USE OF INTEGRATED PEST MANAGEMENT PRACTICES BY THE FARMERS OF KALIA UPAZILA UNDER NARAIL DISTRICT

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USE OF INTEGRATED PEST MANAGEMENT PRACTICES BY THE FARMERS OF KALIA UPAZILA UNDER NARAIL DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled **"USE OF INTEGRATED PEST MANAGEMENT PRACTICES BY THE FARMERS OF KALIA UPAZILA UNDER NARAIL DISTRICT"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science** in **Agricultural Extension**, embodies the result of a piece of *bona fide* research work carried out by **Debashish Das**, Registration No. 07-02515 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:
Dhaka, Bangladesh

Prof. Dr. Md. Sekender Ali
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DEDICATED
TO
MY BELOVED
PARENTS

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The Author

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ACRONYMS AND ABBREVIATIONS

BAU Bangladesh Agricultural University

BBS Bangladesh Bureau of Statistics

BARI Bangladesh Agricultural Research Institute

DAE Department of Agricultural Extension

et al. All others

etc. et cetera, and the other

FAO Food and Agriculture Organization

SO Scientific Officer

SPSS Statistical Package for Social Science

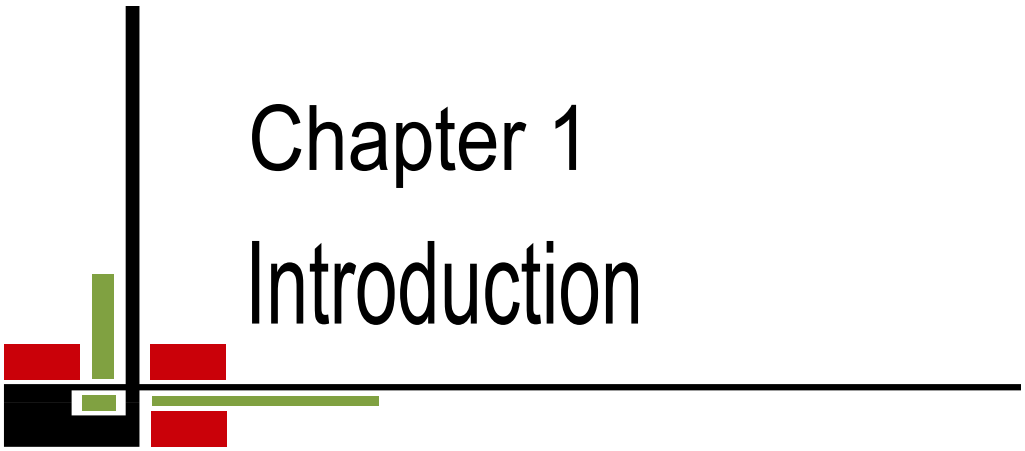
SAAO Sub-Assistant Agriculture Officer

SAU Sher-E-Bangla Agricultural University

USE OF INTEGRATED PEST MANAGEMENT PRACTICES BY THE FARMERS OF KALIA UPAZILA UNDER NARAIL DISTRICT

ABSTRACT

The purpose of this study was to determine the extent use of IPM practices by the farmers and to explore the relationship of the selected characteristics of the farmers with their use of IPM practices. The selected characteristics were age, education, farm size, annual family income, training exposure on IPM practices, farming experience, extension contact, problem faced in IPM practices, knowledge on IPM practices an IPM practices and attitude towards IPM practices. Data were gathered from 103 farmers of four villages of Joynagar and Khasial Union of Khalia Upazila under Narail district by using a pretested interview schedule during the period from 20 May to 30 June, 2015. For harmonious representation from each village 10 percent farmers were selected as the sample by using proportionate random sampling method. Pearson's Product Moment Co-efficient of Correlation was used to examine the relationship of the selected characteristics of the farmers with their use of IPM practices. The findings reveal that more than three fifth (61.10%) of the farmers had medium use of IPM practices while 21.40 percent had high use of IPM practices and rest 17.50% had low use of IPM practices. Correlation analysis indicated that among the ten selected characteristics of the farmers age, education, farming experience, problem faced in IPM practices, knowledge on IPM practices and attitude towards IPM practices had significant positive relationship and problem faced in IPM practices had significant negative relationship with their use of IPM practices . The rest characteristics of the farmer namely farm size, annual family income, training exposure on IPM practices and extension contact had no significant relationship with their use of IPM practices.



Chapter 1
Introduction

CHAPTAR 1

INTRODUCTION

1.1 General background

Bangladesh, one of the smallest countries in South-East Asia, has a predominantly farming-based economy. A delta, historically originated through the sedimentation of the Bay of Bengal, the country is blessed with highly fertile agricultural lands. However, due to very high population, the nation has always been struggling against poverty and starvation. Bangladesh economy draws its main strength from agriculture sector. The sector contributes 19.10% (at current prices) and employs about 51% of the labor force (Mondal, 2010). Despite increase in the shares of fisheries, livestock, and forestry, crop sub-sector alone accounts for 60.83% share of agricultural GDP (BBS, 2011).

To feed the ever increasing population it is imperative to increase crop production. One of the main problems to increase crop production is the pest. The word 'pest' refers to organisms such as insects, rodents and birds that cause damage or annoyance to man, his animals, crops or possessions. According to an estimate, annual yield loss due to insect pest alone is 16% for rice and 25% for vegetable (Ahmed *et al.*, 2009). FAO estimated the global harvest losses due to pests to be about 42% of attainable production. (FAO, 2004). It highlighted the paradox between the increase of global crop losses over time and the growth of chemical pesticides use. Experts believed that if current trends continue dependence solely on chemical pesticides will not be a sustainable solution from either an economic or environmental point of view.

In Bangladesh, chemical control has been the principal method of pest control. Although pesticides may provide temporary relief from pest problems, long-term dependency on pesticides is not desirable. Farmers in Bangladesh depend on synthetic insecticides because they are readily available, highly promoted, inexpensive, easy to apply and quick acting. However, applied insecticides also kill non-target arthropods, typically insects involved in pollination and predators such as spiders and ground beetles. Insecticide residues find their way into water sourses, particularly in rice cultivation, and affect the water drinking and food eating (Cork *et al.* 2003).

In the past, pesticides were considered as the panacea for the control of agricultural pests. Although pesticides may provide temporary relief, it is now widely accepted that indiscriminate and excessive use of pesticides and the long-term dependency on them threaten the sustainability of agricultural production. Over dependence on chemical pesticides is not only expensive but also leads to negative environmental impacts, in addition to increased health hazards to both the growers and consumers of crops.

Considering the facts that:

- Bangladesh needs to increase its food production on a sustainable basis;
- pests continue to cause serious damages to crops; and
- the use of toxic pesticides is the main method of pest control and that such continued heavy reliance on chemicals would lead to serious environmental and human health problems, pest resurgence, new pest problems and development of resistance;

There is a need for an alternative method rather than to rely solely on pesticides. Integrated Pest Management (IPM) has now been considered as the most appropriate one in this respect.

Integrated Pest Management (IPM) is a broad ecological approach to pest control using various pest control tactics in a compatible manner. IPM has no standard definition, but comprises approaches that range from carefully-targeted used of chemical pesticides to biological techniques that use natural parasites and predators to control pests (Sorby et al., 2003).

In Bangladesh, IPM activities first started in 1981 with the introduction of the first phase of FAO inter-country programme (ICP) on IPM in rice crop. However, it was in 1987 that IPM activities began to expand and became a popular topic among people from all walks of life. From 1989 to 1995, the ICP played a strong catalytic role in promoting the IPM concept and approach among the government officials and donor community (National IPM policy, 2002). At present IPM activities cover almost all districts and upazilas of Bangladesh. Since chemical pesticides are expensive for poor farmers, IPM also offers the prospect of lower production costs and higher profitability. Vegetables pest management technologies presently available have been developed and modified based on Integrated Pest Management (IPM) approach that has reduced health & environmental hazards. Department of Agricultural Extension (DAE) and some other organizations are conducting IPM training through Farmer Field School (FFS) on vegetables specially eggplant production.

1.2 Statement of the Problem

Agriculture in Bangladesh has improved steadily throughout the last two decades through the adoption of modern technologies (Dorosh , 2000). But the fact remains that agricultural technology is ever changing. In such a context it is highly likely that inefficiency is pervasive in pest management practices. Finding ways to reduce pest damage and increase farm income, while at the same time minimizing use of pesticides, remains a significant challenge in Bangladesh as elsewhere.

Integrated Pest Management is the best strategy for crop pest management. IPM aims to change farmers' attitude towards growing a healthy crop and increasing the farm output and farmers' income on a sustainable basis, which results in improving the environment and community health. But the success of the strategy of the IPM is depending upon the appropriate and timely decision making ability of the farmers to control the pests. Most of the cases farmers apply the insecticides in their fields without knowing the appropriate insecticide for the specific insects. Even sometimes they do not know in which stage of crops, insecticides are effective and they fail to take the appropriate decision whether they use the insecticides or not. So this is a great problem of our farmers and it is a barrier to achieve our aspiration of food sufficiency. Many extension led projects have been implemented by the DAE and other NGOs to popularize IPM practices among the farmers throughout the country, since its inception. Farmers' training result demonstrations, method demonstrations etc. have been conducted to educated the farmers about IPM practices but there is hardly any study on how much extent farmers are being used IPM practices in their farming.

In view of the above background and facts, the present study was undertaken with the title "Use of Integrated Pest Management Practices by the Farmers of Kalia upazila under Narail District". The study aimed at providing information regarding the following questions:

i. What is the extent of use of IPM practices by the farmers?
ii. What are the selected characteristics of the farmers?
iii. To what extent relationships exist between the selected characteristics of the farmers and their use of IPM practices?

1.3 Specific Objectives

1) To determine and describe the following selected characteristics of the farmers:
   a) Age
   b) Education
   c) Farm size
   d) Annual family income
   e) Training exposure on IPM practices
   f) Farming experience
   g) Extension contact
   h) Problem faced in IPM practices
   i) Knowledge on IPM
   j) Attitude towards IPM practices
2) To assess the extent of use of IPM practices by the farmers
3) To explore the relationship between the selected characteristics of the farmers and their extent of use of IPM practices

1.4 Justification of the Study

It is obviously true that farmers are the key elements of use of integrated pest management practices in crop cultivation. At present, there is a lack of adequate understanding as to how the characteristics of the farmers influence their use of integrated pest management (IPM) practices. These facts indicate the need for an investigation to ascertain the relationships of the characteristics of the farmers with their use of integrated pest management practices in crop cultivation. Findings of this study, therefore, will be helpful to the planners and extension workers in planning and execution of programmes for disseminating IPM. The findings of the study will also manifest the extent of use of integrated pest management practices by the farmers and will be able to give a hypothetical thought all over the nation. It is expected that this study will inspire other researchers to conduct same sorts of

research in other parts of the country. Lastly, it is assumed that recommendation of this study will be helpful in formulating effective extension programs that will increase the rate of use of integrated pest management practices by the farmers.

