ADOPTION OF IMPROVED PRACTICES OF VEGETABLE CULTIVATION BY THE FARMERS

BY

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CERTIFICATE

This is to certify that the thesis entitled, "Adoption of Improved Practices of Vegetable Cultivation By the Farmers" submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in AGRICULTURAL EXTENSION AND INFORMATION SYSTEM embodies the result of a piece of bonafide research work carried out by Most. Rafia Pervin, Registration No.00998 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

(Prof. M. Zahidul Haque)
Supervisor

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Researcher

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

The main purpose of the research work was to determine the extent of adoption of improved practices in vegetable cultivation by the farmers of Kaunia upazila. Attempt was also made to explore the relationship between selected characteristics namely age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension media contact, organizational participation and innovativeness of the farmers and their composite adoption of improved practices in vegetable cultivation. Data were collected from randomly selected 114 farmers of Haragach union under Kaunia upazilla of Rangpur district by using an interview schedule. Data were collected during 10th January to 18th March, 2008. Appropriate scales were developed in order to measure the variables. Correlation test was used to ascertain the relationships between the concerned dependent and independent variables of the research work. Majority (58.8 percent) of the farmers had low adoption while 21 percent had medium adoption, 0.9 percent had high adoption and 18.4 percent had no adoption of improved practices in vegetable cultivation. Among the selected characteristics education, vegetable cultivation knowledge, cosmopoliteness, extension media contact, and innovativeness showed significant and positive relationships with their adoption of improved practices in vegetable cultivation. On the other hand only age is the negative and not significant and also farm size, annual family income and organizational participation did not show any significant relationship with their composite adoption of improved practices in vegetable cultivation.

LIST OF ABBREVIATIONS OF SYMBOLS AND TERMS

And others (at elli)	*et al.*
Bangladesh Rice Research Institute	BRRI
Degrees of Freedom	df
Coefficient of Variation	CV
Kilometer	Km
Etcetera	etc.
Example	e.g.
Recommended fertilizer dose	RFD
Hectare	ha
Integrated Pest Management	IPM
Kilogram	kg
Taka	Tk.
Namely	viz.
Percent	%
Ton	t
Metric ton	Mt
Adoption Quotient	AQ
Government Organization	GO
Non-Government Organization	NGO
Department of Agricultural Extension	DAE
Focus Group Discussion	FGD
Sub Assistant Agricultural Officer	SAAO
Bangladesh Economic Review	BER

CHAPTER 1

INTRODUCTION

1.1 General Background

Bangladesh is a developing country crowded with the population of about 150 million in an area of 147,570 skm. Out of this about 80% are farmers. About one-third of GDP comes from agriculture and two-third of labor force (as 60.5%) is engaged in agriculture (BBS 2006).

Agriculture is the dominant sector of the country's economy. In term of GDP it contributes about 20.87%. Exports of agricultural products accounted for about 6.83% of total exports in 2006-2007 (BER 2008). Crop represents a share of about 20.87% in the total GDP and about 73% in agricultural GDP. Production of fruits and vegetables has been projected to be 3.54 million metric ton and 1.82 million metric ton respectively by the end of the fifth five year plan period (Anonymous, 1998).

In Bangladesh, a good amount of vegetables are grown throughout the year. In view of increase in income, population and nutritional considerations, there is a great need for vegetable cultivation. In many countries with adverse weather condition vegetables are grown under artificially controlled environment which is costly. In contrast weather, climate and soil of Bangladesh are very much suitable for growing vegetables round the year.

The quantity of vegetables intake is very negligible here. Nutrition survey of Bangladesh (INFS, 1980) reported that average intake meets only 80% of calories, 58% of vitamin A, 50% of riboflavin and 51% of vitamin C requirements. The production of vegetables in Bangladesh is so low that the per capita/day availability is hardly 32 gm whereas the requirement is estimated to 250 gm (FAO, 1994). This gap is probably one of the main reasons for widespread malnutrition in the country. At present malnutrition is a serious problem for the country. About 94% of the children are malnourished and nearly 30,000

children become blind per year from vitamin A deficiency alone. Intake of other essential micro nutrients like iodine, irons etc. are also low resulting more adverse effects on the malnourished children.

It is believed that vegetables production can be increased in Bangladesh particularly in winter season. The winter season is more suitable for vegetables production due to the availability of suitable land and favorable climate. During the winter season, large area of land remains fallow owing to the lack of rainfall. As the winter vegetables are relatively shorter duration crops and demand lesser amount if water, farmer can take advantage of a quick harvest and thereby can increase their farm income and improve nutritional status. The total production of vegetables during the period from 1992-93 to 2000-2001 is shown in table 1.1.

Table 1.1 Vegetables production in Bangladesh, 1992-93 to 2000-2001

Year	Production (Thousand mt.)
1992-93	2523
1993-94	2603
1994-95	2670
1995-96	2715
1996-97	2759
1997-98	2819
1998-99	4264
1999-2000	4467
2000-2001	4647

Source: Agriculture Statistics, BBS, 2001.

Per capita consumption of vegetable in Bangladesh is perhaps the lowest amongst the countries of South Asia and South-East Asia. Only 3 percent of total land covering 429,000 hectares belonged to vegetable cultivation.

Table 1.2 Per capita consumption of vegetables in some Asian countries

Country	Per capita consumption of vegetable (gm/day)
Bangladesh	50
China	292
Japan	432
Thailand	257
India	80
Indonesia	117

Source: Ahmed, 2001

It can be seen from Table 1.2 that the daily per capita consumption of vegetables in this country is only 50 gm against the required amount of 200 gm. This gap causes malnutrition among the people of Bangladesh. Since almost vegetables are rich in vitamins and minerals.

For several decades, the Department of Agricultural Extension (DAE) has been trying to increase crop production simultaneously in the field as well as in homestead garden especially through cultivation of vegetables. Production of vegetables and the knowledge of nutrition did not get adequate importance in the past. In order to popularize vegetable cultivation, Bangladesh Agricultural Research Institute (BARI) initiated a project named Intensive Winter Vegetable Production Project.

Adoption of improved practices of an individual on certain aspects serves as a driving force for constant efforts on certain perceived action. Unless the farmers of Bangladesh have sufficient knowledge about modern agricultural it would be practically impossible to develop its full potential in Bangladesh. Considering the above fact the investigator became interested to undertake a study to determine the adoption of improved practices in vegetables cultivation.

An exhaustive review of literature indicated that there is no work done on adoption of improved practices in vegetables cultivation known to the present investigator, there is no report available on the adoption of improved practices in vegetables cultivation.

Bangladesh primary exports fresh vegetables and fruits as horticultural products to Middle East and European countries. If the last 10 years of export performance of vegetables and fruits in analyzed, it is observed that there had been a tremendous growth in horticultural export during the first 5-years period from 1992-1993 to 1997-1998 and more or less in the same way, a share decline of horticultural export over the last 5-years period from 1998-1999 to 2002-2003. Year-wise export of vegetable and fruits over the last 10 years is presented below:

Table 1.3 Export of fresh vegetables and fruits

Year	Value('000)US$	Growth (%)	Quantity (MT)	Growth (%)
1992-1993	9370	124.65	9391	150.10
1993-1994	9440	0.75	8422	(-)10.32
1994-1995	10650	12.82	9635	14.40
1995-1996	17920	68.26	15209	57.85
1996-1997	25480	42.19	20834	36.98
1997-1998	32480	27.47	23604	13.30
1998-1999	17700	(-)45.50	13119	(-)44.42
1999-2000	14000	(-)20.90	10270	(-)21.78
2000-2001	12787	(-)8.66	9509	(-)7.41
2001-2002	15320	(+)19.81	12761	(+)34.20
2002-2003	13240	(-)13.58	9792	(-)23.27

Source: Export Promotion Bureau, Bangladesh, 2003.

The reason for declining trend in horticultural export since 1998-1999 may be ascribed to the long duration devastating flood of October, 1998 and consequential loss of export market thereafter. It now appears that export of vegetable and fruits are setting down around US$ 14 million, a level which is very low compared to the potential of this sub-sector.

Horticulture Export Development Foundation has been working to promote horticultural export from Bangladesh, particularly high-value crop to high-price mainstream markets. Over the last few years, the Foundation has make commendable success in developing various types of quality crops, both exotic and non-exotic. To export to mainstream markets of Europe, middle east and south East Asia. The long bean, baby pineapple, teasle gourd, bottle gourd, ridge gourd and broccoli are marketed to the UK, the Netherlands, France, Belgium, Germany, Dubai, Bahrain and Singapore.

1.2 Statement of the problem

In view of the foregoing discussion, an attempt was made to undertake a piece of research entitled "Adoption of improved practices in vegetable cultivation in a selected area of Rangpur District, Kaunia Upazila under three villages like Sonaton, Khanshama and Thakurdan. The economic problems of agriculture in Bangladesh are varied and manifold and low productivity of agriculture leads to low income for the agricultural producers. Due to low income, necessary investment can't be made for improving productivity and procurement of improved quality seed. The availability of quality certified seed could increase yields of vegetable drastically.

It is necessary to have a clear understanding of the present status of the adoption of improved practices in vegetable cultivation. The main purpose of the study was to have an understanding the adoption of improved practices in vegetable cultivation and problems confrontation by the farmers in vegetable cultivation. In order to explore the main issue, this study attempts to find out the answers of the following research questions:

1. What is the extent of adoption of improved practices in vegetable cultivation?
2. What are the characteristics of the farmers who cultivate vegetables?
3. What relationships exist between the characteristics of the farmers and their extent of improved practices in vegetable cultivation?
4. What are the problems faced by the farmers in vegetable cultivation?

1.3 Specific Objectives of the Study

In view of the research works to be done successfully the following specific objectives have been formulated for giving proper directions to the study:

1. To determine and describe the extent of adoption of improved practices in vegetables cultivation.
2. To determine and describe the selected characteristics of the farmers as mentioned below:
   a) Personal characteristics:
      i) Age
      ii) Education
      iii) Vegetable cultivation knowledge
   b) Economic characteristics:
      i) Farm size
      ii) Annual family income
   c) Social characteristics:
      i) Cosmopoliteness
      ii) Extension media contact
      iii) Organizational participation
   d) Psychological characteristics:
      i) Innovativeness
3. To explore the relationship between the extent of adoption of improved practices in vegetables cultivation and each of the selected characteristics of the farmer.

4. To determine the problems of the vegetable growers in connection with the cultivation of vegetables.

1.4 Significance of the Study

1.4.1 Justification of the Study

To meet the nutritional and calorie intake of the growing population and for increasing employment opportunities and income of the farmers, the Government of Bangladesh has given much emphasis on diversified crop production, particularly on the production of vegetable all the year round. Before giving any policy directions towards increasing production of various vegetables, relevant and adequate information on different aspects of production at the farm level are required. So far, little systematic investigations on vegetable have been undertaken either by private or government organization in Bangladesh.

The present study is an attempt to know the adoption of improved practices in vegetable cultivation. This study will be helpful to the researchers for further studies of similar nature and to the extension personnel who are directly involved in different agricultural development programmers and to the planners for making effective plans. The study will also aid extension workers to learn the production problems of the vegetables and therefore, they will be able to give suggestions to the farmers related to various aspects of vegetable cultivation.

1.4.2 Scope of the Study

The present study makes attempt to have an understanding of improved practices of vegetable cultivation by the farmers and explore its relationship with their selected characteristics. The findings of this study will be particularly applicable to Sonaton, Thakurdas and khanshama Union under Kaunia Upazila Rangpur District. The findings may also have applicability to other areas of the country having similarities with the study area. However the findings are expected to be useful to the extension workers and planners for preparation of programmers for rapid diffusion of improved practices in vegetable cultivation among the farmers. The findings would also be helpful to field workers of different nation building department, organizations to improve their technique and strategy of action. It would also be useful for effective work with the rural people to generate rural employment and to improve environmental condition and the rural economy.

1.5 Statement of Hypothesis

In order to guide relevant data correlation, analysis and interpretation of data, a set of hypothesis was formulated for empirical testing. As defined by Goode and Halt (1952) "a hypothesis is a proposition, which can be put 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.

In studying relationship between variables, the following null hypotheses were developed to explore the nature of relationship between the dependant and independent variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between the concerned variable.

The following null hypothesis would be formulated to explore the relationships of the selected characteristics of the farmers with their improved practices in vegetable cultivation. "There are no relationships between the selected characteristics of the farmers and adoption of improved practices in vegetable cultivation".

1.6 Assumptions of the Study

An assumption is the supposition that an apparent factor or principle is true in the light of the available evidence (Goode, 1945). In this study the researcher had the following assumptions in mind:

i. The respondents included in the sample for this study were competent enough to furnish proper responses to the queries included in the interview schedule.

ii. The researcher who acted as interviewer was adjusted to social and environmental conditions of the study area. Hence, the data collected by him and the respondents were free from bias.

iii. The responses furnished by the respondents were respondents were reliable. They expressed the truth about their conversations and opinions.

iv. Views and opinions furnished by vegetable growers included in the sample were representation views and opinions of the whole population of the study area.

v. The findings of the study will similar, socio-economic, cultural and agro-ecological conditions of the study area.

1.7 Limitations of the Study

The present study was under taken to have an understanding of the farmer's adoption of improved practices in vegetable cultivation and to explore the relationships with their selected characteristics. Considering the time, money and other necessary resources available to the researcher and also to make the study meaningful and manageable the researcher had to impose certain limitations as follows:

i. The study was confined mainly improved practices in vegetable cultivation.
ii. The study was confined to three villages under Kaunia upazila of Rangpur district.
iii. Out of many characteristics of vegetable growers only nine characteristics were selected for investigation in this study.
iv. For some cases, the researcher confrontation unexpected interference from the over interested side talkers while collecting data from the target respondents. However, the researcher tried to overcome the problems as far possible with sufficient tact and skill.
v. The researcher relied on the data furnished by the farmers from their memory during interview.
vi. Reluctance of farmers to provide information was overcome by establishing proper rapport.

