

**ADOPTION OF SELECTED WHEAT VARIETIES BY THE
FARMERS IN SAINTARA UNION UNDER
DINAJPUR DISTRICT**

A Thesis

By

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**DEPARTMENT OF
AGRICULTURAL EXTENSION AND INFORMATION SYSTEM
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207**

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REGISTRATION NO: 25220/00612**

A Thesis

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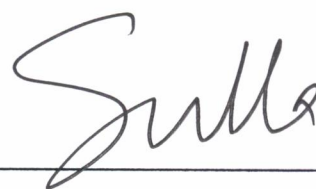
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CERTIFICATE

This is to certify that the thesis entitled, "Adoption of Selected Wheat Varieties by the Farmers of Saintara Union Under Dinajpur District" submitted to the Faculty of Agriculture, Sher-*e*-Bangla Agricultural University, Dhaka in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE in AGRICULTURAL EXTENSION AND INFORMATION SYSTEM, embodies the result of a piece of *bona fide* research work carried out by Bulbul Ahmed, Registration No. 25220/00612 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.

Dated:
Place: Dhaka, Bangladesh


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ADOPTION OF SELECTED WHEAT VARIETIES BY THE FARMERS IN SAINTARA UNION UNDER DINAJPUR DISTRICT

ABSTRACT

The purpose of the study was to determine the extent of adoption of selected wheat varieties by the farmers and to explore the relationships between farmers' characteristics and their adoption of selected wheat varieties. Saintara union under Chirirbandar upazila of Dinajpur district was the locale of the study. Data were collected by using interview schedule from 80 farmers selected randomly during 10th October to 15th November, 2006. The finding revealed that more than half (55%) of the growers had medium adoption, 23.8 percent had low adoption and 21.2 percent had high adoption of selected wheat varieties. Computed 'r' values indicate that selected characteristics of the farmers, namely, training received, cosmopolitaness, attitude towards wheat cultivation, innovativeness, communication behaviour and knowledge on wheat cultivation had significant positive relationship with the adoption of selected wheat varieties. Age, education, farm size and annual family income had no significant relationships with the adoption of selected wheat varieties. More than half (56.2 percent) of the growers faced medium problems compared to 16.3 and 27.5 percent of low and high problem respectively regarding adoption of selected wheat varieties. Ten problems indicated by the growers, which they confronted related to wheat cultivation. Five major problems in descending order of Problem Confrontation Index were: (1) Non availability of wheat seeds in the market, (2) High price of fertilizers, (3) Lack of Agricultural machineries and tools for wheat cultivation, (4) Non availability of pesticides and (5) Scarcity of fertilizer supply in time.

CHAPTER I

INTRODUCTION

1.1 Background of the study

Bangladesh is an agricultural country. The country's population is 137 million with high density of 928/sqkm (Bangladesh Economic Survey, 2005). About 79.9 percent of its population lives in rural areas and 62 percent of the country's total labour force are engaged in agriculture (BBS, 2005). The total land area of Bangladesh is 14.84 million hectare of which 8.29 million hectare are cultivable land and total cropped area is 14.109 million hectare of which 8.022 million hectare are net cropped area (BBS, 2005). In 2003-04 fiscal year production of food crop was 27.6 million metric tons whereas Aus 1.83 million metric tons, Aman 11.52 million metric tons, Boro 12.83 million metric tons, wheat 1.25 million metric tons and maize 2.41 lakh metric tons (Bangladesh Economic Survey, 2005). Different natural calamities or disasters such as flood, drought, cyclone, tidal bore etc. affect the rice production. As a result rice production becomes uncertain. In this situation the cultivation of wheat can be given priority for solution of food crisis.

Wheat is one of the most important cereal crops and main staple food crops in the world. About two-third of the world's population use wheat as staple food (Majumder, 1991). Dubin and Grinkel (1991) reported that in the recent years the largest area of wheat cultivation in the warmer climates exists in the South-East Asia including Bangladesh, India and Nepal. In 2004-2005, the wheat production, seeds required 79000 metric tones, current supply rate 17.98% and present production 14208 metric tons (BBS, 2005). In spite of its importance, the yield of the crop in our country is low in comparison to the

other countries of the world, where average yield estimated 2.69 t/ha (FAO, 2005). Though the area, production and yield rate of wheat have been increasing dramatically during the last decade, the wheat yield in Bangladesh is too low (2.2 t/ ha) in comparison with the developed countries of the world like Japan, France, Germany and UK producing 3.76, 7.12, 7.28, and 8.00 t/ha, respectively (FAO, 2005). Bangladesh is a rice growing country but its climatic conditions are suitable for wheat production. Wheat is the second important cereal crop next to rice in our country and has achieved a remarkable progress in increasing wheat production and productivity over the last 30 years. In 1970 wheat cultivation area was only 0.1 million hectare. In 1985 the area increased at 0.7 million hectare and total production were 1.2 million metric ton. In 1999 wheat cultivation area of our country was 0.85 million hectare and the production were about 1.9 million metric ton (BBS, 2006). Wheat is an important winter cereal crop in our country. It requires relatively cool, moist growing season followed by dry, warm season for ripening. The crop is cultivated during the cool season with temperature of less than 25⁰C. Wheat requires a minimum temperature of 3⁰C-4⁰C, optimum of 25⁰C and maximum of about 30⁰C-32⁰C.

The total production of rice in Bangladesh is not sufficient to feed her people. Wheat can be a good supplement of rice and can play the most vital role to feed the teeming millions of the people. There is ample scope for wheat cultivation in Bangladesh as it is cultivated in Rabi season having minimum competition with rice for land. Wheat can be grown in winter season along with other crops like pulses, oil seeds, vegetable etc. Five wheat production zones have been identified in Bangladesh. The North-West (N-W), North-East (N-E), North Central (N-C), South Central (S-C) and South West (S-W) zones include most of the major wheat growing areas in the country. The majority

of the area under wheat cultivation is found in the northern part is the most important wheat growing area.

In wheat production the requirement of irrigation water and disease infestation is less than that of rice. It is the cheapest source of carbohydrate. It contains a considerable amount of proteins, minerals and vitamins. Wheat grain is rich in nutrient value containing 78.1% starch, 14.7 % protein, 2.1% fat and 2.1% mineral. Wheat grown in Bangladesh is used by making flour. The flour is used for such products as bread, cakes, crackers, macaroni and spaghetti. A small amount of wheat is also used in the manufacture of dextrose, alcohol and certain breakfast food. Wheat is an excellent feed for livestock, but because of its importance as human food only a small part of the total production is used for this purpose. All of the by-products are higher in content of protein than wheat itself and served as a valuable protein supplement in many livestock ration.

The areas under wheat crop were estimated at 741830, 706475 and 641875 hectares in 2001-2002, 2002-2003 and 2003-2004 respectively. Therefore the wheat area 9.1 percent decrease compared to previous year due to more cultivation of boro, maize and potato crops in 2003-04. The following table shows the area & yield rates of wheat crop during 2001-02 to 2003-04.

Table 1.1: Estimated area and yield rate of wheat crop

Year	Area (hectare)	Yield per hectare (M. tons)	% change of yield rate over last year
2001-02	741,830	2.650	(-) 22.11
2002-03	706,475	2.133	(-) 19.50
2003-04	641,875	1.953	(-) 8.44

Source: BBS, 2005

Average yield rate of wheat has been found 1.953 metric ton per hectare this year compared to 2.133 metric tons last year. The yield rate has declined by 8.44 percent this year over last year.

Total production of wheat crop has been estimated at 1.25 million metric tons in 2003-04 as against 1.51 million metric tons in the previous year which is 16.81 percent lower. Decrease in areas and yield rate contributed to lower production in 2003-04.

Table1. 2: Production of wheat

Year	Production (M. tons)	% change of production over previous year
2001-02	1605760	(-) 4.04
2002-03	1506710	(-) 6.17
2003-04	1253380	(-) 16.81

Source: BBS, 2005

1.2 Statement of the problem

Wheat is one of the most important cereal crops in Bangladesh next to rice. The importance of the cultivation of this crop is increasingly recognized by the implement as of agricultural extension programs as well as policy makers. The government of Bangladesh is promoting the extent of cultivation and production of this crop through various projects. As a high value crop (HVC), wheat has much potentiality for widespread cultivation by the respondents. But before undertaking any massive programme for its increased cultivation in Bangladesh, it is first necessary to know the existing situation of the extent of cultivation of wheat in the most potential areas of Bangladesh. The Dinajpur region is mostly well known for cultivation of wheat in this country. Peoples of this area use the wheat as their second staple food. Most people take wheat as bread for their

breakfast. Some people also take bread as their dinner. It is surely good and less expensive than taking rice in every meal. Bangladesh wheat research center (WRC) is situated in Nashipur area of Dinajpur. With the technological help of this research station, the farmers are being more benefited. The station introduces some innovations to increase the wheat production. They developed some varieties such as Kanchan, Akber, Satabdi which were adopted by the farmers of this area. To expand the adoption of these crop varieties in other parts of the country, the knowledge on the present situation of wheat cultivation in this region will be significantly contributory to design appropriate programs for its widespread cultivation. In these respects, the answers to the following questions will be very much pertinent.

1. To what extent of wheat varieties have been adopted by the wheat growers?
2. What are the characteristics of the wheat growers?
3. Is there any relationship between the characteristics of the wheat growers and their extent of adoption of wheat varieties?
4. What problems the growers usually encounter in cultivating the wheat varieties?

These questions obviously indicate the need for conducting a research study entitled “Adoption of selected wheat varieties by the farmers in Saintara union under Dinajpur district”.

1.3 Specific objectives of the study

The following objectives were formulated to give clear direction to the study:

1. To determine and describe the selected characteristics of the farmers.

The selected characteristics are:

- (a) Age
- (b) Education
- (c) Farm size
- (d) Annual income
- (e) Training received

- (f) Cosmopolitaness
 - (g) Attitudes towards wheat cultivation
 - (h) Innovativeness
 - (i) Communication Behaviour
 - (j) Knowledge on wheat cultivation
2. To determine the extent of adoption of selected wheat varieties by the farmers.
 3. To explore the relationships between selected characteristics of the farmers and their adoption of selected wheat varieties.
 4. To describe the extent of problems faced by the farmers in adopting wheat varieties.

1.4 Justification of the study

Production of wheat may be increased by improving wheat cultivation practices by the farmers. The concept and benefits of the wheat varieties should be disseminated to the farmers in a convincing and attractive manner, so that farmers response quickly to adopt wheat varieties. This is undoubtedly an educative process and is possible through Extension Education System, which is concerned mainly with increasing agricultural production and improving living standards of the farmers. On an average about 2.4 to 2.8 million hectares of land remain uncultivated during winter season. There is an assurance of next crop after harvesting of wheat for its short duration and so we can obtain self sufficiency in food. It can play a great role along with rice. To increase wheat production, transfer of modern technology is essential and to get necessary information related to wheat production would be the key factor for the farmers in adoption of wheat cultivation (Islam, 1996). Now considerable effort is being made through research and extension delivery system to increase wheat production in our country. But the actual increase in production will depend on the activities of the wheat growers.

The behaviour of a farmer is influenced by his personal, economic, social and physiological characteristics (Hossain, 1991).

Chirirbandar upazila under Dinajpur district, considered as the most suitable location to study the phenomenon of adoption of selected wheat varieties by the wheat growers.

1.5 Scope of the study

The main focus of the study was to determine adoption of the selected wheat varieties. The findings of the study will be specifically applicable to Dinajpur district. However, the findings will also have implications for other areas of the country having relevance to the socio-cultural context of the study area. The investigator believes that the findings of the study will reveal the phenomenon related to diffusion of innovation. These will be of special interest to the policy makers and planners in formulating and redesigning the extension programmes especially for selected wheat varieties. The findings are expected to be helpful to the field workers of different nation building departments and organizations to develop appropriate extension strategies for effective working with the rural people.

1.6 Assumptions of the study

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

- 1) The respondents included in the sample was capable of providing proper answer to the question in the interview schedule.
- 2) The researcher who acted as interviewer was adjusted to social and environmental condition of the study area. Hence, the data collected by him and the respondents were free from bias.
- 3) The responses furnished by the respondents were reliable. They expressed the truth about their conviction and opinions.

- 4) Views and opinions furnished by farmers included in the sample were representative views and opinions of the whole population of the study.
- 5) The finding of the study will have general application to other parts of the country with similar socio-economic, cultural and agro-ecological conditions of the study area.
- 6) The respondents were more or less conscious about the use of wheat varieties.

1.7 Limitations of the study

Considering the time, money and other necessary resources available to make the study manageable and meaningful, it was necessary to consider the following limitations:

1. The study was confined mainly to farmers' adoption of these selected wheat varieties cultivation.
2. The study was confined in two villages of Saintara union under Chirirbandar upazila under Dinajpur district.
3. The characteristics of wheat growers are many and varied but only ten characteristics were selected for investigation in this study.
4. Population of the study includes only the heads of the farm families.
5. Facts and figures were collected by the investigator applied to the present situation in the selected area.
6. For information about the study, the researcher was dependent on the data furnished by the selected respondent during data collection.

1.8 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 seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test".

The following hypothesis is formulated to explore the relationship between the dependent and independent variables. The major research hypothesis for the study is: “there is relationship between farmers’ adoption of selected wheat varieties and their selected characteristics including age, education, farm size, annual family income, training received, cosmopolitaness, attitude towards wheat cultivation, innovativeness, communication behaviour, knowledge on wheat cultivation”.

The research hypothesis was converted into null form for the purpose of statistical testing. The major null hypothesis states that “there is no relationship between the farmers’ adoption of selected wheat varieties and their selected characteristics”. Ten null hypotheses were formulated dealing with each of the selected characteristics”.

1.9 Definition of key terms

A concept is an abstract of observed thing; events or phenomenon or in other words, it is a short hand representation of variety of facts. A researcher needs to know the meaning and contents of every term that he used. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study defined were interpreted as follows:

Adoption

It is the implementation of a decision to continue the use of an innovation. According to Rogers (1995), "Adoption is a decision to make full use of an innovation as the best course of action available." When an individual takes up a new idea as the best course of action and practices it the phenomenon is known as adoption (Ray, 1991). In this study, adoption was defined as the phenomenon of taking up a new idea (wheat varieties) and put it into practice by the wheat growers of Chiribandar upazila.

Innovation

An innovation is an idea or practice perceived as new by the individual. It is the newness of the idea to the individual that determines his reaction to it.

Farmers/Growers

The persons who were involved in farming activities are called farmers. They participated in different farm and community level activities like crops, livestock, fisheries, other farming activities etc.

Age

It means the age of a farmer that will refer to the period of time from his birth to the time of investigation.

Education

Education is referred to describe change of human behavior, i.e. change in knowledge, skill and attitude of an individual through reading, writing and other related activities. It is measured in terms of years of schooling.

Farm size

The term related to the hectare of land owned by a farmer on which he carried his farming and family business, the area being estimated in terms of full benefit to the farmer. A farmer was considered to have full benefit from cultivated area either owned by himself or obtained or, lease from others and half benefit from the area which *was* either cultivated by borga or given to others for cultivation on borga basis.

Annual family income

It means the total earning by the respondent himself and the members of his family from agriculture and other sources during a year. It is expressed in taka.

Training received

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

Cosmopolitaness

Cosmopolitaness of a respondent is measured by computing a cosmopolitaness score. The cosmopolitaness score is assigned on the basis of different places and frequency of his visit external to and outside his own social system.