1.5 Assumptions of the Study

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

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

1.6 Limitations of the Study

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

1. The study was confined to two selected union of Kalia upazila under Narail district.
2. The characteristics of the farmers in the study area were many and varied but only ten characteristics were selected for investigation in this study as stated in the objectives.
3. The researcher relied on the data furnished by the farmers' from their memory during interview.

4. For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target populations. However, the researcher tried to overcome the problem as far as possible with sufficient tacts and skills.
5. Reluctance of the farmers to provide information was overcome by establishing rapport.
6. Various problems in use of IPM practices are likely to be faced by the farmers. However, only ten problems have been considered for investigation in this study.

1.7 Definition of Related Terms

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

Age

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

Education

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

Farm size

Farm size referred to the cultivated area either owned by the farmer or obtained from others on borga system, the area being estimated in terms of full benefit and

half benefit to the farmer respectively. The self cultivated owned land and cultivated area taken as lease or mortgage from others was recognized as full benefit.

Annual family income

The term annual family income is referred to the total earning by the earning members from agriculture, livestock, fisheries and other accessible sources (business, service, daily labor etc.) during a year. It was expressed in Thousand Taka.

Training exposure

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

Extension contact

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

Farming experience

Farming experience referred to the total duration involved with farming activities by a respondent and it was expressed as total number of years.

Problem faced in IPM practices

Problem referred to a difficult situation about which something to be done. It referred to the extent of problems faced by a respondent in use of IPM practices in terms of social, technical, economical, marketing and psychological problems.

Knowledge

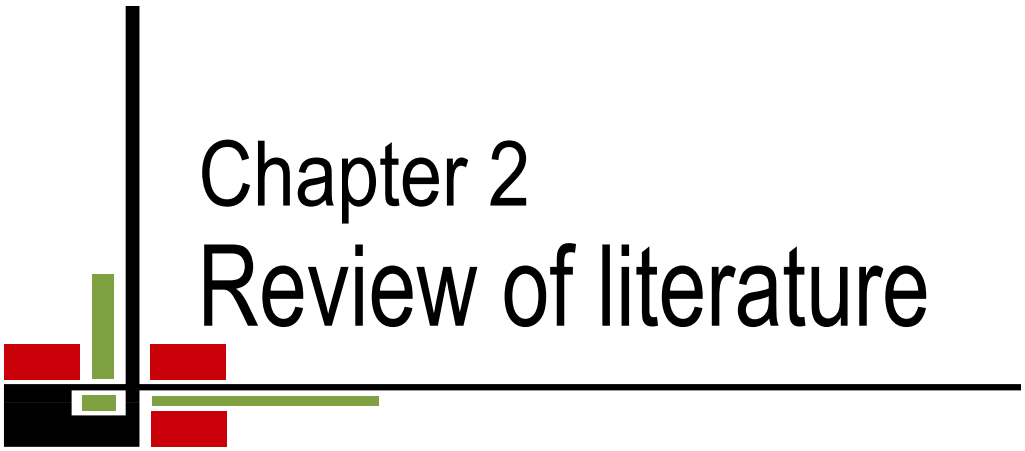
It is referred to the extent of basic understanding of the farmers in different aspects of IPM practices.

Attitude towards IPM practices

Attitude is the mental predisposition of an individual to act in a particular way. In other words, it refers to one's favourable or unfavourable feelings, beliefs, and actions towards an object and concept. Attitude towards IPM practices refers to one's feeling towards the use of IPM practices.

Integrated pest management (IPM)

According to Food and Agricultural Organization (FAO, 2001) IPM can be defined as “A pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in a compatible manner as possible and maintains the pest populations at levels below those causing economic injury.”



Chapter 2
Review of literature

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this chapter is to present the reviews of researches relate to the investigation. The reviews are conveniently presented based on the major objectives of the study. This chapter is divided into three sections. The first section deals with the findings on the extent of use of integrated pest management practices by the farmers; second section is devoted to a discussion on the findings of studies exploring relationship between the selected characteristics of the farmers and their extent of use and third section presents the conceptual framework of the study.

2.1 Extent of use of IPM practices by the farmers

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

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

Hasan (1996) found in his study that the highest proportion (44 %) of the respondents perceived the existence of medium adoption, compared to 26 percent low adoption and 3 percent high adoption in respect of selected agricultural technologies.

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

Juliana *et al.* (1991) undertook a study on adoption of integrated management practices in five villages of vasusdevanallar block in Tirunelvi district, Tamilnaru, India. They found that about 50 percent of marginal farmers, 47.50 percent of small farmers and 52.50 percent of big farmers had medium adoption and 42.50 percent of big farmers, 22.50 percent of small farmers and percent of the marginal farmers had high level of adoption. In both adopts level of big farmers' participation was higher in comparison to other categories of farmers. .

Gogoi and Gogoi (1989) conducted a study on adoption of recommended Plant protection practices in rice in Zorhat district of Assam state in India. The study revealed that among the respondents, 50 percent had low level of 35.36 percent medium level of adoption and 13.64 percent had high adoption of recommended plant protection practices.

Rahman (1986) conducted a research study on the extent of adoption of four improved practices, which were use of fertilizers, line sowing, irrigation and use of insecticides in transplanted aman rice cultivation in two village of Mymensingh district. It revealed that 22 percent of the farmers adopted all the four practices compared to 49 percent adopted three practices, 22 percent adopted two practices, 5 percent adopted one practices and only 2 percent adopted of the four practices.

Mohammad (1974) studied the extent of adoption of insect control measures by the farmers in Khamar union of Rajshahi district. He found that among the respondent farmers, 25 percent did not adopt insect control measure; 28 percent had high level of adoption; 32 percent had medium level of adoption and 25 percent had low level of adoption.

Muttaleb *et al.* (1998) found that over all adoption of plant protection practices was medium. Among the plant protection practices high adoption were observed in fungicides, insecticide and soil treatment and low adoption were found that

treatment and low adoption were found in suberization of cut tuber hand picking of cutworm and rouging of diseased plant.

Podder (1999) concluded a research study on the adoption of Mehersagar banana by the farmers. He found 47 percent of the respondent had medium adoption compared to 14 percent having low and 39 percent having high adoption.

Bembridge and Wiliams (1990) studied the personal , sociological, socio-psychological and communication characteristics that influence the adoption of maize practice in farmer support programme in South Africa. The study revealed that less than 50% of the farmers who adopted practices were implementing them according to recommendation and man y did not have a clear concept that the practices were interrelated.

Haider et al. (200l) observed that one-third (37 percent) of the farmers fell in low adopter category compared to 32.5 percent in optimum adopter 23.5 percent above optimum adopter and only 7 percent had non-adopter on Nitrogenous fertilizer. In respect of extent of phosphoric fertilizer two thirds (68 percent) of the farmers belonged to non adopter category compared to 23 percent having above optimum adopter, 5 percent optimum adopter and only 4 percent had below optimum adopter of phosphoric (P) fertilizer. In respect of extent of potassic fertilizer three quarters categories compared to 1 0 percent falling bellow optimum adopter, 8 percent optimum adopter and only 3 percent above optimum adopter of potassic (K) fertilizer.

Aurangojeb (2002) studied on the extent of adoption of integrated farming technology by the rural women in RDR S. He observed that the highest proportion of rural women (64%) used high level, (28%) of the women used medium level and only 8% used low level integrated homestead farming technologies.

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

2.2 Findings relating to the Relationship between Farmers' characteristics and use of IPM Practices:

2.2.1 Age and Use of IPM Practices:

Gogoi and Gogoi (1989) and Kashem (2003) observed that there was no relationship between age of the farmers and their adoption IPM Practices.

Talukder (2006) found that the age of the farmers had a significant positive relationship with their adoption of selected rice production practices.

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

Kashem (1991) observed that there was positive and significant relationship between the ages of the marginal farmers with their adoption of jute technologies.

Khan (2003), Rahman (2004) and Singh (2005) observed that there was significant and positive relationship between age of the farmers and their adoption of IPM Practices.

2.2.2 Education and Use of IPM practices:

Alam and Balasubramanian (2000), Patil, Haque(2003), Islam (2002), Okoro & Obibuaka, Khan and Kashem (2003) and Singh (2005) observed that there were significant and positive relationship between education of the fanners and their adoption of IPM Practices.

Hossain (2004) concluded that education of the farmers had a significant and positive relationship with their adoption of modern Boro rice cultivation practices.

Sardar (2002) found that the education of the farmers had significant positive relationship with their adoption of 1PM practices.

Aurangozeb (2002) studied on the extent of adoption of integrated homestead farming technologies by the rural women in RDRS. He observed that there was positive relationship between education and adoption of integrated homestead farming technologies.

2.2.3 Farm size and Use of IPM practices:

Ali and Alam (2000),Gogai & Gogai (1989), Hossain (2001), Islam (2002) and Khan (2003) found a strong negative relationship between farm size and adoption of IPM practices of the fanners.

Muttalab (1998),Okoro and Obibuaka (2003) and Rahman(2004) reported that farm size had significant and positive relationship with the adoption of IPM Practices of the fanners.

Hossain (2006) found that farm size of the farmers had no significant and positive relationship with their adoption of selected high yielding varieties of rice.

Hossain (2004) concluded that farm size of the farmers had significant and positive relationship with their adoption of modern Boro rice cultivation practices.

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

2.2.4 Annual family income and Use of IPM practices:

Haque(2003) and Hossain (2001), Hossain (2004), Rahman (2004) and Singh (2005) found that income of the farmers was associated with the adoption of IPM practices.

Hossain (2003) revealed that annual family income of the farmers had a significant and positive relationship with their knowledge and adoption of modern Boro rice cultivation practices.

Sarder (2002) found that the farmers' belief had significant relationships with their adoption of IPM practices.

Bari (2000) observed that the belief of the farmers had significant relationship with their attitude towards the hybrid Rice Aalok 6201.

2.2.5 Training exposure IPM practices and use of IPM practices:

Haque (2003) found a positive relationship with training exposure and adoption of modern technologies.

Rahman (2001) observed in study that training received of the farmers had a significant and positive relationship with their adoption regarding Aalok 6201 hybrid rice.

A positive relationship was also found between training exposure and adoption of improved practices in transplanted Aman rice by Rahman (1986).

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

2.2.6 Farming experience and use of IPM practices

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

Sarkar (1995) in his study observed that farming experience had no relationship with their use of communication media for receiving agricultural information.

Alam (1996) in his study observed that there was no relationship between the farming experience of the farmers and their awareness regarding homestead deforestation.

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

2.2.7 Extension contact and use of IPM practices

No findings were noticed on this aspect to the researcher at the time of reviewing literature.