1.8 Definition of Terms:

In order to avoid confusion and misunderstanding, certain terms were used throughout the study that has been stated below:

Adoption

Adoption 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 practice it, the phenomenon is known as adoption (Ray, 1991).

Improved vegetable cultivation practices

Improved vegetable cultivation practices in respect of any crop refer to those practices, which are advocated by some component authority.

Improved variety

An improved variety is one which possesses the potential of better performance in respect of yields, quality, insect and disease resistance.

Adoption of improved practices

Ray (1991) defined extent of adoption as "The degree to which the farmer has actually adopted a practice." Adoptions of improved practices are those which are helpful for improving the yield and quality of the crop.

Age

Age of an individual farmer was defined as the period of time in years from his birth to the time of interview.

Education

Education referred to the development of desirable knowledge, skill, attitudes, etc. of an individual through the experiences of reading, writing, observation and related matters.

Vegetable Cultivation Knowledge

It refers to extension of understanding of an individual about different facts, information, causes and effects related to crop, vegetables, livestock, fishery and forestry.

Farm size

Farm size refers to the area of land possess by a farmer through different land tenure system such as own land under own cultivation, land given other as borga, land taken from other as borga, land taken as lease etc. Hectare was used as unit of farm size.

Annual Family Income

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

Cosmopolitenesss

Cosmopoliteness is the degree to which an individual respondent how frequent visits, travels to the places external to his own social system for the purpose of achieving new experience, new knowledge related to his farm business.

Extension media contact

The term extension media contact refers to an individual's exposure to or contact with different communication media, source and personalities being used for dissemination of new technologies among the farmers.

Organizational participation

Organizational participation is referred to the degree to which a farmer takes part in different social organizations either as an ordinary member, executive committee member or executive officer within a specified year.

Innovativeness

Innovativeness is an idea, practice or object that is perceived as new by an individual or other unit of adoption (Ray, 1991). In this study selected adoptions of improved practices are treated as innovativeness.

CHAPTER 2

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 vegetables growers and their adoption of improve practices by the farmers and the relationship with their selected characteristics. The research attempted to search the literatures on a number of studies have been conducted on the adoption of improve practices by the farmers. Therefore, the finding of such studies related to the extent of adoption and paste study exploring relationships of the characteristics of the farmers with their adoption of improved practices have been cited in this chapter.

This Chapter is divided into three major sections. The first section deals with review of relevant literature regarding farmers' adoption of improved practices in vegetables cultivation. The second section deals with the research finding relating to the relationship of the farmers adoption of improved practices with their selected characteristics. The third section deals with the conceptual frame work of the study.

2.1 Review of Relevant Literature Regarding Farmers' Adoption of Improved Practices of Vegetables Cultivation

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 responded 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.

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

Sobhan (1975) studied on the extent of adoption of ten winter vegetables namely tomato, radish, lettuce and potato in Boilar 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 adopted winter vegetables cultivation while 28 percent had low adoption and 55 percent high adoption.

Ahmed (1977) studied the extent of adoption of three specific practices of Jute cultivation in Noapara union of Faridpur district. He observed that among the respondent farmers 98 percent adopted the recommended varieties of Jute, 72 percent adopted plant protection measures and 49 percent adopted recommended dose of fertilizers.

Hossain (1983) studied the extent of adoption of HYV rice as transplanted aman and other related aspect in Bhabalhali 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.

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

Karim and Mahboob (1986) conducted a study on the adoption of high yielding variety of wheat in Kushtia Union of Mymensingh district. They observed that 74.0 percent of the farmers adopted HYV wheat cultivation to varying extent while the remaining 26.0 percent were non adopter.

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.

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

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 behaviour of contact wheat growers in Sadar upazila of Jamalpur district. He found the 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.

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.

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

Nikhade *et al.* (1993) observed in their study on adoption of improved practices of soybean cultivation that cent percent adopted improved varieties. More than 82 percent had complete adoption of package practices like timely sowing, spacing and inter cultural operations. Partial adoption was observed in majority of the soybean 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 seri-cultural practices among big and small farmers. They indicate that there were cent percent adoptions in following the recommended system of planting by both big and small farmers. Other practices adoptions 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.

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 3 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, respectively.

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 cutworn and rouging of diseased plant.

Mostafa (1999) studied the adoption of recommended mango cultivation practices by the mango growers of Nawabganj Sadar upazila. 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.

Rahman (1999) studied the adoption of balanced fertilizer by the boro rice farmers of Ishwarganj upazila. He found that the extent of use of balanced nitrogenous fertilizer, 48.57 percent of the farmers had optimum adoption and above optimum respectively. In respect of extent of use of balanced phosphoric fertilizer, 79.05 percent of the farmers had below optimum adoption compared to 20.95 percent having optimum adoption. Regarding the extent of use of balanced potassic fertilizer, 80.95 percent of the farmers had below optimum adoption compare to 18.10 and 0.95 percent having optimum and above optimum adoption, respectively.

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 compare 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) studied the adoption level of improved Package of practices for T. aman rice cultivation in Gouripur upazila of Mymensingh district. He found that the adoption level of farmers categories were 5 percent non adoption, 62 percent low adoption, 24.5 percent medium adopter and 8.5 percent high adopter. Vast majority (95 percent) of the farmers adopted MV programme of T. aman rice.

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 bellow optimum adopter, 8 percent optimum adopter and only 3 percent above optimum adopter of potassic (K) fertilizer.

Aurangojeb (2002) studied on the extent of adoption of integrated farming technology by the rural women in 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 hedgerow 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.

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.

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

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

Hassain (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.

Salam (2003) found that an overwhelming majority (94 percent) of the respondents were found having high constraints in adopting environmentally friendly farming practices while 6 percent had medium constraints. No farmer was found having low constraint.

Rahman (2003) found that ninety seven percent of the pineapple growers adopted 2-4 intercrops viz, Zinger, turmeric, sweet ground 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.

2.2 Research Findings Related to Relationship of Farmer Adoption of Improved Practices with their Selected Characteristics.

2.2.1 Age and adoption of improved practices

Hossain (1991) conducted a study to determine the relationship of farmers' characteristics with their adoption behaviour of improved form practices in Sadar upazila of Jamalpur district. He reported that age of the wheat farmers significantly influenced the adoption of improved farm practices.

Pathak and Sasmal (1992) observed that there was positive and significant relationship between the age of the marginal farmers and their adoption of Jute technology. Similar findings were observed by of Okoro and Obibuaka (1992) and Kashem and Hossain (1992).

Islam (1993) observed that there was no relationship between the age of potato growers and their adoption of improved practices in potato cultivation. Similar results were observed by Karim and Mahaboob (1986), Rahman (1986), Singh (1982), Kher (1992), Pathak *et al.* (1992), Kashem (1991) observed that there was positive and significant relationship between the age of the marginal farmers and their adoption of jute technologies. Similar results were found by Ali *et al.* (1986), Singh and Rajendra (1990), Okoro *et al.* (1992), Narwal *et al.* (1991) and Hossain *et al.* (1991).

Islam (1996) conducted a study on farmers use of indigenous technical knowledge (ITK) in the context of sustainable agricultural development. He found that age of the farmers had significant negative relationship with their extent of use ofITK.

Sharker (1997) observed that there was no significant relationship between age of the farmers and their adoption of improved potato cultivation practices.

Hussen (2001) found that the age was negative significant relationship of the farmers and 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 academic qualifications of the farmers had a significant and positive relationship with their adoption regarding Aalok 6201 hybrid rice.

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

Sardar (2002) found that the age of the farmers had positive significant negative correlation with their adoption of IPM practices.

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

Haque (2005) conducted a study to determine the relationship of farmers' characteristics with their adoption of modern rice varieties in Sadar upazila of Mymensing district. He reported that age of the rice growers were not related with the adoption of rice varieties.

Rahman (2005) found that there was no relationship between ages of the farmers with their adoption of modern rice varieties.

2.2.2 Education and adoption of improved practices

Hossain (1981) in his study found no significant relationship between education of the farmer and their adoption of improved farm practices.

Hossain (1983) in his study found a significant and positive relationship of education of the farmers with their adoption of the selected four improved farm practices.

Rahman (1986) in his study found that education had significant and positive relationship with the adoption of improved practices.

Mustafi *et al.* (1987) reported that education had no significant effects on the adoption of HYV varieties of rice in Bangladesh.

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

Bavalatti and Soundaarswamy (1990) observed no significant relationship between education of the farmers and their adoption of dry land farming practices.

Khan (1993) studied on the adoption of insecticides and related issues in the village of Pachon union, Madaripur district. He observed that education had a significant positive relationship with the adoption of insecticides.

Hasan (1996) concluded a study on adoption of some selected agricultural technologies among the farmers as perceived by the frontline GO and NGO workers. He observed that education have no significant relationship with the perceived adoption of selected agricultural technologies. Similar results were found by Kher (1992) and Islam (1996).

Sarker (1997) conducted a study to determine the relationship between selected characteristics of potato cultivation practices in five villages of Comilla District. He found that education of potato growers had significant relationship with their adoption of improved potato cultivation practices. Similar results was found by Kashem (1991)

Chowdhury (1997) found a positive significant relationship between the education of the farmers and their adoption of selected BINA technologies. Similar results were found by Halim (1985), Islam (1993), Haque (1993), Khan (1993), hossain *et al.* (1997), Pal (1995) and Ali *et al.* (1986).

Alam (1997) observed that the level of education of the farmer had a positive and significant relationship with the use of improved farm practices. Sarker (1997) and chowdhury (1997) also found similar findings about the relationship between education and adoption of improved technologies

Hussen (2001) indicate that the education had 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 upazilla of Mymensing district. He found that academic qualification of the farmers had a significant and positive relationship with their adoption regarding Aalok 6291 hybrid rice.

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

Sardar (2002) found that the education of the farmers had significant positive 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.

Haque (2005) revealed that education of the farmers had a significant and positive relationship with their adoption of modern rice varieties.

2.2.3 Farm size and adoption of improved practices

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 paddy.

Rahman (1986) observed that farm size had significant and positive relationship with adoption of improved practices in transplanted Aman rice.

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.

Muttaleb (1995) in his study observed that farm size of the farmers had a positive relationship with the adoption of improved potato farmers and showed positive and significant effect.

Sarkar (1997) found that farm size of the potato growers had a significant positive relationship with their adoption of improved potato cultivation practices. Similar findings between farm size and adoption of selected BINA technologies was also reported by Chowdhury (1997).

Hussen (2001) conducted an investigation on adoption of modern sugarcane cultivation practices by the farmers of Dewangonj upazila in Jamalpur district. He observed that there was a significant positive relationship between farm size of the farmers and 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 size farm size of the farmers had a significant and positive relationship with their adoption regarding Aalok 6201 hybrid rice.

Aurangozeb (2002) conducted a study on adoption of integrated homestead farming technologies by the rural women in RDRS. He found that there farm size had no relationship between homestead area and their adoption of integrated homestead farming technologies.

Sardar (2002) conducted a study on adoption of IPM practices by the farmers under PETRRA project of RDRS. He found that the farm size of the farmers and a positive significant relationship with their adoption of IPM practices.

Haque (2005) conducted a study to determine the relationship of farmers' characteristics with their adoption of modern rice varieties in Sadar upazila of Mymensing district. He reported that farm size of the rice growers had significant and positive relationship with the adoption of modern rice varieties.

Talukder (2006) conducted a study to determine the relationship of farmers' characteristics with their adoption of selected rice cultivation practices in Char-land of Gomoti River. He reported that farm size of the rice growers had significant and positive relationship with the adoption of selected rice cultivation practices.

2.2.4 Annual income and adoption of improved practices

Hossain (1983) made an investigation in Mymensingh district and found that annual income of farmers had a negative relationship with their adoption of HYV rice as transplanted Aman.

Singh (1989) in a study found that income of the farmers was significantly associated with the level of adoption of plant protection measures.

Pal (1995) in his study found a positive 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. Similar findings were reported by Sarkar (1997) and Alam (1997).

Islam (2002) conducted a study on adoption of modern agricultural technologies by the farmers of Sandip. He observed that he annual income of the farmers had no relationship with their adoption of modern agricultural technologies.

Aurangozeb (2002) conducted a study on adoption of integrated homestead farming technologies by the rural women in RDRS. He found that there was a positive significant relationship between annual income of the respondent and their adoption of integrated homestead farming technologies.

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

Rahman (2003) conducted a study on environmental impacts of modern agricultural technology diffusion in Bangladesh: an analysis of farmers' perception and their determinations. He found that annual income of the farmers had a positive relationship with their modern agricultural technologies diffusion in Bangladesh.

Haque (2005) conducted a study to determine the relationship of farmers' characteristics with their adoption of modern rice varieties in Sadar upazila of Mymensing district. He reported that annual income of the rice growers had significant and positive relation with the adoption of modern rice varieties.

2.2.5 Vegetable cultivation knowledge and adoption of improved practices

Koch (1985) conducted a study in the North western organize free state. South Africa concerning perception of agricultural innovations aspiration, knowledge and innovation adoption. He observed that three was a strong positive relationship between knowledge and practice adoption. This finding is 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.

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.

Hoque (2003) concluded that extension contact of the farmers had a significant positive relationship with the adoption of modern maize cultivation technologies.

2.2.6 Cosmopoliteness and adoption of improved practices

Hoque (1993) revealed a strong positive relationship between cosmopoliteness of the cane farmers and their adoption of improved practices of sugarcane cultivation.

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

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

Aurangogeb (2002) conducted a study on the adoption of integrated homestead farming technologies by the rural women in RDRS. He found a significant relationship between cosmopoliteness and adoption of integrated homestead farming technologies.

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

Sarder (2002) concluded that the cosmopoliteness of the farmers had positively significant relationship with their adoption of IPM practices.

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

2.2.7 Extension media contact and adoption of improved practices

Bezbora (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 agricultural practices by co-operative farmers in Nigeria. The findings of the study indicated a positive relationship between extension contact and adoption of improved practices.