Problem

Problem refers to a difficulty about which something to be done. Problem faced by the farmers in this study was defined as the extent of difficulties faced by wheat growers in the way of adoption of wheat varieties.

Innovativeness

Innovativeness is the degree to which an individual is relatively earlier in adopting agricultural innovations, new ideas, practices and things than the other members of a social system (Rogers, 1995). This was comprehended by the quickness of accepting innovations by an individual in relation to others and was measured on the basis of time dimension.

Attitude towards wheat cultivation

The term attitude towards wheat cultivation of an individual was used to refer to his feelings, belief and action tendencies towards the various aspects of wheat cultivation.

Communication behaviour

It is referred to the respondents becoming accessible to the influence of different information media through different extension teaching methods.

Knowledge on wheat cultivation

It is the extent of basic understanding of the farmers in different aspects of high yielding varieties of wheat. It includes the basic understanding of the use of different wheat varieties.

Respondents

People who answer questions asked by an interviewer for a social survey are called respondents. They are the people from whom a social research worker usually gets most data required for his research.

Variable

A general indication in statistical research of characteristic that occurs in a number of individuals, objects, groups etc. and that can take on various values, for example the age of an individual.

Assumption

An assumption is “The supposition that an apparent fact or principle is true in the light of the available evidence” (Goode and Hatt, 1952).

Hypothesis

Defined by Goode and Hatt (1952), a proposition this can be put to “a test to determine its validity”. It may be true or false, it may seem contrary to or in accord with common sense. However, it leads to an empirical test.

Null hypothesis

The hypothesis which we pick for statistical test is null hypothesis (H_0). In this study the null hypothesis is stated that there is no relationship between the concerned variables.

Statistical test

A body of rules which help to take decision regarding acceptance or rejection of the hypothesis is defined as test. In this study if a null hypothesis is rejected it is assumed that there is a relationship between the variables.

Research methodology

Research methodology is the description, explanation and justification of various methods of conducting research. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying the research problem along with the logic behind them.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this Chapter is to review of literature having relevance to the present study. The researcher made an elaborate search of available literature for the above purpose. But there is hardly any study dealing with the relationship of the characteristics of growers and their adoption of selected wheat varieties by the wheat growers. The researcher attempted to search the literatures on a number of studies have been conducted on the adoption of innovations by the wheat growers. Therefore, the finding of such studies related to the extent of adoption of selected wheat varieties by the wheat growers and other partial studies have been reviewed in this chapter.

This Chapter is divided into three sections; the **first** section deals with Past research findings relating to extent of adoption of innovation, the **second** section deals with past research findings relating to the relationships of farmers' adoption of innovations with their selected characteristics, the **third** section deals with the conceptual framework of the study.

2.1 Past Research Findings Relating to Extent of Adoption of Innovations

Hossain (1971) carried out a research study on the adoption of four improved practices in Gouripur of Mymensingh district. The practices were (i) plant protection measure, (ii) recommended variety of paddy, (iii) line transplanting and (iv) recommended dose of fertilizers. It revealed that among the respondent farmers 57.40 percent adopted plant protection measure, 35.51 percent adopted

recommended variety of paddy, 25.36 percent adopted line transplanting and 11.52 percent adopted recommended dose of fertilizers.

Karim (1973) conducted a study on the adoption of fertilizers by transplanting aman growers in former Keyotkhali union of Mymensingh district. He studied the adoption of three fertilizers-urea, super phosphate (TSP) and muriate of potash (MP). He found that 4 percent of the respondent growers had high adoption of fertilizers while 9 percent had medium adoption and 41 percent low adoption. Remaining forty six percent (46 percent) of the respondent growers did not use any of the three fertilizers.

Rahman (1974) studied the adoption of IR-20 variety of paddy in Bhabakhali union of Mymensingh district. He found that 29 percent of the growers had medium adoption of IR-20 while 31 percent of the growers did not adopt the innovation.

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.

Sobhan (1975) studied on the extent of adoption of ten winter vegetables namely tomato, radish, lettuce and potato in Boilor union of Mymensingh district. Over all winter vegetable adoption scores of the farmers could range from 0 to 140. Over all adoption scores indicated that 27 percent of the farmers did not adopt winter vegetables cultivation while 28 percent had low adoption and 55 percent high adoption.

Hossain (1981) studied on the relationship of the farmers (jute growers) with their adoption of improved practices of jute cultivation. He found that more than half (54 percent) of the respondents had medium adoption of the improved practices compared to 31 percent having high adoption and 15 percent low adoption

Hossain (1983) studied the extent of adoption of HYV rice as transplanted aman and other related aspect in Bhabakhali union of Mymensingh district. He observed that among the respondent farmers, 54 percent had high adoption of HYV rice and 46 percent had medium adoption of HYV rice as transplanted aman.

Haque (1984) investigated the extent of adoption of improved practices in sugarcane cultivation in selected areas of Jessore district. He observed that 62.75 percent respondent growers adopted early time of planting, 60.75 percent of the respondent growers adopted recommended dose of fertilizers and 54.9 percent growers adopted trench method.

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 villages 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.

Karim and Mahboob (1986) conducted a study on the adoption of HYV wheat in Kushtia union of Mymensingh district. They observed that 74 percent of the farmers adopted HYV wheat to varying extent, while the remaining 26 percent were non adopters.

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 adoption, 35.36 percent medium level of adoption and 13.64 percent had high level of adoption of recommended plant protection practices.

Naika and Rao (1989) found that more area was brought under plant protection chemical after adoption of recommended plant protection chemicals. The area increased from 45.75 areas to 104.75 acres in adopted villages and from 8 acres to 11 acres in non-adopter villages.

Singh and Rajendra (1990) found that out of 150 farmers adopted 767 variety of sugarcane, while only 45.0 of the respondents did not adopt. A high level of adoption was found in nitrogen fertilizers, weeding and intercultural operations (110 percent), followed by plant protection measures (74.3 percent), potassium fertilizer (33.1 percent). Only 28.6 percent adopted ridge-sowing practices.

Juliana *et al.* (1991) undertook a study on adoption of integrated pest management practices in five villages of Vasusdevanallar block in Tirunelvi district, Tamilnddu, 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 5 percent of the marginal farmers had high level of adoption. In both adoptions level of big farmers' participation was higher in comparison to other categories of farmers.

Hossain (1991) studied the extent of adoption behavior of contact wheat growers in sadar upazila of Jamalpur district. He found that more than half (52 percent) of the growers had medium adoption of improved farm practices compared to 34 percent having low adoption and only 14 percent high adoption.

Kashem and Hossain (1992) conducted a research study on adoption behaviour of sugarcane growers of Zilbangla Sugar Mill, Dewanganj, Jamalpur, Bangladesh. They found among the growers, that 89 percent had high level of adoption of recommended practices of sugarcane.

Kher (1992) conducted a study on adoption of improved wheat cultivation practices in selected villages of Rajouri block. He found that 72 percent of the respondent had medium level of adoption, 17 percent had low level of adoption and 11 percent had high level of adoption.

Singh *et. al.* (1992) undertook a research study in India on factors affecting the adoption of improved sugarcane production technology. They observed that majority of sugarcane growers had the medium level of adoption and were partial adopters of scientific recommendations of sugarcane production technology.

Nikhade *et at.* (1993) observed in their study on adoption of improved practices of soyabean cultivation that percent adopted improved varieties. More than 82 percent had complete adoption of package practices like time showing, spacing and intercultural operations. Partial adoption was observed in majority of the soyabean growers (74.6 percent) with regard to recommended seed rate.

Nikhade *et al.* (1995) found that the adoption gap about the use of recommended technology of cotton among cotton growers was found to be about 30 percent which was quite high.

Siddaramaiha *et al.* (1995) studied adoption of improved Sericultural practices among big and small farmers. They indicate that there were cent percent adoption in following the recommended system of planting by both big and small farmers. Other practices adoption by a large percentage of farmers were: optimum time of planting (95%), adoption of recommended irrigation schedule (93.75%),

recommended spacing (91.25%) and the use of improve variety of mulberry crop (87.50%). Nearly half of the respondents used the recommended quantity of farmyard manure and plant protection chemicals in mulberry cultivation.

Muttaleb (1995) studied the extent of the adoption of improved technologies of potato cultivation by the farmers in Haibatpur union under sadar thana of Jessore district. The study revealed that 8 percent of the potato growers had high adoption of improved technologies, 43 percent has medium and 49 percent had low adoption.

Hasan (1996) found in his study that the highest proportion (44 percent) of the respondents perceived the existence of medium adoption, compared to 26 percent low adoption and 30 percent high adoption in respect of selected agricultural technologies.

Islam (1996) carried out a study on farmers' use of indigenous technical knowledge (ITK) in the context of sustainable agricultural development. He found the extent use of ITK by individual farmers that, the highest proportion (42.73 percent) of the respondents belonged to the lower user category as compared to 41.82 percent in the moderate user category and 15.45 percent in the higher user category.

Alam (1997) studied the extent of the use of improved farm practices by the rice growers in Anwara thana of Chittagong district. The study revealed that 43.0 percent of the respondents had medium use of improved farm practices and 50 percent of the respondents had low use of farm practices and only 7.0 percent of the respondents had high use of improved practices.

Chowdhury (1997) conducted an investigation on adoption of selected BINA technologies by the farmers of Boyra union in Mymensingh district. The study revealed that the majority (58 percent) of the respondents had no adoption of BINA technologies and 42 percent adopted BINA technologies.

Sarker (1997) studied the extent of adoption of improved potato cultivation practices by the farmers in Comilla district. The study revealed that more than half (55 percent) of the respondents had medium adoption compared to 23 percent having low adoption and 22 percent high adoption of improved potato cultivation practices.

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.

Rahman (1999) conducted investigation on adoption of balanced fertilizer by the farmers of Ishwargonj upazila in Mymensingh district. The study revealed that the majority (71 percent) of the respondents had medium adoption compared to 29 percent having below optimum adoption and there was no respondent at all who adopted the fertilizer at above optimum level.

Mostafa (1999) studied the adoption of recommended mango cultivation practices by the mango growers of Nawabganj Sadar thana. He found that about half (49 percent) of the mango growers had “low adoption” 31 percent “very low” adoption and 20 percent had “medium” adoption of fertilizers.

Podder and Kashem (2000) studied on Use of Extension Contact Media by the farmers in the Adoption of Mehersagar banana. They concluded that about half (47%) of the growers had medium adoption compared to 14 percent low adoption and 39 percent high adoption of Mehersagar banana.

Squire (2000) studied on factors influencing traditional farmers to adopt improved food crop production technologies in BO district of Southern Sierra Leone. He found that agricultural technology communication media (other farmers (54%):

characteristics of the arable crops (good to excellent eating quality of the improved crop varieties (53%); artificial fertilizers (55%); mechanical technology (65%); draught animal technology (59%); pest and disease control technologies (increase in crop yield (61%); and row planting technologies (easy to weed(53%).

Haider *et al.* (2001) observed that one-third (37 percent) of the farmers fell in low adopter category compared to 32.5 percent falling 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 had 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 10 percent falling below optimum adopter, 8 percent optimum adopter and only 3 percent above optimum adopter of potassic (K) fertilizer.

Rahman (2001) conducted an investigation on knowledge, attitude and adoption of Aalok-6201 hybrid rice by the farmers of Sadar Upazila in Mymensingh district. The study revealed that the majority (75 percent) of the farmers had medium adoption while 18 percent and 7 percent had high and low adoption in Aalok-6201 hybrid rice cultivation respectively.

Hussen (2001) conducted an investigation on adoption of modern sugarcane cultivation practices by the farmers of Dewanganj Upazila in Jamalpur district. The study revealed that about cent percent (91 percent) of the farmers had medium adoption compared to 7 percent having low adoption and only 2 percent having high adoption of modern sugarcane cultivation practices.

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.

Zegeye *et al.* (2002) studied the determinants of adoption of improved maize technologies in major maize growing region of Ethiopia. He found that the rate of adoption of improved maize varieties and chemical fertilizer, factors affecting the adoption of improved maize varieties and the determinant factors affecting adoption of chemical fertilizers are also highlighted.

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

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

Swinkels *et al.* (2002) studied assessing the adoption potential of hedge row intercropping for improving soil fertility, in western Kenya. They conduct that the average cost of hedgerow intercropping was 10.5% (SD = 5.5) when based on returns to land and 17.5% (SD = 6.5) based on returns to labour. Fifth planted additional hedges and only 14% did so to improve soil fertility. It thus appears that the potential for its adoption as a soil fertility practices. Hedgerow intercropping appears to have greater adopter potential if its aim is to provide feed for an intensive dairy operation or for curbing soil erosion.

Alexznder and Goodhue (2002) conducted the study on pricing of innovations. They evaluate the producer’s returns to planting patented seed innovation, using a

calibrated optimization model of a south-central maize producer's adoption decision in Iowa, USA. Their results suggest that patented seed innovations do not increase the market power of biotechnology firm in the relevant market for production system.

Gebre (2002) conducted a study on Maize technology adoption in Ethiopia. This study presents the results of the Sasakawa-Global 2000 Agriculture program in Ethiopia and its influence on agricultural research and maize production in the region. The Sasakawa-Global 2000 is an international non-government organization initiated in 1986 because of the 1984-85 famine in Ethiopia, with the aim of empowering Africa to produce its own food through the adoption of improved agricultural technologies.

Hasan (2003) found that majority (60 percent) of the farmers had medium adoption while 33 percent had low adoption and 7 percent had high adoption of recommended potato cultivation practices.

Hossain (2003) found that majority (67 percent) of the Boro rice farmers had medium adoption, 17 percent had low adoption and 16 percent high adoption of modern Boro rice cultivation practices.

Rahman (2003) revealed that about half (47 percent) of the growers had medium adoption 44 percent had low and one percent had high adoption of year round homestead fruit cultivation practices.

Rahman (2003) found that ninety seven percent of the pineapple growers adopted 2-4 intercrops viz, zinger, turmeric, sweetgourd and aroid in pineapple cultivation.

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

Islam (2005) conducted a study on adoption of pashu pusti in cattle rearing at farmer's level. The study revealed that 71 per cent of the farmers had medium adoption while 18 per cent had high adoption and 11 per cent had low adoption of pashu pusti in cattle rearing at farmer's level.

2.2 Past research findings relating to the relationships of farmers' adoption of selected innovations with their selected characteristics

This selection presents a review of previous studies relating the association of the selected characteristics of the farmers and their adoption of innovations. Eleven characteristics of the contract growers were selected as independent variables of this study. The researcher made utmost efforts to search out studies dealing with relationships of each of the selected characteristics with the adoption of wheat cultivation.

2.2.1 Age and adoption of innovation

Ali, *et al.* (1986) observed that there was positive and significant relationship between the age of the marginal farmers and their adoption of jute technologies.

Singh and Rajendra (1990) in their study on adoption of improved sugarcane variety found that age had positive association with the adoption of 767 variety of sugarcane.

Hossain (1991) conducted a study to determine the extent of adoption behaviour of contract wheat growers in Sadar Upazila of Jamalpur district. He found negatively significant relationship between age of the farmers and their level of adoption of improved farm practices.

Singh (1991) conducted a study to determine the extent of adoption of selected recommended practices. He found no relationship between age of the farmers and their level of adoption of plant protection measures.

Kashem et al. (1992) has conducted a study on the use of communication media in adopting agricultural technologies. They reported that age was significantly related to the adoption of rice cultivation.