2.2.8 Problem faced in IPM practices and use of IPM practices

Hossain (1983) studied adoption of HYV rice by the rice farmers in Bhabakhali union under Mymensingh district. The findings indicated no relationship between community problem awareness and adoption of HYV rice.

Kashem (1992) studied adoption behaviour of sugarcane farmers. The study revealed a positive relationship between community problem awareness and adoption of sugarcane farmers.

Muhammad (1974) studied adoption of insect control measures. The study indicated a positive relationship between community problem awareness and adoption of inset control measures.

Rahman (1995) in his study identified problems faced by farmers' in cotton cultivation. Non-availability of quality seed in time, unfavorable and high cost of fertilizer and insecticides, lack of operating capital, not getting fair weight and reasonable price according to grade, affects of cattle in cotton field, lack of technical knowledge, lack of storage facility, stealing from field at maturity stage, and late

buying of raw cotton by Cotton Development Board were identified as major problems of cotton farmers in Mymensingh district.

2.2.8 Knowledge on IPM practice and Use of IPM practices:

Pandya (1981) in his study conducted on transfer of plant protection technology revealed that those farmers who know about the effects of diseases and pests on their crops adopt plant protection measures. The main cause of non-adoption was reported to be ignorance.

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

2.2.9 Attitude toward IPM practice and Use of IPM practices:

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

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

Islam (1990) opined that the success of pesticides in controlling on a short-term basis cannot be denied but their tong term effect on the ecosystems including human health and environment arc very much doughtful for two major regions. One is the rapid evolution or new breed pests, resistant to the pesticides applied, and another in the increasing pesticide hazards.

According to Swaminathan (1991) indiscriminate use of pesticides, fungicides and herbicides could cause biological imbalance as well as to increase the incidence or cancer and other diseases through the toxic residues being present in gains or other edible parts of the plant.

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

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

2.3 The Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. Properly constructed hypothesis of any research contain at least two variables namely, “dependent variable” and “independent variable”. Selection and measurement of those variables is also crucial. A dependent variable is that which appears, disappears or varies as the researcher introduces, remove 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 relationship to an observed phenomenon. Based on these above discussion and the review of literature, the conceptual framework of this study has been formulated and shown in figure 2.1.

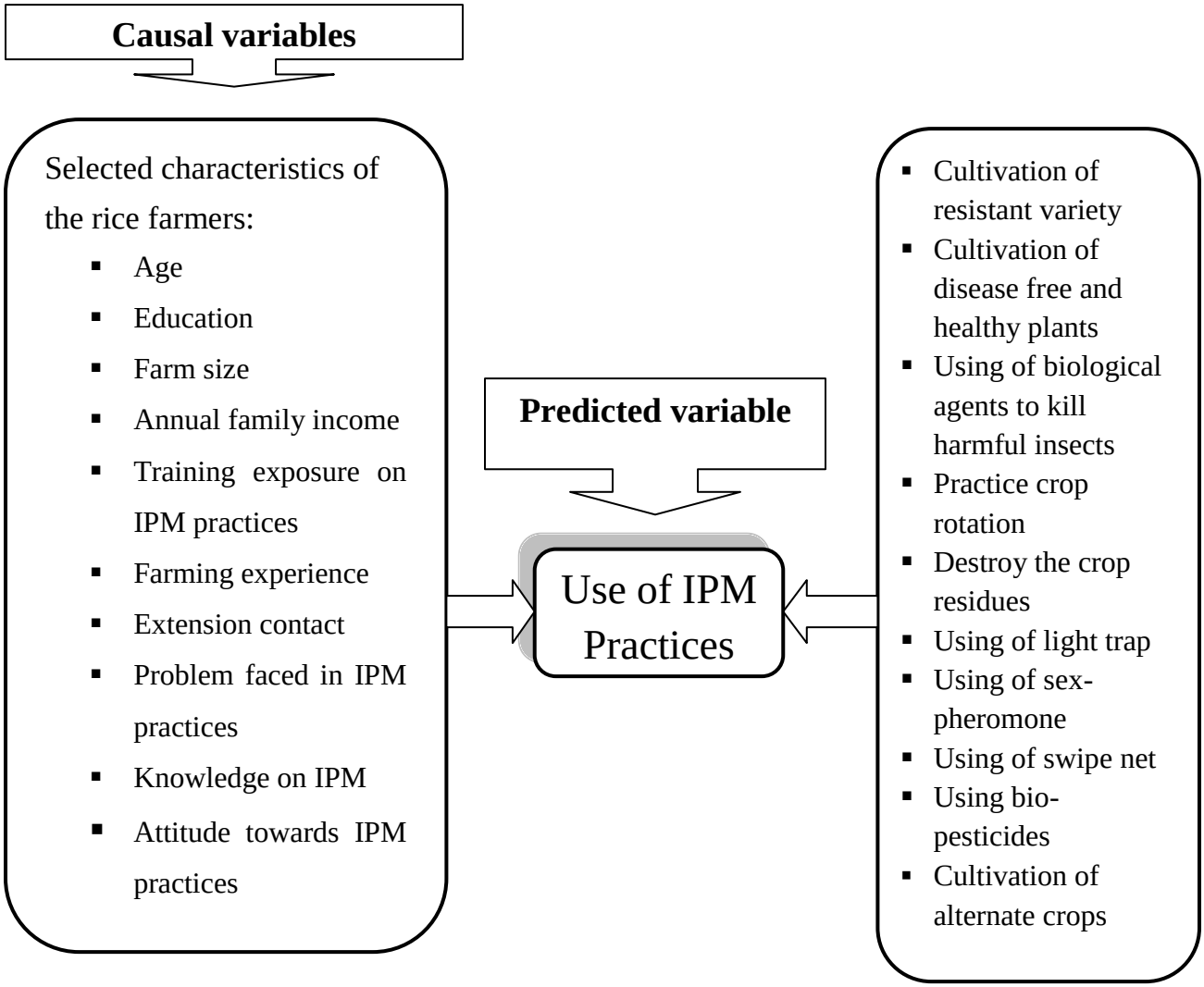
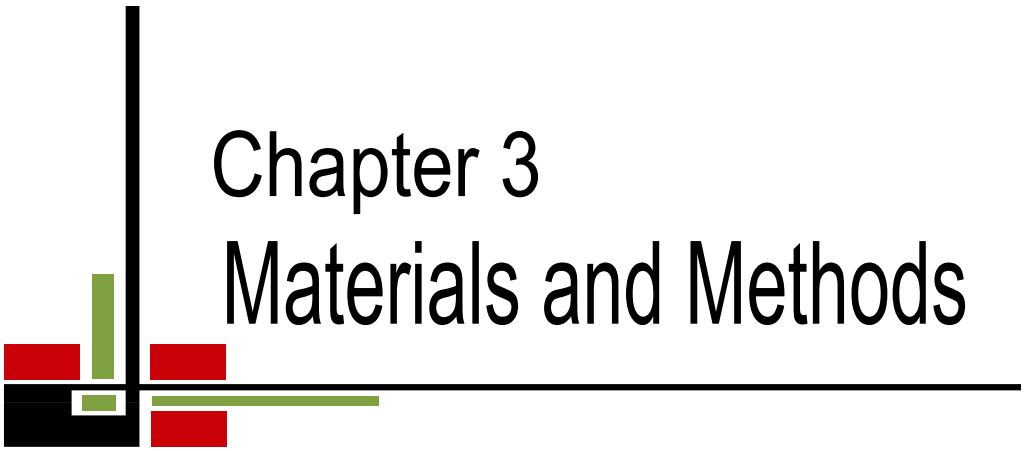


Figure 2.1 Conceptual framework of the study



Chapter 3
Materials and Methods

CHAPTER 3

MATERIALS AND METHODS

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

3.1 The Locale of the Study

Kalia upazila of Narail district was selected purposively for the study as this is a typical upazila of Bangladesh. Out of 11 unions of this upazila 2 were selected randomly. Then four villages were selected randomly as the locale of the study by taking 2 villages from each selected union. A map of Bangladesh showing Narail district, a map of Narail district showing Khalia upazilla and a map of Khalia upazila showing the study unions have been shown in Fig are 3.1, 3.2 and 3.3 respectively.

3.2 Population and Sample

Four separate lists of the farmers of the selected four villages were prepared with the help of the local Sub Assistant Agriculture Officers. There were 1030 farmers in these villages which constitute the population of the study.

Data were collected from the sample rather than the whole population due to time and fund constants. A total of 103 farmers were selected proportionately and

