

**USE OF INTEGRATED PEST MANAGEMENT PRACTICES
IN RICE FIELD BY THE FARMERS IN TAPODHAN UNION
UNDER RANGPUR DISTRICT**

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**MASTER OF SCIENCE (MS)
IN
AGRICULTURAL EXTENSION & INFORMATION SYSTEM**

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DHAKA-1207**

2006

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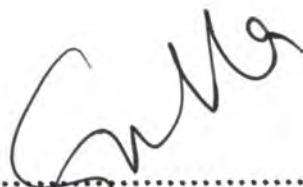
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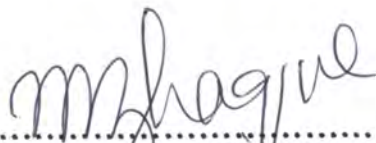
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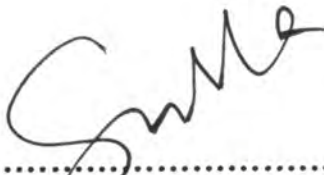
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CERTIFICATE

This to certify that the thesis entitled, “**USE OF INTEGRATED PEST MANAGEMENT PRACTICES IN RICE FIELD BY THE FARMERS IN TAPODHAN UNION UNDER RANGPUR DISTRICT**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in AGRICULTURAL EXTENSION & INFORMATION SYSTEM** embodies the result of a piece of *bona fide* research work carried out by **MD. MOSHARROF HOSSAIN**, Roll No. 00291, Registration No. 00291 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that such help or source of information, as has been availed of during the course of this investigation has been duly acknowledged by him.

(Professor M. Zahidul Haque)

Supervisor

Dhaka, Bangladesh.

**DEDICATED
TO
MY BELOVED PARENTS**

ABBREVIATIONS

SAU	:	Sher-e-Bangla Agricultural University
BBS	:	Bangladesh Bureau of Statistics
BANBEIS	:	Bangladesh Bureau of Educational information and Statistics
DAE	:	Department of Agricultural Extension
NGO	:	Non Governmental Organization
RDRS	:	Rangpur Dinajpur Rural Service
IPM	:	Integrated Pest Management
<i>et al</i>	:	Associates
<i>viz.</i>	:	Namely
<i>i.e.</i>	:	That is
LSD	:	Least Significant Difference
NS	:	Not-significant
<i>df</i>	:	Degrees of Freedom
SPSS	:	Statistical Package for Social Science
<i>Fig.</i>	:	Figure
<i>Tk.</i>	:	Taka
<i>Ha.</i>	:	Hectare
FAO	:	Food and Agricultural Organization
DANIDA	:	Danish International Development Agency

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USE OF INTEGRATED PEST MANAGEMENT PRACTICES IN RICE FIELD BY THE FARMERS IN TAPODHAN UNION UNDER RANGPUR DISTRICT

ABSTRACT

The main objective of this study was to find out the extent of use of Integrated Pest Management (IPM) practices in rice field by the farmers and to determine the relationship between the selected characteristics of the farmers and their use of IPM practices. The study was conducted in four villages under Tapodhan union of Rangpur sadar upazila. 100 farmers were selected as the respondents of the study randomly out of 1007 farmers. Data collected from the respondents using an interview schedule during April 1 to April 30, 2006. Descriptive statistics such as mean, standard deviation, range and percentage were used to describe the variables under consideration. Pearson's Product Moment Correlation Coefficient (r) was used to explore the relationship between the selected characteristics of the farmers and their use of IPM practices. The data shown that only 82 percent of the farmers were high users while 10 percent medium and 8 percent of the respondents were low users of IPM practices respectively. Among fourteen selected IPM practices, "Cross-bar use in the field to facilitate to sit the birds" ranked first and "To control pest, use of pesticides as a last measurement." ranked last. The findings further revealed that use of IPM practices by the farmers had significant relationship with their education, annual income, contact with extension sources, organizational participation, innovativeness, knowledge on IPM and cosmopolitaness. On the other side, age, family size and farm size had no significant relationship with the farmer's use of IPM practices.

CHAPTER 1

INTRODUCTION

1.1 General Background

Bangladesh is an agricultural country. The development of Bangladesh is related to the development of its agriculture sector which contributes 23.46 percent to the GDP (BBS, 2005). About 80 percent people directly or indirectly depends on agriculture for their livelihood. About 67 percent of the labor forces are employed in agriculture of which 59 percent is employed in the crop sector (BBS, 2005).

Within the crop sub-sector food grains, particularly the rice crop dominates in respect of both area and production. At present, rice covers about 75 percent of the cultivated land in Bangladesh. Area coverage by other crops is: pulses 9.64%, wheat 3.92%, oilseed 3.77%, fruits 0.89% and vegetables 1.39%. Thus, growth of rice crop has got substantial impact on the sectoral performance of agriculture (BBS, 2005).

But there are several constraints on the way to increasing production. One of the main constraints is the pest and diseases. The annual yield loss due to insect pests alone is 16% for rice and 25% for vegetables. Therefore, for increasing crop production it is important to reduce the crop loss caused by pests and diseases. (Anonymous, 2005).

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. It is now widely accepted that indiscriminate use of pesticides not only creates serious environmental and human

health problems but also promotes development of pest resistance to insecticides, destroys beneficial insects, upsets the balance between the pests and their natural enemies leading to the increase in the population of the target pests and even the creation of new problem. To avoid such consequences and at the same time to increase the rice production on a sustainable basis a viable alternative to sole dependence on chemicals for pest management is needed . Integrated Pest Management (IPM) is the best alternative strategy (BANBEIS, 2005).

IPM is a broad ecological approach to pest control using various pest control tactics in a compatible manner. 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: use of cross-bar in the field, use of sweeping net, use of light trap, cut the upper portion of the affected leaves etc.
- Chemical control: It is used as a last measure but priority is given to botanical and bio-pesticides whenever possible.

In Bangladesh, IPM activities first started in 1981 with the introduction of the first phase of FAO's Inter Country Programme (ICP) on IPM in rice field. Based on the success of FAO's Inter Country Programme (ICP), a project- strengthening Plant Protection Services (SPPS) started functioning in 1997. SPPS project was implemented by the Department of Agricultural Extension (DAE) with DANIDA assistance. The project is popularly known as the Integrated Pest Management (IPM) project. RDRS, a leading national NGO, has started the Integrated Pest Management (IPM) projects in rice field in Tapodhan Union of Rangpur Sadar Upazila. The ultimate goal of this project is to increase the productivity of the rice through bringing about improvements to the IPM practices of the farmers.

1.2 Statement of the Problem

In crop fields, 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 no exception from this (Sattar, 2004).

The pesticides uses have a number of adverse effects. Firstly, pesticides use can have adverse health effect for farm workers and others exposed to pesticides. Secondly, it contaminates surface-water, leached to the water sources have also been blamed for causing regular outbreaks of epidemic disease in fishes (Ziauddin, 2005).

The high level of pesticides uses also contaminate surface and ground water and damage our natural resources such as land, fishes, diatoms, beneficial micro-organisms, beneficial insects, plants and so on. So, it is essential to reduce the excess use of pesticides through popularizing IPM.

IPM is an excellent strategy for pest control. To reduce environment hazard, economic inputs and increase rice production as well as increase farmer's life style. IPM is important for farmers that is why the researcher made a study, the use of IPM practices by the farmers in rice field.

1.3 Specific Objectives

The following specific objectives set forth in order to give proper direction of the study:

1. To describe the following selected characteristics of the farmers related to IPM practices.
 - i. Age
 - ii. Education
 - iii. Family size
 - iv. Farm size
 - v. Annual income
 - vi. Contact with Extension Sources.
 - vii. Organizational participation
 - viii. Innovativeness
 - ix. Cosmopolitaness

2. To find out the extent of use of IPM practices (use of cross-bar in the field ,use of light trap, use of sweeping net, practices of crop- rotation etc.) in rice field by the farmers.

3. To determine the relationship between the extent of use of IPM practices and the selected characteristics of the farmers.

1.4 Justification of the study

Integrated Pest Management that is less hazardous to the environment and economically beneficial is a suitable innovation for the farmers to control the pest.

There are many studies conducted relating to knowledge and attitude of farmers on various aspects of agriculture. But very little research has been reported home and abroad to determine the use of IPM practices by the farmers.

IPM educates the farmers to utilize the readily available source of tolerant genetic resources, modern cultivation practices, mechanical means of control, biological means of control, organic, green manuring and bio-fertilizer to the pollution and improve the environment.

Most of the farmers of Bangladesh are poor. They could hardly spare the money for expensive toxic pesticides. IPM helps farmers to utilize the readily available source of biological control agents. Above all, IPM has an ample scope, making the farmer less reliance on chemical control. Through improving IPM practices in the field, farmers could reduce the harmful effects of pesticide in their agricultural field.

Integrated pest management (IPM) helps farmers assess the environmental awareness of the farmers. Under the above consideration the present study will certainly help the research and extension personnel, policy makers and farmers to establish more extensive IPM programs.

1.5 Assumptions

An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence (Goode, 1945). The following assumptions were in the mind of the researcher during conducting the study.

- (a) The respondents included in the sample were capable of furnishing of proper responses to the questions set-up in the interview schedule.
- (b) The researcher who acted as interviewer was well adjusted to the social environment of the study area. Hence the data collected by the researcher were free from bias.
- (c) The responses furnished by the respondents were reliable.
- (d) The items included in the questionnaire to ascertain the practices of IPM were adequate to reflect the practices of IPM.
- (e) The respondents had almost similar background and seemed to be homogenous to a great extent.
- (f) The information sought by the researcher revealed the real situation to satisfy the objectives of the study.
- (g) The findings were useful in choosing the clients as well as for planning, execution and evaluation the extension programme.