Rahman (1995) Studied on farmers' knowledge of improved practices in potato cultivation indicated a significant relationship between extension contact and adoption of improved practices.

Sarkar (1997) found that extension contact of potato growers had a positive significant relationship with their adoption of improved potato cultivation practices. Chowdhury (1997) also observed similar findings.

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

Islam (2002) conducted a study on study on adoption of modern agricultural technologies by the farmers of Sandip. He found that extension media contact of the farmers had no significant relationship with their adoption of modern agricultural technologies.

Haque (2005) conducted a study to determine the relationship of farmers' characteristics with their adoption of modern rice varieties in Sadar upazila of Mymensing district. He reported that extension contact of the rice growers had significant and positive relation with the adoption of modern rice varieties.

2.2.8 Organizational participation and adoption of improved practices

Ali (1984) found that organizational participation of contact farmers had significant positive contribution to their agricultural knowledge.

Kher (1992) carried out a research study on the adoption of improved wheat cultivation practices by the farmers of selected village of Rajouri block, India. He observed that there was no significant relationship between the farmers' social participation and their adoption of improved wheat cultivation practices.

Rahman (1995) in his study found that organizational participation of potato farmers had no relationship with their knowledge regarding improved practices of potato cultivation.

Alam (1997) found that organizational participation of the rice farmers had no significant relationship with their use of improved farm practices in rice cultivation.

Sarkar (1997) conducted a study on correlates of selected characteristics of potato growers with their adoption of improved potato cultivation practices in five village of Comilla district. He observed that organizational participation of the potato growers had no relationship with their adoption of improved potato cultivation practices.

Mostafa (1999) conducted a study on adoption of recommended mango cultivation practices by the mango growers of Nawabganj Sadar upazila. He found that organizational participation of mango growers had a significant positive relationship of organizational participation with their adoption of recommended mango cultivation practices.

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

Sardar (2002) in a study on IPM practices observed that organizational participation of the farmers had no significant relationship with their adoption of IPM practices.

Rahman (2005) found that the organizational participation of the farmers had no significant relationship with their adoption of modern rice varieties.

2.2.9 Innovativeness and adoption of improved practices

Moulik *et al.* (1966) observed that innovation proneness significantly influenced of nitrogenous fertilizers among the farmers.

Rahman (1973) found a positive relationship between modernism and adoption of farm practices. Modernism as used by him is synonymous with the innovation proneness or in other words innovativeness of the present study.

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

Sharma and Sonoria (1983) observed higher average innovativeness among contact farmers than the non contact farmers. They also found that contact farmers adoption of innovations differed significantly with their variation in innovativeness.

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

Rahman (2005) found that the innovativeness of the farmers had no significant relationship with their adoption of modern rice varieties.

2.3 The conceptual Framework of the study

The conceptual framework of Rosenberg and Hovland (1960) was kept in mind while farming the structural arrangement for the dependent and independent variables. This study was concerned with dependent variable, adoption of improved practices in vegetable cultivation by the farmers and the selected characteristics of farmers as independents variables. The present study tried to focus two concepts, first farmers selected characteristics and the second, adoption of improved practices in vegetable cultivation. Adoption of an individual may be influenced and affected through interacting forces of many characteristics in his surroundings. It is impossible to deal with all in a single study. It was therefore, necessary to limit the characteristics which include age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension media contact, organizational participation, and innovativeness. The conceptual model of the study has been presented below:

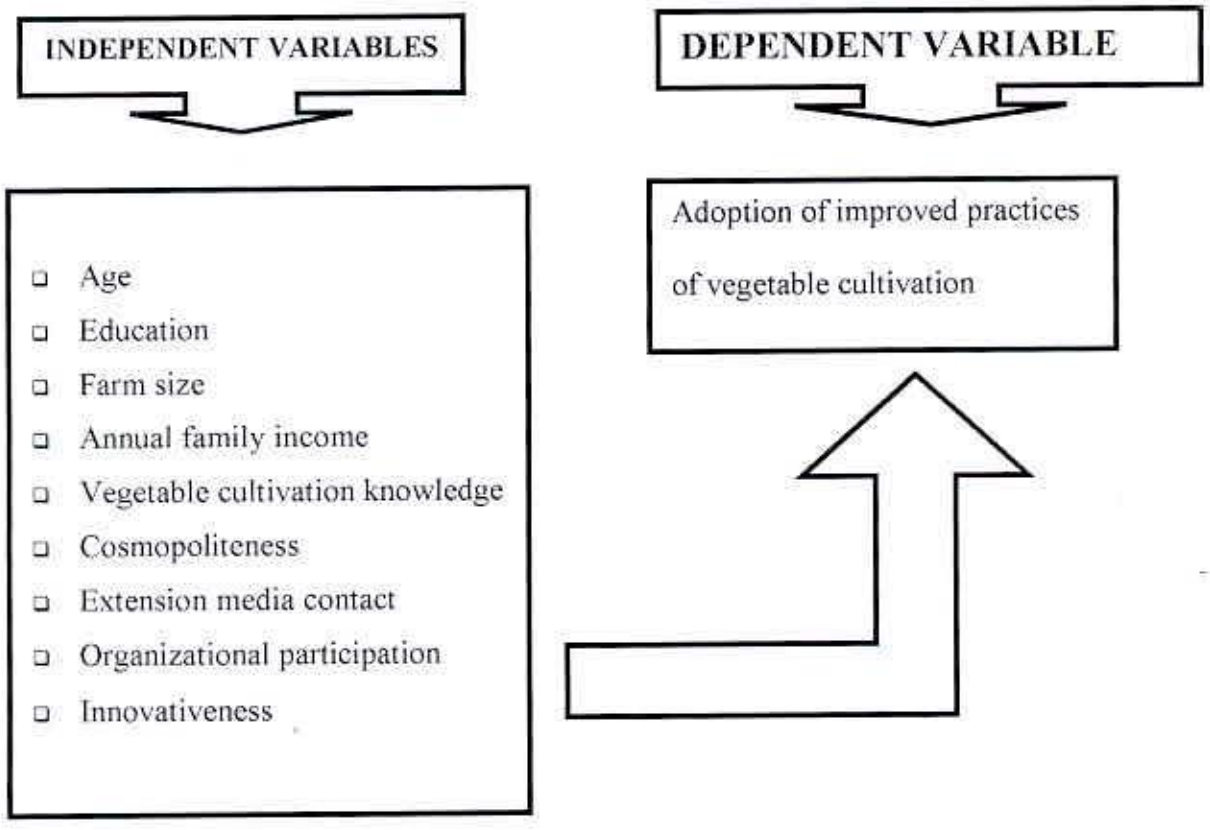

Figure 2.1 The conceptual framework of the study

CHAPTER 3

METHODOLOGY

The methodology used in conducting any research is critically important and 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 meaningful results. Methods and procedures are the key factors in conducting a research. Appropriate methodology will be used in research helps to collect valid and reliable decisions.

3.1 Locale of the study:

Mainly considering the vegetable growing area including others vegetable such as potato, tomato, brinjal etc. and the study was conducted in three villages like Sonaton, Khanshama and Thakurdan of Haragach union under Kaunia Upazila at Rangpur District, which were considered as the study area. The site was situated 15 km away from Rangpur sadar. Kaunis upazila was purposely selected as located of the study. One (1) union (like Haragach) was randomly selected out of three (3) union and three (3) villages (like Sonaton, Khanshama and Thakurdan) were randomly selected out of fifteen (15) villages.

A map of Kaunia Upazila of Rangpur district has been presented in Figs. 3.1

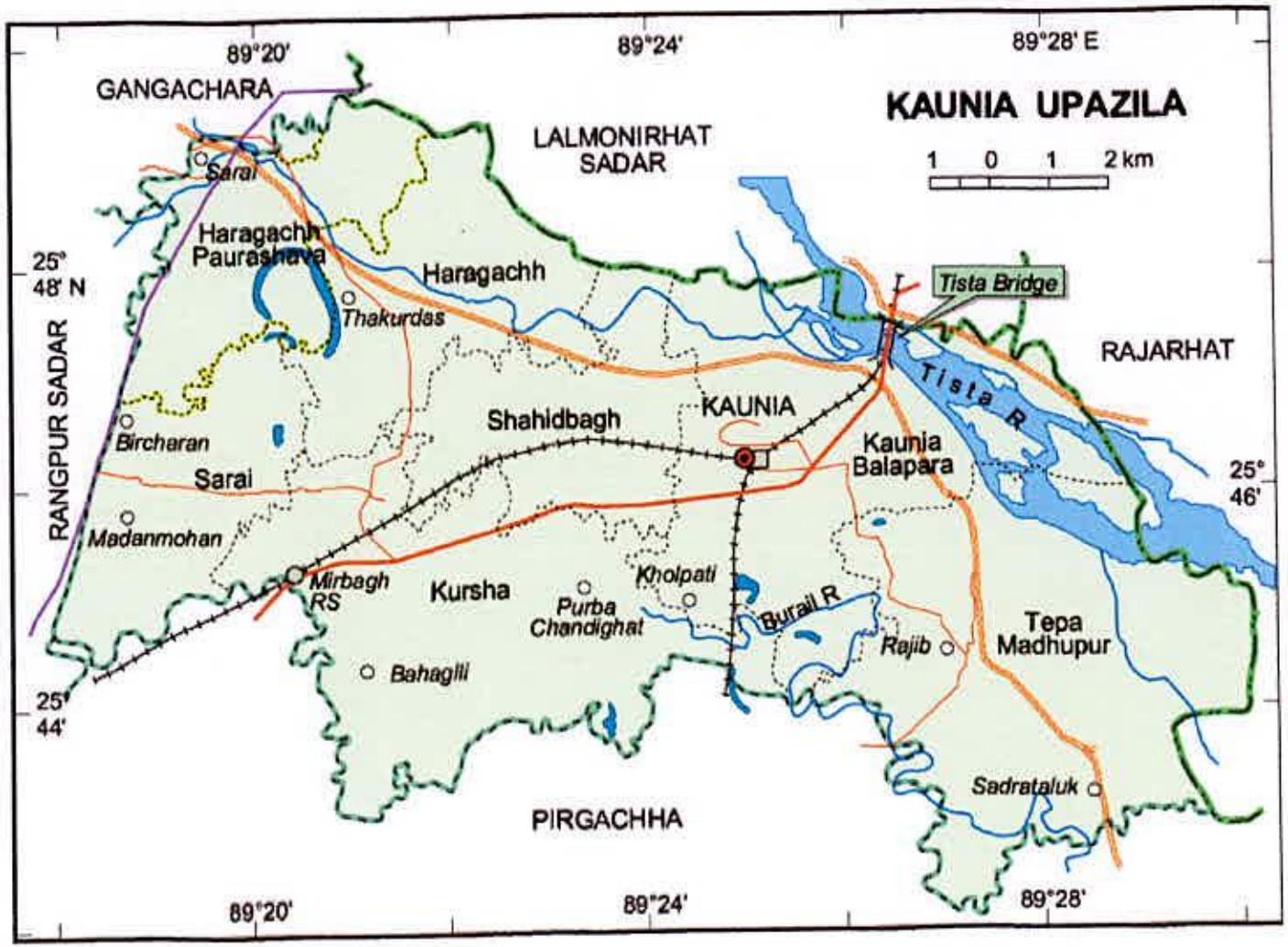
KAUNIA UPAZILA
89°20'
89°24'
89°28' E
GANGACHARA
LALMONIRHAT SADAR
1 0 1 2 km
Sarai
Haragachh Paurashava
Haragachh
Thakurdas
Tista Bridge
25° 48' N
RANGPUR SADAR
RAJARHAT
Tista R
Shahidbagh
KAUNIA
Bircharan
Sarai
Kaunia Balapara
25° 46'
Madanmohan
Mirbagh RS
Kursha
Purba Chandighat
Kholpati
Burail R
Rajib
Tepa Madhupur
Bahaglii
25° 44'
Sadrataluk
PIRGACHHA
89°20'
89°24'
89°28'

Fig. 3.1

3.2 Population and Sampling Design:

Three villages namely Sonaton, Khanshama and Thakurdan of Haragach union under Kaunia Upazila of Rangpur District were selected purposively for the study. Then an update list of vegetable growers of the selected villages was prepared with the help of Sub-Assistant Agricultural Officer (SAAO). The list comprised a total of 457 farmers' constituting the population of this study. Twenty five percent (25%) of the population was randomly selected the sample of population by using a Calculator Random Numbers. Thus, the total sample size of this study area was one hundred and fourteen (114) farmers.

In addition to that, two (2) percent of the population was selected randomly and proportionately of the selected villages to make a reserve list. Thus, the additional sample, so drawn stood twelve (12) farmers, which were included in the reserve list. In case the individuals included in the original sample were not available at the time of data collection, the farmers from the reserve list were used for the purpose. The distribution of the farmers included in the population, sample and those in the reserve list appears in Table3.1.

Table 3.1 Distribution of population, sample and the reserve list of the respondents

Sl. No.	Name of villages	Total number of farmers	Sample size	Number of farmers in the reserve list
1	Sonaton	165	41	5
2	Khanshama	140	35	3
3	Thakurdan	152	38	4
	Total	457	114	12

3.3 Development of the Instrument

In order to collect relevant information from respondents an interview schedule was carefully designed focusing the objectives of the study. Both open and close form, simple and direct questions were included in the interview schedule. The questions were systematically arranged to help the respondents to understand the consequence easily. Scales were developed for collecting information required for measuring the selected characteristics.

3.4 Pilot testing and Final Version

Borg and Gall (1979) indicated that the instrument with a sample of individuals similar to the groups one wishes to use in the research should be tested in a pilot programme before using the instrument in the actual study. Accordingly, the interview schedule that was initially developed was tested with a similar group of farmers to be included for sampling. Ten vegetable growers were interviewed by using the instrument. The pretest helped to examine the suitability of different questions and statements of the instrument in general. Necessary corrections, additions, alterations and rearrangements were made in the schedule on the basis of experience of the pretest. Thus, the final version of the instrument was developed for collection of data from intended respondents.