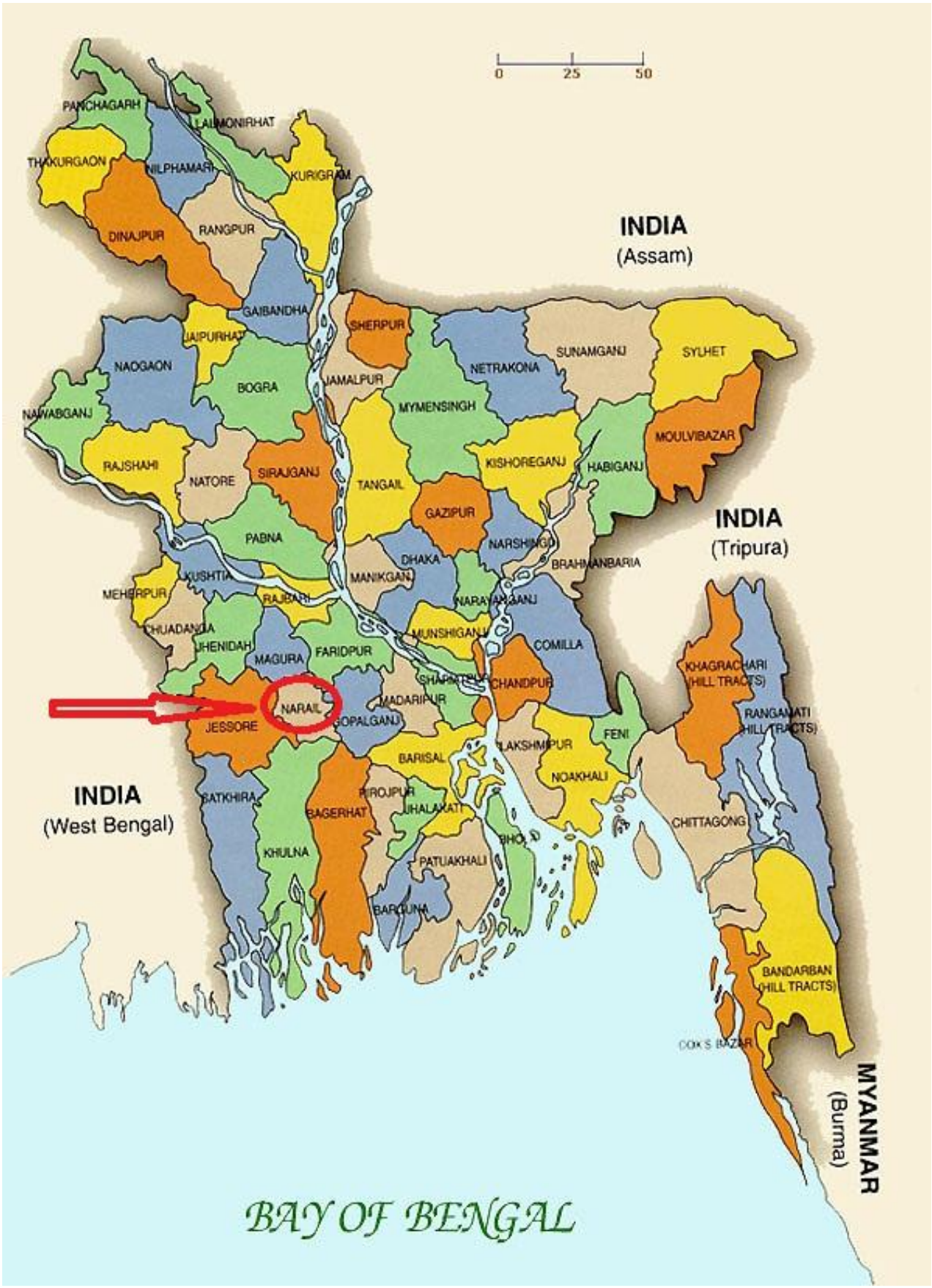


Figure 3.1 Map of Bangladesh showing Narail District

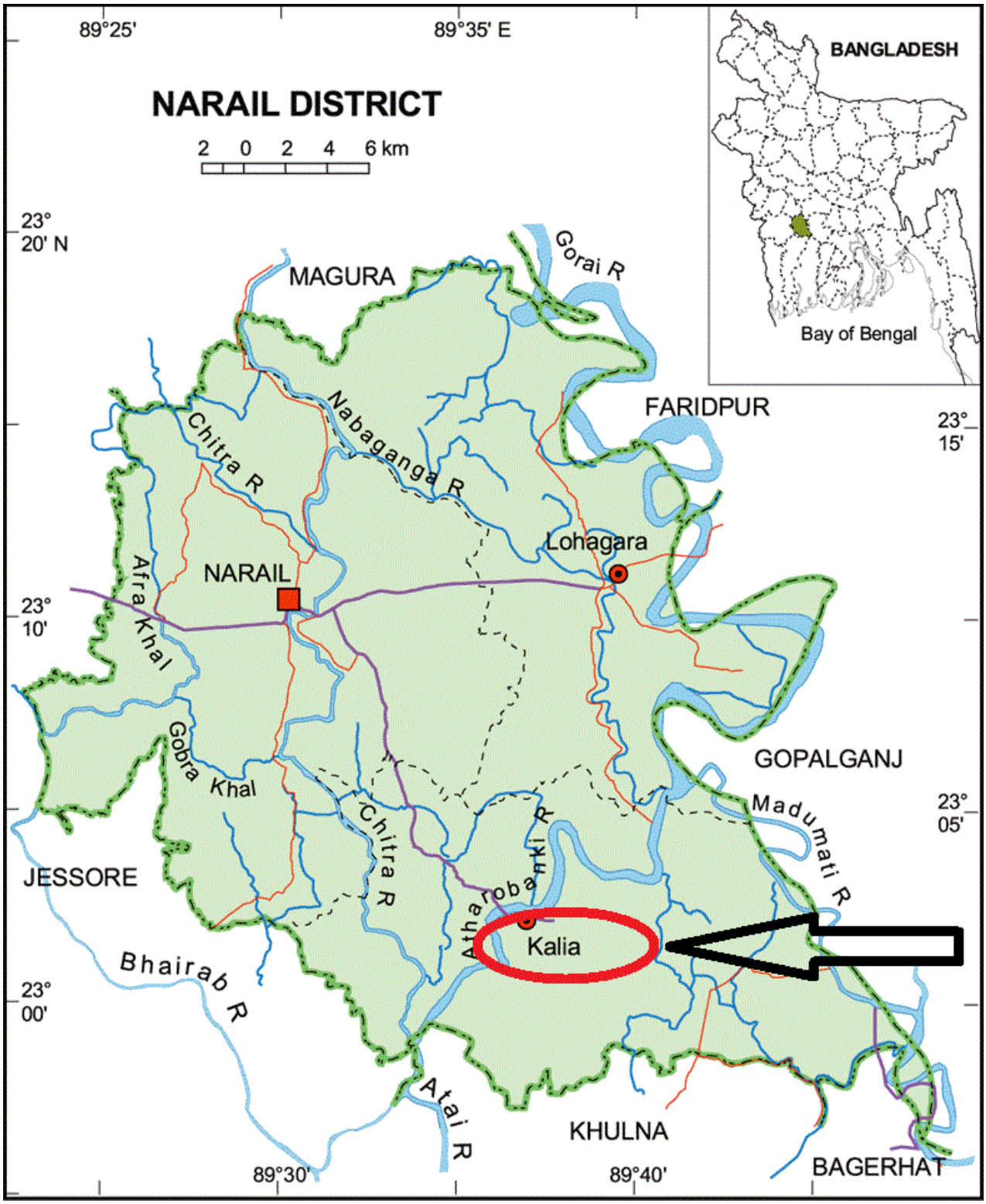


Figure 3.2 Map of Narail district showing Kalia upazila

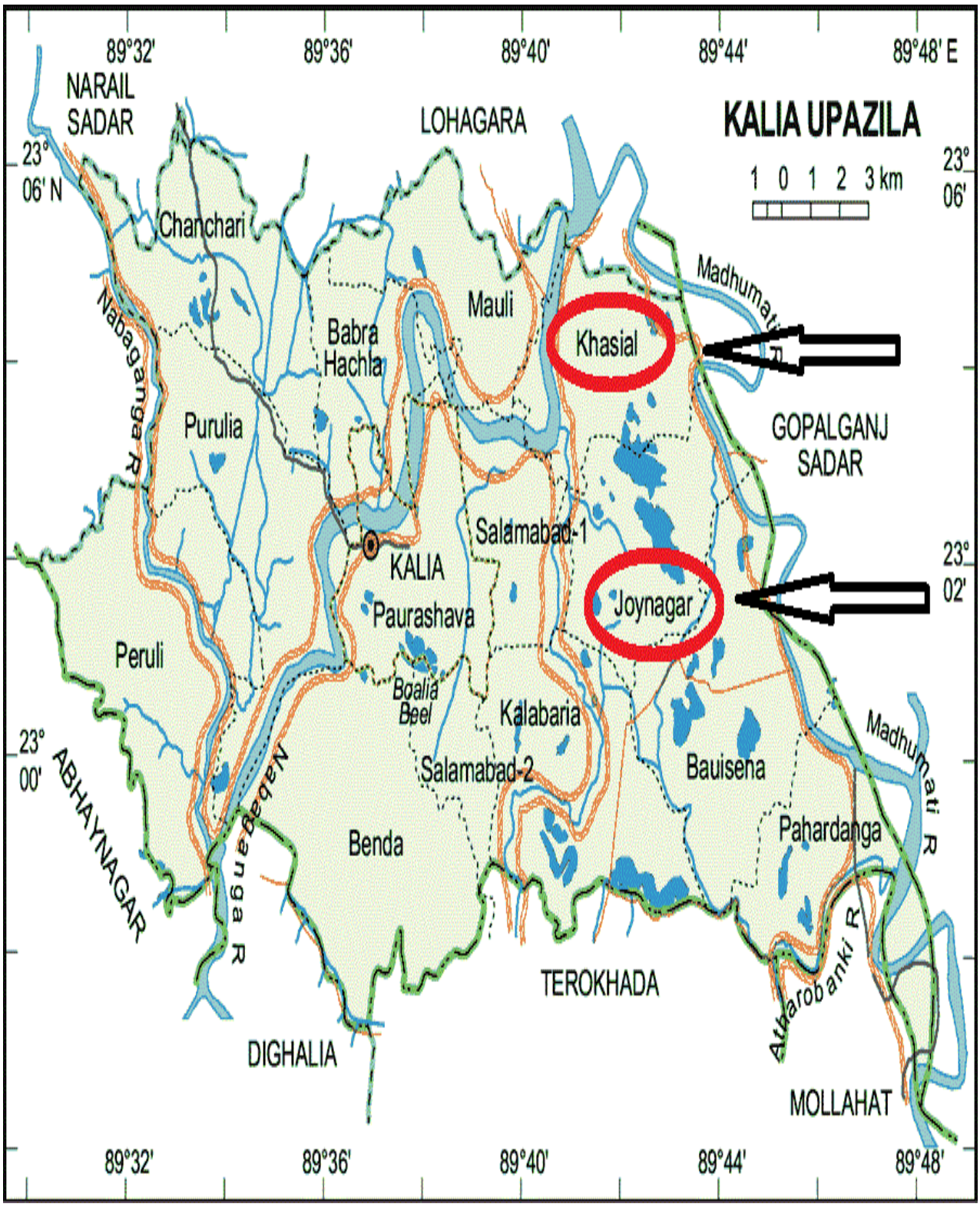


Figure 3.3 A map of Kalia upazilla showing two study unions

randomly from the selected four villages by taking 10% from each village. A reserve list of 10 farmers was also prepared which was used in case of absence of any farmers included in the sample while interviewing. For better understanding, population, sample and reserve list size are mentioned in Table 3.1.

Table 3.1 Distribution of the sampled farmers in the study area

Union	Village	Population size	Sample Size	Reserve list size
Joynagar	Joynagar	320	32	3
	Naraghati	180	18	2
Khasial	Tona	278	28	3
	Khasial	252	25	2
Total		**1030**	**103**	**10**

3.3 Instruments for Data Collection

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

3.4 Measurement of Variables

The various characteristics of the farmers might have influence on their use of integrated pest management practices. These characteristics were age, education, farm size, annual family income, training exposure on IPM practices, farming experience, extension contact, problem faced in IPM practices, knowledge on

IPM pactices and attitude towards IPM practices. Use of IPM practices was the main focus of the study.

Measurement of all the factors of the farmers and their Use of IPM practices are discussed in the following sub sections:

3.4.1 Age

Age of a farmer was measured by counting the actual years from his/her birth to the time of interview. It was expressed in terms of complete years.

3.4.2 Education

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

3.4.3 Farm size

Farm size of a farmer is referred to the total area of land on which his/her family carried out farming operations, the area being in terms of full benefit to his/her family.