1.6 Scope and Limitation of the Study

The present study was undertaken to have an understanding of the use of IPM practices and to determine the relationship with selected characteristics of the farmers. Considering the time; money and other necessary resources available to the researcher and to make the research manageable and meaningful it was necessary to impose certain limitations. The limitations were as follows:

1. The study was conducted in Tapodhan union of Rangpur sadar upazila.
2. The study was restricted within the farmers who had at least some cultivable land under own cultivation.
3. For information about the study, the researcher was dependent on the data furnished by randomly selected respondents during the interview with them.
4. The farmers Characteristics were many and varied but in the present study only ten Characteristics were selected.
5. The researcher relied on the data furnished by the farmers from their memory during interview.

1.7 Definition of Functional Terms

A number of key terms used throughout the study are defined below for clarity of understanding:

Age: Age of a farmer referred to the period of time in complete years from his /her birth to the time of interview.

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

Family size: Family size of a farmer referred to the total members in his/her family including him/her, children and other dependents, who live and eat together in a family unit.

Farm size: Farm size of a farmer referred 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.

Annual income: Annual income of a farmer referred to the total annual earnings of all family members of a farmer from agriculture, livestock, fisheries and other accessible sources (business, service, day laborer, etc).

Organizational participation: Organizational participation of a farmer referred to his/her participation in various organizations as ordinary member, executive committee member or executive officer within a specific period of time.

Contact with extension sources: Contact with Extension sources of a farmer referred to a farmer exposure to or contact with different information sources and personnel being contact for technology dissemination.

Innovativeness: Innovativeness is the degree to which an individual is relatively earlier in adopting an innovation with respect to other members of a social system (Rogers, 1995). This was comprehensive by the quickness of accepting innovation by an individual in relation to others and was measured on the basis of time dimension.

Cosmopolitaness: Cosmopolitaness of a farmer referred to the degree to which an individual's orientation is both inside and out side of his/ her social system.

IPM practices: IPM practices in respect of Rice cultivation refers to those practices which are advocated by competent authority. This practices if use is helpful for improving the yield and/or quality of crop.

Integrated Pest Management (IPM): Integrated Pest Management can be defined in many ways. According to the Food and Agriculture Organization (FAO) "A pest population management system that utilizes all suitable techniques in a compatible manner to reduce pest population and maintain them at levels below that economic injury."

CHAPTER 2

REVIEW OF LITERATURE

This Chapter describes the reviews of past researchers related to this investigation. This present study is concerned with the use of IPM practices by the farmers in rice field and its relationships with their selected characteristics. An effort was made to know the findings of past research in this respect. The researcher came across with some review of literature regarding IPM as well as some studies that dealt with the relationship of characteristics of individuals with their use of IPM practices.

2.1 Findings Relating to the Relationship between Farmers Characteristics and Use of IPM Practices

2.1.1 Age and use of IPM Practices

Haque, Gogoi and Gogoi (2001), Hossain and Katarya (2002) and Kashem (2003) observed that there was no relationship between age of the farmers and their use of IPM Practices.

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

2.1.2 Education and use of IPM practices

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

2.1.3 Family size and use of IPM practices

Alam(2000),Hque and Hossain (2001) ,Hossain (2002) and Osunlogun(2003) reported that family size of the farmers had no significant relationship with their use of IPM Practices.

Igodon and Islam (2002), Okoro and Obibuaka(2003),Rahman and Ullah(2004) reported that family size of the farmers had significant and positive relationship with their use of IPM Practices.

2.1.4 Farm size and use of IPM practices

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

Islam (2002), Muttalab ,Okoro and Obibuaka (2003) and Rahman(2004) reported that farm size had significant and positive relationship with the use of IPM Practices of the farmers.

2.1.5 Annual income and use of IPM practices

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

2.1.6 Contract with Extension sources and use of IPM practices

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

2.1.7 Organizational participation and use of IPM practices

Hoque, Balasubramanian and Kaul (2000), Hossain (2001), Islam (2003), Khan (2003) and Rahman (2004) reported that organizational participation of the farmers had a significant and positive relationship with their adoption of IPM practices .

2.1.8 Innovativeness and use of IPM practices

Hossain (2001), Kashem and Islam (2002), Sardar and Rahman (2004) found a positive and significant relationship between the farmer's innovativeness and their use of modern farm practices.

2.1.9 Cosmopolitanism and use of IPM practices

Aurangozeb and Haque (2000), Haque (2001), Hssain and Hussen (2002), Khan (2003) and Rahman (2004) reported that cosmopolitanism of the farmers significantly influenced the adoption of selected IPM practices.

2.2 Review of studies related to the extent of use of IPM practices.

Haque (2000), Hossain (2001), Hussien (2002), Kher (2003) and Rahman (2004) found that 'use of resistant varieties' , ' use of modern agricultural farm machineries' and 'use of cross -bar in the field' were adopted by the rice growers respectively.

Razzak , Naika and Rao (2003) and Ramaswamy *et al* (2004) in their study on modern rice varieties found that improved technologies have been adopted effectively in favorable areas but the adoption likely to be limited in unfavorable areas.

Singh and Ragendra (2005) found hat out of 150 farmers, 105 farmers adopted in high yielding varieties of rice, while only 45farmers did not adopted. A high level of adoption was found in plant protection measures.

Findings of the research studies regarding the extent of use of IPM practices as presented above indicated that the use of IPM practices in rural areas of Bangladesh encouraging. Till today, most of the farmers practice the traditional methods to a greater extent. This fact indicates that the extension workers have enormous scope to enhance the use of IPM practices among the farmers.

CHAPTER 3

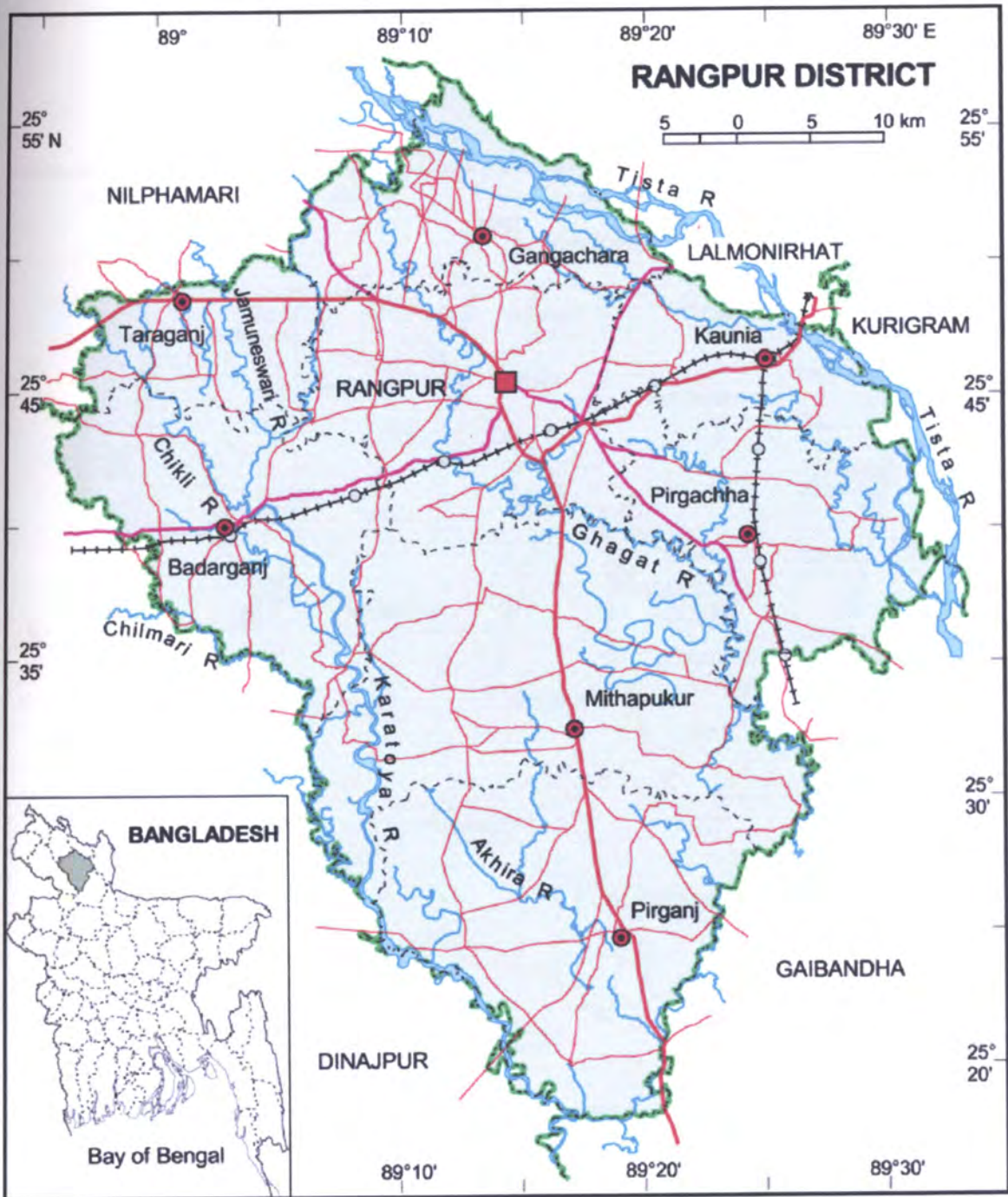
METHODOLOGY

Methodology deserves a very careful consideration in social research. It is very important in conducting research for getting reliable information, accurate analysis and valid results from the study. The methodology used in the study, is described in this chapter.