3.5 Variables of the Study:

In a descriptive social research, the selection of variables constitutes an important task. In this connection, the investigator looked into the literature to widen his understanding about the nature and scope of the variables involved in the research studies.

Ezekiel and Fox (1959) stated variable as any measurable characteristics, which can assume varying or different values in successive individual cases. A research hypothesis contains at least two elements, independent variables and a dependent variable.

The researcher keeping in mind took adequate care in selecting the dependent and independent variables of the study. Before selecting variables, the researcher herself visited the study area and talked to the local farmers intimately and she was able to observe the various factors of the farmers, which might have influence on their adoption of selected vegetable production practices. Based on this experience, literature for the study, discussion with relevant experts and academicians and also with the research supervisor, the researcher selected the variables for this study.

Two types of variables were concerned with the study such as

i. Independent variables and

ii. Dependent variables

i. Independent variables: An independent variable is that factor which is manipulated by the experimenter in his attempt to ascertain the relationship to an observed phenomenon. The respondents' selected characteristics are age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, organizational participation, extension media contact and innovativeness were selected as independent variables.

ii. Dependent variable: A dependent variable is that factor which appears, disappears or varies as the experimenter introduces, removes or varies the independent variables (Townsand, 1995). In this study adoption of improved practices in vegetables cultivation is selected as dependent variable. It was not possible to measure all the improved practices. So, several practices were considered in this study. These were recommended variety, balance fertilizer dose, integrated pest management method and use of insecticide & fungicide.

3.6 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 and dependent variables of the study. The procedures followed in measuring the variables are presented below.

3.6.1 Measurement of independent variables

The selected characteristics of the respondent farmers constituted the independent variables of the study. To keep the research manageable, nine (9) independent variables were selected for the study. The procedures of measurement of the selected variables were as follows:

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/her adoption behavior. The age of a respondent farmer was measured by counting the actual years from his/her birth to the time of interview on the basis of his statement. It was measured in terms of actual years. No fractional year was considered for the study.

Education

Education was measured as the ability of an individual vegetable farmer to read and write or formal education received up to a certain standard. Education of a respondent was measured on the basis of classes he had who passed in formal educational institution. For example, if a respondent passed class 5, his education score was 5. If a respondent did not know how to read and write his education score was taken as zero (0). A score of 0.5 was given to that respondent who could sign his name only.

Farm size

Farm size of the respondent was measured as the size of his farm (including vegetable and other crops) on which he continued his/her farm practices during the period of study. Each respondent was asked to mention the homestead area, the area of land under his/her own cultivation, own land given to others on borga system, land taken from others on borga system, and land taken from others on lease system. The area was estimated in terms of full benefit to the farmers or his family. The following formula was used in measuring the farm size:

Farm size= $A_1 + A_2 + 1/2(A_3+A_4) + A_5$

Where,

A_1 = Homestead area

A_2= Own land under own cultivation

A_3= Own land given to others on borga

A_4= Land taken from others on borga

A_5= Land taken from others on lease

The unit of measurement was hectares.

Annual family income

Annual family income of a respondent was measured on the basis of total yearly earning from agricultural and non-agricultural sources (business, service etc) earned by the respondent himself and other family members. The incomes from different sources were ascertained in two phases.

1. In the first phase, the yield of the entire crop in the previous year was noted, and then the entire yield was converted into cash income according to the prevailing market price. The cash income by selling cattle heads, milk and milk products, poultry and its products, fisheries etc. according to prevailing market price.

2. In the second phase, earnings of each respondent himself/herself and other members of his/her family from different sources (like service, business, labor) in the last year from farming and others sources were added together to obtain total family annual income of the respondent.

* Total annual family income = A+B

Where,

A =Annual income from (Agricultural Sector) agricultural crops, livestock, poultry & fisheries.

B = Annual income from (Non Agricultural Sector) service, business & labor.

Vegetable cultivation knowledge

To measure the vegetable cultivation knowledge of a respondent a 21-items questions was constructed in the interview schedule (Appendix A, item no. 5). Each questions was assigned 1 score. Practical score was given for practically correct answer. So correct answer of 21 questions supposed to obtain 21 marks. Wrong answer was assigned zero. So a respondent could get zero if he/she answer wrong all the 21 question. The possible score of vegetable cultivation score range from 0-21.

Cosmopoliteness

Cosmopoliteness refers to the degree to which a respondent's orientation to external would not of his/her own social system. Cosmopoliteness of a respondent was measured in terms of his/her nature of visits to the 11 different types of places as shown in item number 6 in the interview schedule. The cosmopoliteness was measured by assigning score 3 for frequently visit, 2 for occasionally visit, 1 for rarely visit and 0 for not at all. The cosmopoliteness score of the respondents could range from 0 to 33, where 0 indicating no cosmopoliteness and 33 indicating very high cosmopoliteness.

Extension Media Contact

Extension media contact refers to one's exposure to the influence of extension program through different communication media and sources. The extension media contact of a respondent was measured by computing an extension contact score on the basis of his/her extension contact with sixteen selected extension media. Respondents mentioned the nature of his/her contact by putting a tick mark against any one of the four responses –not at all, rarely, occasionally and frequently. The score for each respondent was determined by adding his/her response to all the items on the basis of his/her frequency of contact with a score of 0, 1, 2 and 3 respectively. The extension media contact score of the respondents could range from 0 to 48, where 0 indicating no extension media contact and 48 indicating very high extension media contact.

Organizational participation

Organizational participation of a respondent was measured by his/her nature of membership in different organizations for a particular period of time. This was measured by participation of a respondent in an organization. Different weights were assigned as 0, 1, 2 and 3 for no participation, ordinary member, executive committee member and executive committee officer respectively. Then these scores were multiplied by number of years, (tenure of participation) the respondent participated in the respective organization.

Innovativeness

Innovativeness is the degree to which an individual adopts an innovation relatively earlier than other members in a social system (Rogers; 1995). In this study, innovativeness of a respondent was measured on the basis of the earlier or later adoption of 10 improved agricultural practices (Appendix A: item no.9). The scores were assigned on the basis of time required by an individual to adopt each of the practices in the following manner:

Period of adoption	Assigned score
Within one year after awareness	5
After one to within two year after awareness	4
After two to within three years after awareness	3
After three to within four years after awareness	2
After four years after awareness	1
No use	0

Innovativeness score of a respondent farmer was obtained by adding his/her scores for adoption of all the 10 selected improved agricultural practices. Innovativeness score of a respondent farmer could range from 0 to 50, where, 0 indicating no innovativeness and 50 indicating very high innovativeness.

3.6.2 Measurement of dependent variable

Adoption of improved practices in vegetables cultivation was my dependent variable. The procedure followed in measuring the dependent variable is presented below:

Adoption of improved practices in vegetables cultivation

Vegetable adoption score

There were three dimensions of adoption of improved practices of vegetable cultivation such as land use for vegetable variety cultivation, fertilizer application and adoption of integrated pest management practices. Adoption of improved practices in vegetables cultivation was measured by computing Adoption Quotient (AQ). It was calculated by asking the farmers i) used land, ii) total land and iii) percentage of this land. Adoption of improved practices in vegetables cultivation was measured by Adoption Quotient as the following formula:

$$AQ = (\text{Use land} \times 100) / \text{Total land}$$

Using above formula, adoption of improved practices in vegetables cultivation score of a respondent could range from 0-100, while 0 indicating no adoption and 100 indicating highest adoption.

Fertilizer application score

The fertilizers used by the respondents were Cow dung, Urea, T.S.P and M.P. Fertilizer application score could range from 0->100 (above 100 means over adoption). Hence, fertilizers score of a respondent was obtained by using the following formula:

$$\text{Use of fertilizer} = (\text{Applied Dose} \times 100) / \text{Recommended Dose.}$$

IPM score

The IPM method use in adoption of improved practices in vegetables cultivation score in the following way:

Extent of use of method	Score
Not used	0
One method used	1
More than one method used	2

Hence, IPM score of a respondent was obtained by using the following formula:

IPM score = (Obtained IPM score) X 100 / Possible highest score.

Insecticides& fungicide score

The insecticides& fungicide use in adoption of improved practices in vegetables cultivation score in the following way:

Extent of use of insecticides& fungicide	Score
Not used	0
One insecticides& fungicide used	1
More than one insecticides& fungicide used	2

Hence, insecticides& fungicide score of a respondent was obtained by using the following formula:

Insecticides& fungicide score = (Obtained score) X 100 / Possible highest score.

3.7 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". A hypothesis simply means a more assumption or some supposition to be proved or disproved. But for a researcher, hypothesis is a normal question that he intends to resolve. According to kerlinger (1973), "A hypothesis is a conjectural statement of the relation between two or more variables. Hypotheses are always in declarative statements form, and they relate either generally or specifically variables to variables". Hypotheses may be broadly divided into two categories, namely, research hypothesis and null hypothesis. In studying relationships between variables, an investigator first formulates research hypotheses which states anticipated relationships between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between concerned variables.

The null hypotheses were developed in this study to explore the relationship between dependent and independent variables. The following null hypotheses were formulated to explore the relationships of the selected characteristics of the farmers with their adoption of improved practices in vegetables cultivation.

"There were no relationships between the farmers' selected characteristics and their adoption of improved practices in vegetables cultivation."

The characteristics were: age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension media contact, organizational participation and innovativeness.

3.8 Collection of Data

Data were collected personally by the researcher himself through face to face visit to all the selected farmers of Sonaton, Khanshama and Thakurdan villages of Kaunia Upazila under Rangpur District to obtain valid and pertinent information. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapports were established with the farmers prior to interview and the objectives were clearly explained by using local language to the extent possible. So he did not hesitate to furnish proper responses to the questions and statements which were collected during 7th March to 9th April, 2008. At the time of data collection, the researcher was also aware of side talking and tried to avoid that problem tactfully. The researcher sought the help of the local Sub Assistant Agricultural Officer (SAAO) for this purpose. Excellent co-operation and co-ordination were obtained from all the respondents.

The interview schedule was prepared both in Bengali and English version. The Bengali version of interview schedule was multiplied as per requirements to collect data from the respondents. The English version of interview schedule is enclosed in appendix- A.

3.9 Processing of Data

The collected raw data were examined thoroughly to find out the errors and omissions. For this, the researcher made a careful scrutiny of the completed interview schedule to make sure that they were entered as complete as possible and well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

Having consulted with research supervisor, the investigator prepared a detailed coding plan. All responses in the interview schedule were given numerical coded values. Local units were converted into standard units. All the individual responses to the questions of the interview schedule were transferred to a master sheet to facilitate tabulation.

In case of qualitative data, appropriate scoring technique was followed to convert the data into quantitative forms. These were then tabulated according to the objectives of the study.

For describing the various independent and dependent variables, the respondents were classified into various categories and arranged in simple table for description. These categories were developed for each of the variable by considering the nature of distribution of the data and the general consideration prevailing in the social system. The procedure and the effect of categorization of a particular variable were discussed while describing the variable in the subsequent sections.

3.10 Statistical Analysis

The collected data were compiled, tabulated, coded and analyzed in accordance with the objectives of the study. The statistical measures such as number and percentage distribution, range, mean, standard deviation and rank order were used for describing the variables of the study. To find out the relationship between the adoption of improved practices in vegetable cultivation and the selected characteristics of the farmers, the Pearson's Product Moment Correlation was computed. Correlation matrix was also computed to determine the interrelationships among the variables. Five percent (0.05) levels of significance was use as the basis of statistical significance. If the computed value of co-efficient of correlation 'r' was equal to or greater than Table value of correlation co-efficient at designated. Level of significance for the relevant degree of freedom, the null hypothesis was rejected and it was concluded that there was significant relationship between the concerned variables. However, when the computed value of co-efficient of correlation was found to be smaller than the tabular value at the designated level of significance for the relevant degree of freedom, it was concluded that the null hypothesis could not be rejected and hence there was no relationship between the concerned variables.

CHAPTER 4

RESULTS AND DISCUSSION

In general, the term "adoption" refers to the integration of an innovation into a farmer's normal farming activity over an extended period of time. In fact, the farmers adopt various types of innovations. Improved vegetable cultivation is one of the innovations. This chapter is divided into four sections. In the first section, the independent variables (selected characteristics of the farmers) have been discussed. The second section deals with the dependent variable of the study. The third section deals with the relationships between selected characteristics of the farmers and their adoption of improved vegetable cultivation. In the fourth section, a discussion was made on the comparative problems confrontation of the farmers in adopting improved vegetable cultivation.

4.1 Selected Characteristics of the Farmers

A summary of the analyzed results for the selected personal, economic, social and psychological characteristics of the farmers (independent variables) for this study were shown in Table 4.1.

Table 4.1 Farmer's Personal Characteristics Profile

Sl. no.	Characteristics	Measuring unit	Possible range	Observed range	Mean	Standard deviation
1.	Age	Actual years	Unknown	25-72	44.60	10.44
2.	Education	Year of schooling	Unknown	0-14	5.42	4.53
3.	Farm size	Hectare	Unknown	0.18-9.14	1.53	1.68
4.	Annual family income	In Tk..1000	Unknown	21.60-846.00	187.04	180.48
5.	Vegetable cultivation knowledge	Score	0-21	3-21	15.44	5.04
6.	Cosmopoliteness	Score	0-33	1-14	6.60	3.97
7.	Extension contact	Score	0-48	1-24	9.83	6.55
8.	Organizational participation	Score	0-14	0-14	2.35	2.86
9.	Innovativeness	Score	0-50	1-17	7.17	3.13

4.1.1 Age

The observed age scores of the farmers ranged from 25 to 72 having an average of 44.60 and a standard deviation of 10.44. On the basis of the age scores of the farmers, they were classified into three categories: "young" (up to 35 years), "middle aged" (36-50 years) and "old" (above 50 years). The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to age

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Young (up to 35 years)	24	21.1	44.60	10.44
Middle aged (36-50 years)	60	52.6		
Old (above 50 years)	30	26.3		
Total	114	100		

The finding indicated that a large proportion (52.6 percent) of the farmers were middle aged compared to 21.1 and 26.3 percent being young and old respectively. It was found that middle aged respondents are more interested in adoption of improved practices of vegetable cultivation. The extension agencies should consider this age category among the farmers and involve them for increasing their adoption of improved practices of vegetable cultivation.