The farm size was measured in hectares for each farmers using the following formula:

$FS=A_1+A_2+{}^1\!/_2\,(A_3+A_4)+A_5$

Where,

FS= Farm size

A_l = Homestead area

A_2= Own land under own cultivation

A_3= Land given to others on borga

A_4= Land taken from others on borga

A_5= Land taken from others on lease

3.4.4 Annual family income

Annual family income of a farmer was measured in Thousand Taka. The total yearly earning from farm sources (crop, livestock, poultry and fisheries) and non-farm sources (business, job, laborer and others) by the farmer himself/herself and other members of his family was determined. Thus, yearly earning from farm and non-farm sources were added together to obtain annual family income of a farmer. A score of one was given for each Tk. 1,000 to compute the annual family income scores of the respondents.

3.4.5 Training exposure on IPM practices

Training exposure on IPM practices of a farmer was measured by the total number of days he/she participated in different training programmes. A score of one (1) was assigned for each day of training received.

3.4.6 Farming experience

Farming experience of a farmer was measured by the total number of years of his/her cultivation. A score of one (1) was assigned for each year of farming experience.

3.4.7 Extension contact

This variable was measured by computing an extension contact score on the basis of a respondent's extent of contact with 10 selected media as obtained in response to item number 6 of the interview schedule (Appendix A). Each respondent was asked to indicate the frequency of his contact with each of the selected media.

With four alternative responses as 'regularly', 'occasionally', 'rarely' and 'never' basis and weights were assigned as 3, 2, 1 and 0 respectively.

The extension contact score of a respondent was determined by summing up his/her scores for contact with all the selected media. Thus possible extension contact score could vary from zero (0) to 30, where Zero indicated no extension contact and 30 indicated the highest level of extension contact.

3.4.8 Problem faced in IPM practices

This variable was measured by computing the extent of various problems of the respondents with 10 selected problems as obtained in response to item no. 8 of the interview schedule (Appendix A). Each respondent was asked to indicate the extent of his/her problem as high problem, medium problem, and low problem and not at all problem and score was assigned as 3, 2, 1 and 0 respectively.

The problem faced score of a respondent was determined by summing up his/her scores for all the problems. Thus, possible score could vary from zero (0) to 30, where zero indicates no problem and 30 indicates the highest level of problem.

3.4.9 Knowledge on IPM practices

After thorough consultation with relevant experts and reviewing of related literature, 10 question regarding IPM practices were selected and those were asked to the respondent to determine their knowledge on IPM practices. Two (2) score was assigned for each correct answer and zero (0) for wrong or no answer. Partial score was also assigned for partially correct answer. Thus, the knowledge on IPM practices score of the respondents could range from 0 to 20, where zero indicating very low knowledge and 20 indicate the very high knowledge on IPM practices.

3.4.10 Attitude towards IPM practices

Attitude of a respondent towards IPM practices was measured by developing an attitude scale. Five-point Likert method of summated ratings was used to find out the farmers' attitude towards IPM practices.

Eight statements expressing positive and negative feelings towards IPM practices were constructed. A statement was considered positive if it indicated a favourable attitude towards IPM practices. If the case was reverse, it was considered as a negative statement. Out of these eight statements four were positive and four were negative. Scoring was done by assigning 5, 4, 3, 2 and 1 scores to the five alternative responses as "strongly agreed", "agreed", "undecided", "disagreed", and "strongly disagreed", respectively in case of a positive statement. Reverse score was assigned for a negative statement. However, attitude towards IPM practices of a farmer was obtained by summing up his/her scores for all the eight statements in item number 10 in the interview schedule. Attitude score, thus, obtained for a respondent could range from zero 8 to 40, where 8 indicates very unfavorable attitude, 24 indicates neutral and 40 indicates highest level of favourable attitude.

3.4.11 Use of IPM practices

This variable was measured by computing the use of IPM practices score on the basis of a respondent's extent of use of IPM practices with 10 selected IPM technologies as obtained in response to item number 11 of the interview schedule (Appendix A). Each respondent was asked to indicate the extent of use of IPM practices with four alternative responses as 'frequently', 'occasionally', 'rarely' and 'not at all' basis and weights were assigned as 3, 2, 1 and 0, respectively.

The use of IPM practices scores of a respondent was determined by summing up his/her scores of all the 10 selected IPM practices.. Thus possible score could vary from zero (0) to 30, where Zero indicated no use and 30 indicated the highest level use of IPM practices.

3.5 Collection of Data

Data were collected personally by the researcher himself through face to face interview. To familiarize with the study area and for getting local support, the researcher took help from the local leaders and the field staffs of Upazila Agriculture Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to interview and the objectives were clearly explained by using local language as far as possible. Data were collected during the period from 20 May to 30 June, 2015.

3.6 Data Processing

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

3.7 Statistical Analysis

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

3.8 Statement of Hypothesis

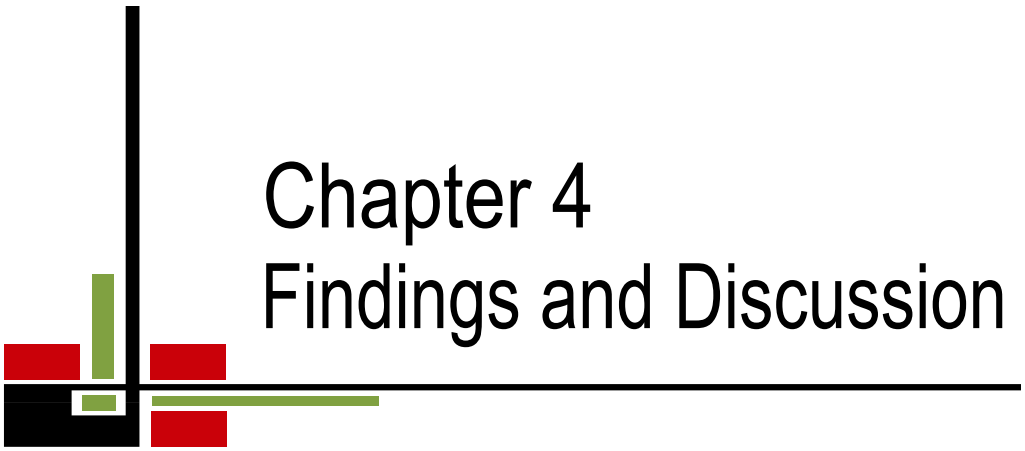
As defined by Goode and Hatt (1952) 'A hypothesis is a proposition, which can be put to a test to determine its validity.' It may prove correct or incorrect of a proposition. In any event, however, it leads to an empirical test. Hypothesis are always in declarative sentence form and they relate either generally of specifically variables to sentence form and they relate either generally or specifically variables to variables. Hypothesis may be broadly divided into two categories, namely, research hypothesis and null hypothesis.

3.8.1 Research hypothesis

Research hypothesis states a possible relationship between the variables being studied or a difference between experimental treatments that the researcher expects to emerge. The following research hypothesis was put forward to know the relationships between each of the 10 selected characteristics of the farmers and their use of IPM practices: "Each of the 10 selected characteristics of the farmers have significant relationship with their use of IPM practices."

3.8.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was undertaken for the present study: "There is no relationship between each of the selected characteristics of farmers and their use of IPM practices". The selected characteristics were age, education, farm size, annual family income, training exposure, farming experience, extension contact, problem faced in IPM practices, knowledge on IPM practices and attitude towards IPM practices.



Chapter 4
Findings and Discussion

CHAPTER IV

FINDINGS AND DISCUSSION

Purpose of this Chapter was to describe the findings of the present study. The study investigated use of integrated pest management practices by the farmers and related matters. In accordance with the objectives of the study, presentation of the findings has been made in three sections of this Chapter.

Section 1: Selected Characteristics of the Farmers

Section 2: Use of Integrated Pest Management Practices by the Farmers

Section 3: Relationship between the Selected Characteristics of the Farmers and their Use of Integrated Pest Management Practices

4.1 Selected Characteristics of the Farmers

This section deals with the characteristics of farmers which were assumed to be associated with the use of integrated pest management practices. Different farmers possess different characteristics which are focused by his/her behavior. In this section, ten characteristics have been discussed. The selected characteristics of the farmers were; age, education, farm size, annual family income, training exposure on IPM practices, farming experience, extension contact, problem faced in IPM practices, knowledge on IPM practices and attitude towards IPM practices. Measuring unit, range, mean and standard deviations of those characteristics of the farmers were described in this section. Table 4.1 provides a summary profile of the farmers' characteristics.

Table 4.1 Characteristics profile of the farmers

Sl. No.	Characteristics (with measuring unit)	Range		Mean	Standard deviation
		Possible	Observed		
01	Age (years)	Unknown	20- 60	37.87	7.57
02	Education (schooling years)	Unknown	00 -17	8.94	4.55
03	Farm size (hectare)	Unknown	0.06 – 3.66	1.13	0.78
04	Annual family income (‘000’Taka)	Unknown	90 – 1500	389.09	277.36
05	Training exposure on IPM practices (number of days)	Unknown	00 - 03	0.38	1.0
06	Farming experience (Years)	Unknown	02 - 30	8.92	6.05
07	Extension contact (score)	00-30	10-20	14.39	1.79
08	Problem faced in IPM practices (score)	00 - 30	10-26	16.40	4.30
09	Knowledge on IPM practices (score)	00 - 20	10-20	16.16	2.42
10	Attitude towards IPM practices (score)	8 - 40	18-40	28.11	5.51

4.1.1 Age

Age of the respondents varied from 20 to 60 years, the average being 37.87 years with the standard deviation of 7.57. According to their age, the respondents were classified into three categories as “young aged” (up to 35 years), “middle aged” (36-50 years) and “old aged” (above 50 years). The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Basis of categorization (year)	Farmers	
		Number	Percent
Young aged	up to 35	42	40.78
Middle aged	36-50	57	55.32
Old aged	Above 50	4	3.90
Total		103	100

Data represented in the Table 4.2 indicate that majority (55.32%) of the respondents were middle aged as compared to 40.78 percent being young and 3.90 percent old aged. Findings again reveal that overwhelming majority (96.10%) of the respondents were young to middle aged. Therefore, it could be said that decision regarding the farming practices in the study area were expected to be considerably influenced by the young and middle aged farmers.

4.1.2 Education

Education level of the respondents ranged from 0-17 in accordance with year of schooling. The average education score of the respondents was 8.94 with a standard deviation of 4.55. On the basis of their level of education, the farmers were classified into five categories as shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their education

Categories	Basis of categorization (schooling year)	Farmers	
		Number	Percent
Illiterate	0	3	2.90
Primary	1-5	27	26.20
Secondary	6-10	38	36.90
Higher secondary	11-12	15	14.60
Above higher secondary	above 12	20	19.40
Total		103	100

Data shown in the Table 4.3 indicate that 36.90 percent of the farmers had secondary education while 26.20 percent had primary level of education compared to 19.40 percent above higher secondary education, 14.60 percent higher secondary education and rest 2.90 percent were illiterate.