3.1 Locale of the study

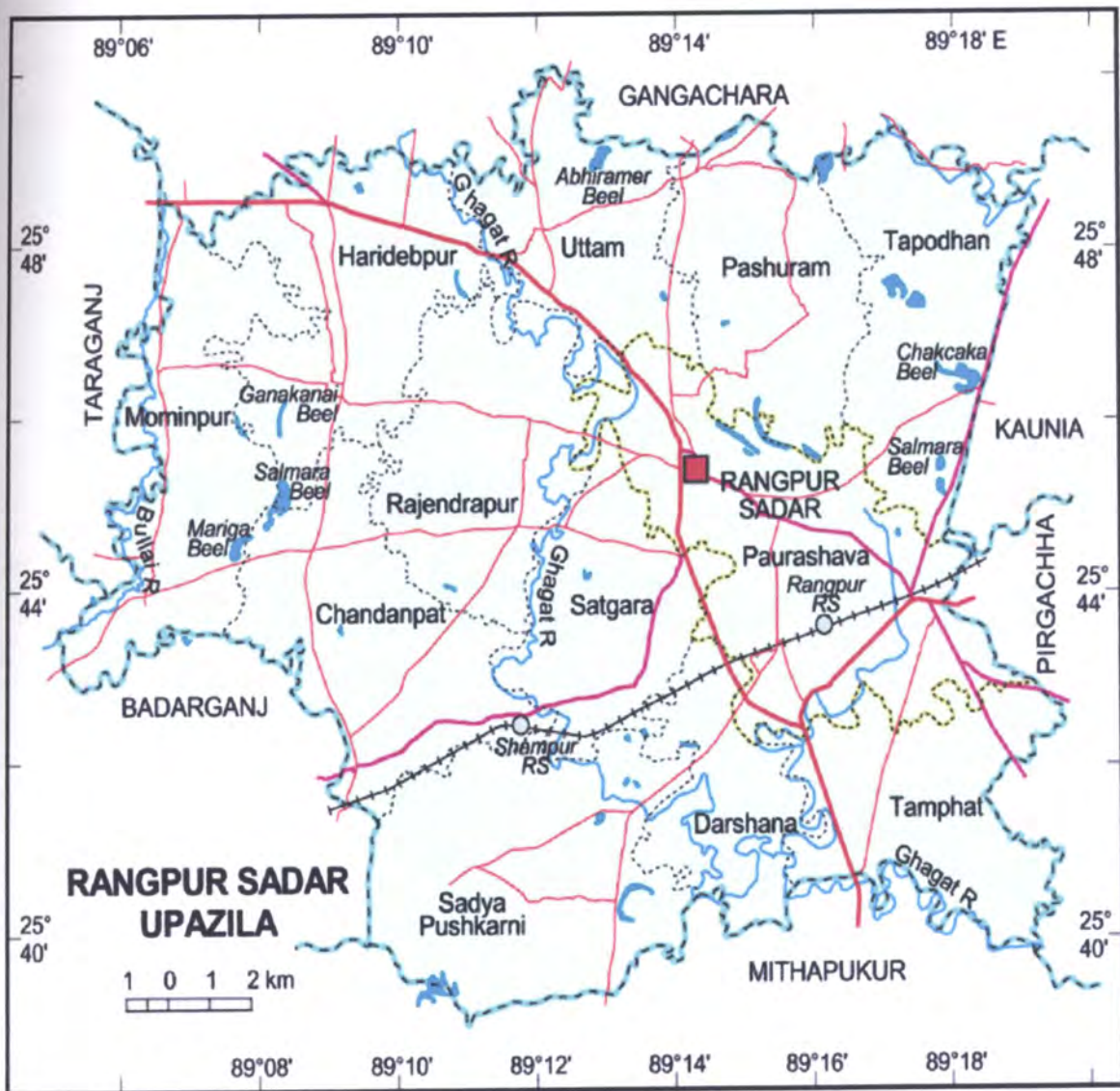
The study was conducted in Tapodhan Union of Rangpur district, which is situated 325 km. north from the Capital city Dhaka and is well communicated. The farmers of this district have been practicing IPM since 2003 under the patroness of certain NGO like RDRS. The reason for selection of this area is that it is easily accessible by road and its socio economic features are well known to the researcher and considering proper utilization of time and resources.

Two maps showing the location and details of the study area are presented in the following pages.



3.1 Map showing Rangpur District in Bangladesh.

Union: Tapodhan
District: Rangpur



3.2 Map showing Tapodhan Union of Rangpur District.

3.2 Population and Sampling Design

The unit of analysis of this study was the farmers of 4 villages under Tapodhan Union of Rangpur district. They got themselves involved in various IPM practices under the patroness of RDRS, a national NGO. The total number of farmers was 1007, which constituted the population. One hundred farmers (sampling rate 10%) were selected through random sampling technique. A reserve list of 4 farmers was made as second sample for using the same in case of non – availability of sampled farmers.

Table 3.1 Population, sample and reserve list of farmers in different Villages of Tapodhan Union of Rangpur district.

Villages	Number of farmers		Number of farmers included in the reserve list
	Population	Sample	
Islampur	301	30	1
Telipara	251	25	1
Mohabbatkha	203	20	1
Sahebgang	252	25	1
Total	1007	100	4

3.3 Selection of Dependent and Independent variables

The Extent of Use of Integrated Pest Management (IPM) practices in rice field by the farmers was the dependent variable of this study. As the use of IPM Practices in rice field by the farmers was the main focus of the study, so there are various factors which could influence this phenomenon. But it was not possible in a single study to deal with all the factors. So discussing with the research supervisor, co-supervisor and members of the examination committee and considering the limitations of time, money and other resources, 9 characteristics of the farmers

were selected as the independent variables of this study. These variables were: Age, Education, Family size, Farm size, Annual income, Contact with extension sources, Organizational participation, Innovativeness and Cosmopolitaness.

3.3.1 Measurement of Independent Variables

The procedures for measuring the independent variables were as follows:

3.3.1.1 Age

The age of a respondent was measured in terms of years from his / her date of birth to interview time.

3.3.1.2 Education

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

3.3.1.3 Family size

Family size of a respondent was determined by the total members in his/her family including him/her, children 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.

3.3.1.4 Farm size

Farm size of a respondent was measured by using the following formula:

$$F_s = A + B + \frac{1}{2} C + \frac{1}{2} D - E + F$$

Where,

F_s = Farm size

A = Home stead area owned by a respondent

B = Cultivated area owned by a respondent

C = Cultivated area taken as barga

D = Cultivated area given as barga

E = Lease given

F = Lease taken

3.3.1.5 Annual income

Annual income of a respondent was measured in taka on the basis of total yearly earnings of his/her family from agriculture and non-agricultural sources. For determining agricultural income of a respondent, first, annual production of different farm out puts like crops, livestock, fisheries etc. was ascertained. Then the total market prices of the above items were determined on the basis of prevailing market price of the items at the time of interviewing. Income of the respondent and other members of his/her family from non-agriculture sources (services, business etc) was also determined. Yearly earnings from agriculture and non-agriculture sources were added together to obtain the total income of the Respondents. A score of 1 was given for each 1000 Tk.

3.3.1.6 Contact with extension sources

Contact with extension sources of a respondent was measured according to the nature of his/her contact with different extension sources. The scale used for determining the extension contact score of an individual is given below.

Possible range was 0-42.

Table 3.2 Measurement of respondents contact with extension sources.

Extension sources	Extent of contact		Scores assigned
Individual contact			
Sub-assistant Agricultural Officer	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
NGO worker(s)	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Agricultural Extension Officer	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Upazila Fisheries Officer	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Veterinary Surgeon	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Group contact			
Participation in Group Discussion	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0

Table 3.2 (Cont'd.)

Participation in Method/Result Demonstration	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Participation in Training	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Mass contact			
Listening Agricultural program in Radio	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
watching Agricultural program in Television	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Observing Agricultural Fair	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Reading Agricultural Magazine	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0

3.3.1.7 Organizational participation

Organizational participation of a respondent was measured by his/her nature and duration of participation in different organizations. Possible range was 0-42.

$$\text{Organizational participation} = P \times D.$$

Where,

P = Participation

D = Duration

Participation scores was measured in the following way

Nature of participation	Scores assigned
No participation	0
General member	1
Member of the executive committee	2
Executive officer	3

Duration scores was measured in the following way

Duration of participation	Scores assigned
Up to One year	1
Two Years	2
Three Years	3

Organizational participation 'P' should be multiplied by duration 'D' i.e $P \times D$.

Then add all the organizational participation score to get the actual score.

3.3.1.8 Innovativeness

Innovativeness of a respondent was measured on the basis of his/her extent of use of 14 selected modern agricultural practices. Scores was assigned on the basis of period of adoption Possible range was 0-70..

Period of Adoption	Scores assigned
Do not use	0
1-2 years	1
3-4 years	2
5-6 years	3
7-8 years	4
above 8 years	5

The innovativeness score for a particular modern practice was calculated using the period of adoption. Then all scores of the 14 selected practices were added together to get the innovativeness score of a respondent.

3.3.1.9 Cosmopolitaness

Cosmopolitaness of a respondent was measured on the basis of frequency of visit of the respondent to different places both inside and out side of his/her own social system. Possible range was 0-21. Cosmopolitaness score was computed according to following table.

Table 3.3 Measurement of Cosmopolitaness of the respondents.

