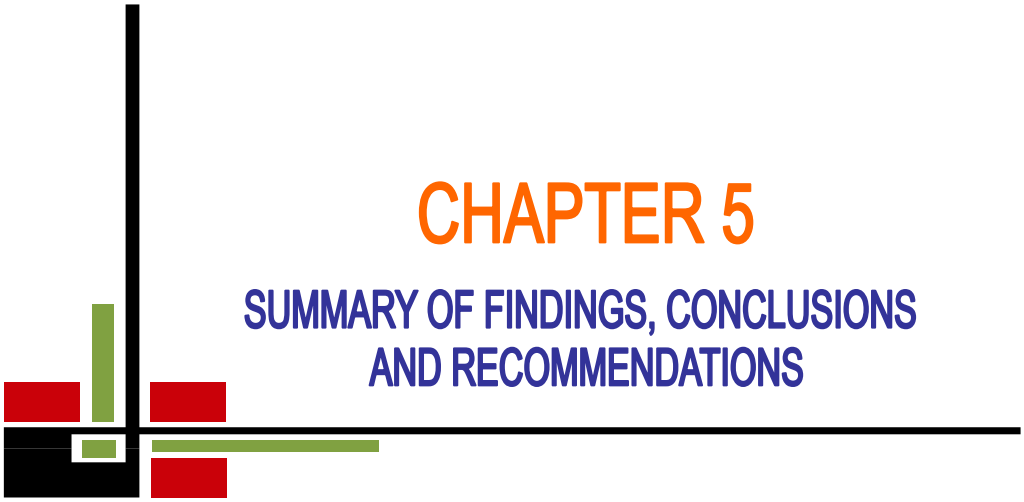
between knowledge on IPM practices and perception on the effect of IPM. This means that the farmers with high knowledge on IPM practices had more positive perception than the farmers with low knowledge on IPM practices. Sayeed (2003) also found similar relationships in his respective studies.

4.4.9 Constraints faced in using IPM practices and farmers' perception

The correlation coefficient between constraints faced by the farmers in using IPM practices and their perception on the effect of IPM was " – 0.788" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and negative relationship between constraints faced by the farmers in using IPM practices and their perception on the effect of IPM. This means the farmers with high constraints faced in using IPM practices had more negative perception than the farmers with low constraints faced in using IPM practices.

4.4.10 Farmers' awareness about environmental pollution and farmers' perception

The correlation coefficient between awareness of farmer about environmental pollution and their perception on the effect of IPM was "0.787" as shown in Table 4.15. The correlation coefficient "r value" was larger than the tabulated value at 0.01 percent level of probability. So, the concerned null hypothesis was rejected. Thus, it may be concluded that there was significant and positive relationship between farmers' awareness about environmental pollution and perception on the effect of IPM. This means that the farmers with high awareness about environmental pollution had more positive perception on the effect of IPM than the farmers with low awareness about environmental pollution.



CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

5.1.1 Selected characteristics of the farmers (Independent variable)

The major findings of the study are summarized below:

Age

Age of the farmers ranged from 20 to 65 years with the average of 40.67 years and the standard deviation was 10.73. Highest proportion (48 percent) of the farmers was under middle aged category.

Education

Education score of the respondents ranged from 0 to 12 with the average of 4.34 and the standard deviation was 2.71. Highest proportion (72 percent) of the farmers was under primary level of education.

Family size

The family size of the respondents ranged from 3 to 11 with the average of 5.09 and the standard deviation was 1.62. The majority of the respondents fell into medium (46 percent) family size category while 91 percent of the respondents had small to medium family size.

Annual family income

Annual income score of the respondents ranged from Tk. 45000 to Tk. 250000 with the average of Tk. 97930.0 and the standard deviation was Tk. 40413.3. The highest proportion (75 percent) of the respondents had medium annual

income while 90 percent of the respondents in the study area were medium to high income earners.

Farm size

The farm size of the farmers in the study area varied from 0.067-3.80 hectares (ha.). The average farm size was 1.02 ha. and the standard deviation was 0.76. The highest proportion (57 percent) of the respondents belonged to small farm size, while 96 percent of the farmers were in the categories of small to medium farm size.

Training received

Training received scores of the respondents were found to be varying from 0 to 16 days with the average of 4.64 and the standard deviation was 5.98. The highest proportion (56 percent) of the respondents belonged to no training received, while 81 percent of the farmers were in the categories of no training to low training received.