Education helps the farmers to face the adverse condition and adjust with unfavorable condition through reading leaflets, booklets, books and other printed materials in this case. Education helps the farmers to broaden their outlook and expand mental horizon by helping them to develop favorable attitude, correct perception and knowledge about crop production technology. Comparatively educated person is relatively more responsive to the technology and new innovation. The findings of this study, however, indicate that almost all (97.10%) of the farmers had different level of education which is very much helpful for diffusion of any innovation.

4.1.3 Farm size

Farm size of the respondents ranged from 0.06 hectare to 3.66 hectares with the mean of 1.13 and standard deviation of 0.78. On the basis of their farm size, the farmers were classified into three categories followed by DAE (1999) as shown in Table 4.5.

Table 4.4 Distribution of the farmers according to their farm size

Categories	Basis of categorization (ha))	Farmers	
		Number	Percent
Small farm	≤ 1	59	57.28
Medium farm	>1 - 3	40	38.83
Large farm	>3	4	3.89
Total		103	100

Data presented in the Table 4.5 demonstrate that majority (57.28%) of the farmers had small farm compared to 38.83 percent having medium farm and 3.89 percent large farm. In Bangladesh most of the farmers live on below a subsistence level and this is in one of the vital reasons for not belonging large farm.

4.1.4 Annual family income

Annual family income of the respondents ranged from 90 to 1500 thousand taka. The mean was 389.09 thousand taka and standard deviation was 277.36. On the basis of annual family income, the respondents were categorized into three groups as shown in Table 4.5.

Table 4.5 Distribution of the farmers regarding their annual family income

Categories	Basis of categorization ('000' taka)	Farmers	
		Number	Percent
Low income	up to 250 (Tax free income)	51	49.52
Medium income	251-500	26	25.24
High income	Above 500	26	25.24
Total		103	100

Data shown in the Table 4.5 presents that near about half (49.52) of the respondents had low family income while 25.24 percent and 25.24 percent of the respondents had medium and high annual family income respectively.

The gross annual family income of a farmer is an important indicator of how much s/he can invest in his farming. Generally higher income encourages one's integrity to achieve better performance and to show his/her individual better status in the society. The higher income increases the risk taking capacity of the farmers.

4.1.5 Training exposure on IPM practices

The score of training exposure on IPM practice of the farmers ranged from 0-3 days. The mean was 0.37 days and standard deviation was 1.00. On the basis of training exposure on IPM practice, the respondents were categorized into two groups as shown in Table 4.6.

Table 4.6 Distribution of the farmers according to their training exposure on IPM practices

Categories	Basis of categorization (Days)	Farmers	
		Number	Percent
No training	0	90	87.40
Short term training	1-3	13	12.60
Total		103	100

Data presented in the Table 4.6 shows that overwhelming majority (87.40%) of the farmers had no training exposure; while 12.60 percent of the farmers had short term training exposure. Training develops the farmers' knowledge, skill, and attitude in positive manner. The findings suggest that training experience might be the most important factor for the respondents to change their knowledge and skill level on IPM practices. However, in the study area it is observed that due to no training exposure on IPM practices farmers are lacking of adequate knowledge and skill on IPM.

4.1.6 Farming experience

Computed scores of the farmers about farming experience ranged from 2 to 30 years with a mean of 8.92 and standard deviation of 6.05. On the basis of farming experience, the respondents were classified into three categories as shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their farming experience

Categories	Basis of categorization (Years)	Farmers	
		Number	Percent
Short farming experience	<5.89 (<Mean-0.5sd)	37	35.92
Medium farming experience	5.89-11.95 (Mean ± 0.5sd)	34	33.00
Long farming experience	>11.95 (>Mean+0.5sd)	32	31.08
Total		103	100

Data contained in the Table 4.7 shows that 35.92 percent of the farmer had short farming experience, where as 33 percent had medium farming experience and 31.08 percent had long farming experience. Farming experience is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need. Majority (64.08%) of the farmers had medium to long farming experience. Generally, experience helps to cope up any problematic situation. Therefore, the higher experience might be increased the risk bearing ability of the farmers in IPM practices.

4.1.7 Extension contact

The scores of the farmers regarding extension media contact ranged from 10-20 against the possible range of 0-30 with a mean of 14.39 and standard deviation of 1.79. On the basis of their extension contact scores, the farmers were classified into three categories (Table 4.8).

Table 4.8 Distribution of the farmers according to their extension contact

Categories	Basis of categorization (score)	Farmers	
		Number	Percent
Low contact	<12.60 (<Mean-1sd)	21.40	21.40
Medium contact	12.60-16.18 (Mean ± 1sd)	71.80	69.90
High contact	>16.18 (>Mean+1sd)	6.80	6.80
Total		103	100

Data presented in the table 4.8 indicate that majority (71.80%) of the farmers had medium extension contact as compared to 21.40 percent having low extension contact and 6.8 percent had high extension contact. Thus, an overwhelming majority (93.20%) of the farmers had low to medium extension contact. Generally people having high extension media contact assume that they have more information regarding crop cultivation as well as IPM practices. More extension contact make the people acquainted with new technologies and information. Discussion with the agriculture related personnel makes the people more up to date about the modern practices. In the study area, it is noticed that farmers had low to medium extension media contact.

4.1.8 Problem Faced in IPM practices

The scores of problem faced in IPM practices of the respondents ranged from 10 to 26 against the possible range of 0 – 30 with an average of 16.40 and standard deviation of 4.30. Based on the problem faced in IPM practices, the respondents were classified into the three categories i.e. low problem, medium problem and high problem faced. The distribution has been shown in Table 4.12.

Table 4.9 Distribution of the farmers according to their problem faced in IPM practices

Categories	Basis of categorization (score)	Farmers	
		Number	Percent
Low	<12.10 (<Mean-1sd)	18	17.50
Medium	12.10-20.70 (Mean ± 1sd)	63	61.14
High	Above 21 (>Mean+1sd)	22	21.36
Total		103	100

Majority (61.14%) of the respondents faced medium problem in IPM practices and 17.50 percent faced low problems and 21.36 percent faced high problems. Findings again reveal that overwhelming majority (82.50%) percent of the farmers faced medium to high problems in IPM practices. Problem defined by Goode (1945) is any significant perplexing and challenging situation, real and artificial, the solution of which requires reflective "thinking". Problem faced, therefore, refers to the extent to which individual faces difficult situations about which something needs to be done. It is quite logical that farmers facing lower problems could minimize their losses in crop production.

4.1.9 Knowledge on IPM practices

Knowledge on IPM practices score of the respondents ranged from 10 to 20 against the possible range of 0 – 20 having an average of 16.16 and standard deviation of 2.42. On the basis of knowledge scores, the respondents were classified into three categories namely, 'low knowledge', 'medium knowledge' and 'high knowledge'. The distribution of the respondents according to their knowledge on IPM practices is given in Table 4.10.

Table 4.10 Distribution of the farmers according to their knowledge on IPM practices

Categories	Basis of categorization (score)	Farmers	
		Number	Percent
Low knowledge	<13.70 (<Mean-1sd)	5	4.85
Medium knowledge	13.74-18.58 (Mean ± 1sd)	82	79.65
High knowledge	>18.58 (>Mean+1sd)	16	15.50
Total		103	100

Data in the Table 4.10 show that near about four fifth (79.65%) of the respondents fell in medium knowledge category followed by 15.50 percent in high knowledge category and only 4.85 percent in low knowledge category. Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding practices. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he may have to face in future. It makes individuals to become rational and conscious about related field. To perform optimum production, farmers should have adequate knowledge on different aspects of IPM practices.

4.1.10 Attitude towards IPM practices

The score of extent of attitude of the farmers towards IPM practices ranged from 18-40 against the possible range of 8-40. with an average of 28.11 and standard deviation of 5.51. The respondents were categorized into unfavourable, neutral attitude, less favourable and highly favourable based on of attitude score.

Table 4.11 Distribution of the farmers according to their attitude towards IPM practices

Categories	Basis of categorization (score)	Farmers	
		Number	Percent
Unfavourable	8-23	22	21.40
Neutral	24	10	9.70
Less favourable	25-32	52	50.50
Highlyfavourable	33-40	19	18.40
Total		103	100

Data presented in the Table 4.11 indicates that more than half (50.50%) of the respondents had less favourable attitude towards IPM practices out of which 21.40% unfavourable and 18.40% highly favourable only 9.70 percent had neutral attitude. It was due to their medium and high knowledge on IPM.

4.2 Use of IPM practices

Use of IPM practices of the respondents ranged from 14 to 28 against the possible range of 0 – 30 with an average of 21.06 and standard deviation of 4.32. Based on the observed scores of use of IPM practices, the respondents were classified into the three categories i.e. low use, medium use and high use. The distribution has been shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their use of IPM practices

Categories	Basis of categorization (score)	Farmers		Mean	Standard deviation
		Number	Percent		
Low	<16.74 (<Mean-1sd)	18	17.50	21.06	4.32
Medium	16.74-25.38 (Mean ± 1sd)	63	61.10		
High	>25.38 (>Mean+1sd)	22	21.40		
Total		103	100		

Findings reveal that more than three fifth (61.10%) of the farmers had medium use of IPM practices while 21.40 percent had high use of IPM practices and rest 17.50% had low use. This scenario is moderate satisfactory and should increase by taking necessary steps by DAE and NGOs. Appropriate knowledge can effectively change behaviour of the farmers towards adopting IPM practices. So, for the continuous improvement in the earning, living status of the farmers and environmental pollution of the country it is the high time to increase the use of IPM practices by the rural farmers to a great extent. Motivational campaign should promote to increase the IPM practices as well as aware the farmers about the bad effect of using different insecticides and pesticides indiscriminately.

4.3 Relationship between the Selected Characteristics of the Farmers and their Use of IPM Practices

The purpose of this section is to examine the relationship of 10 selected characteristics of the farmers with their use of IPM practices. The 10 characteristics of the farmers included: age, education, farm size, annual family income, training exposure on IPM practices, farming experience, extension contact, problem faced in IPM practices, knowledge on IPM practices and attitude towards IPM practices. Each of the characteristics constituted the causal variables, while use of IPM practices was the predicted variable. To explore the relationships between each of

the selected individual characteristics of the farmers and their use of IPM practices, Pearson's product moment co-efficient of correlation (r) has been used. Five percent level of probability was used as the basis for rejection of a null hypothesis. The computed values of ‘r’ were compared with relevant tabulated values for 101 degrees of freedom at the designated level of probability in order to determine whether the relationships between the concerned variables were significant or not.

The summary of the results of the correlation analysis has been presented in Table 4.13 showing the relationship between each of 10 selected characteristics of the farmers and their use of IPM practices. For understanding about the intercorrelations among all the variables Appendix-B may be seen.