Pathak *et al.* (1992) observed that there was positive and significant relationship between the age of the marginal farmers and their adoption of jute technologies. Similar finding was observed by Okoro *et al* (1992) and Hossain *et al.* (1992).

Islam (1996) carried out a research study on growers' use of indigenous technical knowledge (ITK), in the context of sustainable agricultural development. He observed that age of the respondent growers had significant negative relationship with their extent of use of ITK (at 0.01 level of probability). Hossain (1991), Ali (1993), Haque (1993), Khan (1993), Pal (1995) and Hasan (1996) found similar relationships.

Sarkar (1997) observed that there was no significant relationship between age of the farmers and their adoption of improved potato cultivation practices. Similar findings were observed by Karim and Mahaboob (1986) and Kher (1992) in their respective studies.

Aurangzeb (2002) observed that there was significant negative relationship between age and use of integrated homestead farming technologies. The interpretation is that with increased age level of the respondents there was a corresponding decrease of the adoption of homestead farming technologies.

Haque (2003) conducted a study on farmer's adoption of modern maize cultivation technologies. He observed that age of the respondents had negatively significant relationship with their extent of farmer's adoption of modern maize cultivation technologies.

Islam (2005) conducted a study on adoption of pashu pusti in cattle rearing at farmers' level. He observed that age of the respondents had insignificant

relationship with their extent of adoption of pashu pusti in cattle rearing at farmers' level.

2.2.2 Education and adoption of innovation

Kaur (1988) found that education influenced the opinion of the women about adoption of vegetable gardening, animal husbandry etc.

Hossain (1991) conducted a study to determine the extent of adoption behaviour of contract wheat growers in Sadar Upazila of Jamalpur district. He found positively and moderate significant relationship between education of the farmers and their level of adoption of improved farm practices.

Okoro and Obibuaka (1992) studied adoption of recommended practices among small holders in IMO state, Nigeria. The findings of the study indicated a positive relationship between education of the respondents and their adoption of recommended management practices.

Pal (1995) conducted a study on adoption of recommended sugarcane cultivation practices by the farmers. He found that education had significant and positive relationship with the adoption of recommended sugarcane cultivation practices. Most of the studies revealed similar findings. Haque (1993), Khan (1993) and Hossain *et al.* (1997) observed similar results.

Muttaleb (1995) studied the relationship of education with adoption of improved potato technologies. The study observed that education had a positive relationship with their adoption of potato technologies.

Hasan (1996) conducted a study on adoption of some selected agricultural technologies among the farmers as perceived by the frontline GO and NGO

workers. He found that the education had no significant relationship with the perceived adoption of selected agricultural technologies.

Alam (1997) observed that the level of education of the farmer had a positive and significant relationship with the use of their improved farm practices.

Sarkar (1997) found that the level of education of the farmer had a positive significant relationship with their adoption of improved potato cultivation practices.

Hussen (2001) conducted a study on farmer's knowledge and adoption of modern sugarcane cultivation practices. He found that education of the growers had a positive significant relationship with their adoption of modern sugarcane cultivation practices.

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

Aurangozeb (2002) observed that there was positive relationship between education and adoption of integrated homestead farming technologies. The educated women were more interested in adoption of integrated homestead farming technologies than the illiterate women.

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

Sardar (2002) conducted a study on adoption of IPM practices by the farmers under PETRRA projects of RDRS. He found that education of the farmers had a positive significant relationship with their adoption of IPM practices.

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

2.2.3 Farm size and adoption of innovation

Abdullah (1983) reported that homestead agricultural production activities undertaken by different categories of households varied according to ownership and size of homestead land. It reveals the family living on others' land usually was not interested in growing permanent fruit or fuel trees. However, vegetable cultivation, livestock rearing, poultry rearing etc. were common in all the families.

Hossain (1983) found that size of the farm of transplanted aman farmers in Bhabakhali union of Mymensingh district had a negative relationship with their adoption of HYV T-aman rice.

Ali *et al.* (1986) found a strong negative relationship between farm size and adoption of improved sugarcane production practices.

Gogoi and Gogoi (1989) in their study observed that size of land holding of farmers had a significant relationship and positive effect on their adoption of plant protection practices.

Singh (1991) in a study found that income of the farmers was significantly associated with the level of adoption of plant protection measures.

Hossain (1991) conducted a study to determine the extent of adoption behaviour of contract wheat growers in Sadar upazila of Jamalpur district. He found negatively insignificant relationship between farm size of the farmers and their level of adoption of improved farm practices.

Hossain and Crouch (1992) studied the relationship of farm size with adoption of farm practices. They found positive relationship between the farm size and adoption of farm practices. Similar result was found by Kashem (1991).

Ali (1993) in his study found that farm size of the respondents had no significant relationship with STP adoption behaviour of sugarcane farmers.

Basher (1993) conducted a study on the adoption of intercropping of sugarcane. He observed that there was no relationship between farm size of the respondent farmers and their adoption of sugarcane intercropping.

Muttaleb (1995) observed that farm size of the growers had a positive relationship with the adoption of improved potato varieties.

Islam (1996) found that there was significant and negative relationship between the farm size of the farmers and their extent of use of indigenous technical knowledge.

Chowdhury (1997) observed that there was a positively significant relationship between farm size and adoption of selected BINA technologies. Similar results were found by Islam (1993), Pal (1995) and Sarkar (1997) in their respective studies.

Alam (1997) studied the use of improved farm practices in rice cultivation by the farmers. The findings of the study showed that the farm size had a significant relationship with their use of improved farm practices in rice cultivation.

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

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

Aurangozeb (2002) observed that there was no relationship between homestead area and adoption of integrated homestead farming technologies.

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

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

Haque (2003) conducted a study on farmer's adoption of modern maize cultivation technologies. He observed that farm size of the respondents had insignificant relationship with their extent of farmer's adoption of modern maize cultivation technologies.

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

2.2.4 Annual income and adoption of innovation

Hossain (1991) conducted a research study on the adoption behaviour of contract wheat growers. In the study, he found that there was negatively insignificant relationship between the annual income of contract growers and the adoption of improved farm practices in wheat cultivation.

Singh (1991) found that income of the farmers was associated with the level of adoption of plant protection measures. He also found that low income farmers had greater tendency to apply less than the recommended doses.

Pal (1995) in his study found a positive and significant relationship between income of the farmers and their adoption of recommended practices in sugarcane cultivation.

Chowdhury (1997) found that the annual income of the respondents had a positively significant relationship with their adoption of selected BINA technologies.

Hussen (2001) conducted a study on farmer's knowledge and adoption of modern sugarcane cultivation practices. He found that annual income of the growers had a positive significant relationship with their adoption of modern sugarcane cultivation practices.

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

Aurangozeb (2002) in his study found a positive significant relationship between annual income and adoption of integrated homestead farming technologies.

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

Sardar (2002) conducted a study on adoption of IPM practices by the farmers under PETRRA project of RDRS. He found that the annual income of the farmers had no significant relationship with their adoption of IPM practices.

Haque (2003) conducted a study on farmer's adoption of modern maize cultivation technologies. He observed that annual income of the respondents had insignificant relationship with their extent of farmer's adoption of modern maize cultivation technologies.

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

2.2.5 Training received and adoption of innovation

Haque (2003) found that training received of the respondent had positive significant relationship with their practices in farmers adoption of modern maize cultivation technologies.

Islam (2002) conducted a study on farmers' knowledge and adoption of ecological agricultural practices under the supervision of proshika. He found that agricultural training exposure of the farmers had no significant relationship with their adoption of ecological agricultural practices.

Verma *et al.* (1989) found there was significant change in attitude of rural women from before training to after training in improved home making tasks. They said that due to gain in knowledge the attitude became more favourable.

Hossain (1981) showed that proper training could raise the knowledge and skill level of participants significantly.

2.2.6 Cosmopolitanism and adoption of innovation

Hossain (1991) undertook a research study on the adoption behaviour of contract wheat growers in Sadar upazila of Jamalpur district. He observed that there were no significant relationship between the cosmopolitanism of the growers and improved farm practices. Similar findings were observed by Bhuiyan (1988) and Islam (1996).

Islam (1993) found a significant relationship between cosmopolitanism of the farmers and their adoption of recommended doses of fertilizer and plant protection measures in potato cultivation.

Pal (1995) conducted a research study on the adoption of recommended sugarcane cultivation practices by the farmers. He observed that the cosmopolitanism of the farmers had significant positive relationship with their adoption of recommended sugarcane cultivation practices.

Rogers (1995) found that innovators and early adopters had much more non-localite behaviour than late majority and laggard, were some isolates who had relatively little interaction without their own social system.

Chowdhury (1997) conducted a study on the adoption of selected BINA technologies by the farmers of Boyra union in Mymensingh district. He found that there was no significant relationship between farmers' cosmopolitanism and their composite adoption of selected BINA technologies.

Hossain (1999) found a positive significant relationship between cosmopolitanism of the farmers and their adoption of improved practices.

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

Hussen (2001) found that the cosmopolitaness had positive significant relationship with their adoption of modern sugarcane cultivation practices.

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

Sardar (2002) concluded that the cosmopolitaness had positively significant relationship with their adoption of IPM practices.

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

Haque (2003) conducted a study on farmer's adoption of modern maize cultivation technologies. He observed that cosmopolitaness of the respondents had insignificant relationship with their extent of farmer's adoption of modern maize cultivation technologies.

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

2.2.7 Attitude towards wheat cultivation and adoption of innovations

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

Hasan (1996) conducted a study on adoption of some selected agricultural technologies among the farmers as perceived by the frontline GO and NGO

workers. He found that there was strong positive relationship between attitude towards development and perceived adoption of selected technologies.

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

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

2.2.8 Innovativeness and adoption of innovation

Moulik *et al.* (1966) observed that innovativeness significantly influenced the adoption of nitrogenous fertilizers among the farmers. They stated that it was in simple term that the more a cultivator exhibited a general tendency towards accepting innovations, the higher would be his adoption score.

Rahman (1973) found a positive relationship between modernism and adoption of farm practices. He defined modernism as leading for new experience or opener to innovation. So, modernism as used by him is synonymous with the innovativeness of the present study.

Muhammad (1974) conducted the study on the extent of adoption of insect control measures by the farmers. He observed a strong positive relationship between innovativeness and adoption of insect control measures.

Kashem and Halim (1991) reported that innovativeness of the farmers had significant positive correlation with their adoption of modern rice technology use of communication media in livestock production.

Jamal (1996) found no relationship between innovativeness of dropout rural youth with their preference in selected agricultural and non-agricultural

entrepreneurship. Similar findings were obtained by Rahman (1995) and Rahu (1989), found a significant negative relationship between the farmers innovativeness and their problem confrontation in feeds and feeding cattle. Saha *et al.* (1988) supported such findings in their respective studies. Sharma and Sanoria (1983) observed higher average innovativeness among contract farmers than the non contract farmers.

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

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

Rahman (2003) revealed that the highest proportion (63 percent) of the farmers had low innovativeness as compared to 22 percent medium innovativeness and 15 percent very low innovativeness.

2.2.9 Communication behavior and adoption of innovation

Bezborra (1980) studied adoption of improved agricultural technology by the farmers of Assam. The study indicated a positive relationship between extension contact and adoption of improved cultivation practices.

Osunloogun *et al.* (1986) studied adoption of improved agril. practices by cooperative farmers in Nigeria. The findings of the study indicated a positive relationship between extension contact and adoption improved practices.

Slade *et al.* (1988) studied that adoption rates among farmers receiving one or more VEW visits per month were generally higher than those farmers who were not visited by VEW'S contact farmers were better adopter of some technologies that non contact farmers.

Heong (1990) observed that the lack of adoption of IPM technologies in rice was frequently attributed to lack of sufficient extension.

Ali (1993) conducted a study based on farmer's response to spaced transplanting technology of sugarcane. He found a significant positive relationship between extension contact and adoption. Similar results were obtained by Kher (1992), Haque (1993), Pal (1995), Bhatkar et al. (1998) and by many other researchers.

Alam (1997) studied use of improved farm practices of rice cultivation by the farmers of Anwara thana of Chittagong district. His study indicated no significant relationship of extension contact of farmers with their use of improved farm practices in rice cultivation.

Sarkar (1997) observed a positive and significant relationship between extension contacts and adoption of improved potato cultivation practices.

Hossain (1999) conducted a study to determine the farmers' perception of the effect of agro-chemicals on environment. He found that there was no relationship between the farmers' media exposure with the adoption of agro-chemicals. Ali *et al.* (1986) observed similar findings with respective studies.

Rahman (1999) found that extension contact of the Boro rice farmers had a significant positive relationship with their adoption of balanced fertilizers in Boro rice cultivation.

Hussen (2001) conducted a study on farmers' knowledge and adoption of modern sugarcane cultivation practices. He found that extension contact of the growers had significant relationship with their adoption of modern sugarcane cultivation practices

Rahman (2001) found that extension contact of the farmers had a significant and positive relationship with their adoption regarding Aalok 6201 hybrid rice.

Aurangzeb (2002) conducted a study on adoption of integrated homestead farming technologies by the rural women in RDRS. He found that there was significant relationship between contact with extension media and adoption of integrated homestead farming technologies.

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

2.2.10 Knowledge on wheat cultivation and adoption of innovation

Most of the researchers found very high relationships between farmers' knowledge on a particular technology and its adoption.

Koch (1985) conducted a study in the North Western organize free state of South Africa concerning perception of agricultural innovations aspiration, knowledge and innovation adoption. He observed that there was a strong positive relationship between knowledge and practice adoption. These findings are very much in agreement with that of Rogers and Shoemaker (1971).

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

Rahman (1995) in his study observed no significant relationship between farmers' adoption of improved practices and their knowledge on improved practices of potato cultivation.

Moullik *et al.* (1996) conducted a study on predictive values of some factors of adopting nitrogenous fertilizers by the north Indian farmers in India. He found a

significant positive relationship between agricultural knowledge and adoption of nitrogenous fertilizers among the cultivators.

Alam (1997) observed that agricultural knowledge of the rice growers had significant relationship with their use of farm practices in rice cultivation.

Sarkar (1997) found that potato production knowledge of potato growers had a positive and significant relationship with their adoption of improved potato cultivation practices.

Sardar (2002) studied adoption of IPM practices by the farmers under PETRRA Project of BDRS. He found that agricultural knowledge had positive significant relationship with their adoption of IPM practices.