Organizational participation

The observed organizational participation scores of the respondents ranged from 1 to 8. The mean score was 3.79 with the standard deviation 1.05. The highest proportion (69 percent) of the respondents had medium organizational participation.

Knowledge on IPM practices

Scores of knowledge on IPM practices of the respondents could range from 0 to 30 while the observed scores ranged from 13 to 28. The mean score was 21.42 with the standard deviation 3.00. The highest proportion (43 percent) of the farmers had medium IPM knowledge while 83 percent of the respondents in the study area were medium to high knowledge on IPM practices categories.

Constraints faced by the farmers in using IPM practices

Scores of constraints faced by the farmers in using IPM practices of the respondents could range from 0 to 39 while the observed scores ranged from 16 to 36. The mean score was 23.84 with the standard deviation 4.70. The highest proportion (44 percent) of the farmers had low constraints while 87 percent of the farmers were in the categories of low to medium constraints in using IPM practices.

Farmers' awareness about environmental pollution

Farmers' awareness scores about environmental pollution of the respondents could range from 0 to 10 while the observed scores ranged from 6 to 10. The mean score was 8.12 with the standard deviation 1.04. The highest proportion (66 percent) of the farmers had medium awareness about environmental pollution.

5.1.2 Dependent variable

Scores of farmers' perception on the effect of IPM of the respondents could range from 15 to 60 while the observed scores ranged from 34 to 58. The mean score was 46.33 with the standard deviation 5.59. The highest proportion (53 percent) of the farmers had medium perception on the effect of IPM.

5.1.3 Constraints faced by the farmers in using IPM practices

As many as 13 constraints as mentioned by the respondents were ranked in order of their importance. The problems were as follows:

i. Lack of experienced trainer

ii. Time consuming in mechanical control of pest

iii. IPM practice requires regular monitoring

iv. Lack of training facility of IPM practices

v. Training program was not organized in suitable time

vi. Absence of sufficient demonstration plots on IPM

vii. Lack of credit facilities for preparing IPM

viii. Lack of knowledge in using IPM

ix. Biased selection for training

x. Doubt about the effectiveness of IPM practices

xi. Lack of printed materials like leaflets, booklets etc. about IPM

xii. Expensive in using IPM practices

xiii. Unavailability of organic fertilizer

5.1.4 Relationships between the farmers selected characteristics and their extent of perception on the effect of IPM

Out of ten independent variables, seven characteristics of the respondents such as Education, Annual family income, Farm size, Training received, Organizational participation, Knowledge on IPM practices and farmers' awareness about environmental pollution had significant positive relationship with their perception on the effect of IPM but the constraints faced by the farmers in using IPM practices was negatively correlated with their perception. The remaining independent variables *e.g.* age and family size did not show any significant relationship with their perception.

5.2 Conclusions

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

i. The results indicate that more than half (53 percent) of the respondents of the respondents had medium favorable perception and still there were some respondents (24 percent) who possessed low favourable perception of IPM. Thus, it is indicative that there is scope to take necessary steps to make them aware of the effect of IPM.

ii. The results indicate that a positive and significant relationship had been observed between education of the farmers and their perception on the effect of IPM. Education develops mental and psychological ability of average person to understand, decide and adopt new practices and ideas. This lead to the conclusion that any attempt to raise higher literacy level of the farmers would be helpful for increasing their perception on the effect of IPM.

iii. The results indicate that three fourth (75 percent) of the respondents had medium family income. Again more than half (57 percent) of the respondents had small land size. The results also indicate that annual family income and farm size of farmers had a positive and significant relationship with their perception. It plays a vital role in any socio-economic development of farmers. Therefore, it can be concluded that more the annual income and farm size possessed by the respondent, higher would be favourable extent of their perception on the effect of IPM.

iv. Training received and organizational participation of farmers had a positive and significant relationship with their perception. Training received and organizational participation help the respondents in different farming activities. Therefore, it can be concluded that more the training received and organizational participation by the respondents, higher would be favourable extent of their perception on the effect of IPM.

v. Majority (83 percent) of the respondents in the study area had medium to high knowledge on IPM practices. The results also indicate that knowledge on IPM practices of farmers had a positive and significant relationship with their perception. Therefore, it can be concluded that more the knowledge on IPM practices, higher would be favourable perception on the effect of IPM.

vi. The results indicate that a negatively significant relationship had been observed between constraints faced by the farmers in using IPM practices and their perception on the effect of IPM. Therefore, it can be concluded that less the constraints faced by the farmers in using IPM practices, higher would be favourable perception on the effect of IPM.

vii. The results indicate that more than half (66 percent) of the respondents had medium awareness and rest (34 percent) of the respondents had high awareness about environmental pollution. The results might be a good scenario to taking IPM practices for present and future. Therefore, it could be concluded that farmers of Bangladesh are in favour of adopting IPM practices.