Table 4.13 Co-efficient of correlation showing relationships between each of the selected characteristics of the farmers and their use of IPM practices

(n= 103; with df 101)

Predicted variable	Causal variable	Computed value "r"	Tabulated value of "r"	
			at 0.05 level	at 0.01 level
Use of IPM practices	➢ Age	0.215*	0.196	0.254
	➢ Education	0.605**		
	➢ Farm size	0.130 NS		
	➢ Annual family income	0.067 NS		
	➢ Training exposure on IPM practices	0.138 NS		
	➢ Farming experience	0.233*		
	➢ Extension contact	0.129 NS		
	➢ Problem faced in IPM practices	- 0.549**		
	➢ Knowledge on IPM practices	0.483**		
	➢ Attitude towards IPM practices	0.633**		

NS Not significant

* Significant at 0.05 level of probability

** Significant at 0.01 level of probability

4.3.1 Relationship between age of the farmers and their use in IPM practices

Relationship between age of the farmers and their use in IPM practices was determined by testing the following null hypothesis: "There is no relationship between age of the farmers and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.215 as shown in Table 4.13. The following observations

were made regarding the relationship between the two variables under consideration.

a) *The computed value of 'r' (r=* 0.215*) was found to be larger than the tabulated value (r= 0.196) with 101degrees of freedom at 0.05 level of probability.*
b) *The null hypothesis could be rejected.*
c) *The relationship between the concerned variables was significant.*
d) *The relationship showed a positive trend between the concerned variables.*

Based on the above findings, the researcher can be concluded that age of the farmers had a significant positive relationship with their use of IPM practices. This is meant that age of the farmers was an important factor in using IPM practices.

4.3.2 Relationship between education of the farmers and their use of IPM practices

Relationship between education of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between education of the farmers and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.605 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a) *The computed value of 'r' (r= 0.605) was found to be larger than the tabulated value (r= 0.254) with 101egrees of freedom at 0.01 level of probability.*
b) *The null hypothesis could be rejected.*
c) *The relationship between the concerned variables was highly significant.*
d) *The relationship showed a positive trend between the concerned variables*

Based on the above findings, the researcher can be said that education of the farmers had a significant and positive relationship with their use of IPM practices. This

indicates that education of the farmers was an important factor for their use of IPM practices.

4.3.3 Relationship between farm size of the farmers and their use of IPM practices

Relationship between farm size of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between farm size of the farmers and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variable was found to be 0.130 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a) *The computed value of 'r' (r= 0.130) was found to be smaller than the tabulated value (r= 0.217) with 101 degrees of freedom at 0.05 level of probability.*
b) *The null hypothesis could not be rejected.*
c) *The relationship between the concerned variables was not significant.*
d) *The relationship showed a positive trend between the concerned variables*

The findings indicated that farm size of the farmers had no significant relationship with their use of IPM practices. This indicated that farm size of the farmers was not an important factor for their use of IPM practices **.**

4.3.4 Relationship between annual family income of the farmers and their use of IPM practices

Relationship between annual family income of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between annual family income of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.067 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a. *The computed value of 'r' (r= 0.067) was found to be smaller than the tabulated value (r= 0.196) with 101 degrees of freedom at 0.05 level of probability.*
b. *The null hypothesis could not be rejected.*
c. *The relationship between the concerned variables was not significant.*
d. *The relationship showed a positive trend between the concerned variables*

Based on the above findings, the researcher concluded that annual family income of the farmers had no relationship with their use of IPM practices. This indicated that annual family income of the farmers was not an important factor for their use of IPM practices

4.3.5 Relationship between training exposure on IPM practices of the farmers and their use of IPM practices

Relationship between training exposure on IPM practices of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between training exposure on IPM practices of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.138 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a) *The computed value of 'r' (r= 0.138) was found to be smaller than the tabulated value (r= 0.196) with 101 degrees of freedom at 0.05 level of probability.*
b) *The null hypothesis could be rejected.*
c) *The relationship between the concerned variables was not significant.*

d) The relationship showed a positive trend between the concerned variables

Based on the above findings, the researcher concluded that training exposure on IPM practices of the farmers had no relationship with their use of IPM practices. This indicated that training exposure on IPM practices of the farmers was not an important factor for their use of IPM practices

4.3.6 Relationship between farming experience of the farmers and their use of IPM practices

Relationship between farming experience of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between farming experience of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.233 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a. *The computed value of 'r' (r= 0.233) was found to be larger than the tabulated value (r= 0.196) with 101 degrees of freedom at 0.05 level of probability.*
b. *The null hypothesis was rejected.*
c. *The relationship between the concerned variables was significant.*
d. *The relationship showed a positive trend between the concerned variables*

Based on the above findings, the researcher concluded that farming experience of the farmers had a significant positive relationship with their use of IPM practices. This indicated that farming experience of the farmers was an important factor for their use of IPM practices

4.3.7 Relationship between extension contact of the farmers and their use of IPM practices

Relationship between extension contact of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between extension contact of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.129 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a. *The computed value of 'r' (r= 0.129) was found to be smaller than the tabulated value (r= 0.0.196) with 101 degrees of freedom at 0.05 level of probability.*
b. *The null hypothesis could not be rejected.*
c. *The relationship between the concerned variables was not significant.*
d. *The relationship showed a positive trend between the concerned variables*

Based on the above findings, the researcher concluded that extension contact of the farmers had no relationship with their use of IPM practices. This indicated that extension contact of the farmers was not an important factor for their use of IPM practices.

4.3.8 Relationship between problem faced in IPM practices of the farmers and their use of IPM practices

Relationship between problem faced in IPM practices of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between problem faced in IPM practices of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be -0.549 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a. *The computed value of 'r' (r= -0.549) was found to be larger than the tabulated value (r= 0.254) with 101degrees of freedom at 0.01 level of probability.*
b. *The null hypothesis could be rejected.*
c. *The relationship between the concerned variables was significant.*
d. *The relationship showed a negative trend between the concerned variables.*

Based on the above findings, the researcher concluded that problem faced in IPM practices of the farmers had negative and significant relationship with their use of IPM practices. This indicated that problem faced in IPM practices of the farmers was an important factor for their use of IPM practices.

4.3.9 Relationship between knowledge on IPM practices of the farmers and their use of IPM practices

Relationship between knowledge on IPM practices of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between knowledge on IPM practices of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.483 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

a. *The computed value of 'r' (r= 0.483) was found to be larger than the tabulated value (r= 0.254) with 101degrees of freedom at 0.01 level of probability.*
b. *The null hypothesis could be rejected.*
c. *The relationship between the concerned variables was significant.*

d. The relationship showed a positive trend between the concerned variables

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

4.3.10 Relationship between attitude towards IPM practices of the farmers and their use of IPM practices

Relationship between attitude towards IPM practices of the farmers and their use of IPM practices was determined by testing the following null hypothesis: "There is no relationship between attitude towards IPM practices of the farmer and their use of IPM practices".

The calculated value of the co-efficient of correlation between the concerned variables was found to be 0.633 as shown in Table 4.13. The following observations were made regarding the relationship between the two variables under consideration.

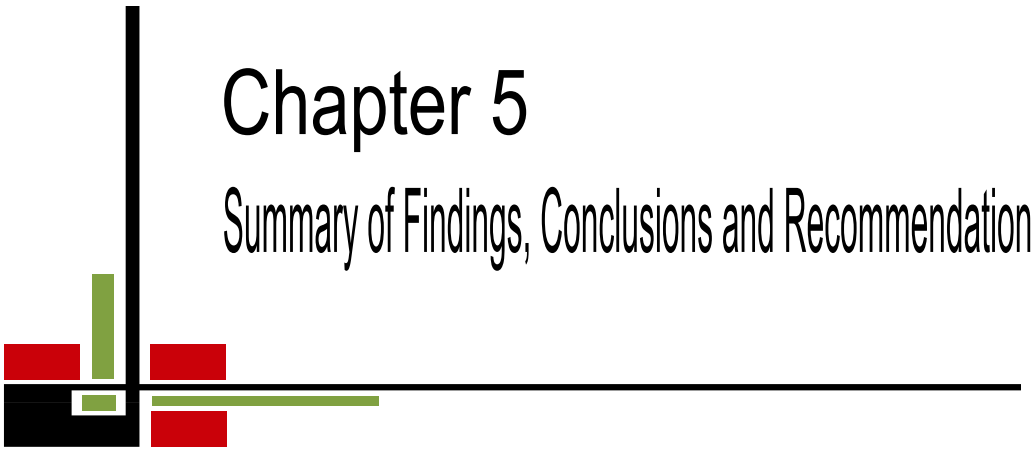
a. The computed value of 'r' (r= 0.0.633) was found to be larger than the tabulated value (r= 0.254) with 101degrees of freedom at 0.01 level of probability.

b. The null hypothesis could be rejected.

c. The relationship between the concerned variables was significant.

d. The relationship showed a positive trend between the concerned variables

Based on the above findings, the researcher concluded that attitude towards IPM practices of the farmers had significant and positive relationship with their use of IPM practices. This indicated that attitude towards IPM practices of the farmers was an important factor for their use of IPM practices.



Chapter 5

Summary of Findings, Conclusions and Recommendations

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter presents summary of findings, conclusions and recommendations of the study.

5.1 Summary of findings

The major findings of the study are summarized below:

5.1.1 Individual characteristics of the farmers

Findings in respect of the 10 selected characteristics of the farmers are summarized below:

Age: Overwhelming majority (96.10%) of the respondents were young to middle aged.

Level of Education: Almost all (97.10%) of the farmers had different level of education.

Farm size: Majority (57.28%) of the farmers had small farm compared to 38.83 percent having medium farm and 3.89 percent large farm.

Annual family income: Near about half (49.52) of the respondents had low family income while 25.24 percent and 25.24 percent of the respondents had medium and high annual family income respectively.

Training exposure on IPM practices: Overwhelming majority (87.40%) of the farmers had no training exposure while 12.60 percent having low training exposure on use of IPM practices.

Farming experience: Majority (68.92%) of the respondents had short to medium farming experience while 31.08 percent had long farming experience.

Extension contact: An overwhelming majority (93.20%) of the farmers had low to medium extension contact and only 6.80 percent had high extension contact.

Problem faced in IPM practices: Majority (61.14 %) of the respondents faced medium problem in IPM practices and 17.50 percent faced low problems and 21.36 percent faced high problems. Findings again reveal that an overwhelming majority 82.50% percent of the farmers faced medium to high problems in IPM practices.

Knowledge on IPM practices: Near about four fifth (79.50%) of the respondents fell in medium knowledge category followed by 15.50 percent in high knowledge category and only 4.85 percent in low knowledge category.