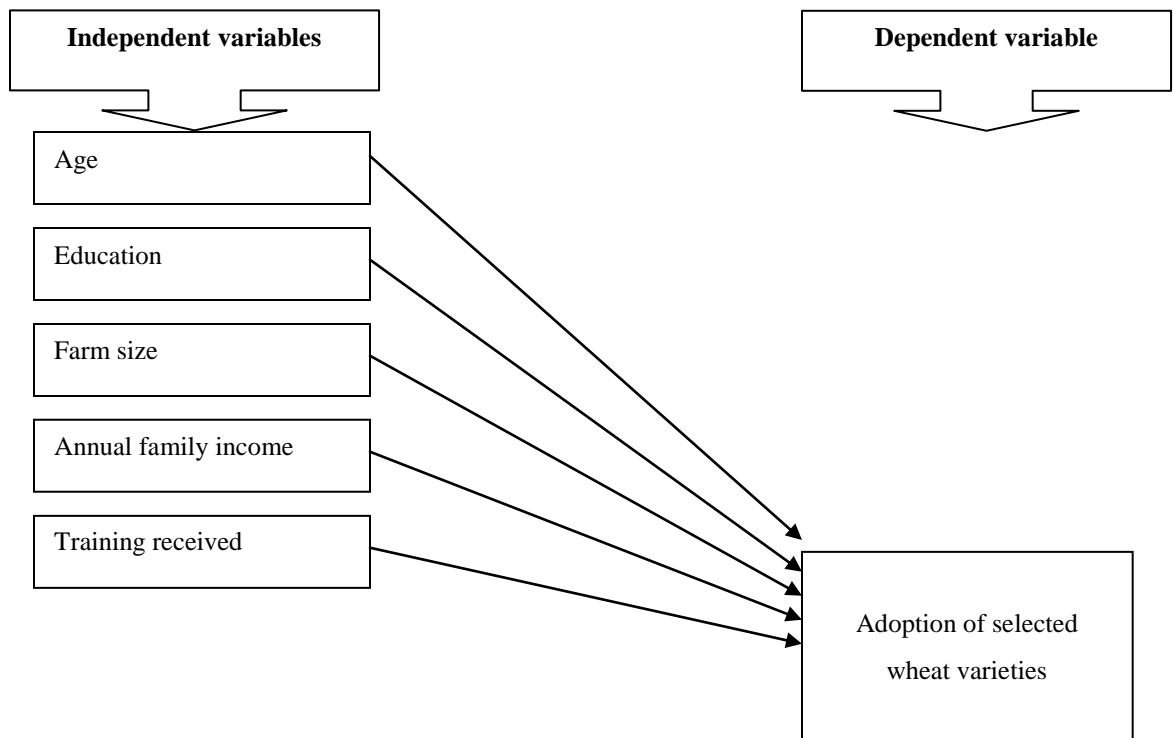
2.2.11 Problem confronted by the farmers in different agricultural aspects

Rahman (1995) in his study identified problems faced by farmers' in cotton cultivation. Non-availability of quality seed in time, unfavourable 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.

Salam (2003) in his study identified constraints in adopting environmentally friendly farming practices. Top six identified constraints according to their rank order were: i) low production due to limited use of fertilizer (ii) lack of organic matter in soil, (iii) lack of Govt. support for environmentally friendly farming practices, (iv) lack of capital and natural resources for integrated farming practices, (v) lack of knowledge on integrated farm management and (vi) unavailability of pest resistant varieties of crops.

2.3 The conceptual framework of the study

In scientific research, selection and measurement of variables constitute an important task. The hypothesis of a research when constructed properly contains at least two important elements i.e. “a dependent variable” and “an independent variable”. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variables (Townsend, 1953). An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. In view of the prime findings of the review of literature, the researcher constructed a conceptual framework of the study which is self-explanatory and is presented in Fig. 2.1.



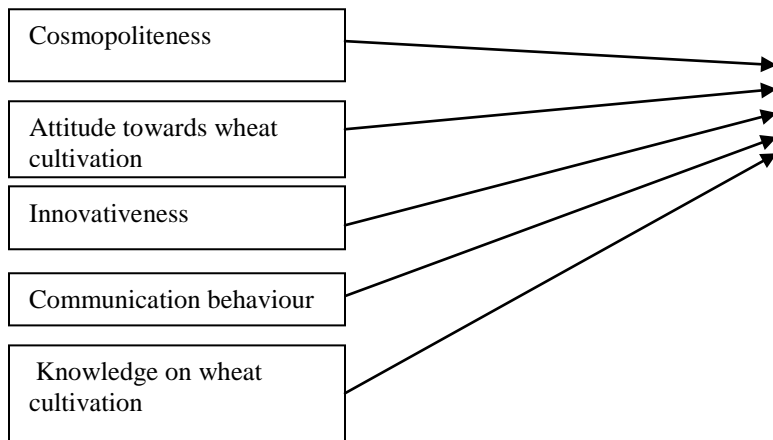


Figure 2.1. Conceptual framework of the study on adoption of wheat varieties

CHAPTER III

METHODOLOGY

The methodology used in conducting any research is critically important and it deserves careful consideration. It enables the researcher to collect valid and reliable information in terms of hypothesis or research instrument and to analyze the information properly to arrive at valid results.

3.1 Locale of the Study

The study was conducted in two villages namely, Khochna and South Polash bari in Saintara union under Chirirbandar upazila of Dinajpur district. The area of Chirirbandar upazila is 157.78 sq km and population 2,58,585; male 79,140, female 76,760. The density of population is 988 per sq km. It consists of 13 union parishads, 65 mouzas and 91 villages. Saintara union is the north side of Chirirbandar upazila. The two villages are 5 kilometers away from upazila headquarter and situated on the bank of Kakra River. Wheat is the second crop of the farmers of this union.

The map of district showing Chirirbandar upazila and a map of Chirirbandar upazila showing the study area have been presented in Figs. 3.1 and 3.2 respectively. Source: Dinajpur Bureau of Statistics Office.

3.2 Design of the study

The design of the study was a descriptive survey research. It was designed to describe the relationship between selected characteristics of the farmers and their extent of adoption of selected wheat varieties. Efforts were also made to assess the problems of the wheat growers in adopting the selected wheat varieties.



Fig: 3.1 A Map of Dinajpur District.

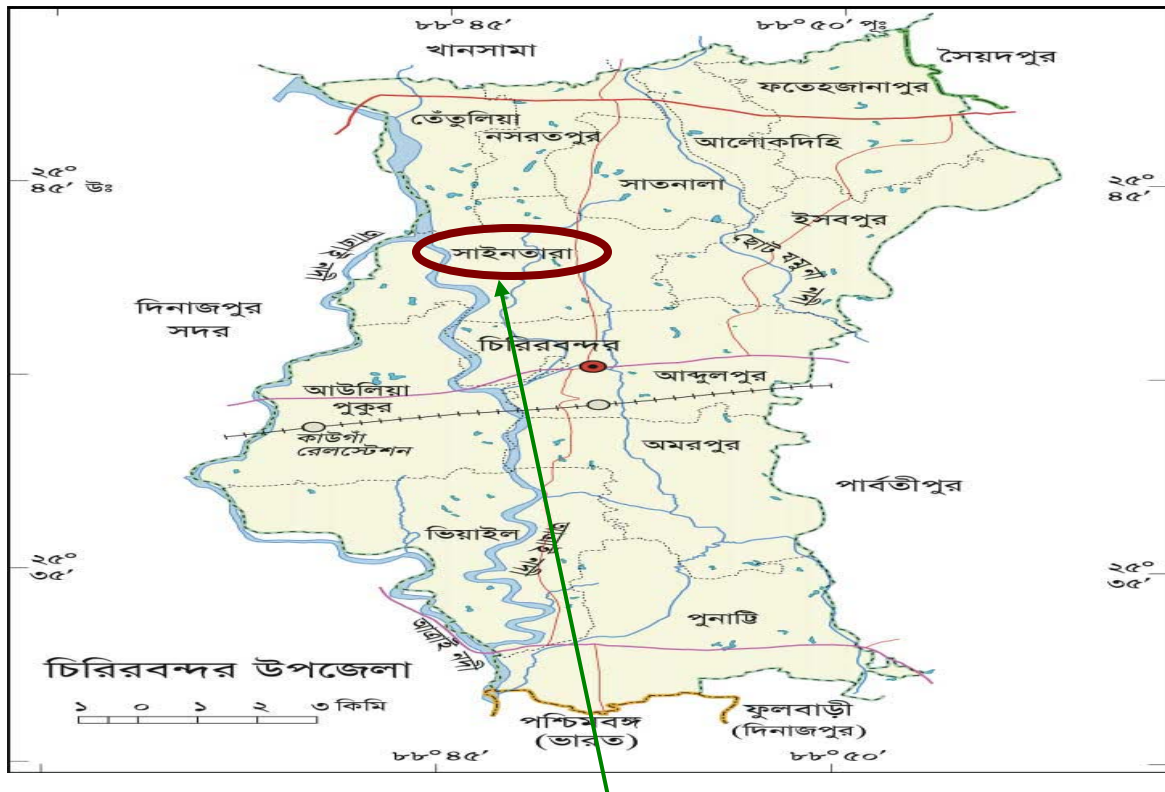


Fig: 3.2 Study area of Chirirbandar Upazila.

3.3 Population and sampling design

Saintara union covering two villages namely, South Polashbari and Khosna were selected purposively. Then a list of wheat growers of these two villages was made by the help of the Sub-Assistant Agricultural Officer. The number of wheat growers of these two villages was 325. Only heads of these 325 wheat growers constituted the population. Twenty percent of the wheat growers were selected from each village by using proportionately systemic random sampling methods. As a result 80 farmers constituted the sample size.

In addition to that, 2 percent of the population was selected randomly and proportionately from each of the selected villages. Thus, the additional sample, so drawn stood 12 growers, which were included in the reserve list. In case, the individuals included in the original samples were not available or not found suitable at the time of data collection, the growers of the reserve list were used for the purpose. The distribution of the growers included in the population, sample and those in the reserve list appears in Table 3.1.

Table 3.1: Distribution of Wheat Growers (target population) and samples in two villages

Union	Village	Wheat Growers	Sample	Reserve List
Saintara	Khochna	155	35	8
	S.Polashbari	170	45	4
Total		325	80	12

3.4 Selection of the variables of the study

Before setting the variable of the study, the researcher himself visited the study area and talked to the farmers and he was able to observe the selected characteristics of the farmers (in the study area) which might have influence on the adoption of selected wheat varieties. Based on this experience, review of literature, discussion with the relevant experts and academicians and also with the research supervisor, the researcher selected the dependent and independent variables. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variables (Townsend, 1953).

The dependent variable is often called 'criterion or predicted variable' whereas independent variable is called 'treatment, experimental or antecedent variable'. Ezekiel and Fox (1959) stated variable as any measurable characteristics, which can assume varying or different values in successive individual cases.

3.4.1 Independent variables

The Research Advisory Committee and the researcher selected ten characteristics of the farmers as independent variables of the study. These were age, education, farm size, annual family income, training received, cosmopolitaness, attitude towards wheat cultivation, innovativeness, communication behavior and knowledge on wheat cultivation.

3.4.2 Dependent variables

A dependent variable is that factor which appears, disappears or varies as the experimenter introduces, removes or varies the independent variables. Adoption of selected wheat varieties is selected as dependent variable.

3.5 Measurement of variables

In order to conduct the study in accordance with the objectives, it was necessary to measure the selected variables. This section contains procedures for measurement of both independent as well as dependent variables of the study. The procedures followed in measuring the variables are presented below:

3.5.1 Measurement of independent variables

The selected characteristics of the respondent growers constituted the independent variables of the study. To keep the research within the manageable sphere, ten independent variables were selected for the study. The procedures of measurement of the selected variables were as follows:

3.5.1.1 Age

The age of individual is one of the important factors pertaining to his personality make up (Smith and Zope, 1970) which can play an important role in his adoption behaviour. The age of respondent growers was measured by counting the actual years from his birth to the time of interview on the basis of his statement. It was measured in terms of actual years. No fraction of year was considered. A score of one (1) was assigned for each years of age. Age was placed in item no.1 of the interview schedule.

3.5.1.2 Education

Education was measured in terms of grades of formal education (school/college) completed by an individual. It was expressed in terms of years of schooling. A score of one (1) was assigned for each year of schooling completed. For example, if the respondent passed the S.S.C. examination, his education score was given as 10, if passes the final examination of class Seven (VII), his education score was given as 7. If the respondent did not know how to read and write, his education

score was given as '0' (zero). A score of 0.5 (half) was given to that respondent who could sign his name only.

3.5.1.3 Farm size

Farm size of the respondent was measured as the size of his farm (including wheat and others crops) on which he continued his farm practices during the period of study. Each respondent was asked to mention the homestead area, the land under his own cultivation, own and given to others on barga (share cropping) system, land taken from others on barga system, land given to others on lease system, land taken from others on lease system, own pond, own garden and miscellaneous fallow land. The area was estimated in terms of full benefit to the growers or his family. The following formula was used in measuring the farm size:

$$\text{Farm size} = A_1 + A_2 + \frac{1}{2} (A_3 + A_4) + A_5$$

Where,

A_1 = Homestead area

A_2 = Own land under own cultivation

A_3 = Own land given to others on barga

A_4 = Land taken from others on barga

A_5 = Land taken from others on lease

The unit of measurement was hectare.

3.5.1.4 Annual family income

Annual family income refers to the total earnings in taka of the respondent and all family members of a farm family from agriculture, livestock, fisheries and other sources (service, business etc.) during the previous year. The methods of ascertaining income from different sources were involved three phases. In the first phase, the yield of all the crops in the previous year was noted. Then all the yields

were converted into cash income according to the prevailing market price. In the second phase, the prices of other enterprises (livestock, poultry, fisheries etc.) were also added to the price of crops. In the third phase, earning of each respondent himself or other members of his family from different sources (like service, business, and labors) were also included in calculating the income. Yearly earning from farming and other sources were added together to obtain total family annual income of a respondent. In case of business or service their monthly income was multiplied by twelve to determine annual family income. Annual family income of an individual was expressed in 1,000 Taka. A score of one was given for each Tk. 1000 to compute the annual income scores of the respondents. Data obtained in response to item no. 5 of the interview schedule were used to determine the annual family income of the respondents.

3.5.1.5 Training received

Training received was operationalized by the number of days that a respondent had received training in his or her entire life. It was indicated by the total number of days of training received by a respondent under different training programs.

3.5.1.6 Cosmopolitaness

Cosmopolitaness of a respondent was measured in terms of his nature of visits to the eight different places external to his own social system and as shown in item number 6 in the interview schedule. The respondents indicated whether they visited those places frequently, occasionally, rarely and never. Weights assigned to these visits were 3, 2, 1 and 0 respectively. A respondent's cosmopolitaness score was obtained by adding the weights for his visits to all the places listed in the instrument. The cosmopolitaness score of the respondents could range from 0 to 24, where 0 indicating no cosmopolitaness and 24 indicating high cosmopolitaness.

3.5.1.7 Attitude towards wheat cultivation

An attitude may be defined as predisposition to act towards an object in a certain manner. Attitude of a grower towards wheat cultivation was used to refer to his belief, feelings and action towards the various aspects of wheat cultivation. It was measured by constituting 10 statements (five positive and five negative). A statement was considered positive if it possessed an idea favourable towards the wheat cultivation. On the other hand, a statement was considered negative if it was unfavourable towards the wheat cultivation. The respondents were asked to express their opinion in the form of 'strongly agree', 'agree', 'no opinion', 'disagree' and 'strongly disagree'. A score of 4 was given to 'strongly agree', 3 to 'agree', 2 to 'no opinion', 1 to 'disagree' and 0 to 'strongly disagree', if the statement was positive. A reverse scoring method was followed in case of statements considered negative. Attitude score of a respondent was determined by summing the scores obtained by him for all the items in the scale. The index scores of respondents could range from 0 to 48 where 0 indicating unfavorable and 48 for favourable attitude towards wheat cultivation.

3.5.1.8 Innovativeness

Innovativeness of a wheat grower was measured by computing an "innovativeness score" on the basis of his adoption of 7 selected wheat production technologies. Innovativeness is the degree to which an individual adopts an innovation relatively earlier than other members in a social system (Rogers, 1995). Scores were assigned on the basis of time required by an individual to adopt each of the technology in the following manner:

Period of Adoption	Assigned Score
Within one year after hearing	4
Within two years after hearing	3

Within three years after hearing	2
Within four years after hearing or above	1
Do not use	0

The scores for all the 7 selected wheat production technologies were added together to constitute the innovativeness score of a respondent. Innovativeness score of a respondent growers could range from 0 to 28, where, 0 indicating no innovativeness and 28 indicating very high innovativeness.