4.1.2 Education

The observed education scores of the farmers ranged from 0 to 14 having an average of 5.42 and the standard deviation was 4.53. On the basis of their education scores, the farmers were classified into four categories, namely "illiterate" (0), "primary level" (1-5), "secondary level" (6-10) and "above secondary level" (above 10). The distribution of the farmers according to their level of education is shown in Table 4.3.

Table 4.3 Distribution of the farmers according to education

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Illiterate (0)	14	12.3	5.42	4.53
Can sign only (0.5)	18	15.8		
Primary level (1-5)	33	28.9		
Secondary level (6-10)	30	26.3		
Above secondary level (above 10)	19	16.7		
Total	114	100		

The finding showed that the majority (55.2 percent) of the farmers had primary to secondary level of education compared to 16.7 percent having education above secondary level. On the other hand, among the respondents 12.3 percent had illiterate and 15.8 percent could sign only. It was assumed that majority of the respondents were progressive and innovative with respect to adoption of improved practices of vegetable cultivation.

4.1.3 Farm Size

The observed farm size scores of the farmers varied from 0.18 hectare to 9.14 hectares. The average farm size was 1.53 hectares and the standard deviation was 1.68. The farmers were classified into the following four categories based on their farm size scores: "marginal farm size" (up to 0.5), "small farm size" (0.51-1.00), and "medium farm size" (1.01 -3.00) and "large farm size" (above 3.00 ha). The distribution of the farmers according to their farm size is shown in Table 4.4

Table 4.4 Distribution of farmers according to farm size

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Marginal farm size (up to 0.5 ha)	27	23.7	1.53	1.68
Small farm size (0.51-1.00 ha)	41	35.9		
Medium farm size (1.01-3.00 ha)	28	24.6		
Large farm size (above 3.00 ha)	18	15.8		
Total	114	100		

The finding showed that 84.2 percent of the farmers possessed marginal to medium farm size compared to 15.8 percent of them having large farm size. The average farm size of the farmers was 1.53 hectare which is a much higher than the national average farm size which is equivalent to 0.80 hectare (BBS, 2006). This indicates that the farm size levels of the farmers in the study area were like a higher than a typical agricultural farming community of Bangladesh.

4.1.4 Annual Family Income

The observed annual family income of the farmers ranged from 21.60-846.00 having an average of 187.04 with a standard deviation of 180.48. Based on their annual family income scores, the farmers were classified into three categories: "low income" (up to 100 thousand Taka), "medium income" (101-300 thousand Taka) and "high income" (above 300 thousand Taka). The distribution of the farmers according to their annual family income is shown in Table 4.5.

Table 4.5 Distribution of farmers according to annual family income

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low income (up to 100 thousand Taka)	48	42.1	187.04	180.48
Medium income (100-300 thousand Taka)	46	40.4		
High income (above 300 thousand Taka)	20	17.5		
Total	114	100		

The finding revealed that the highest portion (82.5 percent) of the farmers had low to medium annual family income while 17.5 percent of them had high annual family income. That means majority of the farmers of the study area had moderate family income.

4.1.5 Vegetable cultivation knowledge

The observed vegetable cultivation knowledge scores of the farmers ranged from 3 to 21 with an average of 15.44 and a standard deviation of 5.04 against the possible range of 0 to 21. On the basis of their vegetable cultivation knowledge scores, the farmers were classified into three categories: "Poor knowledge" (up to 7), "medium knowledge" (8-14), and "high knowledge" (above 14). The distribution of the farmers according to their vegetable cultivation knowledge is shown in Table 4.6.

Table 4.6 Distribution of farmers according to vegetable cultivation knowledge

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Poor knowledge (up to 7)	14	12.3	15.44	5.04
Medium knowledge (8-14)	21	18.4		
High knowledge (above 14)	79	69.3		
Total	114	100		

The finding showed that the majority (69.3 percent) of the farmers had high knowledge on vegetable cultivation compared to 12.3 and 18.4 percent having poor and medium vegetable cultivation knowledge respectively. It was remarkable that the farmers of the study area were very conscious about vegetable cultivation process.

4.1.6 Cosmopoliteness

The observed cosmopoliteness scores of the farmers ranged from 1 to 14 with an average of 15.44 and a standard deviation of 5.04 against the possible range of 0 to 33. On the basis of their cosmopoliteness scores, the farmers were classified into four categories: "low cosmopoliteness" (up to 6), "medium cosmopoliteness" (7-10) and "high cosmopoliteness" (above 10). The distribution of the farmers according to their cosmopoliteness scores is shown in Table 4.7.

Table 4.7 Distribution of farmers according to cosmopoliteness

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low cosmopoliteness (up to 6)	66	57.9	6.60	3.97
Medium cosmopoliteness (7-10)	21	18.4		
High cosmopoliteness (above 10)	27	23.7		
Total	114	100		

The finding showed that the majority (57.9 percent) of the farmers had low cosmopoliteness compared to 18.4 and 23.7 percent having medium and high cosmopoliteness respectively. It was revealed that social barrier, economic hardship and illiteracy discouraged them from going outside their own location.

4.1.7 Extension Media Contact

The observed extension media contact scores of the farmers ranged from 1-24 against the possible range of 0 to 48 having an average of 9.83 with a standard deviation of 6.55. Based on the extension media contact scores, the farmers were classified into three categories: "low extension media contact" (up to 8), "medium extension media contact" (9-16) and "high extension media contact" (above 16). The distribution of the farmers according to their extension media contact scores is shown in Table 4.8.

Table 4.8 Distribution of farmers according to extension media contact

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low extension media contact (up to 8)	63	55.3	9.83	6.55
Medium extension media contact (9-16)	26	22.8		
High extension media contact (above 16)	25	21.9		
Total	114	100		

The finding showed that the highest proportion (55.3 percent) of the farmers had low extension media contact as compared to 22.8 and 21.9 percent having medium and high extension media contact respectively. Thus, it can be concluded that most of the farmers were either not getting help from the extension workers or they were not aware of the services provided by different extension agencies.

4.1.8 Organizational Participation

The observed organizational participation scores of the farmers ranged from 0 to 14 having an average of 2.35 and a standard deviation of 2.86. On the basis of their agricultural training scores, the farmers were classified into four categories: "low organizational participation" (up to 6), "medium organizational participation" (7-10) and high organizational participation (above 10). The distribution of the farmers according to their organizational participation scores is shown in Table 4.9.

Table 4.9 Distribution of farmers according to organizational participation

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low organizational participation (up to 6)	103	88.6	2.35	2.86
Medium organizational participation (7-10)	11	9.6		
High organizational participation (above 10)	2	1.8		
Total	114	100		

The finding revealed that 88.6 percent of the farmers had low organizational participation compared to 9.6 and 1.8 percent having medium and high organizational participation respectively. So, there is a need to motivate farmers of the study area towards the involvement with different organizations.

4.1.9 Innovativeness

The observed innovativeness scores of the farmers ranged from 1 to 17 having an average of 7.17 and a standard deviation of 3.13 against the possible range of 0-50. Based on the innovativeness scores, the farmers were classified into the following three categories: "low innovativeness" (up to 6), "medium innovativeness" (7 to 12) and "high innovativeness" (above 12). The distribution of the farmers according to their innovativeness scores is shown in Table 4.10.

Table 4.10 Distribution of farmers according to innovativeness

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low innovativeness (up to 6)	53	46.5	7.17	3.13
Medium innovativeness (7-12)	56	49.1		
High innovativeness (above 12)	5	4.4		
Total	114	100		

The finding indicated that the highest proportion (49.1 percent) of the farmers had medium innovativeness compared to 46.5 and 4.4 percent having low innovativeness and medium innovativeness respectively. The above data reveal that maximum (95.6 percent) of the respondents had low to medium innovativeness.

4.2 Adoption of Improved Practices in Vegetable Cultivation

4.2.1 Adoption of Improved Varieties by the Farmers

An Adoption is ration scale was used to measure farmers' adoption of improved practices of vegetable cultivation. The findings are described below:

The observed adoption of improved varieties of vegetable cultivation scores of the farmers ranged from 0 to 188.83 having an average of 43.70 with a standard deviation 30.56. On the basis of their adoption scores, the farmers were classified into four categories: "no adoption" (0), "low adoption" (up to 63), "medium adoption" (64-126) and "high adoption" (above 126).

The distribution of the farmers according to their adoption of improved practices is shown in Figure 4.1.

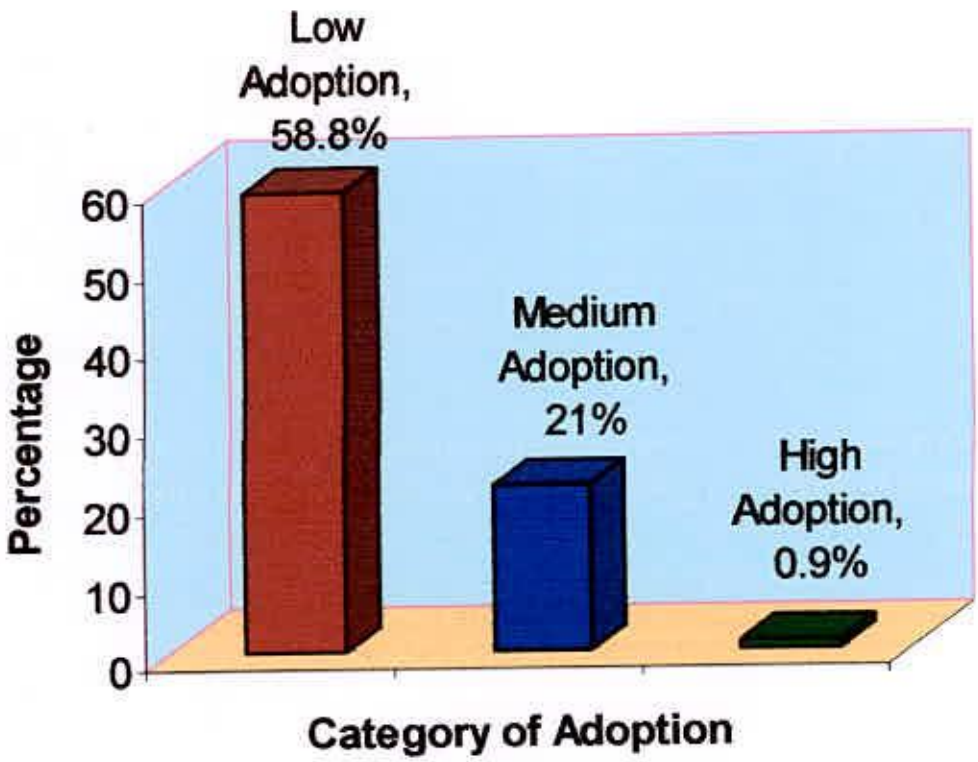

Figure 4.1 Bar graph showing categories of participation

The highest proportion (58.8 percent) of the farmers fell in the "low adoption" category while 21 percent of them fell in the "medium adoption" category and only 0.9 percent fell in the "high adoption" category. On the other hand, 18.4 percent of the respondents had no adoption of improved practices of vegetable cultivation at all. This scenario is not satisfactory and therefore should overcome immediately by taking necessary steps by GOs and NGOs.

4.2.2 Adoption of Recommended Fertilizer and Insecticide & Fungicide Dose/Method by the Farmers

(i) Adoption of Fertilizer in Potato Cultivation

a) The observed adoption of Urea in potato cultivation scores of the farmers ranged from 0 to 90.90 having an average of 60.96 with a standard deviation 36.67. On the basis of their adoption scores, the farmers were classified into four categories: "no adoption" (0), "low adoption" (0.1-50), "medium adoption" (50.1-99.9) "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of Urea in potato cultivation scores is shown in Table 4.11.

Table 4.11 Distribution of farmers according to adoption of Urea (Potato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	25	21.9	60.96	36.67
Low adoption (0.1-50)	20	17.6		
Medium adoption (50.1-99.9)	69	60.5		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (60.5 percent) of the farmers had medium adoption while 21.9 percent and 17.6 percent of them had no adoption and low adoption of Urea in potato cultivation at all. On the other hand, no optimum adoption and over adoption of Urea in potato cultivation were found.

b) The observed adoption of TSP in potato cultivation scores of the farmers ranged from 0 to 833.33 having an average of 67.54 with a standard deviation 80.14. On the basis of their adoption scores, the farmers were classified into four categories: "no adoption" (0), "low adoption" (0.1-50), "medium adoption" (50.1-99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of TSP in potato cultivation scores is shown in Table 4.12.

Table 4.12 Distribution of farmers according to adoption of TSP (Potato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	25	21.9	60.96	36.67
Low adoption (0.1-50)	3	2.7		
Medium adoption (50.1-99.9)	83	72.8		
Optimum adoption (100.0)	1	0.9		
Over adoption (above 100.0)	2	1.7		
Total	114	100		

The highest proportion (72.8 percent) of the farmers had medium adoption while 21.9 percent and 2.7 percent of them had no adoption and low adoption of TSP in potato cultivation at all. On the other hand, 0.9 percent optimum adoption and 1.7 percent over adoption of TSP in potato cultivation were found.

c) The observed adoption of MP in potato cultivation scores of the farmers ranged from 0 to 90.90 having an average of 59.44 with a standard deviation of 36.55. On the basis of their adoption scores, the farmers were classified into four categories: "no adoption" (0), "low adoption" (0.1-50), "medium adoption" (50.1-99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of MP in potato cultivation scores is shown in Table 4.13.