Attitude towards IPM practices: More than half (50.50%) of the respondents had less favourable attitude towards IPM practices out of which 21.40% unfavourable and 18.40% highly favourable and only 9.70 percent had neutral attitude.

5.1.2 Use of IPM practices

Use of IPM practices of the respondents ranged from 14 to 28 against the possible range of 0 – 30 with an average of 21.06 and standard deviation of 4.32. Findings reveal that more than three fifth (61.10%) of the farmers had medium use of IPM practices while 21.40 percent had high use of IPM practices and rest 17.50% had low use.

5.1.3 Relationship between the selected characteristics of the farmers with their use of IPM practices

Age, education, farming experience, extension contact, knowledge on IPM practices and attitude towards IPM practices had significant positive relationships with the use of IPM practices and problem faced in IPM practices had significant and

negative relationship with their use of IPM practices. Farm size, annual family income, training exposure on IPM had no relationship with use of IPM practices.

5.2 Conclusions

Findings of the present study and the logical interpretation of other relevant facts prompted the researcher to draw the following conclusions:

1. More than three fifth (61.10%) of the farmers had medium use of IPM practices. The finding leads to the conclusion that there is necessity to increase the use of IPM practices.
2. Almost three fifth (59.22%) of the respondents were middle to old aged and correlation revealed that age of the respondent had significant positive relationship with their use of IPM practices. Therefore, it may be concluded that IPM practices were used more by old aged farmers than young aged farmers.
3. Almost all (97.10%) of the farmers had different level of education and correlation revealed that education of the respondent had significant positive relationship with their use of IPM practices. Therefore, it may be concluded that more the level of education of the farmers more the use of IPM practices.
4. Majority (68.92%) of the respondents had short to medium farming experience while 31.08 percent had long farming experience, while there was a positive significant relationship between farming experience and their use of IPM practices. Therefore, it may be concluded that individuals having more farming experience used more IPM practices.
5. Overwhelming majority 82.50% percent of the farmers faced medium to high problems in IPM practices, while there was a negative significant relationship between problem faced in IPM practices and their use of IPM practices. Therefore, it may be concluded that individuals having more use of IPM faced fewer problems in IPM practices.

6. Near about four fifth (79.50%) of the respondents had medium knowledge, while there existed a positive significant relationship between knowledge on IPM practices and their use. The above facts lead to the conclusion that farmers having more IPM knowledge used more IPM practice.

7. More than half (50.50%) of the respondents had less favourable attitude towards IPM practices, while there exists a positive significant relationship between attitude towards IPM practices of the farmers and their use of IPM practices. One would, therefore, conclude that favourable attitude towards IPM practice is very much helpful for using more IPM practices.

5.3 Recommendations

5.3.1 Recommendations for policy implications

On the basis of experience, observation and conclusions drawn from the findings of the study following recommendations are made:

1. In view of the urgent need for increasing IPM practices, it is recommended that the DAE may take effective steps for strengthening extension services in order to change using percentage of the farmers regarding IPM practices.
2. Age of the respondent had significant positive relationship with their use of IPM practices. Therefore it may be recommended that attempts should be taken by the concerned authorities to increase use of IPM practices especially for the young and middle farmers.
3. Education of the respondent had significant positive relationship with their use of IPM practices. Therefore it may be recommended that attempts should be taken to establish adult learning centre to increase educational level of the farmers as well as IPM practice.
4. There was a positive significant relationship between farming experience of the farmers and their use of IPM practices. Therefore, it may be

recommended that necessary technical support to be provided to the short and medium to long farming experienced farmers for increasing their use of IPM practices.

5. There was a negative significant relationship between problem faced in IPM practice and their use of IPM practices. Therefore, it may be recommended that attempts should be taken to provide technical support to the farmers to minimize their problems in using IPM practices.
6. There existed a positive significant relationship between knowledge on IPM practices and their use of IPM practices. Therefore, it may be recommended that attempts should be taken by Department of Agricultural Extension (DAE) and other extension providers to arrange training, motivational campaigning and provide IPM practices guide for increasing their use of IPM practices.
7. There exists a positive significant relationship between attitude towards IPM practices of the farmers and their use of IPM practices. Therefore, it may be recommended that frequent extension service should provide to form favourable attitude of the farmers towards IPM practices.

5.3.2 Recommendations for further study

A small and limited research work cannot provide unique and universal information related to use of IPM practices by the farmers. Further studies should be undertaken on related matters. On the basis of scope and limitations of the present study and observations made by the researcher, the following recommendations are made for further study:

i. The study was conducted in Kalia upazila of Narail District. Similar studies should be conducted in other parts of the country to get a clear picture of the whole country which will be helpful for effective policy formulation.

ii. It is difficult to determine actual use of IPM practices by the farmers. Measurement of use IPM practices by the farmers is not free from questions.

More reliable measurement of concerned variable is necessary for further study.

iii. To measure use of IPM practices by the farmers' the researcher developed a scale and the validity of the scale may be verified by further studies using the same scale.

iv. The present study was undertaken to explore relationships of ten selected characteristics of the farmers with their use of IPM practices. Therefore, it could be recommended that further studies should be designed considering other agricultural and non-agricultural activities and including other characteristics of the farmers that might affect the use of IPM practices.

v. In the present study farm size, annual family income, training exposure on IPM practices, extension contact had no significant relationship with their use of IPM practices. In this connection, further verification is necessary.

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Appendices

APPENDICES

Appendix - A

(English version of the interview schedule)
Department of Agricultural Extension and Information System

Sher-e-Bangla Agriculrural University, Dhaka-1207

Interview schedule for collection of data to determine

USE OF INTEGRATED PEST MANAGEMENT PRACTICES BY THE FARMERS OF KALIA UPAZILA UNDER NARAIL DISTRICT

Respondent No. ……....

Respondent Name: ……..

Village: …….

Union: ……..

Upazila: …….....

District: …….

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

1. Age

What is your present Age? ----------Year /Years.

2. Education

a) Can't read and write: ----------

b) Can sign only: ----------

c) I read up to class: ----------

4. Farm size

Please indicate your area of lands according to use

Sl. No.	Use of land	Land possession	
		Local unit	Hectare
1	Homestead area (A_1)		
2	Own land under own cultivation (A_2)		
3	Land taken from others on borga system(A_3)		
4	Land given to others on borga system (A_4)		
5	Land taken from others on lease (A_5)		
	Total		

Total farm size = $A_1 + A_2 + {}^1/_2 (A_3 + A_4) + A_5$

4. Annual family income:

Mention your annual family income from the following sources.

Income sources	Income in '000' Tk.
A. Farm source	
1) Crop	
2)Livestock	
3)Poultry	
4)Fisheries	
B. Non-farm sources	
(i) Business	
(ii) Job	
(iii) Laborer	
(iv) Others	
Total	

5. Training exposure

Have you received any training on IPM ?

Yes …….. No. ……..

If yes, please give the following information:

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

6. Extension contact

Please state the extent of your contact with the following personnel.

Sl. No.		Extent of Participation			
		Regularly	**Occasionally**	**Rarely**	**Never**
1	Model farmers				
2	Agricultural input dealer				
3	NGO worker				
4	Sub-Assistant Agricultural Officer(SAAO)				
5	Upazila Agricultural Officer (UAO)				
6	Radio				
7	Television program				
8	Publications like newspaper, poster, leaflet etc.				
9	Friends/neighbor				
10	Group discussion				

7. Farming experience

What is the extent of your farming experience ? …….. Years.

8. Problem Faced in IPM practices

Please state the extent of the following problems faced in IPM practices

Sl. No.	Problem	Extent of Problems			
		High	Medium	Low	Not at all
1	Lack of technical knowledge in IPM practices				
2	Unavailability of inputs of IPM practices				
3	High cost of inputs of IPM practices				
4	Require more labour than chemical pesticide application				
5	Lack of demonstration plot				
6	Lack of knowledge about beneficiaries and harmful insects and pests				
7	Inadequate training facilities				
9	Doubt about the effectiveness of IPM practices				
10	Surrounding farmers are not interested towards IPM practices				

9. Knowledge

Please answer the following questions

Questions	Full marks	Marks obtained
1. What do you mean by IPM?	2	
2. Mention some pests in your area?	2	
3. Mention two IPM technique.	2	
4.Mention the pesticides name which are available in local market	2	
5. What are the disadvantages of pesticides?	2	
6. What is light trap?	2	
7. Do you know how sex-pheromone works?	2	
8. Mention some beneficial insects.	2	
9. What do you mean by resistant variety?	2	
10. Mention two bio-pesticides.	2	
Total	20	

10. Attitude towards

Please state your degree of agreement with the following statement

Sl. No.	Statements	Extent of agreement				
		Strongly agreed	Agreed	Undecided	Disagreed	Strongly disagreed
1(+)	Use of IPM is environment friendly					
2(-)	Long time is required to control pests than pesticide use					
3(+)	Use of IPM techniques are very easy					
4(-)	Many instruments are required which are not available at all the time					
5(+)	Use of IPM save beneficial insects					
6(-)	Total elimination of pests are not possible					
7(+)	Require low cost than pesticides used					
8(-)	Require more labor to manage it					

10. Use of IPM practices:

SI. No.	IPM Technologies	Extent of Use			
		Frequently	occasionally	rarely	Not at all
1.	Cultivation of resistant variety				
2.	Cultivation of disease free and healthy plants				
3.	Using of biological agents to kill harmful insects				
4.	Practice crop rotation				
5.	Destroy the crop residues				
6.	Using of light trap				
7.	Using of sex-pheromone				
8.	Using of swipe net				
9.	Using bio-pesticides				
10	Cultivation of alternate crops				

Thank you for your cooperation.

_____

Signature of the Interviewer

Date:

Appendix-B

Correlation Matrix

Characters	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Y
X1	-										
X2	0.011	-									
X3	-0.047	0.059	-								
X4	0.017	-0.025	-0.501**	-							
X5	-0.029	0.018	-0.082	-0.088	-						
X6	0.931**	0.037	-0.094	0.019	0.044	-					
X7	0.001	0.029	-0.032	0.100	-0.034	-0.002	-				
X8	-0.173	-0.502**	0.107	0.015	-0.199*	-0.230*	-0194*	-			
X9	-0.078	0.655**	-0.008	-0.044	-0.146	0.185	-0.106	-0313**	-		
X10	0.002	0.610**	-0.002	-0.066	0.179	0.162	0.006	-0.556**	0.575**	-	
Y	0.215*	0.605**	0.130	0.067	0.138	0.233*	0.129	-0.549**	-0.483**	0.633**	-

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

X1: Age
X2: Education
X3: Farm Size
X4: Annual Family Income
X5: Training Exposure on IPM practices
X6: Farming Experience
X7: Extension Contact
X8: Problem Faced in IPM practices
X9: Knowledge on IPM practices
X10: Attitude towards IPM practices
Y: Use of IPM Practices