Places of visit	Extent of visit		Scores assigned
Neighbors, friends, Relatives and market	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Neighbouring unions	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Own upazilla headquarter	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Other headquarters	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
District/ town	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0
Captial city Dhaka	Frequently	9-12 times/month	3
	Occasionally	5-8 times/month	2
	Rarely	1-4 times/month	1
	Not at all	0 times/month	0

3.3.2 Measurement of dependent variable

The extent of use of IPM practices by the farmers was measured on the basis of 14 selected IPM practices. The respondents were asked to express their extent of use in the form of 'frequently', 'occasionally', 'rarely' and 'not at all', while scores assigned to the above four responses were 3,2,1 and 0 respectively. Possible range was 0-42.

An IPM Practices Use Index (IPUI) was used to measure the dependent variable.

$$IPUI = N \times F + N \times O + N \times R + N \times NA$$

Where,

IPUI = IPM Practices Use Index

N= Number of farmers used IPM Practices.

F= Frequently

O = Occasionally

R = Rarely

NA= Not at all.

Table 3.4 Measurement of dependent variable.

Name of IPM practices	Extent of use		Scores assigned
Use of Frog, Praying Bird etc.	Frequently	5 times or above/years	3
	Occasionally	3-4 times/years	2
	Rarely	1-2 times/years	1
	Not at all	0 times/years	0
Use of BR26, BR31, BR35 etc.	Frequently	5 times or above/years	3
	Occasionally	3-4 times/years	2
	Rarely	1-2 times/years	1
	Not at all	0 times/years	0
Use of healthy and disease free seeds.	Frequently	5 times or above/years	3
	Occasionally	3-4 times/years	2
	Rarely	1-2 times/years	1
	Not at all	0 times/years	0
Use of power tiller, tractor etc.	Frequently	5 times or above/years	3
	Occasionally	3-4 times/years	2
	Rarely	1-2 times/years	1
	Not at all	0 times/years	0

Table 3.4 (Cont'd)

Use of Crop rotation.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Water management.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Weed management (rouging, eradication etc).	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Use of sweeping net.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Use of Light trap.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Cut the upper portion of the affected leaves.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Destroy the crop residues.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Use of cross-bar in the field to sit the birds.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Collection and destroy eggs and larvae of insects.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0
Use of pesticides as a last measurement.	Frequently Occasionally Rarely Not at all	5 times or above/years 3-4 times/years 1-2 times/years 0 times/years	3 2 1 0

The scores of the all practices were added together to calculate the actual Extent of use of IPM practices by the farmers.

3.4 Statement of the 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 see 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." In studying the relationship between variables, research hypotheses are formulated which state the anticipated relationship between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between the concerned variables. If a hypothesis is rejected on the basis of a statistical test, it is assumed that there is a relationship between the concerned variables.

3.5 Instrument for Data Collation

In order to collect relevant information from the respondents, interview schedule was used as the research instrument. The schedule was carefully designed keeping the objectives of the study in mind. Both open and closed forms of questions were used to collect information. Simple, direct questions and scales were included in the interview schedule for collecting information regarding the use of IPM practices by the farmers and 10 individual characteristics namely age, education, family size, farm size, annual income, contact with extension sources, organizational participation, innovativeness and cosmopolitaness.

3.6 Pre-testing of the Interview Schedule

The interview schedule was pre-tested with 10 farmers and final shape was given to the interview schedule according to the experience of 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 basis of suggestions and comments of the appropriate authority. ion of the interview schedule is presented at Appendix-A.

3.7 Collection of Data

Data were collected personally by the researcher himself through face to face interview. Interviews were usually conducted in respondent's house during their leisure period. While starting interview with any respondent, at first the researcher took all possible care to establish rapport so that he/she did not hesitate to furnish proper responses to the questions and statements included in the interview schedule. However, if any respondent felt difficulty in understanding any question, the researcher took almost care to explain and clarify the questions. Data were collected during April 1 to April 30, 2006.

3.8 Compilation of Data

After completion of field survey all the interview schedules were compiled. Local units were converted into standard unit. Appropriate scoring technique was followed to convert the qualitative data into quantitative forms. The responses of the individual respondent contained in the interview schedules were transferred to

a master sheet for entering the computer. As soon as the data entered into the computer, these were analyzed in accordance with the objectives of the study.

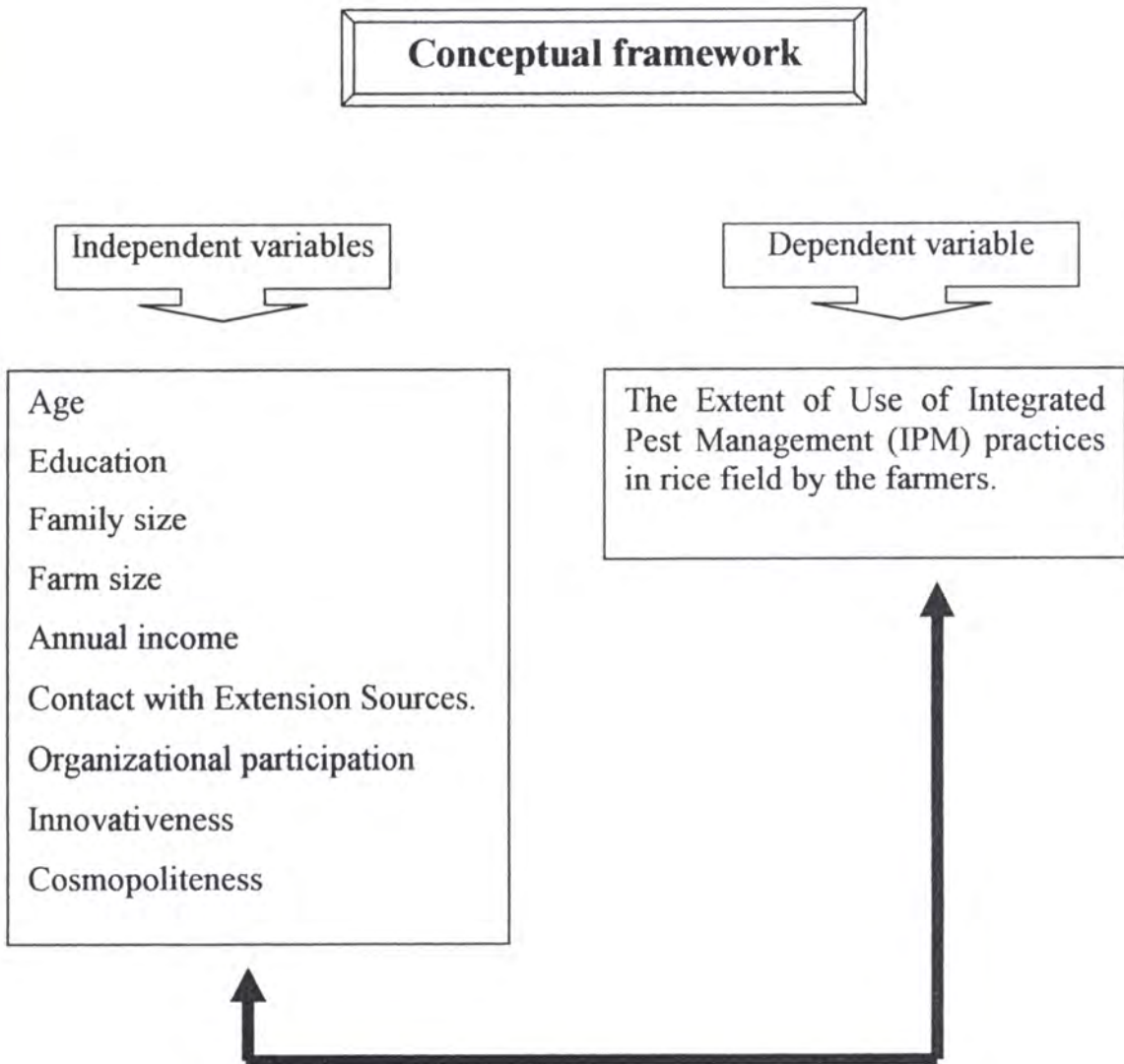
3.9 Categorization of Data

For describing the independent and dependent variables, the respondents were classified into appropriate categories. In developing categories, the investigator was guided by the nature of data and general considerations prevailing in the social system. The procedures for categorization have been discussed while describing the variables in the relevant Chapter-4.

3.10 Statistical Treatment

The data after collection were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. The SPSS PC + Package in micro computer was used to perform the data analysis. Various statistical measures such as percentage distribution, number, frequency distribution, range, rank order, average and standard deviation were used in categorizing and describing the selected dependent and independent variables. For clarity of understanding tables were also used for presentation of data. Correlation tests were used in order to test (i) the interrelationship among selected characteristics of the respondents and (ii) the relationship of selected characteristics of the respondents with their use of IPM practices in rice field. Throughout the study one percent (0.01) level of significance was used to reject or accept any null hypothesis.

3.11 Conceptual framework



CHAPTER 4

FINDINGS AND DISCUSSIONS

The findings of the study and interpretations have been presented in three separate sections of this chapter. The first section deals with the selected individual characteristics of the respondents while the second section deals with the extent of use of IPM practices. The third section deals with the relationships between the selected characteristics of the respondents and their extent of use of IPM practices.

4.1 Selected characteristics of the respondents

In this section the respondent's individual characteristics have been discussed. Salient feature of the respondents with their 9 selected characteristics have been presented in the table 4.1(Page no.31)

4.1.1 Age

Age of the respondents ranged from 24 -75 years with the average of 45.44 years and standard deviation 11.19. Based on their age, the respondents were classified into three categories as shown in the table 4.1. Data presented in the table indicates that the highest proportion (62 percent) of the farmers were in middle aged group ranged from 26 to 50 years, while 4 percent and 34 percent belonged to young and old category. However, the data also revealed that 66 percent of the respondents of the study area were young to middle aged category. Basher (2002) and Hussen (2002) also found the similar findings in their findings. Young and middle aged people are generally receptive to new ideas and things. However, they might have valuable opinion in regard to use of IPM practices.