3.5.1.9 Communication behavior

It was measured as one's extent of exposure with different information sources. It was assumed that the more contact an individual would have with different information sources, the more he becomes educated and knowledgeable. An extension contact score was computed for each respondent on his extent of contact with 13 selected media. Each respondent was asked to mention the frequency of his contact with each of the 13 selected media. Here the score measured as 0 for no contact, 1 for occasionally and 2 for frequently of the contact respectively. The communication behaviour score of the respondents could range from 0 to 26, where 0 indicating no communication behaviour and 26 indicating very high communication behaviors. Respondent's communication behaviour score was obtained by adding the weights for his responses to all the sources listed in the instrument.

3.5.1.10 Knowledge on wheat cultivation

To measure the knowledge on wheat cultivation of a respondent 20-items scale was constructed in the interview schedule. Each respondent was asked to answer all the 20 questions. Out of assigned scores against each question, the summation of obtained scores against 20 questions represented the agricultural knowledge of a respondent. Agricultural knowledge was measured by the total knowledge score about agriculture. The total assigned score was 50. But, the score of each question

was not equal, it was determined according to the extent of difficulty. Full score was assigned for each correct answer and zero (0) for the wrong answer. However, for correct responses to all questions, a respondent could get a total score of 50, while wrong responses to all questions he could get 0 (zero). 0 indicating no agricultural knowledge and 50 indicates very knowledge.

3.5.2 Measurement of dependent variable

Adoption of selected wheat varieties

The procedure followed in measuring the dependent variable is presented below:

The adoption of selected wheat varieties was measured by percentage of area coverage of the present year using the following formula developed by M. A. Kashem (2004):

$$\text{Extent of Adoption} = \frac{\text{Cultivated Area (ha)}}{\text{Potential Area (ha)}} \times 100$$

3.6 Problems confronted by the wheat growers

Growers in the study area might have faced various types of problems in the way of adopting selected wheat varieties. But the investigator gained an experience through personal contact regarding common problems faced by the respondents before collection of data. Besides, the researcher gained experience through consultation with experts pre-testing experience and reviewing previous research findings. Finally, he prepared a list of ten possible problems in this regard. A scale was prepared to indicate the extent to which each of the ten problems was applicable in the case of a respondent. The responses were obtained through a 4-point scale: 'high', 'medium', 'low' and 'not at all' and weights were assigned to these responses as, 3, 2, 1 and 0 respectively. Problem Confronted score of a

respondent growers could range from 0 to 30, where, 0 indicating no problem confrontation and 30 indicating very high problem confrontation.

Extent of Problems	Scoring System
High	3
Medium	2
Low	1
Not at all	0

In order to determine the comparative importance of the ten problems, a Problem Confronting Index (PCI) was computed for each of the ten problems by summing up the weights assigned for responses of all the respondents against each problem. Problem Confronting Index of any problem could range from 0 to 240, where, 0 indicated no problem and 240 indicated high problem.

3.7 Instruments for data collection

Keeping the objectives of the study in mind an interview schedule was prepared to collect relevant data from the respondents. Both open and closed form questions were used in collecting data. Simple and direct questions were included in the schedule to ascertain dependent and independent variables. The interview schedule was pre-tested with 15 wheat growers of the study area. On the test experiences, necessary additions, corrections and modifications of the schedule were done. Valuable suggestions and comments were received from the research supervisor and co-supervisor. Appropriate scales were developed to operationalize some characteristics of the wheat growers. The interview schedule was prepared in Bengali language. A copy of the interview schedule in English version is presented in the Appendix-A.

3.8 Collection of data

Data were collected personally by the researcher himself through face to face interview from selected respondents. But for familiarizing the researcher with the study area and for getting local support and establishing rapport with the wheat growers at the time of interview, the interviews were usually conducted with the respondents in their homes. While starting interview with any respondent the researcher took all possible care to establish rapport with him so that he did not hesitate to furnish proper responses to the questions and statements in the schedule. However, if any respondent failed to understand any question the researcher took care to explain the issue. He received excellent co-operation from the respondents and others concerned during the time of interview. The entire process of collecting data took place during October 10 to November 15, 2006.

3.9 Data processing and analysis

After completion of field survey, all the data were processed according to the objectives of the study. Local units were converted into standard unit. All the individual responses to questions of the interview schedule were transferred to 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. Data was transferred to coding sheet with numerical scores given to each question. Simple statistics like frequency, percentage, range, mean, standard deviation and rank order were used to perform the data analysis. Correlation coefficients were to determine the relationships between selected characteristics of the farmers and adoption of selected wheat varieties.

3.10 Statement of hypothesis

According to Kerlinger (1973), a hypothesis is a conjectural statement of the relation between two or more variables. Hypotheses are always in declarative sentence form and they relate either generally or 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.

3.10.1 Research hypothesis

The following research hypotheses were put forward to know the relationships between each of the ten selected characteristics of the wheat growers and their adoption of selected wheat varieties. "Each of the ten selected characteristics of the wheat growers will have significant relationships with their adoption of selected wheat varieties".

3.10.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was undertaken for the present study: "there is no relationship between the selected characteristics of wheat growers and their adoption of selected wheat varieties". The selected characteristics are age, education, farm size, annual family income, training received, cosmopolitaness, attitude towards wheat cultivation, innovativeness, communication behaviour, and knowledge on wheat cultivation. If a null hypothesis is rejected on the basis of a statistical tests, it is assumed, that there is a relationship between the concerned variables.

3.11 Statistical treatment

Data collected were compiled, coded, tabulated and analyzed in accordance with the objectives of the study. Qualitative data were quantified by means of suitable scoring techniques. The statistical measures such as range, mean, standard deviation, percentage distribution and rank order were used to describe both the independent and dependent variables. Tables were also used in presenting data for clarity of understanding. In order to explore the relationships of the selected characteristics of the growers with their adoption of selected wheat varieties, the

Pearson's Product Moment Correlation Co-efficient was computed. Correlation matrix were also computed to determine the inter relationships among the variables. Five percent (0.05) and one percent (0.01) level of significance was used as the basis of rejecting any null hypothesis. If the calculated value of co-efficient of correlation "r" was equal to or greater than tabulated value at designated level of significance for the relevant degrees of freedom, the null hypothesis was rejected and it was concluded that there was a significant relationship between the concerned variables. However, when the calculated value of co-efficient of correlation was found to be smaller than the tabulated value at the designated level of significance for the relevant degrees of freedom, it was concluded that the null hypothesis was accepted and hence, there was no relationship between the concerned variables. Co-efficient values significant at 0.05 level is indicated by single asterisk (*) and at 0.01 level by double asterisks (**).

CHAPTER IV

RESULTS AND DISCUSSION

In this Chapter, the findings of the study and interpretation of the results have been presented. Data obtained from respondents by interview were measured, analyzed, tabulated and statistically treated according to the objectives of the study. These are presented in four sections according to the objectives of the study. The **first**

section deals with the selected characteristics of the wheat farmers, the **second** section deals with the extent of adoption of selected wheat varieties by the farmers, the **third** section, relationships between the extent of adoption of selected wheat varieties of the farmers and their characteristics have been discussed. The **fourth** section deals with the problem confrontation by the wheat growers in wheat cultivation.

4.1 Selected characteristics of the farmers

This section deals with the classification of the farmers according to their various characteristics. Behaviour of an individual is largely determined by his characteristics. These characteristics of an individual contribute to a great extent in the matter of shaping of his behaviour. In this section the findings on the farmer's twelve selected characteristics have been discussed. The selected characteristics are (i) age, (ii) education, (iii) farm size, (iv) annual family income, (v) training received, (vi) cosmopolitaness (vii) attitude towards wheat cultivation, (viii) innovativeness, (ix) communication behaviour, and (x) knowledge on wheat cultivation. Therefore, the major hypothesis of the study was that the adoption of selected wheat varieties would also be influenced by various characteristics of the farmers. Range, mean and standard deviations of these characteristics of the wheat growers are described in this section. Table 4.1 gives a summary profile of the farmer's characteristics.

Table 4.1 A summary profile of the farmer's characteristics

Sl. No.	Characteristics	Measuring Unit	Possible range	Observed range	Categories	Number (N = 80)	Mean	Standard deviation
1.	Age	Actual years	Unknown	24-50	Young (24 to 35) Middle aged (36-50)	48 32	34.31	6.86
2.	Education	Years of schooling	Unknown	0-16	Illiterate (up to 0.5) Primary level (1-5) Secondary level (6-10) Upper secondary (11 and above)	20 23 17 20	6.42	5.08
3.	Farm size	Hectare	Unknown	0.16-5.61	Marginal (up to 0.50) Small (0.51-1.00) Medium (1.01-3.00) Large (3.01 and above)	4 10 44 22	2.20	1.28
4.	Annual family income	In Tk.1000	Unknown	20-650	Low (up to 100) Medium (101-300) High (301 and above)	23 51 6	176.23	102.51
5.	Training received	Number of days	Unknown	0-15	Less (up to 6) Medium (7-10) High (11 and above)	32 33 15	8.11	3.10
6.	Cosmopolitaness	Scaling	0-24	7-24	Low (up to 10) Medium (11-20) High (21 and above)	9 63 8	14.68	4.20
7.	Attitude towards wheat cultivation	Scaling	0-50	15-40	Low (up to 25) Medium (26-35) High (36 and above)	37 32 11	27.65	6.60
8.	Innovativeness	Scaling	0-28	7-26	Low (up to 10) Medium (11-20) High (21 and above)	31 30 19	14.24	5.94
9.	Communication behaviour	Scaling	0-26	9-26	Low (up to 15) Medium (16-20) High (21 and above)	23 40 17	17.55	3.74
10.	Knowledge on wheat cultivation	Scaling	0-50	13-47	Poor (up to 25) Medium (26-40) High (41 and above)	17 49 14	31.94	8.47

4.1.1 Age

Age scores of the farmers ranged from 24 to 50 having an average of 34.31 with a standard deviation 6.86. On the basis of the age scores of the farmers, they were classified into two categories: "young" (up to 35) and "middle aged" (36-50). The distribution of the wheat growers according to their age is shown in Table 4.2.

The highest proportion (60 percent) of the wheat growers fell in the "young" category while 40 percent of them fell in the "middle aged" category.

Table 4.2 Distribution of the farmers according to their age

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Young (up to 35)	10	12.5	34.31	6.86
Middle aged (36-50)	59	73.8		

The findings indicate that a large proportion (60) of the farmers were young. The young people are generally receptive to new ideas and things. They have a favourable attitude towards trying new ideas. However, the older growers because of their longer farm experience might have valuable opinions in regard to adoption of selected wheat varieties. The extension agents can make use of these views and opinion in designing their extension activities. Young farmers are proving to accept various agricultural innovations and according to rural social system in Bangladesh generally young people of the family own land and cash and dominate family decisions.

4.1.2 Education

The education scores of the farmers ranged from 0 to 16 having an average of 6.42 and the standard deviation was 5.08. On the basis of their educational scores, the wheat growers were classified into four categories, namely "illiterate/can sign only" (0-0.5), "primary" (1-5), "secondary" (6-10) and "upper secondary" (11 and

above). The distribution of the farmers according to their education is shown in Table 4.3.

The majority (28.8 percent) of the wheat growers had primary level of education compared to 25, 21.2 and 25 percent illiterate, secondary and upper secondary level of education respectively. The findings indicate that minimum level of education of an individual is likely to be more receptive to the modern facts and ideas; they have much mental strength in deciding on a matter related to problem solving.

Table 4.3 Distribution of the farmers according to their education

Categories	Farmers (N=80)		Mean	Standard Deviation
	Number	Percent		
Illiterate/can sign only(0-0.5)	20	25	6.42	5.08
Primary level(1-5)	23	28.8		
Secondary level(6-10)	17	21.2		
Upper secondary level (11 and above)	20	25		

Possession of some education by the wheat growers is a positive aspect in the context of the adoption of selected wheat varieties. Education helps the wheat growers to gain knowledge on the improved methods of cultivation by reading books, leaflets, bulletins and other printed materials. Thus, farming community in the study area may be well considered as a suitable ground for the adoption of selected wheat varieties. Considering the largest proportion of farmers having primary level of education (28.8%), it would be obviously necessary to undertake efforts to increase their level of education.

4.1.3 Farm size

The farm size score of the respondents varied from 0.16 to 5.61. The average farm size was 2.20 hectares with a standard deviation of 1.28. The respondents were

classified into the following four categories based on their farm size: "marginal" (up to 0.5), "small" (0.51 – 1.00), and "medium" (1.01 -3.00) and large (3.01 and above). The distribution of the farmers according to their farm size is shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their farm size

Categories	Farmers (N =80)		Mean	Standard Deviation
	Number	Percent		
Marginal (up to 0.5)	4	5	2.20	1.28
Small (0.51-1.00)	10	12.5		
Medium (1.01-3.00)	44	55		
Large(3.01 and above)	22	27.5		

More than half (55 percent) of the farmers possessed medium farms compared to 5, 12.5 and 27.5 percent having marginal, small and large farms respectively. Thus, the majority 55 percent of the farmers were the owners of medium farms. According to the data contained in the table 4.5 there are rich farmers in the study area. So, they can adopt new technologies and target oriented special extension services.

4.1.4 Annual family income

The observed annual family income of the respondents ranged from 20-650 having the average of 176.23 and standard deviation was 102.51. Based on their income scores, the farmers were classified into three categories: "low" (up to 100), "medium" (101-300) and "high" (301 and above). The distribution of the wheat growers according to their annual family income is shown in Table 4.5.

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

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (up to 100)	23	28.8	176.23	102.51
Medium (100-300)	51	63.7		
High (301and above)	6	7.5		

From the above Table, it was observed that the highest portion (63.7%) of the respondents were medium income group, while 28.8 percent respondents were from low income group and only 7.5 percent were from high income group. Most of farmers of the study area were medium group. The average income of the farmers was much higher of the study area than national average income of the country. This might be due to the fact that the farmers of the study area were not engaged in agriculture only, they earned from other sources such as service, business etc.

4.1.5 Training received

Training received scores of the respondents ranged from 0-15 with an average of 8.11 and a standard deviation of 3.10. Based on their training received scores of the respondents are classified into three groups: “less” (up to 6), “medium” (7-10), and “high” (11 and above). The distribution of the farmers is shown according to their classified groups in table 4.6.

Table 4.6 Distribution of the farmers according to their training received

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Less (up to 6)	32	40	8.11	3.10

Medium (7-10)	33	41.3		
High (11 and above)	15	18.7		

The majority (41.3 percent) of the farmers received medium training while 18.7 percent of them received high training. About 40 percent of the respondents had low training. The table revealed that the farmers of Chirirbandar upazila had medium training. As a result they obtain a good adoption scope. It proved that there is always a relationship between training received and adoption of innovation. In order to decrease the less adoption they need more training.