Table 4.13 Distribution of farmers according to adoption of MP (Potato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	25	21.9	59.44	36.55
Low adoption (0.1-50)	23	20.2		
Medium adoption (50.1-99.9)	66	57.9		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (57.9 percent) of the farmers had medium adoption while 21.9 percent and 20.2 percent of them had no adoption and low adoption of MP in potato cultivation at all. On the other hand, no optimum adoption and over adoption of MP in potato cultivation were found.

(ii) Adoption of Fertilizer in Tomato Cultivation

a) The observed adoption of Urea in tomato cultivation scores of the farmers ranged from 0 to 20.58 having an average of 2.18 with a standard deviation of 4.84. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of Urea in tomato cultivation scores is shown in Table 4.14.

Table 4.14 Distribution of farmers according to adoption of Urea (Tomato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	2.18	4.84
Very low adoption (up to 15.0)	19	16.6		
Low adoption (15.1 to 50.0)	1	0.9		
Medium adoption (50.1 to 99.9)	0	0		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 16.5 percent and 0.9 percent of them had very low adoption and low adoption of Urea in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of Urea in tomato cultivation were found.

b) The observed adoption of TSP in tomato cultivation scores of the farmers ranged from 0 to 25.72 having an average of 2.69 with a standard deviation of 6.01. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of TSP in tomato cultivation scores is shown in Table 4.15.

Table 4.15 Distribution of farmers according to adoption of TSP (Tomato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	2.69	6.01
Very low adoption (up to 15.0)	2	1.7		
Low adoption (15.1 to 50.0)	18	15.8		
Medium adoption (50.1 to 99.9)	0	0		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 1.7 percent and 15.8 percent of them had very low adoption and low adoption of TSP in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of TSP in tomato cultivation were found.

c) The observed adoption of MP in tomato cultivation scores of the farmers ranged from 0 to 20.58 having an average of 2.72 with a standard deviation of 6.05. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of MP in tomato cultivation scores is shown in Table 4.16.

Table 4.16 Distribution of farmers according to adoption of MP (Tomato)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	2.72	6.05
Very low adoption (up to 15.0)	5	4.3		
Low adoption (15.1 to 50.0)	15	13.2		
Medium adoption (50.1 to 99.9)	0	0		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 4.3 percent and 13.2 percent of them had very low adoption and low adoption of MP in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of MP in tomato cultivation were found.

(iii) Adoption of fertilizer in Brinjal Cultivation

a) The observed adoption of Urea in brinjal cultivation scores of the farmers ranged from 0 to 27.80 having an average of 3.06 with a standard deviation of 6.97. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of Urea in brinjal cultivation scores is shown in Table 4.17.

Table 4.17 Distribution of farmers according to adoption of Urea (Brinjal)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	3.06	6.97
Very low adoption (up to 15.0)	1	0.9		
Low adoption (15.1 to 50.0)	19	16.6		
Medium adoption (50.1 to 99.9)	0	0		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 0.9 percent and 16.6 percent of them had very low adoption and low adoption of Urea in brinjal cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of Urea in brinjal cultivation were found.

b) The observed adoption of TSP in brinjal cultivation scores of the farmers ranged from 0 to 70.97 having an average of 7.71 with a standard deviation of 17.60. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of TSP in brinjal cultivation scores is shown in Table 4.18.

Table 4.18 Distribution of farmers according to adoption of TSP (Brinjal)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	7.71	17.60
Very low adoption (up to 15.0)	1	0.9		
Low adoption (15.1 to 50.0)	16	14		
Medium adoption (50.1 to 99.9)	6	2.6		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 0.9 percent, 14 percent and 2.6 percent of them had very low adoption, low adoption and medium adoption of TSP in brinjal cultivation respectively. On the other hand, no optimum adoption and over adoption of TSP in brinjal cultivation were found.

c) The observed adoption of MP in brinjal cultivation scores of the farmers ranged from 0 to 21.43 having an average of 2.36 with a standard deviation of 5.38. On the basis of their adoption scores, the farmers were classified into six categories: "no adoption" (0), "very low adoption" (0.1 to 15), "low adoption" (15.1 to 50.0), "medium adoption" (50.1 to 99.9), "optimum adoption" (100.0) and "over adoption" (above 100.0). The distribution of the farmers according to their adoption of MP in brinjal cultivation scores is shown in Table 4.19.

Table 4.19 Distribution of farmers according to adoption of MP (Brinjal)

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
No adoption (0)	94	82.5	2.36	5.38
Very low adoption (up to 15.0)	16	14		
Low adoption (15.1 to 50.0)	4	3.5		
Medium adoption (50.1 to 99.9)	0	0		
Optimum adoption (100.0)	0	0		
Over adoption (above 100.0)	0	0		
Total	114	100		

The highest proportion (82.5 percent) of the farmers had no adoption while 14 percent and 3.5 percent of them had very low adoption and low adoption of MP in brinjal cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of MP in brinjal cultivation were found.

(iv) Use of IPM Method in Vegetable Cultivation

The observed adoption of IMP method scores of the farmers ranged from 0 to 1.0 having an average of 0.82 with a standard deviation of 0.39. On the basis of their adoption scores, the farmers were classified into three categories: "low use" (0 to 0.50), "medium use" (0.51 to 1.00) and "high use" (above 1.00). The distribution of the farmers according to their adoption of IPM method in vegetable cultivation scores is shown in Table 4.20.

Table 4.20 Distribution of farmers according to adoption of IPM method

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low adoption (0 to 0.50)	21	18.4	0.82	0.39
Medium adoption (0.51 to 1.00)	93	81.6		
High adoption (above 1.00)	0	0		
Total	114	100		

The highest proportion (81.6 percent) of the farmers had medium adoption of IPM method while 18.4 percent of them had low adoption of IMP method in vegetable cultivation. On the other hand, no high adoption of IPM method in vegetable cultivation was found.

(v) Use of Insecticide and Fungicide in Vegetable Cultivation

The observed adoption of insecticide and fungicide scores of the farmers ranged from 0 to 3.0 having an average of 1.68 with a standard deviation of 0.87. On the basis of their adoption scores, the farmers were classified into three categories: "low use" (0 to 0.50), "medium use" (0.51 to 1.00) and "high use" (above 1.00). The distribution of the farmers according to their adoption of insecticide and fungicide in vegetable cultivation scores is shown in Table 4.20.

Table 4.21 Distribution of farmers according to adoption of insecticide and fungicide

Categories	Farmers		Mean	Standard Deviation
	Number	*Percent*		
Low adoption (0 to 0.50)	21	18.4	1.68	0.87
Medium adoption (0.51 to 1.00)	84	73.7		
High adoption (above 1.00)	9	7.9		
Total	114	100		

The highest proportion (73.7 percent) of the farmers had medium adoption of insecticide and fungicide while 18.4 percent and 7.9 percent of them had low adoption and high adoption of insecticide and fungicide in vegetable cultivation.

4.3 Relationship between the Characteristics of the Farmers and their Adoption of Improved Practices of Vegetable Cultivation

Coefficient of correlation was computed in order to explore the relationship between the selected characteristics of the farmers and their adoption of improved practices of vegetable cultivation. The selected characteristics of the farmers constituted independent variables and adoption of improved practices of vegetable cultivation constituted the dependent variable of the study.

In this section relationship between nine selected characteristics (independent variables) of the farmers viz. age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension contact, organizational participation, innovativeness and dependent variable i.e. adoption of improved practices in vegetable cultivation have been described.

Person's Product Moment Co-efficient of Correlation (r) has been used to test the hypothesis concerning the relationship between two variables. Five percent and one percent level of probability were used as the basis for rejection of a hypothesis. The table value of 'r' was calculated at (114-2) = 112 degrees of freedom. The summary of the results of the co-efficient of correlation indicating the relationships between the selected characteristics of the respondents and their adoption of improved practices of vegetable cultivation is shown in Table 4.21.

Table 4.22 Correlation coefficient between the selected characteristics of the farmers with their adoption of improved practices of vegetable cultivation

Dependent Variable	**Computed Value of 'r'**	**Independent Variables**	**Table Value of 'r' at 112 Degrees of Freedom**	
			at 5% level	**at 1% level**
Adoption of improved practices of vegetable cultivation	-0.098^{NS}	Age	0.182	0.238
	0.286**	Education		
	0.155^{NS}	Farm size		
	0.104^{NS}	Annual family income		
	0.529**	Vegetable cultivation knowledge		
	0.227*	Cosmopoliteness		
	0.205*	Extension contact		
	0.181^{NS}	Organizational participation		
	0.379**	Innovativeness		

^{NS} = Not significant

* = Significant at 0.05 level of probability

** = Significant at 0.01 level of probability

4.3.1 Relationship between age of the farmers and dependent variable

The relationship between age of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between age of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between age of the farmers and their adoption of improved practices of vegetable cultivation was found to be -0.098^{NS} as shown in Table 4.21. 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 negative trend.
- The computed value of 'r' (0.098) was smaller than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The co-efficient of correlation between the concerned variables was not significant at 0.05 level of probability.

The findings demonstrate that age of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation. It was observed in one study area that the older farmers had higher adoption of improved practices of vegetable cultivation, but in another area reverse result was observed. Therefore, it can be concluded that other factors of the farmers like annual family income, extension contact, cosmopoliteness etc. might have influenced them in adopting improved practices of vegetable cultivation.

4.3.2 Relationship between education of the farmers and dependent variable

The relationship between education of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between education of the farmers and their adoption of improved practices of vegetable cultivation".

The co-efficient of correlation between education of the farmers and adoption of improved practices of vegetable cultivation was found to be 0.286** as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.286) was greater than the table value (± 0.238) with 112 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables was not significant at 0.01 level of probability.

The findings demonstrate that there was significant positive relationship between education of the farmers and their adoption of improved practices of vegetable cultivation.

4.3.3 Relationship between farm size of the farmers and dependent variable

The relationship between farm size of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between farm size of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between farm size of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.155^{NS} as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.155) was smaller than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The co-efficient of correlation between the concerned variables was not significant at 0.05 level of probability.

The findings demonstrate that the farm size of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation.

4.3.4 Relationship between annual family income of the farmers and dependent variable

The relationship between annual family income of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between annual family income of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between annual family income of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.104^{NS} as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.104) was smaller than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The co-efficient of correlation between the concerned variables was not significant at 0.05 level of probability.

The findings demonstrate that the annual family income of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation.

4.3.5 Relationship between vegetable cultivation knowledge of the farmers and dependent variable

The relationship between vegetable cultivation knowledge of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between vegetable cultivation knowledge of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between vegetable cultivation knowledge of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.529** as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.529) was greater than the table value (± 0.238) with 112 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables was significant at 0.01 level of probability.

The findings demonstrate that the vegetable cultivation knowledge of the farmers had significant relationship with their adoption of improved practices of vegetable cultivation.

4.3.6 Relationship between cosmopoliteness of the farmers and dependent variable

The relationship between cosmopoliteness of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between cosmopoliteness of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between cosmopoliteness of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.227* which is shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.227) was greater than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables was significant at 0.05 level of probability.

The findings demonstrate that the cosmopoliteness of the farmers had significant positive relationship with their adoption of improved practices of vegetable cultivation. Findings as documented above implied that the farmers who are more cosmopolite adopt more improved practices of vegetable cultivation. Movement outside one's periphery creates opportunity to meet with others, learn and see new innovations which ultimately change attitudes.

4.3.7 Relationship between extension media contact of the farmers and dependent variable

The relationship between extension media contact of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between extension media contact of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between extension media contact of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.205^{NS} which is shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.205) was greater than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables was significant at 0.05 level of probability.

The findings demonstrate that the extension media contact of the farmers had significant positive relationship with their adoption of improved practices of vegetable cultivation. From the above findings it was revealed that extension media contact had immense influence on the adoption of improved practices of vegetable cultivation. It is obvious that contact with extension agents and other extension teaching methods change attitude of clients radically and as a result they become interested to adopt new technologies which had somewhat been reflected here.

4.3.8 Relationship between organizational participation of the farmers and dependent variable

The relationship between organizational participation of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between organizational participation of the farmers and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between organizational participation of the farmers and their adoption of improved practices of vegetable cultivation was found to be 0.181^{NS} as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.181) was smaller than the table value (± 0.182) with 112 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was accepted.
- The co-efficient of correlation between the concerned variables was not significant at 0.05 level of probability.

The findings reveal that the organizational participation of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation.

4.3.9 Relationship between innovativeness of the farmers and dependent variable

The relationship between innovativeness of the farmers and their adoption of improved practices of vegetable cultivation was examined by testing the following null hypothesis:

"There is no relationship between innovativeness and their adoption of improved practices of vegetable cultivation".

Computed value of the co-efficient of correlation between innovativeness and their adoption of improved practices of vegetable cultivation was found to be 0.379** as shown in Table 4.21. The following observations were recorded regarding the relationship between the two variables on the basis of co-efficient of correlation:

- The relationship showed a positive trend.
- The computed value of 'r' (0.379) was greater than the table value (= 0.256) with 112 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables was significant at 0.01 level of probability.

The findings demonstrate that innovativeness had significant positive relationship with their adoption of improved practices of vegetable cultivation.

4.4 Comparative Problem Confrontation of the Farmers in Adoption of Improved Practices of Vegetable Cultivation

The Problem Confrontation Index (PCI) was calculated to find out major problems confronted by the farmers in adopting improved practices of vegetable cultivation.

Here, PCI = (3 X High problem) + (2 X Medium problem) + (1 X Low problem) + (0 X No problem)

The severity of problem confrontation of the respondents is shown in Table 4.22.