4.1.2 Education

Education of a farmer was measured by the level of his formal education i.e. highest grade (class) passed by him. The education score of the respondents ranged from 0-14 with the average of 5.7 and standard deviation 3.65. Based on their level of education, the farmers were classified in to four categories as shown in the table 4.1 (Page no. 31). The data indicated that the majority (50 percent) of the farmers had primary level of education while 36 percent farmers had secondary level of education, 6 percent illiterate and 8 percent above secondary level of education. Basher (2002) and Ali (2001) also found that the highest number of rice growers were in the primary education group.

Table 4.1 Salient feature of the respondent's with their characteristics (N = 100).

Characteristics	Scoring system	Range		Category	Farmers		Mean	Standard deviation
		Possible	Actual		No	%		
Age	Actual years	.	24-75	Young (up to 25)	4	4	45.44	11.134
				Middle aged (26-50)	62	62		
				Old (Above 50)	34	34		
Education	Level of schooling	.	0-14	Illiterate (0)	6	6	5.7	3.65
				Primary level (1-5)	50	50		
				Secondary level (6-10)	36	36		
				Above secondary (>10)	8	8		
Family size	Numbers	.	4-12	Small (up to 4)	8	8	7	2
				Medium (5-6)	46	46		
				Large (>6)	46	46		
Farm size	Hectares	.	0.42-4.2	Small (0.41-1.00)	54	54	1.21	0.72
				Medium (1.01-3.00)	42	42		
				Large (>3.00)	4	4		
Annual income (In thousand)	Computed score	.	18-250	Low (up to 55)	8	8	92.55	41.55
				Medium (56-100)	70	70		
				High (>100)	22	22		
Contact with extension sources	Scale score	0-42	4-30	Low (up to 10)	14	14	16.26	4.86
				Medium (11-23)	82	82		
				High (>23)	4	4		
Organizational participation	Scale score	0-42	0-42	No (0)	2	2	13.78	11.66
				Low (1-15)	20	20		
				Medium (16-30)	55	55		
				High (>30)	23	23		
Innovativeness	Scale score	0-70	10-30	Low (up to 10)	4	4	17.78	6.36
				Medium (11-20)	74	74		
				High (>20)	22	22		
Cosmopolitaness	Scale score	0-21	5-11	Low (up to 5)	2	2	8.64	1.64
				Medium (6-10)	84	84		
				High (>10)	14	14		
Practices of IPM	Scale score	0-42	7-30	Low (up to 10)	8	8	17.84	4.12
				Medium (11-20)	10	10		
				High (>20)	82	82		

4.1.3 Family size

The family size of the respondents ranged from 4 to 12 with an average of 6.6. The data in table 4.1(Page no.31) indicated that the majority (46 percent) of the respondents had large, 46 percent had medium and 8 percent had small family size respectively. However, 92 percent of the respondents had medium to large family size.

The data also indicate that the average family size (7persons) in the study area was higher than the national average of 4.8 persons (BBS (2005). This may be due to lack of proper adoption of family planning measures among the respondents or the prevalence of joint family system in the study area. Another reason was that the national average of 4.8 persons per family was conducted with rural and urban families but the present study was concern with the rural families only.

4.1.4 Farm size

The farm size of the farmers in the study area varied from 0.42 to 4.2 ha. Majority (54 percent) of the respondents had small farm size compared to 42 and 4 percent with medium and marginal farm size respectively. The average farm size of the respondents was 1.212 ha with standard deviation of 0.722. Findings show that maximum farmers of the study area had small farm size. It may be due to high population.

4.1.5 Annual income

Annual income score of the farmers ranged from 18 to 250(1 score for tk.1000) with the mean of 92.55 and standard deviation 41.55. On the basis of the annual income, the farmers were classified into three categories as shown in Table 4.1.

Data presented in table 4.1 (Page no.31) show that the highest proportion (70 percentages) of the farmers had medium annual income, while only 8 percent had low income and 22 percent had high income. As a result, the most (78 percent) of the farmers in the study area had low to medium annual income.

4.1.6 Contact with extension sources

Data furnished in table 4.1 indicates that great majority (82 percent) of the farmers of the study area had medium extension contact while 14 percent farmers had low extension contact and 4 percent had high extension contact. The average score of contact with extension sources was 16.26 and standard deviation 4.86. The findings of the study area indicated that most (96 percent) of the respondents had low to medium contact with various information sources for getting agricultural information. Basher (2002), Pal (2000), Hussien (2002) and Islam (2003) observed almost the similar findings in their studies.

4.1.7 Organizational participation

Organization participation scores of the respondents ranged from 0 to 45 with an average of 13.78 and standard deviation 11.66. Data in Table 4.1 reveal that a major portion (20 percent) of the respondents had low organizational participation while 2 percent had no participation. 55 percent of the respondents had medium and 23 percent had high organizational participation. Organizational participation enables the farmers to come in contact with people having diversified experiences and problem solving capabilities.

4.1.8 Innovativeness

Data in Table 4.1 (Page no.31) indicate that majority (74 percent) of the respondents had medium innovativeness and 4 percent had low and 22 percent high innovativeness scores. The average Innovativeness score of the respondents was 17.78 with the standard deviation of 3.63. As high extension media contact, education and high cosmopolite ness, for this reasons innovativeness was high.

4.1.9 Cosmopoliteness

The cosmopoliteness scores of the farmers of the study area ranged from 5 to 11 against the possible range of 0 to 21. The mean and standard deviation were 8.64 and 1.642 respectively. The information of 4.1 indicated that 84 percent of the respondents had medium cosmopolite ness as compared to 2 percent had low cosmopoliteness and 14 percent had high cosmopoliteness. Hussen (2002) and Islam (2003) also observed the similar findings in their studies.

4.2 Dependent variable

As noted earlier (chapter 3), the extent of use of IPM practices was considered as the dependent variable of the study.

4.2.1 Comparison among the extent of use of selected IPM practices

In order to compare among the selected IPM practices regarding their extent of use of IPM Practices Use Index (IPUI) was developed following the formula as described in chapter 3. The IPUIs along with their associated ranks appear in Table 4.2.

Table 4.2 Comparison of identified IPM practices used by the farmers.

IPM Practices	Citation (N = 100)					
	F	O	R	N	IPUI	Rank
Use of Cross-bar in the field to facilitate to sit the birds.	65	23	12	0	253	1
Cut the upper portion of the affected leaves.	64	24	9	3	249	2
Use of Healthy and disease free seeds.	58	33	6	3	246	3
Use of BR26, BR31, BR35 etc.	57	30	11	2	242	4
Weed management (rouging, eradication etc.	59	24	12	5	237	5
Water management	55	24	12	4	230	6
Use of Crop rotation.	51	29	15	5	226	7
Destroy the crop residues.	33	58	6	3	221	8
Use of Light trap.	29	60	10	1	217	9
Use of Power tiller, Tractor etc.	33	51	13	3	214	10
Use of Sweeping net.	31	53	13	3	212	11
Use of Frog, Praying Bard etc.	36	44	15	5	221	12
Collection and destroy eggs and larvae of insects.	235	44	16	5	209	13
Use of pesticides as a last measurement.	37	33	30	0	207	14

Abbreviations:

IPUI= IPM Practices Use Index

F = Frequently

O = Occasionally

R = Rarely

N = Not at all

Among the 14 selected IPM practices, 'Cross-bar use in the field to facilitate to sit the birds' ranked first and indicated highest extent of use by the rice growers. The

2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th and 14th position in the rank order were 'Cut the upper portion of the affected leaves', 'Use of healthy and disease free seeds', 'Use of BR26, BR31, BR35 etc', 'weed management', 'water management', 'Use of crop rotation', 'Destroy the crop residues', 'trap', 'Use of Power tiller, Tractor etc', 'Use of sweeping net', 'Use of Bard etc.', 'collection and destroy eggs and larvae of the insects' and 'Use of pesticides as a last measurement' respectively.

It was found that Use of pesticides as a last measure was relatively complex and costly and less popular among the farmers. This was indicated by low IPUI values. Again the top eleven practices in the rank order were found popular among the farmers.

4.2.2 Overall use of IPM practices

Observed practices of IPM scores of the farmers ranged from 7 to 30 against the possible range of 0 to 42. The average and standard deviation were 17.84 and 4.12 respectively. Based on possible scores, the farmers were classified in to three categories as shown in Table 4.3.

Table 4.3 Distribution of farmers according to IPM practices

Category	Number of farmers	Percent	Mean	Standard deviation
Low practices (up to 10)	8	8	17.84	4.12
Medium practices (11 to 20)	10	10		
High practices (>20)	82	82		

Data presented in Table 4.3 indicate that highest proportion (82 percent) of the farmers had high IPM practices where 10 percent had medium IPM practices and 8 percent had low IPM practices. The findings of use of IPM practices by the farmers are diagrammatically shown in Fig. 4.1 (Page no.37).