4.1.6 Cosmopolitaness

Cosmopolitaness scores of the respondents ranged from 7 to 24 with an average of 14.68 and a standard deviation of 4.20 against the possible range of 0 to 24. On the basis of their cosmopolitaness scores, the farmers were classified into three categories: "low" (upto10), medium" (11-20) and "high" (21 and above). The distribution of the wheat growers according to their cosmopolitaness is shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their cosmopolitaness

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (up to 10)	9	11.3	14.68	4.2
Medium (11-20)	63	78.7		
High (21 and above)	8	10		

The majority (78.7 percent) of the farmers had medium cosmopolitaness compared to 11.3 and 10 percent of them having low and high cosmopolitaness respectively. Thus, most (78.7 percent) of the farmers had medium outward exposure in terms of cosmopolitaness which has a positive relationship with adoption.

4.1.7 Attitude towards wheat cultivation

The attitude towards wheat cultivation practice scores ranged from 15 to 40 against the possible range 0 to 50 with an average of 27.65 and a standard deviation of 6.60. Based on the observed attitude towards wheat cultivation scores, the respondents were classified into three categories: “low” (up to 25), “medium” (26-35) and “high” (36 and above). The distribution of the respondents according to their attitude towards wheat cultivation practice scores is shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their attitude towards wheat cultivation

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (upto 25)	37	46.3	27.65	6.60
Medium(26-35)	32	40		
High (36 and above)	11	13.7		

Data presented in Table 4.8 show that the highest proportion (46.3 percent) of the wheat growers belonged to low attitude towards wheat cultivation as compared to 40 and 13.7 percent medium and high attitude towards wheat cultivation respectively. This indicates that 46.3 percent of the respondent growers had low attitudes towards wheat cultivation.

4.1.8 Innovativeness

The maximum innovativeness score of the respondents was 26 and the minimum was 7 against the possible range of 0 to 28. However, the average was 14.24 and the standard deviation was 5.94. Based on their innovativeness scores, the respondents were classified into three categories: “low” (up to 10), “medium (11-

20) and “high” (21 and above). The distribution of the respondents according to their innovativeness is shown in Table 4.9.

Table 4.9 Distribution of the farmers according to their innovativeness

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (up to 10)	31	38.8	14.24	5.94
Medium (11-20)	30	37.5		
High (21 and above)	19	23.7		

Data contained in table. 4.9 indicate that the highest proportion (38.8 percent) of the growers had low innovativeness as compared to 37.5 and 23.7 percent medium and high innovativeness respectively. Data also revealed that majority (38.8 percent) of the respondent growers of the study area had low level of innovativeness. It may also be concluded that majority of the respondent growers of the study area had low innovativeness. The result would help the extension planners to chalk out future extension programmes for transferring technologies to the potential growers.

4.1.9 Communication behavior

The computed communication behaviour scores of the respondents ranged from 6 to 26 with an average of 17.55 and a standard deviation of 3.74 against the possible range of 0 to 26. On the basis of their communication behaviour scores, the farmers were classified into three categories: “low” (up to 15), "medium" (16-

20) and "high" (21 and above). The distribution of the wheat growers according to their communication behaviour is shown in Table 4.10.

Table 4.10 Distribution of the farmers according to their communication behavior

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (up to 15)	23	28.8	17.55	3.74
Medium (16-20)	40	50		
High (21 and above)	17	21.2		

The majority (50 percent) of the farmers had medium communication behavior, while 21.2 and 28.8 percent of them had high and low communication behaviour. The table revealed that the farmers of Chirirbandar Upazila had good communication behavior. As a result they obtained a good adoption score. It proved that there is always a relationship between communication behavior and adoption of innovation.

4.1.10 Knowledge on wheat cultivation

Knowledge on wheat cultivation scores of the respondents ranged from 13 to 47 against the possible range of 0 to 50. The average and standard deviation were 31.94 and 8.47 respectively. Based on the observed knowledge on wheat cultivation scores, the farmers were classified into the following three categories: "poor" (up to 25), "medium" (26 to 40) and "high" (41 and above). The distribution of the wheat growers according to their knowledge on wheat cultivation is shown in Table 4.11.

Table 4.11 Distribution of the farmers according to their knowledge on wheat cultivation

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		

Low (upto25)	17	21.3	31.94	8.47
Medium (25-40)	49	61.2		
High (41and above)	14	17.5		

The highest proportion (61.2 percent) of the farmers had medium knowledge on wheat cultivation compared to 17.5 percent of them having high knowledge on wheat cultivation and 21.3 percent low knowledge on wheat cultivation. Thus in general, the agricultural knowledge level of the farmers of the study area was moderately satisfactory. Possession of comparatively medium agricultural knowledge is likely to be contributory to the adoption of wheat cultivation.

4.2 Adoption of selected wheat varieties

The observed adoption of selected wheat varieties of the farmers ranged from 28.65 to 89.24 against the possible range of 0 to 100. The average adoption was 58.03 with a standard deviation of 15.13. Based on the adoption score, the farmers were classified into three categories: “low” (up to 45.00), medium” (45.01-70.00) and “high” (70.01 and above). The distribution of the respondents according to their adoption of selected wheat varieties is shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their adoption of selected wheat varieties

Categories	Farmers (N = 80)		Mean	Standard Deviation
	Number	Percent		
Low (up to 45.00)	19	23.8	58.03	15.13
Medium (45.01-70.00)	44	55		
High (70.01and above)	17	21.2		

Data contained in table. 4.12 indicate that the highest proportion (55 percent) of the growers had medium adoption as compared to 21.2 percent high adoption and 23.8 percent low adoption respectively. It indicates that majority (55 percent) of

the respondent growers of the study area had medium adoption of selected wheat varieties. The farmers of Chirirbandar upazila had good agricultural knowledge. So, the respondents showed medium level adoption of wheat cultivation.

The adoption of the respondents towards selected wheat varieties was classified into three categories as shown in Figure 4.1.

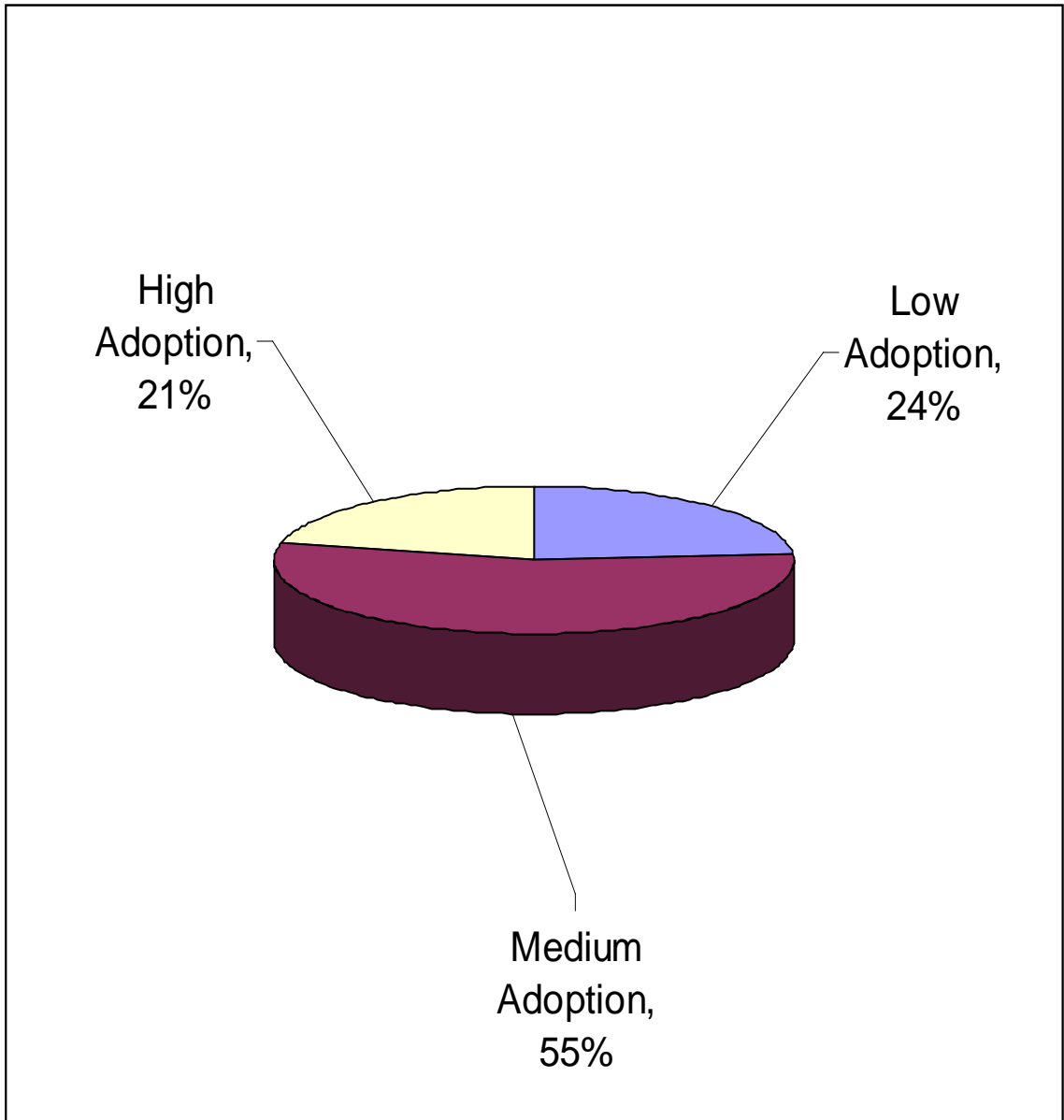


Figure 4.1 A pie graph showing adoption of selected wheat varieties

In Figure 4.1, it was showed that the majority (55%) proportion of the respondents had medium adoption of selected wheat varieties, while 23.8 and 21.2 percent of the respondents had low and high adoption respectively. It indicates that selected wheat varieties are not adopted by all the farmers of this area.

4.3 Relationships between the Selected Characteristics of the Wheat Growers and their Adoption of Selected Wheat Varieties

Coefficient of correlation was computed in order to explore the relationship between the selected characteristics of the wheat growers and their adoption of selected wheat varieties. The selected characteristics constituted independent variables and adoption of selected wheat varieties by the wheat growers constituted the dependent variable. Table 4.13 has been used for descriptive interpretation of the meaning of 'r'.

Table 4.13: The meaning of 'r' values

'r' values	Meaning
0.00 to 0.19	A very low correlation
0.20 to 0.39	Low correlation
0.40 to 0.59	A moderate correlation
0.60 to 0.79	A high correlation
0.80 to 1.00	A very high correlation

Source: Cohen and Holliday, 1982; 92-93

As mentioned earlier, the ten characteristics of the wheat growers were the independent variables of the study. The variable were: age, education, farm size,

annual family income, training received, cosmopolitaness, attitude towards wheat cultivation, innovativeness, communication behaviour, knowledge on wheat cultivation. The dependent variable was adoption of selected wheat varieties. To explore the relationships, Pearson's product moment correlation co-efficient (r) has been used to test the hypothesis concerning the relationships between two variables. Five percent (5%) and one percent (1%) level of significance were used as the basis of acceptance or rejection of a hypothesis. The summary of the results of the correlation co-efficient between the selected characteristics of the respondent growers and their adoption of selected wheat varieties is shown in Table 4.14.

Table 4.14 Co-efficient of correlation of the selected characteristics of the respondents and their adoption of selected wheat varieties

Independent variables	Computed value of 'r'	Dependent variable	Table value of 'r' of 78 degrees of freedom	
			0.05%	0.01%
Age	-0.187 ^{NS}	Adoption of selected wheat varieties	0.220	0.286
Education	0.070 ^{NS}			
Farm size	0.033 ^{NS}			
Annual family income	0.097 ^{NS}			
Training received	0.708 ^{**}			
Cosmopolitaness	0.384 ^{**}			
Attitude towards wheat cultivation	0.423 ^{**}			
Innovativeness	0.596 ^{**}			
Communication behaviour	0.347 ^{**}			
Knowledge on wheat cultivation	0.790 ^{**}			

^{NS} = Non significant

* = Significant at 0.05 level of probability

** = Significant at 0.01 level of probability

4.3.1 Relationship between age of the wheat growers and their adoption of selected wheat varieties

The relationship between age of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis: “There is no relationship between age of the wheat growers and their adoption of selected wheat varieties.”

As shown in the Table 4.14 the co-efficient of correlation between the concerned variables was computed and found to be ‘ r ’ = -0.187 which led to the following observations.

- Firstly, the relationship showed a negative trend.
- Secondly, a very negligible relationship was found to exist between the two variables.
- The computed value of ‘ r ’ (0.187) was smaller than the table value ($r = 0.220$) with 78 degrees of freedom at 0.05 level of probability.
- Hence, the concerned null hypothesis was accepted.
- The correlation co-efficient between the two concerned variables was not significant.

The findings imply that the age of the wheat growers had negatively insignificant relationship with their adoption of selected wheat varieties. Islam (1993), Kher (1992) and Sarkar (1997) observed the similar findings in their studies.

4.3.2 Relationship between the education of the wheat growers and their adoption of selected wheat varieties

The relationship between the education of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis:

“There is no relationship between education of the wheat growers and their adoption of selected wheat varieties”

The co-efficient of correlation between the concerned variables was found to be 'r' = 0.070 as shown in Table 4.14. This led to the following observations regarding the relationship between the two variables under consideration:

- The relationship showed a tendency in the positive direction between the concerned variables.
- The relationship between the concerned variables was very negligible.
- The computed value of 'r' (0.070) was smaller than the table value ($r = 0.220$) with 78 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The correlation co-efficient between the two concerned variables was not significant.

The findings indicate that the education of the farmers had no significant relationship with their adoption of selected wheat varieties. Similar findings were also observed by Hossain (1981).

4.3.3 Relationship between farm size of the wheat growers and their adoption of selected wheat varieties

The relationship between farm size of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis:

“There is no relationship between farm size of the wheat growers and their adoption of selected wheat varieties”.

Computed value of the co-efficient of correlation between farm size of the farmers and their adoption of selected wheat varieties was found to be 'r' = 0.033 as shown in Table 4.14. The following observations were recorded regarding the relationship between the two variables on the basis of the co-efficient of correlation:

- The relationship showed a tendency in the positive direction between the concerned variables.
- A negligible relationship was found between the two variables.

- The computed value of 'r' (0.033) was found to be greater than the table value ($r = 0.220$) with 78 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The co-efficient of correlation between the concerned variable was not significant at 0.05 level of probability.

The findings imply that the farm size of the wheat growers had no significant relationship with their adoption of selected wheat varieties. It was found in the study area that people having large farm size had low adoption of selected wheat varieties. So, the finding is quite rational. Many researchers such as Ali (1993), Aurangozeb (2002), Haque (2003) observed the similar findings in their studies.

4.3.4 Relationship between annual family income of the wheat growers and their adoption of selected wheat varieties

The relationship between annual income of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis: "There is no relationship between annual family income of the wheat growers and their adoption of selected wheat varieties."

Computed value of the co-efficient of correlation between annual family income of the wheat growers and their adoption of selected wheat varieties was found to be $r = 0.097$ as shown in Table 4.14. The following observations were recorded regarding the relationship between the two variables on the basis of the co-efficient of correlation:

- The relationship showed a tendency in the positive direction between the concerned variables.
- A negligible relationship was found between the two variables.
- The computed value of 'r' (0.097) was found to be smaller than the table value ($r = 0.220$) with 78 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.

- The co-efficient of correlation between the concerned variable was not significant at 0.05 level of probability.

The researcher concluded that the annual family income of the wheat growers had no significant relationship with their adoption of selected wheat varieties.

It was found in the study area that people having high annual family income had low adoption of selected wheat varieties. So, the finding is quite logical. Sardar (2002) and Haque (2003) also found the similar findings.