Table 4.23: Problem Confrontation Index (PCI) for selected 10 problems with rank order

Sl. no.	Problems	Opinion on extent of problem				PCI	Rank order
		High	Medium	Low	Not at all		
1.	Lack of proper knowledge about improved cultivation practices	94	17	3	0	319	1
2.	Transport problem	91	20	3	0	316	2
3.	High price of labor	82	32	0	0	310	3
4.	Lack of government support	74	36	4	0	298	4
5.	Lack of extension services	77	27	10	0	295	5
6.	Lack of resistant variety	59	41	12	2	271	6
7.	Lack of quality seed	53	48	13	0	268	7
8.	Unable to store vegetables for long time	36	64	14	0	250	8
9.	Low market price for vegetables during peak production season	28	58	27	1	227	9
10.	Insect infestation in vegetable	30	51	31	2	223	10

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This Chapter presents the summary of findings, conclusion and recommendation of the study.

5.1 Summary of the Findings

5.1.1 Introduction

The adoption of selected improved practices among the vegetable growers depends upon a number of factors including farmers' characteristics. An understanding of the factors that influence the adoption behavior of the farmers is necessary to design and implement the adoption and diffusion process in the country. Therefore, the present study was conducted in Kaunia Upazila of Rangpur District to attain the following specific objectives:

In view of the research works to be done successfully the following specific objectives have been formulated for giving proper directions to the study:

1. To identify and describe the extent of adoption of improved practices in vegetables cultivation.

2. To determine and describe the selected characteristics of the vegetable growers. The selected characteristics include: age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension media contact, organizational participation, and innovativeness.

3. To explore the relationship between the extent of adoption of improved practices in vegetables cultivation and each of the selected characteristics of the farmer.

4. To identify the problem of the vegetable growers in connection with the cultivation of vegetables.

5.1.2 Methodology

The study was conducted in three villages namely, Sonaton, Khanshama and Thakurdan of Haragach union under Kaunia Upazila of Rangpur District. From a population of 457, a total number of 114 vegetable farmers were selected for interview. Data were collected by using a pre-tested interview schedule. Collected data were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Statistical measure such as percentage distribution, range, average, standard deviation and adoption quotient were used to determine the extent of adoption of improved practices in vegetables cultivation by the farmers and their selected characteristics. Coefficient of correlation was calculated to explore the relationship between the selected characteristics of the farmers and their adoption of improved practices in vegetables cultivation.

5.1.3 Hypothesis

The following null hypothesis was formulated for this study:

"There were no relationships between the farmers' selected characteristics and their adoption of improved practices in vegetables cultivation." Thus, there were nine null hypotheses, which have been explained in chapter 3.

5.1.4 Selected characteristics of the farmers

Age

Age of the farmers ranged from 25 to 72 years. The average score being 44.60 and the standard deviation was 10.44. The highest proportions (52.6 percent) of the farmers were middle aged, while 26.3 percent were old aged and 21.1 percent were young.

Education

Education of the farmers ranged from 0-14 years. The average score being 5.42 and the standard deviation was 4.53. The highest proportion (28.9 percent) of the farmers had "primary level" compared to 26.3 percent "secondary level", 16.7 percent having "above secondary level", 15.8 percent having "can sign only" and 12.3 percent having "illiterate".

Farm size

Farm size of the farmers ranged from 0.18 to 9.14 hectares with an average of 1.53 and the standard deviation was 1.68. The highest proportion (35.9 percent) of the farmers had small farm sized compared to 24.6 percent having medium farm, 23.7 percent having marginal farm and 15.8 percent having large farm.

Annual family income

Annual family income scores of the farmers ranged from 21.60 thousand to 846.00 thousand with an average of 187.04 thousand and the standard deviation was 180.48 thousand. The highest proportion (42.1 percent) of the farmers had low income compared to 40.4 percent under medium income and 17.5 percent under high income categories.

Vegetable cultivation knowledge

Vegetable cultivation knowledge score of the farmer range from 3 to 21 with an average of 15.44 and a standard deviation of 5.04. The highest proportion (69.3 percent) of the farmers had high knowledge compared to 18.4 percent under medium knowledge and 12.3 percent under poor knowledge.

Cosmopoliteness

Cosmopoliteness scores of the farmers ranged from 1 to 14, against the possible range was found to be 0 to 33. The average cosmopoliteness scores were found to be 15.44 with a standard deviation of 5.04. The highest proportion (57.9 percent) of the farmers had low cosmopoliteness compared to 23.7 percent having high cosmopoliteness and 18.4 percent having medium cosmopoliteness.

Extension Media Contact

Extension media contact scores of the farmers ranged from 1-24 against the possible range of 0 to 48 having an average of 9.83 with a standard deviation of 6.55. The highest proportion (55.3 percent) of the respondents had low extension contact compared to 22.8 percent having medium and 21.9 percent having high extension media contact.

Organizational Participation

Organizational participation scores of the farmers ranged from 0 to 14 having an average of 2.35 and a standard deviation of 2.86. The highest proportion (88.6 percent) of the farmers had low participation in organization compared to 9.6 percent had medium participation, and only 1.8 percent had high organizational participation categories.

Innovativeness

The innovativeness scores of the farmers ranged from 1 to 17, against the possible range of 0 to 50 with an average of 7.17 and the standard deviation of 3.13. The highest proportion (49.1 percent) of the farmers had medium innovativeness as compared to 46.5 percent having low innovativeness and only 4.4 percent having high innovativeness.

5.1.5 Adoption of Improved Practices in Vegetable Cultivation

5.1.5. Section I: Adoption of Improved Vegetable score by the Farmers

Adoption of selected improve practice in vegetable cultivation was the main focus of the study. It was quantified by computing scores. These scores of the respondent could range from 0 to 188.88 the average being 43.70 and the standard deviation 30.56. The highest proportion (58.8 percent) of the farmers had low adoption compared to 21 percent low adoption and 0.9 percent had high adoption.

5.1.5. Section II: Adoption of Recommended Fertilizer and Insecticide & Fungicide Dose/Method by the Farmers

a) Adoption of Fertilizer in Potato Cultivation

i) Adoption of Urea in potato cultivation scores of the farmers ranged from 0 to 90.90 having an average of 60.96 with a standard deviation 36.67. The highest proportion (78.1 percent) of the farmers had low adoption while 21.9 percent of them had no adoption of Urea in potato cultivation at all. On the other hand, no optimum adoption and over adoption of Urea in potato cultivation were found.

ii) Adoption of TSP in potato cultivation scores of the farmers ranged from 0 to 833.33 having an average of 67.54 with a standard deviation 80.14. The highest proportion (75.5 percent) of the farmers had low adoption while 21.9 percent of them had no adoption of TSP in potato cultivation at all. On the other hand, 0.9 percent optimum adoption and 1.7 percent over adoption of TSP in potato cultivation were found.

iii) Adoption of MP in potato cultivation scores of the farmers ranged from 0 to 90.90 having an average of 59.44 with a standard deviation of 36.55. The highest proportion (78.1 percent) of the farmers had low adoption while 21.9 percent of them had no adoption of MP in potato cultivation at all. On the other hand, no optimum adoption and over adoption of MP in potato cultivation were found.

b) Adoption of Fertilizer in Tomato Cultivation

i) Adoption of Urea in tomato cultivation scores of the farmers ranged from 0 to 20.58 having an average of 2.18 with a standard deviation of 4.84. The highest proportion (82.5 percent) of the farmers had no adoption while 16.5 percent and 0.9 percent of them had very low adoption and low adoption of Urea in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of Urea in tomato cultivation were found.

ii) Adoption of TSP in tomato cultivation scores of the farmers ranged from 0 to 25.72 having an average of 2.69 with a standard deviation of 6.01. The highest proportion (82.5 percent) of the farmers had no adoption while 1.7 percent and 15.8 percent of them had very low adoption and low adoption of TSP in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of TSP in tomato cultivation were found.

iii) Adoption of MP in tomato cultivation scores of the farmers ranged from 0 to 20.58 having an average of 2.72 with a standard deviation of 6.05. The highest proportion (82.5 percent) of the farmers had no adoption while 4.3 percent and 13.2 percent of them had very low adoption and low adoption of MP in tomato cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of MP in tomato cultivation were found.

c) Adoption of fertilizer in Brinjal Cultivation

i) Adoption of Urea in brinjal cultivation scores of the farmers ranged from 0 to 27.80 having an average of 3.06 with a standard deviation of 6.97. The highest proportion (82.5 percent) of the farmers had no adoption while 0.9 percent and 16.6 percent of them had very low adoption and low adoption of Urea in brinjal cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of Urea in brinjal cultivation were found.

ii) Adoption of TSP in brinjal cultivation scores of the farmers ranged from 0 to 70.97 having an average of 7.71 with a standard deviation of 17.60. The highest proportion (82.5 percent) of the farmers had no adoption while 0.9 percent, 14 percent and 2.6 percent of them had very low adoption, low adoption and medium adoption of TSP in brinjal cultivation respectively. On the other hand, no optimum adoption and over adoption of TSP in brinjal cultivation were found.

iii) Adoption of MP in brinjal cultivation scores of the farmers ranged from 0 to 21.43 having an average of 2.36 with a standard deviation of 5.38. The highest proportion (82.5 percent) of the farmers had no adoption while 14 percent and 3.5 percent of them had very low adoption and low adoption of MP in brinjal cultivation respectively. On the other hand, no medium adoption, optimum adoption and over adoption of MP in brinjal cultivation were found.

d) Use of IPM Method in Vegetable Cultivation

Adoption of IMP method scores of the farmers ranged from 0 to 1.0 having an average of 0.82 with a standard deviation of 0.39. The highest proportion (81.6 percent) of the farmers had medium adoption of IPM method while 18.4 percent of them had low adoption of IMP method in vegetable cultivation. On the other hand, no high adoption of IPM method in vegetable cultivation was found.

e) Use of Insecticide and Fungicide in Vegetable Cultivation

Adoption of insecticide and fungicide scores of the farmers ranged from 0 to 3.0 having an average of 1.68 with a standard deviation of 0.87. The highest proportion (73.7 percent) of the farmers had medium adoption of insecticide and fungicide while 18.4 percent and 7.9 percent of them had low adoption and high adoption of insecticide and fungicide in vegetable cultivation.

5.1.5. Section III: Relationship between the Characteristics of the Farmers and their Adoption of Improved Practices of Vegetable Cultivation

To explore the relationship of the ten selected characteristics of the farmers with their adoption of improve practice of vegetable cultivation, nine null hypotheses were formulated. For test hypothesis, co-efficient of correlation (r) was computed. Five (0.05) percent level of significance was the basis for rejecting a null hypothesis. The results of hypothesis testing are presented below in brief:

Coefficient of correlation was computed in order to explore the relationship between the selected characteristics of the farmers and their adoption of improved practices of vegetable cultivation. The selected characteristics of the farmers constituted independent variables and adoption of improved practices of vegetable cultivation constituted the dependent variable of the study.

In this section relationship between nine selected characteristics (independent variables) of the farmers viz. age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension contact, organizational participation, innovativeness and dependent variable i.e. adoption of improved practices in vegetable cultivation.

5.2 Conclusions

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

1. For increasing the yield of vegetable, the farmers need to adopt all the available improved practices to a greater extent. This study revealed that 79.8 percent of the farmers had either medium or low adoption of improved practices in vegetable cultivation. These facts lead to conclude that farmers had a satisfactory level of adoption of improved vegetable cultivation practices.
2. Most of the vegetable farmers were either middle or old aged, while age of the vegetable farmers had no significant relationship with their adoption. Therefore, it may be concluded that special attention need not be given to any particular age group. But as larger proportion of the vegetable farmers were middle aged and old aged, hence it is necessary to give some importance to these categories.

3. Education of the farmers showed a significant and positive relationship with their adoption of improved practices of vegetable cultivation. This means that high literacy and educational level among the farmers might have influenced high adoption of improved practices of vegetable cultivation.

4. Farm size of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation. It means that small farm size more adoption, but most of the farmers were large and marginal farm size. So, conclusion can be drawn that large, medium, small and marginal – all farm size categories should be given equal opportunities by fixing target beneficiaries.

5. Findings of the study showed that annual family income of the farmers had no significant relationship with their adoption of improved practices. In the study area about 82.5 percent of the vegetable farmers had low to medium income.

6. Findings of the study showed that vegetable cultivation knowledge of the farmer had a significant positive relationship with their adoption of improved practices of vegetable cultivation. Having more vegetable cultivation knowledge an individual grower becomes aware of the recent information on the various aspects of vegetable cultivation. Consequently, they become motivated to adoption of practices. It can be concluded that vegetable cultivation knowledge was an important factor for getting more adoption of improved practices of vegetable cultivation.

7. The findings showed that the cosmopoliteness of the farmers had significant positive relationship with their adoption of improved practices of vegetable cultivation. Findings as documented implied that the farmers who are more cosmopolite adopt more improved practices of vegetable cultivation.

8. The findings revealed that extension media contact of the farmers had significant and positive relationship with their adoption of improved practices of vegetable cultivation. Extension media contact increases the outlook of the farmers which lead them to adopt selected improved practices of vegetable cultivation.

9. Organizational participation of the vegetable farmer had no significant relationship with their adoption. Probably they did not visualize any benefit that may be derived from organizational participation. Unfortunately, the levels of participation of the respondents were found to be quite low. This is evident from the fact that 88.6 percent of the vegetable farmers had low participation. Hence, it may be concluded that there is need for medium or higher participation of the vegetable farmers in different organizations.

10. Innovativeness of the farmers had highly significant and positive relationship with their adoption of improved practices of vegetable cultivation. It may be concluded that the farmers of the study area had the positive attitude towards innovation. The farmers with high innovativeness use modern farm technologies and provide opportunity to others to see the advantages and disadvantages of those methods. This situation is quite favorable for the implementation of agricultural development programmes.

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:

1. The level of adoption of improved practices of vegetable cultivation was encouraging. Still there is a need of efforts for wide adoption of improved practices of vegetable cultivation by the farmers.

2. In view of the absence of no relationship between age of the farmers and their adoption of improved practices of vegetable cultivation, it is recommended that the extension workers should work with the farmers of all age groups to prompt the cultivation of vegetable.