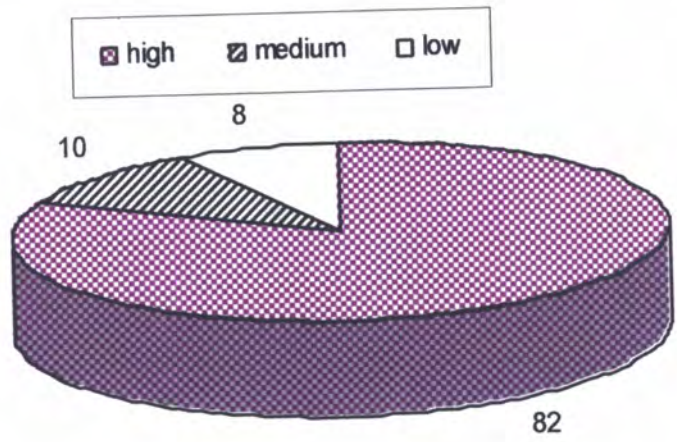


Fig. 4.1 Pie graph showing the extent of use of IPM practices by the farmers in rice fields.

4.3 Relationship between the selected Characteristics of Respondents and their use of IPM Practices

The purpose of this section is to find out the relationship between the selected characteristics of the farmers and their extent of use of IPM practices in rice field. Ten selected characteristics constituted the independent variables which were: age, education, family size, farm size, annual income, contact with extension sources, organizational participation, innovativeness, knowledge on IPM practices and cosmopolitaness. The extent of use of integrated pest management practices in rice field was the dependent variable. Pearson's Product Moment Correlation coefficient 'r' has been used to test the null hypothesis. The null hypothesis was stated in chapter 3. The summary of the result of the correlation co-efficient analysis has been presented in Table 4.4.

Table 4.4 Co-efficient of correlation showing relationship between selected characteristics of the farmers and their extent of use of IPM practices in rice field (N = 100).

Characteristics of the respondents	Correlation coefficient (r) with practices of IPM
Age	0.250 ^{NS}
Education	0.290 *
Family size	0.196 ^{NS}
Farm size	0.241 ^{NS}
Annual income	0.416 *
Contact with extension sources	0.516 *
Organizational participation	0.401*
Innovative ness	0.717 *
Cosmopoliteness	0.484 *

NS = Not significant

Tabulated value at 0.01 Level = 0.254

* = Significant at 0.01 level

N = 100, df = 98

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

Practices

The relationship between age of the farmers and their use of IPM practices in rice field was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concern variable was found to be ' $r = 0.250$ ' as shown in Table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a negative trend.
- The computed value of ' r ' (-0.250) was smaller than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of significance.

On the basis of above findings, the null hypothesis was not rejected. Hence, the researcher concluded that age of the farmers had no significant relationship with their use of IPM practices in rice field. Similar findings were also observed by Rahman (2001), Kher (2003), Islam (2002), Chowdhury (2001), Mostofa (2003) and Rahman (2001) in their studies.

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

The relationship between education of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concern variable was found to be ' $r = 0.290$ ' as shown in Table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend.
- The computed value of ' r ' (0.290) was higher than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of significance.

On the basis of above findings, the hypothesis was rejected and hence, it can be concluded that education of the farmers had a significant and positive relationship with their use of IPM practices in rice field. Also the findings indicated that more education of the farmers led to a tendency toward more use of integrated pest management practices. Hossain (2002), Hoque (2001), Khan (2003), Pal (2000) and many other also found positive and significant relationship between the farmer's education and their use of IPM practices.

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

The relationship between family size of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concern variable was found to be ' $r = - 0.196$ ' as shown in Table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a negative trend.
- The computed value of ' r ' (-0.196) was lower than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of significance.

On the basis of above findings, the hypothesis was not rejected and hence, it can be concluded that family size of the farmers had no significant relationship with their use of IPM practices in rice field. Similar findings were observed by Karim (2002), Khan (2003), Alam (2000) and Islam (2003).

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

The relationship between farm size of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concern variable was found to be ' $r = 0.241$ ' as shown in Table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend.
- The computed value of ' r ' (0.241) was smaller than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of significance.

On the basis of above findings, the hypothesis was not rejected and hence, it can be concluded that farm size of the farmers had no significant relationship with their use of IPM practices in rice field.

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

The relationship between annual income of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concerned variable was found to be ' $r = 0.416$ ' as shown in table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend with the concerned value.
- The computed value of ' r ' (0.416) was higher than the tabulated value ' r ' (0.254) with 98degrees of freedom at 0.01 level of significance.

On the basis of above findings, the null hypothesis was rejected. Hence, the researcher concluded that annual income of the farmers had significant and positive relationship with their use of IPM practices in rice field. Similar findings observed by Karim(2002), Pal (2000), Chowdhury (2001)in their studies.

4.3.6 Relationship between the farmers contact with extension sources and their use of IPM practices

The relationship between the farmers contact with extension sources and their use of IPM practices was examined by testing the concerned null hypothesis.

Co-efficient of correlation of the concerned variable was found to be ' r ' = 0.516 as shown in table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend with the concerned value.
- The computed value of ' r ' (0.516) was higher than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis was rejected. Hence, the researcher concluded that contact with extension sources of the farmers had significant and positive relationship with their use of IPM practices in rice field.

Farmers become aware of the improved agriculture practices through the various extension communication media. Farmers having no or low extension contact were expected to be low in adoption of improved cultural practices because lack of their knowledge about the practices. It was likely that farmers with high extension contact received more information of farm affairs which strengthened the base of their agricultural knowledge. Such knowledge was probably conducive to motivate the farmers toward adoption of modern IPM practices. Kashem *et al.* (2002), Basher (2002), Pal (2000), Chowdhury (2001) and Sarkar (2002) also found the similar results.

4.3.7 Relationship between the farmer's organizational participation and their use of IPM practices

The relationship between the farmer's organizational participation and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concerned variable was found to be ' r ' = 0.221 as shown in table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend with the concerned value.
- The computed value of ' r ' (0.401) was higher than the tabulated value ' r ' (0.254) with 98degrees of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis was rejected. Hence, the researcher concluded that organizational participation of the farmers had significant and positive relationship with their use of IPM practices in rice field.

4.3.8 Relationship between innovativeness of the farmers and their use of IPM practices

The relationship between innovativeness of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concerned variable was found to be ' r ' = 0.717 as shown in table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend with the concerned value.
- The computed value of ' r ' (0.717) was higher than the tabulated value ' r ' (0.254) with 98degrees of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis was rejected. Hence, the researcher concluded that innovativeness of the farmers had significant and positive relationship with their use of IPM practices in rice field.

4.3.9 Relationship between of the farmer's cosmopoliteness and their use of IPM practices

The relationship between cosmopoliteness of the farmers and their use of IPM practices was examined by testing the concerned null hypothesis. Co-efficient of correlation of the concerned variable was found to be ' r ' = 0.484 as shown in table 4.4. This led to the following observations regarding the relationship with the variable under consideration:

- The relationship showed a positive trend with the concerned value.
- The computed value of ' r ' (0.484) was higher than the tabulated value ' r ' (0.254) with 98 degrees of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected. Hence, the researcher concluded that cosmopoliteness of the farmers had a significant and positive relationship with their use of IPM practices in rice field.

The findings also justifiable because the cosmopolitan farmers might have more extension exposure which influence them towards the use of IPM practices in rice field.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

This chapter presents summary of findings, conclusion and recommendation of the study:

5.1 Summary of Findings

The major findings of the study summarized below:

5.1.1 Selected characteristics of the respondents

Age

Age of the respondents ranged from 24 to 75 year with an average of 45.44 years. The highest proportion (62 percent) of the respondents was middle aged.

Education

Education score of the respondents ranged from 0 to 14 with the average of 5.7. The highest proportion (50 percent) of the respondents were primary level followed by 36 percent respondents had secondary level of education.

Family size

The highest proportion (46 percent) of the farmers had medium(5-6) family size where 46 percent of large family (>6) and 8 percent of small family size.

Farm size

The farm size of the respondents ranged from 0.42 to 4.2 hectares. The average farm size was 1.212 ha and the highest proportion (54 percent) of the respondents had small farm size followed by 42 percent had medium farm size and 4 percent had large farm size.

Annual income

Annual income scores of the respondents ranged from 18 to 250 (in thousand) with an average of 92.55. The highest proportion (70 percent) of the farmers had medium income compare to 8 percent had low income and 22 percent had high annual income.

Contact with extension sources

Contact with extension sources scores of the respondents ranged from 4 to 30 with the average 16.26. The majority (82 percent) of the respondents belonged to medium extension contact category followed by 14 percent had low extension contact and 4 percent had high extension contact.

Organizational participation

Organizational participation scores of the respondents ranged from 0 to 42 with an average 13.78. The majority (55 percent) of the respondents belonged to medium participation category followed by 2 percent had no participation.

Innovativeness

Innovativeness scores of the respondents ranged from 10 to 30 with the average score 17.78. The majority (74 percent) of the respondents belonged to medium innovativeness category followed by 4 percent had low innovativeness category and 22 percent had high innovativeness.

Cosmopolitanness

Cosmopolitanness scores of the respondents ranged from 5 to 11 with the average score 8.64. The majority (84 percent) of the respondents belonged to medium cosmopolitanness category followed by 14 percent had high Cosmopolitanness and 2 percent had low cosmopolitanness.

5.1.2 Practices of IPM

Practice scores of the respondents ranged from 7 to 30, against the possible range 0 to 42. The average and standard deviation were 17.84 and 4.12 respectively. The majority (82 percent) of the respondent's belonged to high practices category and 10 percent had medium practices and 8 percent had no practices.

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

Age and use of IPM practices

Age of the farmers had no significant positive relationship with their use of IPM practices.

Education and use of IPM practices

Education of the farmers had significant relationship with their use of IPM practices.

Family size and use of IPM practices

Family size of the farmers had no significant relationship with their use of IPM practices.

Farm size and use of IPM practices

Farm size of the farmers had no significant relationship with their use of IPM practices.

Annual income and use of IPM practices

Annual income of the farmers had significant relationship with their use of IPM practices.