4.3.5 Relationship between training received of the wheat growers and their adoption of selected wheat varieties

The relationship between training received of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis:

“There is no relationship between training received of the wheat growers and their adoption of selected wheat varieties.”

Computed value of the co-efficient of correlation between training received of the wheat growers and their adoption of selected wheat varieties was found to be ‘r’ = 0.708 as shown in Table 4.14. The following observations were recorded regarding the relationship between the two variables on the basis of the co-efficient of correlation:

- The relationship showed a tendency in the positive direction between the concerned variables.
- A high relationship was found between the two variables.

- The computed value of 'r' (0.708) was found to be smaller than the table value ($r = 0.286$) with 78 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

The researcher concluded that the training received of the wheat growers had significant relationship with their adoption of selected wheat varieties.

It was found in the study area that people receiving high training had high adoption of selected wheat varieties. So, the finding is quite logical. Verma et al. (1989) and Haque (2003) also found the similar findings.

4.3.6 Relationship between cosmopolitanism of the wheat growers and their adoption of selected wheat varieties

The relationship between cosmopolitanism of the wheat growers and their adoption of selected wheat varieties was examined to the following null hypothesis: "There is no relationship between cosmopolitanism of the wheat growers and their adoption of selected wheat varieties".

The co-efficient of correlation between the concerned variables was found to be 'r' = 0.348^{**} as shown in Table 4.14. This led to the following observations regarding the relationship between the two variables under consideration:

- The relationship showed a positive trend.
- A high relationship was found to exist between the two variables.
- The computed value of 'r' (0.348) was greater than the table value ($r = 0.286$) with 78degrees of freedom at 0.01 level of probability.
- Hence, the concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

The researcher concluded that cosmopolitanism of the wheat growers had positive and significant relationship with their adoption of selected wheat varieties. Hossain (1999), Rahman (2001), Aurangozeb (2002), Islam (2002), Sardar (2002) and Hossain (2003) also found the similar findings.

4.3.7 Relationship between attitude towards wheat cultivation of the wheat growers and their adoption of selected wheat varieties

The relationship between attitude towards wheat cultivation of the wheat growers and their adoption of selected wheat varieties as examined to the following null hypothesis: “There is no relationship between attitude towards wheat cultivation of the wheat growers and their adoption of selected wheat varieties”.

Computed value of the co-efficient of correlation between attitude towards wheat cultivation of the wheat growers and their adoption of selected wheat varieties was found to be ‘ $r = (0.423^{**})$ ’ as shown in Table 4.14. The following observations were recorded regarding the relationship between the two variables on the basis of the co-efficient of correlation:

- The relationship showed a positive trend.
- A high relationship was found between the concerned variables.
- The computed value of ‘ r ’ (0.423) was found to be greater than the table value ($r = 0.286$) with 78 degrees of freedom at 0.01 level of probability.
- Hence, the concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

Thus, the researcher concluded that the attitude towards wheat cultivation of the wheat growers had positive significant relationship with their adoption of selected wheat varieties.

It could influence directly to adopt selected wheat varieties. Innovative farmers are more dynamic, conscious and have more eagerness towards innovation. Adoption

of selected wheat varieties among the innovative farmers is probably due to the manifestation of their aforesaid behavioural aspects. Mostafa (1999) and Islam M.S (2002) also found the similar significant and positive relationship between these two variables.

4.3.8 Relationship between the innovativeness of the wheat growers and their adoption of selected wheat varieties

The relationship between innovativeness of the wheat growers and their adoption of selected wheat varieties was examined to the following null hypothesis: “There is no relationship between innovativeness of the wheat growers and their adoption of selected wheat varieties”.

The co-efficient of correlation between the concerned variables was found to be ‘r’ = 0.596** as shown in Table 4.14. This led to the following observations regarding the relationship between the two variables under consideration:

- The relationship showed a positive trend.
- The relationship between the concerned variables was a high correlation.
- The computed value of ‘r’ (0.596) was greater than the table value ($r = 0.286$) with 78 degrees of freedom at 0.01 level of probability.
- Hence, the concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

Considering the findings the researcher concluded that innovativeness of the wheat growers had significant and positive relationship with their adoption of selected wheat varieties. Hossain (1999), Kashem and Halim (1991) also found the similar significant and positive relationship between these two variables.

4.3.9 Relationship between communication behaviour of the wheat growers and their adoption of selected wheat varieties

The relationship between communication behaviour of the wheat growers and their adoption of selected wheat varieties was examined to the following null hypothesis:

“There is no relationship between communication behaviour of the wheat growers and their adoption of selected wheat varieties”.

The co-efficient of correlation between the concerned variables was found to be ‘r’ = 0.347^{**} as shown in Table 4.14. This led to the following observations were recorded regarding the relationship between the two variables under consideration:

- The relationship showed a positive trend.
- A moderate relationship was found between the concerned variables.
- The computed value of ‘r’ (0.347) was greater than the table value ($r = 0.286$) with 78 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

Thus, the researcher concluded that the communication behaviour of the wheat growers had positive significant relationship with their adoption of selected wheat varieties. The communication behaviour strengthened the base of their knowledge. The knowledge definitely act as motivator towards adoption of new technologies. Pal (1995), Chowdhury (1997) and Sarker (1997) also found the similar findings.

4.3.10 Relationship between knowledge on wheat cultivation of wheat growers and their adoption of selected wheat varieties

The relationship between knowledge on wheat cultivation of the wheat growers and their adoption of selected wheat varieties was examined by testing the following null hypothesis:

“There is no relationship between knowledge on wheat cultivation of the wheat growers and their adoption of selected wheat varieties”.

Computed value of the co-efficient of correlation between knowledge on wheat cultivation of the wheat growers and their adoption of selected wheat varieties was found to be 'r' = 0.790** as shown in Table 4.15. The following observations were recorded regarding the relationship between the two variables on the basis of the co-efficient of correlation:

- The relationship showed a positive trend.
- A high relationship was found between the two variables.
- The computed value of 'r' (0.790) was found to be greater than the table value (r = 0.286) with 78 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 0.01 level of probability.

Thus, the researcher concluded that the knowledge on wheat cultivation of the wheat growers had positive significant relationship with their adoption of selected wheat varieties.

This finding indicates that adoption of selected wheat varieties increases with the increase of knowledge of the growers. It helps the farmers to grow crops by using environmentally friendly cultivation practices. Moulik *et al.* (1996), Bezborra (1980), Ali *et al.* (1986), Reddy *et al.* (1987), Ali (1993) and Sardar (2002) found the similar findings.

4.4 Problem Confrontation Index (PCI)

In order to measure the problems regarding wheat cultivation open and closed questionnaire was used. The purpose of this section was to have an understanding on the problems faced by the wheat growers in adopting selected wheat varieties. Problem in each item has been presented with frequency distribution of the wheat growers in percent.

For clear understanding of problems of the wheat growers an index for each item along with rank order was computed by using the following formula:

$$\text{Problem Confrontation Index (PCI)} = P_h \times 3 + P_m \times 2 + P_l \times 1 + P_n \times 0$$

Where,

P_h = Percent of respondent with "high problem"

P_m = Percent of respondent with "medium problem"

P_l = Percent of respondent with "low problem"

P_n = Percent of respondent with "not at all problem"

The problem confrontation of the respondents towards adoption of selected wheat varieties was described through the Problem Confrontation Index (PCI) as shown in Table 4.16.

Table 4.15 Ranked order of the problems confronted by the wheat growers (N=80) in adopting selected wheat varieties

Sl. No.	Problem	Problem Confrontation Index	Rank order
1.	Non availability of wheat seeds in the market	224	1
2.	High price of fertilizers	212	2
3.	Lack of Agricultural machineries & tools for wheat cultivation	202	3
4.	Non availability of pesticides	198	4
5.	Scarcity of fertilizer supply in time	187	5
6.	Lack of training in adoption of selected wheat varieties	165	6
7.	High price of seeds	149	7
8.	Non availability of printed materials about cultivation of wheat	138	8
9.	Lack of IPM knowledge	127	9
10.	Requires high amount of fertilizers in wheat crops	112	10

Problem Confrontation Index (PCI) of the wheat growers for the 10 items in adopting selected wheat varieties ranged from 224 to 112 against a possible range of 0 to 240. According to the rank order the ten problems are described here:

Data contained in Table 4.16 indicated that “Non availability of wheat seeds in the market” ranked **1st** with PCI value of 224. Most of the farmers of the study area did not get wheat seed timely for insufficient supply of wheat seeds.

The **2th** cited problem of the growers was "High price of fertilizers" with the PCI of 212. The growers of the study area did not get fertilizer in normal price for the unfair handing of price rate by the dealers.

The **3rd** cited problem of the growers was “Lack of Agricultural machineries & tools for wheat cultivation" with the PCI of 202. It is the big problem of the growers. Agricultural machineries & tools for wheat cultivation are costly. Most of the farmers are unable to buy those tools.

The **4rd** cited problem of the growers was “Non availability of pesticides” with the PCI of 198. They need adequate supply of pesticides during cropping season. For scarcity at pesticides, growers could not produce better yield.

The **5th** cited problem was "Scarcity of fertilizer supply in time" with the PCI of 187. The growers do not get fertilizers in time when they go for cultivation of wheat. Fertilizers were not available at the village market due to lack of transport facilities.

The **6th** cited problem of the growers was “Lack of training in adoption of selected wheat varieties” with the PCI at 165. The people of this area are deprived of

modern technologies due to facilities of receiving training. So, it is a problem for the growers hindering the adoption of wheat varieties.

The 7th problem of the growers was "High price of seeds" with the PCI of 149. The seed production companies are not selling seeds in reasonable price.

The 8th cited problem of the growers was "Non availability of printed materials about cultivation of wheat" with the PCI 138. The growers of the study area do not get printed materials to learn about wheat cultivation.

The 9th problem of the growers was "Lack of IPM knowledge" with PCI of 127. The performance of Sub Assistant Agriculture Officers in making awareness among the farmers about IPM practices is not satisfactory.

The 10th problem of the growers was "Requires of high amount of fertilizers in wheat crops" with the PCI of 112. Wheat cultivation cost is higher because more fertilizers are needed for wheat production than other crops.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

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

5.1 Summary of Findings

The major findings of the study are summarized below:

5.1.1 Selected characteristics of the farmers

Eleven individual characteristics of the farmers were selected for investigation in this study. The findings of ten characteristics of the farmers are summarized below:

5.1.1.1 Age

The age scores of the farmers ranged from 24 to 50 years. The average age score was 31.31 with a standard deviation of 6.86. Highest proportions (60 percent) of the farmers were fell in young category as compared to 40 percent middle aged category.

5.1.1.2 Education

Education scores of the farmers ranged from 0 to 16. The average score was 6.42 and the standard deviation was 5.08. The majority (28.8 percent) of the wheat growers had primary level of education compared to 25, 21.2 and 25 percent illiterate, secondary and upper secondary level of education respectively.

5.1.1.3 Farm size

Farm size scores of the farmers ranged from 0.16 to 5.61 hectares with an average of 2.20 and the standard deviation was 1.28. More than half (55 percent) of the

farmers possessed medium farms compared to 5, 12.5 and 27.5 percent having marginal, small and large farms respectively.

5.1.1.4 Annual family income

Annual family income scores of the farmers ranged from 20-650 with an average of 176.23 and the standard deviation was 102.51. The highest portion (63.7%) of the respondents were medium income group, while 28.8 percent respondents were from low income group and only 7.5 percent were from high income group.

5.1.1.5 Training received

Training received scores of the farmers ranged from 0 to 15 with an average of 8.11 and the standard deviation was 3.10. The majority (41.3 percent) of the farmers received medium training while 18.7 and 40 percent of them received high low training respectively.

5.1.1.6 Cosmopolitaness

Cosmopolitaness scores of the farmers ranged from 7 to 24 against the possible range was found to be 0 to 24. The average cosmopolitaness scores were found to be 14.68 with a standard deviation of 4.2. The majority (78.7 percent) of the farmers had medium cosmopolitaness compared to 11.3 and 10 percent of them having low and high cosmopolitaness respectively.

5.1.1.7 Attitude towards wheat cultivation

The attitude towards wheat cultivation scores of the farmers ranged from 15 to 40 against the possible scores 0 to 50. The average attitude towards wheat cultivation score was found to be 27.65 with a standard deviation of 6.60. The highest proportion (46.3 percent) of the wheat growers belonged to low attitude towards wheat cultivation as compared to 40 and 13.7 percent medium and high attitude towards wheat cultivation respectively.

5.1.1.8 Innovativeness

The innovativeness scores of the farmers ranged from 7 to 26 against the possible range of 0 to 28 with an average of 14.24 and the standard deviation of 5.94. the highest proportion (38.8 percent) of the growers had low innovativeness as compared to 37.5 and 23.7 percent medium and high innovativeness respectively.

5.1.1.9 Communication behaviour

The communication behaviour scores of the farmers ranged from 9 to 26 against the possible range of 0 to 26. The average communication behaviour score was found to be 17.55 with a standard deviation of 3.74. The majority (50 percent) of the farmers had medium communication behavior, while 21.2 and 28.8 percent of them had high and low communication behaviour.

5.1.1.10 Knowledge on wheat cultivation

Knowledge on wheat cultivation scores of the farmers ranged from 13 to 47 against the possible range of 0 to 50 with an average of 31.94 and the standard deviation of 8.47. The highest proportion (61.2 percent) of the farmers had medium knowledge on wheat cultivation compared to 17.5 percent of them having high knowledge on wheat cultivation and 21.3 percent low knowledge on wheat cultivation.

5.1.1.11 Adoption of selected wheat varieties

Adoption of wheat cultivation was the main focus of the study. It was quantified by computing scores. These scores of the respondent could range from 28.65 to 89.24 against the possible range of 0 to 100 with an average of 58.03 and the standard deviation of 15.13. The highest proportion (55 percent) of the growers had medium adoption as compared to 21.2 percent high adoption and 23.8 percent low adoption respectively.

5.1.2 Relationship between the selected characteristics of the farmers with their adoption of selected wheat varieties

Ten null hypotheses were developed and tested to explore the relationship between ten selected characteristics of the farmers and their adoption of selected wheat varieties. The result of the tested hypotheses were summarized and presented below:

5.1.2.1 Relationship of age with adoption

The age of the wheat growers had negatively insignificant relationship with their adoption of selected wheat varieties.

5.1.2.2 Relationship of education with adoption

It was found that the education of the respondent farmers had no significant relationship with their adoption of selected wheat varieties at 0.05 level of probability.

5.1.2.3 Relationship of farm size with adoption

It was found that the farm size of the wheat growers had no significant relationship with their adoption of selected wheat varieties at 0.05 level of probability.

5.1.2.4 Relationship of annual family income with adoption

It was observed that the annual family income of the wheat growers had no significant relationship with their adoption of selected wheat varieties at 0.05 level of probability.

5.1.2.5 Relationship of training received with adoption

It was found that the training received of the wheat growers had significant relationship with their adoption of selected wheat varieties at 0.01 level of probability.

5.1.2.6 Relationship of cosmopolitaness with adoption

There was positive and significant relationship between the cosmopolitanism of the respondent farmers and their adoption of selected wheat varieties at 0.01 level of probability.

5.1.2.7 Relationship of attitude with adoption

There was positive and significant relationship between the attitude of the respondent farmers and their adoption of selected wheat varieties at 0.01 level of probability.