5.3 Recommendations

5.3.1 Recommendations for policy implications

IPM system, which embodies a combination of many environmental friendly techniques of managing the crops and the pests that will help to reduce crop losses due to pests and lead to sustainable agriculture. A sound IPM policy will facilitate the spread of' the IPM knowledge on environmental awareness to the millions of farmers in Bangladesh. Agricultural degradation and environmental hazard will continue and will accelerate if proper and prompt measures are not taken through the integrated pest management. Based on the results and conclusions of the study the following recommendations are formulated:

i. Majority (53 percent) of the respondents had medium perception on the effect of IPM. So in order to increase perception it is necessary to motivate farmers. Department of Agricultural Extension (DAE) along with experts NGO representatives, different social media and mass media can play a crucial role in this regard.

ii. The study indicated that majority (72 percent) of the farmers had primary level of education. This low level of education might make them unable to manage the complex issues of integrated pest management system. Education develops mental and psychological ability of a person to understand, decide and adopt new practices and ideas. Therefore adult education and training participation may help them in this regard. Department of Agricultural Extension (DAE), NGO and government can play a key role in this regard.

iii. Majority of the farmers of the study area had medium annual income. Their income may increase by providing resistant good variety, organic fertilizer, proper irrigation facility, supplying electricity etc.

iv. The study indicated that farm size of farmers and training received by the farmers had a positive and significant relationship with their perception. So extension agencies should arrange environment related massive training to utilize farm properly.

v. The study indicated that majority (69 percent) of the farmers had medium level of organizational participation but no one had high level of organizational participation. So in order to increase organizational participation of farmers, cultural activities, food programme, monetary facility etc. should be done.

vi. Majority (43 percent) of the farmers of the study area had medium knowledge on IPM practices. So to increase knowledge on IPM practices, expert experienced trainer is prerequisite. Department of Agricultural Extension (DAE) along with experts NGO representatives, different social media and mass media can play a key role in this regard.

vii. The problems of the farmers to be solved through information or support services so that the farmers can easily use IPM for sustainable production.

viii. The study indicated that Majority of the farmers of the study area had medium awareness about environmental pollution. Awareness of the farmers can be increased by different social media, mass media, books, placard, leaflets, Department of Agricultural Extension (DAE), NGO etc. This awareness will help to reduce environmental hazard.

5.3.2 Recommendations for further study

A single research work is very inadequate to have in-depth understanding of the perception of IPM. Further studies should be undertaken covering more dimensions of the same issue. Therefore, the following suggestions are made for further research work:

i. The present study was conducted in Koyra upazila under Khulna district. It is recommended that similar studies should be conducted in other areas of the country.

ii. This study investigated the relationship of only ten characteristics of the farmers with their perception on the effect of IPM. Therefore, it is recommended that further study should be conducted with other independent and dependent variables.

iii. In the present study age and family size had no significant relationship with the perception on the effect of IPM. In this connection, further verification is necessary.

iv. Studies need to be undertaken to ascertain the principles and procedures for establishment and maintenance of serving organization in the rural areas of Bangladesh.

v. Further research is necessary to find out the effective ways and means of providing education including environmental issues as well as sustainable production to the farmers.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APPENDICES

APPENDICES

Appendix - I

AN ENGLISH VERSION OF THE INTERVIEW SCHEDULE

Department of Agricultural Extension & Information System

Sher-e-Bangla Agricultural University, Dhaka-1207

An Interview schedule for a research study entitled:

"Farmers' Perception on the Effect of IPM"

Serial no..... Date.....

Name of respondent **:** .....

Village **:**.....

Union **:**.....

Thana **:**.....

District **:**……...

(Please answer the following questions .Give tick (√) marks if necessary. Provided information will be kept confidently)

1. Age.....years

2. Sex

(a) Male

(b) Female

3. **Education**

Please mention your educational level:

a) Can't read and write……..

b) Can sign only ……...……..

c) Upto or equivalent to class .....