Contact with extension sources and use of IPM practices

Farmers contact with extension sources had significant relationship with their use of IPM practices.

Organizational participation and use of IPM practices

Organizational participation of the farmers had significant relationship with their use of IPM practices.

Innovativeness and use of IPM practices

Innovativeness of the farmers had significant relationship with their use of IPM practices.

Cosmopolitaness and use of IPM practices

Cosmopolitaness of the farmers had significant relationship with their use of IPM practices.

5.2 Conclusion

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

1. Most of the IPM practicing farmers (82 percent) in the study area had high practice of IPM, while 10 percent had medium practices and 8 percent respondents fell in low practices category. The findings might be a good scenario to taking IPM program for present and future. Assuming that the findings have a general applicability throughout the country, it could be concluded that farmers of Bangladesh are welcoming IPM practices.
2. Among the 14 selected IPM practices, the farmers were found having good extent of IPM practices. Again practices exert immediate benefits and easily available in nature were found highly popular.
3. The findings indicated that majority (66 percent) of the respondents were young to middle aged. Age of the farmer's dad no relationship with their use of IPM practices in rice field. It may be concluded that all aged farmers are equal concerned about IPM strategy.
4. The findings showed that the farmers had significant and positive relationship with their education, annual income, contact with extension sources, organizational participation, innovativeness, knowledge on IPM and cosmopolitaness. Literate people have in general higher contact with extension sources, higher organizational participation, higher innovativeness, higher knowledge on IPM and higher cosmopolitaness. So, it may be concluded that education is an important factor for popularizing IPM practices.

5. Annual income of the farmers had a significant positive correlation with their use of IPM practices. The findings led to the conclusion that farmers having relatively high income can easily use all the practices of IPM.

6. Findings indicated that age, family size and farm size of the farmers had no significant relationship with their use of IPM practices. It may be concluded that age, family size and farm size of the respondents were not important factors for using IPM practices and it was the fact at least for the present study.

5.3 Recommendations

Based on the findings and conclusions of the study, the following are made as follows:

5.3.1 Recommendations for policy implication

1. As an overwhelming majority of the farmers were in high practicing of IPM practices category, the IPM program should therefore be strengthened and the horizon should be broadened. At the same time proper strategy and realistic work plan should be developed in order to popularize IPM.
2. The findings indicated that the farmers had strategies of selecting and using the practices which are comparatively less costly and exert quick benefits. So, DAE should take a unique strategy that will be in favor of popularizing all good IPM practices.
3. Education, annual income, contact with extension sources, Organizational participation, innovativeness, knowledge on IPM and cosmopolitaness of the farmers had positive and significant relationship with their practices of IPM. The concerned authorities should take necessary steps to increase the level of education, annual income, contact with extension sources, Organizational participation, innovativeness, knowledge on IPM and cosmopolitaness.
4. The findings of the study indicate that age and family size of the farmers had no relationship with their use of IPM practices. So, giving importance of farmer's age and family size should not be included in the IPM programs.
5. Although farm size of the farmers did not show significant relationship with their IPM practices but this character still might have importance on taking a realistic strategy for popularizing IPM.

5.3.2 Recommendations for further study

1. This study was conducted in only four villages of Topodhan union under Rangpur sadar Upazilla. Similar study may be undertaken in other parts of the country to justify the findings of the present one.
2. The present study was conducted taking ten selected characteristics of the farmers. Further study may be conducted considering other characteristics.
3. Further research may be conducted with farmer's problem confrontation in practicing of IPM.

REFERENCES

- Alam, M.S. (2000). Use of Improved Farming Practices in Rice cultivation By the Farmers. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangaldesh Agricultural University, Mymensingh.
- Ali,K.A.,Chodhury,S.A.,Kadar, M.A.andGoni,M.O. (2000).Factors influencing Adoption of Sugarcane Production Technologies among the Growers of a Sugar mill Zone. *Bangladesh Journal of Extension Education*, 1(2): 25-30.
- Ali,M.M.(2001).Farmers Response of Spaced Transplanting Technology of Sugarcane. *M.S.(Ag.Ext.Ed.)Thesis*, Department of Agricultural Extension Education, Bangaldesh Agricultural University, Mymensingh.
- Anonymous, (2005). *An overview of Strengthening Plant Protection Service (SPPS) Project Phase I and Phase II*, A Report prepared for the Ministry of Agriculture, Department of Agriculture Extension, Khamarbari, Dhaka.
- Aurangozeb,M.K.(2000).Adoption of Integrated Homestead Farming Technologies by the rural women in RDRS. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangaldesh Agricultural University, Mymensingh.
- Balasubramanian , S. and Kaul, P.N. (2000). Adopton of Improved Practices by Traditional Fisherman of Bijapur District. *Indian Journal of Extension Education*, 26 (3&4): 67-69.

- Bashar, M.K. (2002). Adoption of Intercropping in Sugarcane Cultivation. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- BBS, (2005). Guidelines for Farmers Field Schools (IPM Practices in Rice cultivation). Strengthening Plant Protection Services Project, DAE-DANIDA, Dhaka.
- BBS, (2005). *Statistical Year Book of Bangladesh*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.
- BANBEIS, (2005). The Daily Independent, July 13, 2005.
- Ezekiel, M. and Fox, K.A. (2002). *Method of Correlation and Regression Analysis*. 3rd Ed. New York: John Wiley and Sons, Inc.
- Gogoi, S.K and Gogoi, D.K. (2001). Adoption of Recommended Plant Protection Practices in Rice. *Indian Journal of Extension Education*, 25 (1&2): 26-29.
- Goode, C.V. (1999). *Dictionary of Education*, New York: McGraw Hill Book Company Inc.
- Goode, W.J. and Hatt, P.K. (1998). *Methods in Social Research*, New York: McGraw Hill Book Company Inc.

- Halim, A. (2000). Schooling Extension and Agricultural Production. Bangladesh Journal of Agriculture. 6&7: 57-61. As cited in: Alam, S.M. (2000). "Use in Improved Farm Practices in Rice Cultivation by the Farmers." *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.
- Hasan, M.Z. (2001). Adoption of some Selected Agricultural Technologies among the Farmers as perceived by the Frontline GO and NGO Workers. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Haque, M.M. (2000). Adoption of Improved Practices in Sugarcane Cultivation by Sugarcane Growers of Sripur Upazilla under Gazipur District. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Haque, M.S. (2001). Adoption of Improved Practices in Sugarcane Cultivation of Some Selected Areas of Jessore District. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension and Teacher's Training, Bangladesh Agricultural University, Mymensingh.
- Hossain, M.A. (2001). Adoption of Improved Farm Practices by the Transplanted Aman Rice Growers in Gouripur Union of Mymensingh District. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension and Teacher Training, Bangladesh Agricultural University, Mymensingh.

- Hossain, M.A. (2002). Relationship of Farmer's Characteristics with Their Adoption of HYV as T. Aman and other Related Aspects in Bhabakhali Union of Mymensing District. *M.S. (Ag.Ext.Ed.)Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.
- Hossain, M.A. (2002). "Adoption Behaviour of Contact Wheat Growers in Sadar Upazila of Jamalpur District." *M.S. (Ag. Ext. Ed.)Thesis*, Department of Agricultural Extension & Teachers' Training, Bangladesh Agricultural University, Mymensingh.
- Hossain, M.M. (2003) Farmers' Knowledge and Adoption of Modern Boro Rice Cultivation Practices. *M.S.(Ag. Ext. Ed.) Thesis*, Department of Agricultural University, Mymensingh.
- Hossain, M.N. (2004). Farmers Perception on the Effects of Agro-chemicals on Environment. *M.S.(Ag.Ext.Ed.)Thesis*, Department of Agricultural Extension Education, Bangladesh.
- Hossain, S.M.A and Crouch B.R. (2001). Patterns and determinants of adoption of farm practices : Some evidence from Bangladesh. *Agricultural Systems*, 38: 1-15.
- Hussen, M. A. M. (2002). Farmers Knowledge and Adoption of Modern Sugarcane Cultivation Practices. *M. S. (Ag. Ext. Ed) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University , Mymensingh.

- Igodan, C. O., Ohaji, P. E. and Ekepere, J. A. (2002). Factors Associated with the Adoption of Recommended Practices for Maize Production in the Kainj, Lack Basis of Nigeria. *Journal of Agricultural Administration and Extension*, 29(2): 149-156.
- Islam M. M. (2002). Farmers' Use of Indigenous Technical Knowledge (ITK) in the Context of Sustainable Agricultural Development. *M. S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Islam, M. S. (2003). Adoption of Modern Agricultural Technologies by the Farmers of Sanduip. *M. S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Juliana, C. S., Annamalai, R. and Somasundram, S. (2002). Adoption of Integrated Pest Management Practices. *Indian Journal of Extension Education*, XXVII (3&4): 23-27.
- Karim, A.S.M.Z. (2002). Adoption of Fertilizers by the Transplanted Aman Rice Growers in keyotkhali Union of Mymensing District. *M.S. (Ag.Ext.Ed.) Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.
- Kashem, M.A. (2002). Small Farmers Constrains to the Adoption of Modern Rice Technology. *The Bangladesh Development studies*, XV (10): 18-30.