5.1.2.8 Relationship of innovativeness with adoption

There was positive and significant relationship between the innovativeness of the respondent farmers and their adoption of selected wheat varieties at 0.01 level of probability.

5.1.2.9 Relationship of communication behaviour with adoption

There was positive and significant relationship between the communication behaviour of the respondent farmers and their adoption of selected wheat varieties at 0.01 level of probability.

5.1.2.10 Relationship of agricultural knowledge with adoption

There was positive and significant relationship between the knowledge on wheat cultivation of the respondent farmers and their adoption of selected wheat varieties at 0.01 level of probability.

5.1.3 Problem confronted by the wheat growers in adopting selected wheat varieties

The farmers expressed some problems as for effective dissemination of selected wheat varieties. An attempt was made to identify the problems faced by the farmers in adopting selected wheat varieties. As many as 10 problems were mentioned by the farmers and ranked based on Problem Confrontation Index (PCI). The problems were as follows according to rank order.

1. Non availability of wheat seeds in the market
2. High price of fertilizers
3. Lack of Agricultural machineries & tools for wheat cultivation
4. Non availability of pesticides
5. Scarcity of fertilizer supply in time
6. Lack of training in adoption of selected wheat varieties
7. High price of HYV seeds
8. Non availability of printed materials about cultivation of wheat
9. Lack of IPM knowledge
10. Requires of high amount of fertilizers in wheat crops

5.2 Conclusions

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

- I. The adoptions of selected wheat varieties of the farmers were moderate, as nearly 55 percent of the farmers had medium adoption. If we want to solve food problem of the country its adoption must be increased. However, to meet the ever-growing demand of food, there is a need to further enhance the rate and extent of adoption of selected wheat varieties among the farmers. Particularly, both the Government Organization and Non-Government Organization workers should provide appropriate technical and management related information to the farmers through continued extension and other support services. It may be concluded that the adoption of selected wheat varieties is moderate and needs further improvement.
- II. Age of the farmers had negatively insignificant relationship with their adoption of selected wheat varieties. It may, therefore be concluded that for

adoption of selected wheat varieties by the farmers, the extension workers should concentrate their works with all age categories of farmers.

- III. Education of the farmers showed that there was no significant relationship with their adoption of selected wheat varieties. It could not influence farmers to adopt selected wheat varieties. So, it may, therefore be concluded that formal education of the respondents had no contribution to increase adoption of selected wheat varieties by the farmers.
- IV. Farm size of the farmers had no significant relationship with their adoption of selected wheat varieties. The farmers having large farms and being economically solvent not always try to adopt new innovations. Considering the above facts, it may be concluded that the adoption of selected wheat varieties can be encouraged to all the farmers equally having small, medium and large farms.
- V. Annual family income of the farmers showed no significant relationship with their adoption of selected wheat varieties. Although it is an important factor for the adoption of selected wheat varieties by the farmers for getting increased yield, a number of respondents were found in the study area who having high annual family income had low adoption of selected wheat varieties. It may be concluded that the money is not the only considerable factor for the adoption of selected wheat varieties.
- VI. Training received of the farmers had positive significant relationship with their adoption of selected wheat varieties. The farmers having high training gain more knowledge and as a result, they adopt new innovations swiftly. Considering the above facts, it may be concluded that the adoption of selected wheat varieties can be increased if more training is conducted.

- VII. Cosmopolitaness increases the outlook of the farmers, which lead them to adopt improved farm practices. There was a significant positive relationship between farmers' cosmopolitaness and their adoption of selected wheat varieties. Hence, the higher the cosmopolitaness of the farmers, the higher will be their adoption of selected wheat varieties.
- VIII. Communication behaviour of the farmers had a positive significant relationship with their adoption of selected wheat varieties. It can be concluded that any attempt to increase the communication behaviour of the farmers would be helpful to increase the level of adoption of selected wheat varieties.
- IX. Knowledge on wheat cultivation of the farmers had a significant positive relationship with their adoption of selected wheat varieties. Having more knowledge on wheat cultivation, an individual farmer becomes aware of the recent information on the various aspects of wheat cultivation. So, it can be concluded that knowledge on wheat cultivation is an important factor for higher adoption of selected wheat varieties by the farmers.
- X. Attitude towards wheat cultivation of the farmers had a significant and positive relationship with their adoption of selected wheat varieties. In the area of human behaviour, it is important to know that the nature of human behaviour is very complex and the personality with its high complex components manifests itself in different kinds of behaviour. Adoption of a new innovation is very much dependent on the attitude towards that innovation of a respondent. So, it may be concluded that favourable attitude towards improved farm practices can led the farmers to adopt selected wheat varieties.

- XI. Problems of the farmers had a negative and significant relationship with their adoption of selected wheat varieties. It means that the higher the problem of the farmers, the lower was their adoption of selected wheat varieties. In the present study problem is the very important factor for adoption. So, efforts need to be taken to minimize problem as far as possible.
- XII. Innovativeness of the farmers had a significant and positive relationship with their adoption of selected wheat varieties. It can be concluded that any attempt to increase the innovativeness of the farmers would be helpful to increase the level of adoption of selected wheat varieties.

5.3 Recommendations

5.3.1 Recommendations for policy implications

Based on the findings and conclusions of the study, the following recommendations are presented below:

- I. It may be recommended that agricultural extension agencies especially the DAE and relevant NGOs should critically review their training programmes and make sound provisions so that the farmers understand the benefits of adoption of selected wheat varieties. The DAE and other non-governmental organizations should strengthen their extension services to the growers and farmers to motivate them for adoption of wheat cultivation practices. The farmers should be encouraged to take proper cares of their wheat cultivation.
- II. It is recommended that the extension workers should work with the farmers of all age groups to promote adoption of selected wheat varieties. However,

they will have to work with comparatively larger number of middle-aged farmers as majority of the farmers belongs to middle-aged group.

- III. It may be recommended that special attention should be given by the extension providers to the farmers having education up to primary level so that they become aware of the benefits of adoption of selected wheat varieties.
- IV. Majority of the farmers had medium farms and they could give more attention to their farming operation as they generally work on the farm. Hence, extension workers should give emphasize to farmers of all category farm size especially farmers of medium farm size category so that they can increase the adoption of selected wheat varieties on a high significant scale.
- V. Extension services should provide adequate farm management advice to the growers for increasing their farm income. In this connection government should come forward to launch various income generating activities for the rural people and encourage them to involve with those activities in order to enhance their income.
- VI. The DAE should take necessary steps to increase the opportunities for the growers to visit demonstration plots and establish farmers' organization in the rural areas in order to make them more cosmopolite and organizationally involved.
- VII. The concerned authorities should take necessary steps to find out how communication behaviour of the farmers can be increased. For this, the SAAO (Sub Assistant Agriculture Officer) should frequently visit the farmers and advice them on wheat cultivation practices. Other print, electronic and inter-personal information media should be used extensively to create awareness and encourage for adoption wheat cultivation.
- VIII. Adoption of selected wheat varieties was significant and positive correlation with the knowledge on wheat cultivation of the farmers. This

indicates an urgent need for an effective educational programme to increase the agricultural knowledge for developing favourable attitude of the farmers towards the adoption of selected wheat varieties. Hence, it may be recommended that arrangements should be made by the relevant authorities to increase the agricultural knowledge of the farmers through increased extension contact, training programme and so on.

- IX. Necessary inputs such as seedling, chemical fertilizers, insecticides, quality seeds to be made available to the respondents at right time and at fair prices.
- X. To ensure proper prices for wheat products, marketing support should be ensured.
- XI. Extension agencies should realize the existing problems of the wheat cultivation and take necessary steps to minimize these problems.

5.3.2 Recommendations for further study

A small piece of study as has been conducted which can not provide all information for the proper understanding of the adoption of selected wheat varieties. Therefore, the following suggestions are made for further study:

- I. The present investigation explored the relationships of the ten characteristics of the wheat growers with their adoption of wheat cultivation. Further research may be conducted by taking other characteristics to observe relationships with their adoption of selected wheat varieties.
- II. The present study was conducted in two villages of Saintara union in Chirirbandar upazila under Dinajpur district. So, similar studies may be undertaken in other parts of the country to verify the findings of the present study.

- III. A positive trend of relationship was obtained between education of the growers and their adoption of selected wheat varieties, but the relationship was not statistically significant. Generally a positive significant relationship is expected to be observed between level of education of the farmers and their adoption of selected wheat varieties. Hence, further studies are necessary to verify the relationship between concerned variables.
- IV. The present study has been carried out among the male farmers only. So, a similar study may be conducted with the farm women to examine their views and opinions regarding the adoption of selected wheat varieties.
- V. The present study was concerned only with the extent of adoption of selected three wheat varieties which are Kanchan, Akber and Satabdi. It is therefore, suggested that future studies should include other important wheat varieties.

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APPENDIX A

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

AN INTERVIEW SCHEDULE FOR COLLECTION OF DATA

ON

‘ADOPTION OF SELECTED WHEAT VARIETIES BY THE FARMERS IN SAINTARA UNION OF DINAJPUR DISTRICT’

Sample no.

Name of the respondents :

Village :

1. Age :

How old are you years

2. Educational qualifications

-Do not know reading and writing

-Do not know reading and writing but can sign only

-Read up to class

3. Firm size

Please indicate your firm size.

Sl. No.	Types of Land Ownership	Area of Land	
		Local unit(Bigha)	(hectare)
1	Home stead		
2	Own land under own cultivation		
3	Own land given to others on barga		
4	Land taken from others on barga		
5	Land taken from others on lease		

	Total		
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4. Annual family income

Please furnish the annual income from different sources in the last year.

Sl. No.	Sources of income	Amount of taka
1	Field crop cultivation	
2	Animal rearing	
3	Poultry rearing	
4	Vegetable and fruit production	
5	Business	
6	Service	
7	Fish culture	
8	Others	
	Total	

5. Training received

Please state your participation in training in past days.

Sl. No.	Topics of training	Duration (Days)	Sponsor
1			
2			
3			
4			
5			
6			
7			

6. Cosmopolitaness

Please indicate the number of times you visits the following places within the specific periods.

Sl. No.	Place of visit	Frequency of visits			
		Never	Rarely	Occasionally	Frequently
1.	Other village/month	0 time ()	1 time ()	2-3times ()	>3 times ()
2.	Out side of your own union /month	0 time ()	1 time ()	2-3times ()	>3 times ()
3.	Own upzilla H.Q./month	0time ()	1 time ()	2-3 times ()	>3 times ()
4.	Other thana H.Q.	0time ()	1 time ()	2-3 times ()	>3 times ()
5.	Own district/Quarter	0time ()	1 time ()	2-3 times ()	>3 times ()
6.	Other district/Year	0time ()	1 time ()	2-3 times ()	>3 times ()
7.	Capital city/Year	0time ()	1 time ()	2-3 times ()	>3 times ()
8.	Regional Research station/Year	0 time ()	1 time ()	2-3 times ()	>3 times ()

7. Attitude towards wheat cultivation

Please mention the extent of your opinion towards the following statements.

Sl. No.	Statements	Extent of opinion				
		Strongly agree	Agree	No opinion	Disagree	Strongly disagree
1(-)	Wheat seeds are costly					
2(+)	Less insect infestation					
3(-)	No significant yield difference between					

	HYV and LIV					
4(+)	Production is higher in wheat cultivation					
5(-)	Use of pesticide is must					
6(-)	Wheat is high costly technology					
Sl. No.	Statements	Extent of opinion				
		Strongly agree	Agree	No opinion	Disagree	Strongly disagree
7(+)	Wheat is more disease resistant					
8(-)	Wheat is more fertilizer consuming					
9(+)	Comparatively less Production periods					
10(+)	Wheat is more stress resistant					

8. Innovativeness:

Sl. No.	Name of Technologies	Duration of use				Do not use
		Within 1 years after hearing	Within 2 years after hearing	Within 3 years after hearing	Within 4 years or above after hearing	
1	Use of granular urea					
2	Use of irrigation					
3	Use of green manure					
4	Use of power tiller					
5	Use of IPM					
6	Use of supplied seeds					
7	Use of Balanced fertilizer					

9. Communication Behavior

Media	Frequency of use		
	Frequently	Occasionally	Never
Interpersonal			
Sub Assistant Agricultural Officer	>1 time/month ()	1 time/month ()	0 time/month ()
NGO Worker	>1 time/month()	1 time/month ()	0 time /month ()
Neighbor farmers	>1 time/Week()	1 time/week ()	0 time/week ()
Input Dealer	>1 time/month()	1 time/month ()	0 time/month ()
Agriculture Officer	>1 time/quarter()	1 time/quarter ()	0 time/quarter ()
Group Media			
Group Meeting	>1 time/quarte ()	1 time/quarter ()	0 time/quarter ()
Method demonstration	>1 time/year ()	1 time/year ()	0 time/year ()
Result demonstration	>1 time/year ()	1 time/year ()	0 time/year ()
Agricultural field day	>1 time/year ()	1 time/year ()	0 time/year ()
Mass Media			
Radio	>1 time/week ()	1 time/week ()	0 time/week ()
Television	>1 time/week ()	1 time/week ()	0 time/week ()
Newspaper	>1 time/week ()	1 time/week ()	0 time/week ()
Agril. printed material	>1 time/year ()	1 time/year ()	0 time/year ()

10. Knowledge on wheat cultivation

Please answer the following question

Sl. No.	Questions	Score	
		Weighted	Obtained
1	Name four wheat varieties.	4	

2	Mention two major function of Urea on wheat.	2	
3.	What is the required rate of Fertilizer (like Urea, TSP and MP per hectare)?	2	
4.	Name four common Fertilizers available at your local market.	4	
Sl. No.	Questions	Score	
		Weighted	Obtained
5.	Mention the name of two organic manures	2	
6.	Mention three important diseases of wheat.	3	
7.	Mention the major harmful insect of wheat.	2	
8.	What are the deficiency symptoms of TSP Fertilizer?	4	
9.	What is the deficiency symptom of MP Fertilizer?	2	
10.	Name two beneficial pests.	2	
11.	Name two green manuring crops.	2	
12.	Name three insecticides available in your local market.	3	
13.	What is IPM?	2	
14.	How would you use IPM in field?	2	
15.	Name two predator insect.	2	
16.	What do you mean by balanced fertilizer?	3	
17.	Do you have any idea of split fertilization?	2	
18.	What are the characteristics of good seed?	2	
19.	How would you improve of your soil?	2	
20.	Name three good seed company.	3	

11. Problem Confrontation

Please mention your problem that you confronted during wheat cultivation.

Sl. No.	Problem	Extent of problem			
		High	Medium	Low	Not at all
1.	High price of seeds				
2.	Non availability of wheat seeds in the market				
3.	Requires of high amount of fertilizers in wheat crops				
4.	High price of fertilizers				
5.	Scarcity of fertilizer supply in time				
6.	Lack of IPM knowledge				
7.	Lack of Agricultural machineries & tools for wheat cultivation				
8.	Lack of training in adoption of selected wheat varieties				
9.	Non availability of printed materials about cultivation of wheat				
10.	Non availability of pesticides				

12. Adoption of selected wheat varieties

a) Do you cultivate wheat varieties? Yes/ No

b) If yes then please answer the following questions.

Sl. No.	Recommended Variety	Cultivated area(ha)	Potential area (ha)
1.	Kanchan		
2.	Akber		
3.	Satabdi		

Thank you for kind co-operation.

Name of the interviewer :

Signature of the interviewer :

Date :