4. Family size

Please mention the number of your family member in the following groups:

a) Male member _____person

b) Female member _____ person

c) Total member _____person

d) Family member involved in agriculture _____person

5. Annual family income (Tk)

Please mention the production and income of your family from different sectors in the last year:

Sl no.	Source of income	Quantity of production	Price per unit (Tk)	Total (Tk)
A	Agriculture			
i	Rice			
ii	Potato			
iii	Jute			
iv	Pulse			
v	Fruits			
vi	Spices			
vii	Oilseed			
viii	Vegetables			
ix	Other crops			
x	Nursery			
xi	Fish culture			
xii	Poultry rearing			
xii	Cattle rearing(dairy)			
B	Business			
C	Service			
D	Labour			
E	Others			

Total annual income = A+B+C+D+E=……Tk

6. Farm Size

Please mention the area of your land possession:

Sl. no.	**Types of land ownership**	**Land Area**		**Total Area** (Hectare)
		Local unit	Hectare	
i	Homestead area (Including pond)			
ii	Own land under own cultivation			
iii	Land given to others as borga			
iv	Land taken from others as borga			
v	Fallow land			
	Total			

7. Training Received

Have you attended any agricultural training programme?

Yes……. No……..

If yes, please mention the following information:

Sl. No.	Name of the training course	Name of the organization	Duration of training (days)
i			
ii			
iii			
iv			
v			

8. Organizational participation

Please mention the nature and duration of your participation in the following organizations:

Sl. No.	Name of the organizations	Duration/Nature of the participation (yrs)			
		No Participation	Ordinary member	Executive Committee Member	Executive Committee Officer
i	Union parishad				
ii	Rural arbitration Committee				
iii	Youth Club				
iv	Cultural Organization				
v	School committee				
vi	Madrasa committee				
vii	Mosque/Temple Committee				
viii	Bazaar Committee				
ix	Cooperative Society				
x	Other				

9. Knowledge on IPM practices

Please answer the following question

Sl. no.	Questions	Full Marks	Marks Obtained
i	What do you mean by IPM (Integrated Pest Management)?	2	
ii	Mention two examples of biological control of pest	2	
iii	Mention two examples of mechanical control of pest	2	
iv	How to use green manure in crop cultivation?	2	
v	What are the benefits of Bio-fertilizer?	2	
vi	What are the advantages of crop rotation?	2	
vii	What is bamboo buster? What is done by it?	2	
viii	What are the characteristics of quality seed'?	2	
ix	What do you mean by resistant variety'?	2	
x	What is light- trap? Mention two insects which are controlled by the light trap'?	2	
xi	Name two local techniques of aphids' control	2	
xii	What is the benefit of cross-bar in the field to sit the birds?	2	
xiii	What are the advantages of weed management?	2	
xiv	How can you collect & destroy eggs of harmful insects?	2	
xv	How frog can help you in insect control?	2	
	Total number	30	

10. Constraints faced by the farmers in using IPM practices

Please mention the extent of constraints you faced in using IPM practices:

Sl. No.	Constraints of farmers	Extent of Constraints			
		High	Medium	Low	Not at all
A. Related to Information					
i	Lack of printed materials like leaflets, booklets etc. about IPM				
ii	Lack of knowledge in using IPM				
iii	Doubt about the effectiveness of IPM practices				
B. Related to Management					
iv	Expensive in using IPM practices				
v	Absence of sufficient demonstration plots on IPM				
vi	Lack of credit facilities for preparing IPM				
vii	Time consuming in mechanical control of pest				
viii	IPM practice requires regular monitoring				
ix	Unavailability of organic fertilizer				
C. Related to Training					
x	Lack of training facility of IPM practices				
xi	Biased selection for training				
xii	Lack of experienced trainer				
xiii	Training program was not organized in suitable time				

11. Farmers' awareness about environmental pollution

Please indicate your opinion as true or false about the following statements:

Sl. No.	Statements	Opinion	
		True	False
i	Excessive use of chemical fertilizers has great impact on soil physical properties and environmental pollution		
ii	Burning of cow dung, crop residues, grasses, leaves etc have no harmful effect on environment		
iii	Frequent outbreak of pest and diseases in crop field may cause environmental pollution		
iv	Indiscriminate cutting of plants and trees may cause environmental pollution		
v	Frequent refining of chemicals does not affect the environment		
vi	Increasing intensive cropping area does not affect the environment much		
vii	Lowering of water table and depletion of underground water may cause environmental pollution		
viii	Rapid unplanned and uncontrolled industrialization and urbanization decrease forest area and cause environmental pollution		
ix	Black smoke emission from agricultural machines and oil engines may cause environmental pollution		
x	Destruction of all forms of wild life may cause environmental Pollution		

12. Farmers' perception on the effect of IPM

Please indicate your opinion on the following harmful effect of chemical pesticide in crop production on environmental pollution:

Sl. No.	Farmers' perception	Extent of farmer's perception			
		Strongly agree	Agree	disagree	Strongly disagree
i	Environment friendly IPM practices are very essential because persistent of toxic pesticides like DDT, Heptachlor etc. in the environment for many years causes health hazard and environment pollution.				
ii	Pesticides applied in crop fields being washed to pond, canals and rivers cause environment pollution.				
iii	Organic fertilizer is essential because continuous pesticides application in crop fields increase resistance to insect-pest which is harmful for agricultural environment.				
iv	Application of pesticides in crop fields causes death of beneficial and pollinating insects like spider, wasp, bees etc. which is very harmful for agricultural environment.				
v	Use of organic fertilizer in crop fields increases beneficial organisms like earthworms, frogs, snakes etc. which is essential for agricultural environment.				
vi	Avoid of insecticides application is necessary because most of the insecticides cause death and health hazards to the domestic animals and poultry birds if applied carelessly in homestead vegetable gardens and crop fields which is ultimately harmful for agricultural environment.				
vii	Application of toxic pesticides in rice-fish culture fields causes death of fish species which is harmful for agricultural environment.				
viii	Application of toxic pesticides two or three days before harvesting of vegetables may cause death hazards of the consumers which is harmful For public health and environment.				

ix	Environment friendly IPM practices is very essential because some pesticides and residues can exist in human body and work as slow poison likes pops polio.				
x	Application of toxic insecticides in irrigated crop fields cause water pollution which ultimately cause pollution in canals, ponds, rivers etc.				
xi	Use of Bio-fertilizer in crop production is useful for soil environment internally which makes the soil productive.				
xii	Inhalation of toxic insecticides causes cancer and other diseases to human being which is harmful for public health and environment.				
xiii	Indiscriminate use of toxic insecticides causes the reduction of some bird species which is harmful for environment due to break down of ecological balance.				
xiv	Environment friendly IPM practices can reduce many fatal diseases like cancer, skin diseases, eye irritation, breathing trouble, diarrhoeal disease etc. and make pollution free environment.				
xv	IPM practices increase the crop yield if applied timely which is useful for safe environment.				

Thanks for your co-operation

_____

Signature of Interviewer

Date……

APPENDIX-II

Correlation co-efficient matrix of the dependent and independent variables (N = 100)

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	Y
X_1	1										
X_2	0.153	1									
X_3	0.138	-0.206*	1								
X_4	0.455**	0.312**	0.265**	1							
X_5	0.152	0.137	0.198*	0.541**	1						
X_6	-0.010	0.104	0.099	0.102	0.331**	1					
X_7	-0.009	0.435**	-0.013	0.202*	0.237*	0.215*	1				
X_8	-0.012	0.289**	0.048	0.207*	0.442**	0.679**	0.436**	1			
X_9	-0.042	-0.460**	0.015	-0.240*	-0.342**	-0.653**	-0.350**	-0.793**	1		
X_{10}	0.037	0.385**	0.102	0.296**	0.462**	0.728**	0.423**	0.772**	-0.798**	1	
Y	0.069	.413**	0.058	0.227*	0.367**	0.666**	0.422**	0.771**	-0.788**	0.787**	1

Note: *Significant at 0.05 level (tabulated value 0.164)

** Significant at 0.01 level (tabulated value 0.254)

Legend:

X_1 = Age

X_2 = Education

X_3 = Family size

X_4 = Annual family income

X_5 = Farm size

X_6 = Training received

X_7 = Organizational participation

X_8 = Knowledge on IPM practices

X_9 = Constraints faced by the farmers in using IPM practices

X_{10} = Farmers' awareness about environmental pollution

Y = Farmers' perception on the effect of IPM