- Kaur, M.R. (2003). An Evaluation Study of Women Development Programme under Indo-German Dhauhadhar Prject Palampur District Kumgra, H.P. *Thesis Abstract*, 16 (4): 258. Haryana Agricultural University, Hissar, India.
- Khalil, M.I. (2003). Strengthening Plant Protection Service, The Independent, July 2, 2003, Bangladesh.
- Khan, M.H.(2003). Adoption of Insecticides and Related Issues in Villages of Pachon Union, Madaripur District. *M.S.(Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Kher, A.O. (2003). Critical Analysis of Sugarcane Growers' Knowledge and Adoption of Sugarcane Production Technology. *M.S.(Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Muhammad, A. (2001). A study on the Farmer's Adoption of Insect Control Measures and Related Aspects. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.
- Mustafi, B.A.A., Islam, M.M. and Rahman, M.M. (2003). Factors affecting adoption of modern varieties of rice of Bangladesh. *Indian Journal of Extension Education*. 2(1): 29-32.

Muttalab, M.A. (2003). Relationships of Selected Characteristics of Potato Growers with their Adoption of Improved Potato Technologies. *M.S. (Ag.Ext. Ed.) Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.

Naika , K. V. and Rao, M. K. S. (2003). A Study on Village Adoption Programme in Selected Villages of Mysore District, Kornataka. *Indian Journal of Extension Education*. 25(142): 13-17.

Okoro, E. U. and Obibuaka, L. U. (2003). Factors Infiuencing the Adoption of Improved Oil Palm Management Practices among Small Holders in IMO State, Nigeria. *Bangladesh Journal of Extension Eduction*, 7(1&7): 45-52.

Osunlogun, A., Ademoyo, R. and Anyanwu, E. (2003). The Adoption of Innovations by Co-operative Farmers in Nigeria. *Tropical Agriculture*. 63(2): 158-160.

Pal, S. K. (2000). Adoption of Recommended Sugarcane Cultivation Practices by the Farmers of Two Selected Centres of North Bangal Sugar Mills. *M. S. (Ag. Exl. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladeh Agricultural University, Mymensingh.

Patil, N. B. (2001). A study of Factors Associated with the Knowledge and Adoption Behavior of Farmers in Relation to Recommended Practices of BIDI Tobacco Cultivation in Nepal Area of Kanataka State, *Thesis Abstract*, 10 (1-4): 20-11.

Rahman, M.M. (2004). An Investigation into Factors Related to Adoption of Improved Farm practices in Transplanted Aman Cultivation in Two Villages of Mymensingh District. M.S. (*Ag. Ext. Ed.*) Thesis, Department of Agricultural Extension and Teachers Training, Bangladesh Agricultural University, Mymensingh.

Rahman, M.M. (2003). Correlates of an Adoption of improved practices in Transplanted Aman Rice. *Bangladesh Journal of Extension Education* . 1(2) : 75.

Rahman, M.S.(2001). Knowledge, Attitude and Adoption of the Farmer's Regarding Aalok 6201 Hybrid rice in Sadar Upazila at Mymensingh District. M.S.(*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Ramaswamy, C.P., Paramcivam,H. and Otsuka, K. (2004) Modern Seed Fertilizer Technologies and Adoption of Labour Saving Technologies in Rice Cultivation. Tamil Nadu Care. *Indian Journal of Extension Education*. 47 (1): 35-47.

Razzaque, M.A. (2003).Relationship of the Selected Characteristics of the Farmers with their Adoption of High Yielding Varieties of Rice Farmers in three Villages of Agricultural University Project Area. M.S. (*Ag. Ext.Ed.*) Thesis, Department of Agricultural Extension and Teacher's Training, Bangladesh Agricultural University , Mymensingh.

Rosenbarg, M.and Hovland, C.I. (2002). Reaearch on Communication and Attiude Quoted in Triands, H.C. 1971. *Attitude and Attitude Change*.John wiley and Sons, Inc. Publisher,New York.

- Sattar, M.H.U. (2002) Adoption of IPM Practices by the Farmers under PETRRA Project at RDRS. *M.S. (Ag.Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Singh, P.K. (2004). Extent of Adoption of Selected Recommended Practices by Kinnow Growers of Ferozepur and Faridkot District of Panjab. *Thesis Abstract*, 17(3): 209-210, Directorate of Publication, Haryana Agricultural University, Hissar, India.
- Singh, S.P. and Rajendra (2005). A Study on Adoption of Improved Sugarcane Vairety. *Indian Journal of Extension Education*. 26 (1&2) : 110-111.
- Townsend, J.C. (2004). *Introduction of Experimental Methods*. New York: Mc Graw Hill Book Company Inc.
- Ullah, M.B. (2004). Adoption of Livestock and Green Revolution Technologies among Farmers of Musuddi Union, Tangail District. *A Comparative study, M.S. (Ag. Ext.Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Ziaddin, A.A. (2005). Nature, Environment and Danger to Civilization, Asia Central Forum on Rural Development (ACFORD).

Appendix -A

Department of Agricultural Extension and Information System Sher-e-Bangla Agricultural University, Dhaka-1207.

Sample No.

“Use of IPM practices in rice field by the farmers”

-: Interview schedule :-

Name of respondents:.....

Village:..... Union:.....

Upazila:..... Zila:.....

[Please answer the following question. Use tick mark (√) if necessary]

1 .i) Ageyears.

ii) Education

- a. Can not read or write.
- b. Can sign only.
- c. Up to the Class.

iii) Family members Persons.

iv) Farm size

Please mention your farm size.

Type of land	Area of land	
	Local unit	Hectare
Homestead		
Own cultivable land		
Cultivable land taken as barga		
Cultivable land given as barga		
Cultivable land given as lease		
Cultivable land taken as lease		
Others (Specify)		
Total		

v) Annual income

Please mention your family's annual income (In taka).

Sources of income	Total income (Tk.)
From agriculture	
Rice	
Wheat	
Jute	
Potato	
Pulse crops	
Sugarcane	
Vegetable and fruit	
Domestic animal (Cow, Goat etc.)	
Poultry	
Fisheries	
Others(Specify)	
From non-agriculture	
Business	
Service	
Day labor	
Others (Specify)	
Total	

vi) Contact with extension sources

Please mention your extent of contact with the following extension sources.

Extension sources	Extent of contact			
	Frequently	Occasionally	Rarely	Not at all
Individual contact				
Sub-assistant Agricultural Officer				
NGO worker's				
Agricultural Extension Officer				
Upazila Fisheries Officer				
Veterinary surgeon				
Others(Specify)				
Group contact				
Participation in group discussion				
Participation in field day or farmers day				
Others(Specify)				
Mass contact				
Radio				
Television				
Agricultural fair				
Others(Specify)				

vii) Organizational participation

Please mention your nature and duration of participation with the following organization.

Organizations	Nature and duration of participation				
	No participation	General member	Executive member	Executive officer	Duration
Farmers co-operation club					
Village club					
School/madrasha committee					
Mosque/mandir committee					
Others(Specify)					

viii) Innovativeness

Please mention your extent of use the following modern practices.

Modern Technologies	Duration (Years)	Do not use
Frog, Praying Bard etc.		
BR26, BR31, BR35 etc.		
Use of healthy and disease free seeds.		
Power tiller, Tractor etc.		
Use of crop rotation.		
Use of water management.		
Use of weed management (rouging, eradication etc).		
Use of sweeping net.		
Use of light trap.		
Cut the upper portion of the affected leaves.		
Destroy the crop residues.		
Use of cross-bar in the field to sit the birds.		
Collection and destroy eggs and larvae of insects.		
Use of pesticides as a last measurement.		
Others(Specify)		

ix) Cosmopoliteness

Please mention your commutation extent to the following places.

Places	Extent of contact			
	Frequently	Occasionally	Rarely	Not at all
Meet with your relatives in your union but out of your village				
Communicate to other union				
Communicate to your own Upazilla parisad				
Communicate to other Upazilla parisad				
Communicate to district				
Communicate to capital city				
Others(Specify)				

2. Practices of IPM

Please mention your extent of use of the following IPM practices.

IPM practices	Extent of use			
	Frequently	Occasionally	Rarely	Not at all
Frog, Praying Bard etc.				
BR26, BR31, BR35 etc.				
Use of healthy and disease free seeds.				
Power tiller, Tractor etc.				
Use of crop rotation.				
Use of water management.				
Use of weed management (rouging, eradication etc).				
Use of sweeping net.				
Use of light trap.				
Cut the upper portion of the affected leaves.				
Destroy the crop residues.				
Use of cross-bar in the field to sit the birds.				
Collection and destroy eggs and larvae of insects.				
Use of pesticides as a last measurement.				
Others(Specify)				

Thanks for your co-operation.

.....
Signature of Interviewer
Date:

APPENDIX-B

Correlation matrix and Independent variables of the farmers at Tapodhan Union under Rangpur District (N=100).

Variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	Y ₁
X ₁	1.000									
X ₂	-0.250	1.000								
X ₃	0.290*	0.016	1.000							
X ₄	-0.196	0.367*	-0.386*	1.000						
X ₅	0.241	0.410*	0.471*	-0.046	1.000					
X ₆	0.416*	0.233	0.414*	-0.062	0.762*	1.000				
X ₇	0.516*	-0.312	0.264	-0.110	-0.135	-0.024	1.000			
X ₈	0.221	0.287	0.588*	-0.086	0.457*	0.471*	0.042	1.000		
X ₉	0.572*	-0.210	-0.043	0.233	-0.055	0.059	0.482*	-0.105	1.000	
Y ₁	0.484*	-0.086	0.461*	-0.205	0.162	0.162	0.442*	0.371*	0.337*	1.000

NS = Not significant

N = 100, df = 98

* = Significant at 0.01 level Tabulated value at 0.01 Level = 0.254

Legend:

X₁ = Age

X₅ = Annual income

X₉ = Cosmopolitaness

X₂ = Education

X₆ = Contact with extension sources Y₁ = Use of IPM practices

X₃ = Family size

X₇ = Organizational participation

X₄ = Farm size

X₈ = Innovativeness