3. Education of the farmers had significant relationship with their adoption of improved practices of vegetable cultivation. It indicates the importance of education of the vegetable growers for rapid adoption of improved practices of vegetable cultivation. The findings also indicate that 28.1 percent of the farmers had no education (illiterate and can sign only) under the above situation; it may be recommended that arrangements should be made for increasing the literacy level of the vegetable farmers by the concerned authorities through the establishment of night school, adult education and other extension methods.

4. Farm size indicated no significant relationship with their adoption of improved practices. On the other hand, 59.6 percent of the farmers had marginal and small farm any they could give more attention to their farming operation as they generally work on the farm. Hence, extension workers should utilize the marginal and small farmers in their extension activities to introduce improved farm practices on a significant level.

5. The annual family income of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation. It leads to the recommendation that extension service should provide adequate farm management advice to the farmers but there are no proper follow this advice. It is a fact that if income be increased, farmers receptive capacity to adopt improved technologies will be increased and there by production will be increased.

6. Adoption of improved practices of vegetable cultivation was significant and positive correlated with the vegetable cultivation knowledge of the growers. This indicates an urgent need for an effective programme of proper education to increase the vegetable cultivation knowledge for developing favorable attitude of the farmers in respect of improved practices of vegetable cultivation. Hence, it may be recommended that arrangements should be made by the relevant authorities to increase the vegetable cultivation knowledge of the farmers through increased extension contact, training programme and so on.

7. Cosmopoliteness of the farmers had insignificant relationship with their adoption of improved practices of vegetable cultivation. This means that these variables had no important influence on adoption of improved practices of vegetable cultivation.

8. Extension contact of the farmers showed significant influence on adoption of improved practices of vegetable cultivation. Hence the concerned authorities should take cognizance of these facts and should take necessary steps to increase the frequency of extension contact of the farmers.

9. Organizational participation of the farmers had no significant relationship with their adoption of improved practices of vegetable cultivation. It is recommended that the concerned authorities should take necessary steps to mobilize the local organizations, more participation of the vegetable farmers in different organization. This will facilitate them to solve their problems collectively to adopt the new ideas and practices.

10. Innovative farmers possess the modern idea, which compel them to use new ideas even in the face of various problems and difficulties. The farmers with high innovativeness use modern farm practices and provide opportunity to others to see the advantages and disadvantages of those methods. It is therefore, recommended that extension workers should encourage innovative farmers and uses them as local leaders by introducing farmers to farmer's extension approach.

5.3.2 Recommendations for further study

The present study which mainly highlights some aspects of particular dimensions (adoption of improved practices of vegetable cultivation) of agricultural development. So, it is suggested that concerned agencies should undertake further studies in order to have a deeper insight into the various aspects of the adoption of technologies as well as agricultural development. The aspects for future study are presented below:

1. The present study was conducted in the three villages of Haragach union under Kaunia Upazila in Rangpur District. It is recommended that similar studies should be conducted in other parts of the country.

2. The present study was concern only with the extent of adoption of improved practices of vegetable cultivation. It is therefore suggested that future studes should include attributes of innovations, adopter categories and use of information sources in relation to adopter stages and adopter categories.

3. The study was based on the farmers' adoption of improved practices of vegetable cultivation. Further studies may be conducted in respect of adoption of other vegetable production practices.

4. The relationships of nine important characteristics of the farmers with their adoption of improved practices of vegetable cultivation have been investigated in this study viz. age, education, farm size, annual family income, vegetable cultivation knowledge, cosmopoliteness, extension media contact, organizational participation, and innovativeness. But besides these nine characteristics of the farmers, there might be other factors such as farming experience, family size, attitude towards technology etc. which influence the adoption of improved practices of vegetable cultivation. Therefore, further research should be conducted to explore the relationships of other characteristics of the farmers with their adoption of improved practices of vegetable cultivation.

5. Adoption is the measurement of implementation by the farmers as well as vital indicator of agricultural development. It is a continuous process due to change of social system, change of technologies, change of human behavior, change of cropping patterns, change of adoption patterns etc. So, it is suggested that there should be continuous adoption research in various aspects for agricultural development.

6. Research should also be undertaken to identify the factors causing hindrance towards adoption of improved practices of vegetable cultivation.

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Appendix- A

Department of Agricultural Extension & Information System
Sher-E-Bangla Agricultural University
Sher-E-Bangla Nagar
Dhaka- 1207

An Interview Schedule on
Adoption of Improved Practices of Vegetable Cultivation by the Farmers

Serial No..... Date:

Name of the respondent :
Husband/Fathers name :
Village :
Union :
Upazila :
District :

Please answer the following questions:

1. Age:

How old are you? .....years

2. Education:

Please mention your level of education qualification:

a. I cannot read or write (.....)
b. I can sign only (.....)
c. I have studied up to (.....) class

3. Farm size:

Please furnish information about your farm size.

Sl. No.	Types of land	Land area	
		Local unit	Hectare
1	Homestead area(A1)		
2	Own land under own cultivation (A2)		
3	Own land given to others on borga (A3)		
4	Land taken from others on borga (A4)		
5	Land taken from others on lease (A5)		
Total			

Total farm size =A1+A2+1/2(A3+A4) +A5

4. Annual family income:

Please mention the income of your annual family income

Sl. No.	Source of income	Total production (Kg/mound/number)	Market Price (Tk/unit)	Total price (Tk)
A)	**Agricultural Sector**			
1	Crops			
	a) Rice			
	b) Jute			
	c) Wheat			
	d) Vegetable			
	e) Fruits			
	f) Pulses/oil seed			
	g)Others			
2	Livestock			
	a) Milk			
	b) Calves			
	c) Bullocks /cow			
3	Poultry			
	a) Egg			
	b) Chicken			
	c) Duck			
4	Fisheries			
5	Others			
B)	**Non Agricultural Sector**			
1	Service			
2	Business			
3	Day labors			
4	Others			

Total annual income (A+B) = ...Tk

5. Vegetable cultivation knowledge:

Please answer the following questions:

Sl. No.	Questions	Full Marks	Marks Obtained
1	Name two high yielding tomato varieties	1	
2	Name two high yielding potato varieties.	1	
3	Name two diseases of vegetables.	1	
4	Name two high yielding egg plant varieties	1	
5	Name two harmful insects of vegetable cultivation.	1	
6	Mention fertilizer dose of tomato cultivation.	1	
7	Mention two qualities of good seed.	1	
8	Which vegetables contain vitamin A?	1	
9	Mention two green manuring crops.	1	
10	Mention two major diseases of potato.	1	
11	How do you control insects of your vegetable field?	1	
12	Mention a harmful effect of using pesticide.	1	
13	Whom do you ask advice to control insects & diseases?	1	
14	Please mention the name of early variety of potato.	1	
15	Name two quick growing vegetables.	1	
16	What is IPM? Mention its methods.	1	
17	What do you mean by resistant variety?	1	
18	How do you harvest and preserve potato?	1	
19	Name two tomato varieties that can be grown year round.	1	
20	Mention two disadvantages of using over dose of chemical fertilizers.	1	
21	Name one HYV of cauliflower and one cabbage.	1	
Total		21	

6. Cosmopoliteness:

Please indicate your extent of visit in the following places:

Sl. No.	Place of visit	Nature of visit			
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)
1	Visit to demonstration plots at other villages	>5 times / month	3-4 times / month	1-2 times / month	
2	Visit to market / relatives / friends / familiar home outside of your own village for purchase or collection of inputs & information	>5 times / month	3-4 times / month	1-2 times / month	
3	Visit to ward commissioner's office for the demand of development work	>5 times / month	3-4 times / month	1-2 times / month	
4	Visit to own Upazila Saddar to meet with officers	>5 times / month	3-4 times / month	1-2 times / month	
5	Visit to other Upazila head quarter for collection new information	>3 times / year	2 times / year	Once / year	
6	Visit to Upazila agricultural office for seeking advice	>4 times / year	2-3 times / year	Once / year	
7	Visit to Upazila/District agricultural fair	>3 times / year	2 times / year	Once / year	
8	Visit to Divisional town includes capital city (Dhaka, Chittagong, Khulna, Sylhet etc).	>3 times / year	2 times / year	Once / year	
9	Visit to pourosabha office	>5 times / month	3-4 times / month	1-2 times / month	
10	Participation in the procession for demand of fertilizer.	4 times / life	2-3 times / life	1 time / life	
11	Work as arbiter to mitigate local conflict.	>3 times / year	2 times / year	Once / year	

7. Extension media contact:

Please indicate your extent of contact with the following different extension media to seek information on vegetable cultivation:

a) Personal contact

Sl. No.	Information Source	Extension of contact			
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)
1	Neighbors	>3 times / week	2-3 times / week	1 time / week	
2	Relatives	>4 times / month	3-4 times / month	1-2 times / month	
3	Fertilizers, seed, pesticides dealer	>6 times / year	4-6 times / year	1-3 times / year	
4	SAAO	>6 times / year	4-6 times / year	1-3 times / year	
5	NGO worker	>6 times / month	4-6 times / month	1-3 times / month	
6	Upazila level Agricultural Officers	>4 times / year	3-4 times / year	1-2 times / year	

b) Group contact

Sl. No.	Information Source	Extension of contact			
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)
1	Group discussion	3 times / year	2 times / year	1 time / year	
2	Field day	3 times / year	2 times / year	1 time / year	
3	Result demonstration/ meeting	4 times / life	2-3 times / life	1 time / life	
4	Training	4 times / life	2-3 times / life	1 time / life	
5	Farmers field school	4 times / life	2-3 times / life	1 time / life	
6	Tour (visit RD plots in group)	3 times / year	2 times / year	1 time / year	

c) **Mass contact**

Sl. No.	Information Source	Extension of contact			
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)
1	Newspaper (Reading agricultural news stories)	>5 times / week	3-4 times / week	1-2 times / week	
2	Radio (Listening agricultural program)	>5 times / week	3-4 times / week	1-2 times / week	
3	Television (watching agricultural program)	>4 times / month	3-4 times / month	1-2 times / month	
4	Visit agricultural fair	3 times / year	2 times / year	1 time / year	

8. Organizational participation

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

Sl. No.	Nature of the organization	No participation	Nature and duration of participation		
			Ordinary member (years)	Executive committee member (years)	Executive committee officer (years)
1	Farmers' Co-operative Society				
2	Youth Club/Village Club				
3	School Committee				
4	Mosque/ Temple Committee				
5	NGO Samity				
6	Madrasha Committee				
7	IPM Club				
8	Irrigation committee				
9	Others				

9. Innovativeness:

Please furnish the information about the extent use of the following improved practices

Sl. No.	Nature of innovation	Extent of use					
		Adopted within after awareness					
		1 year	1-2 years	2-3 years	3-4 years	4 years & above	No use
1	Use of Integrated Pest Management (IPM)						
2	Use of homestead vegetables gardening						
3	Use of poultry-fish culture						
4	Use of green manure in crop cultivation / compost						
5	Use of organic fertilizer						
6	Seed treatment						
7	Use of recommended dose of fertilizers						
8	Use of Diamond variety of potato						
9	Cultivation of BARI-41, 11, 28, 29 variety of rice						
10	Use of deep tube-well						

10. Adoption of improved vegetable cultivation:

a) How much land do you have for vegetables cultivation? .....Ha.

b) For how long and in how much land do you cultivate the following vegetables?

Sl. No.	Vegetables	Varieties	Years/Ha.		
			2003-2004	2004-2005	2005-2006
1	Potato	Diamont,Granola, Lal pakri			
2	Tomato	Manic, Raton			
3	Brinjal	Shingnath, Khotkhotia			

c) Recommended dose of fertilizers and doses used by the respondent:

i) Potato

Fertilizer	Recommonded Dose	Doses used
Urea	220-250 kg/ha	
TSP	120-150 kg/ha	
MP	220-250 kg/ha	
Zipsum	100-120 kg/ha	
$ZnSO_4$	8-10 kg/ha	
Boron (sandy soil)	8-10 kg/ha	
$MgSO_4$	80-100 kg/ha	
Cow dung	8-10 ton	

ii) Tomato

Fertilizer	Recommonded Dose	Doses used
Urea	500-600 kg/ha	
TSP	400-500 kg/ha	
MP	200-300 kg/ha	
Cow dung	8-12 ton	

iii) Brinjal, BARI-1-5

Fertilizer	Recommonded Dose	Doses used
Urea	370-380 kg/ha	
TSP	145-155 kg/ha	
MP	240-260 kg/ha	
Cow dung	8-12 ton	

d) Which method is used to protect vegetables from the diseases and insects?

i) IPM Method:

Sl. No.	IPM	The method is used -	
		For how many years	On how much land
1	Use of resistant variety		
2	Hand net		
3	Bird		
4	Light trap		
5	Pesticides		

ii) Use of insecticides& fungicide:

Sl. No.	Name	Frequency of use	Doses used	Appropriare Dose
1	Furadan			
2	Diazinon			
3	Dimecron			
4	Marshal 20 EC			
5	Bavistin DF			
6	Nemispore 80 WP			
7	Suncozeb 80 WP			

11. Problems confronted in adoption of improved practices in vegetable cultivation

Please mention the frequency of confronted in adoption of improved practices in vegetable cultivation:

Sl. No.	Problems	Frequency of problem confronted			
		High	Medium	Low	Not at all
1	Lack of resistant variety				
2	Lack of quality seed				
3	Unable to store vegetables for long time				
4	Low market price for vegetables during peak production season				
5	Insect infestation in vegetable				
6	Lack of proper knowledge about improved cultivation practices				
7	High price of labor season				
8	Transport problem				
9	Transport problem				
10	Lack of necessary advice from agricultural office in time				

Thanks for your kind co-operation.

.....
Date

.....
Signature of the respondents

CORRELATION MATRIX AMONG THE VARIABLES OF THE STUDY

VARIABLE	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y
X1	1									
X2	-.217*	1								
X3	-.070	.091 NS	1							
X4	.339**	.075 NS	.120 NS	1						
X5	.104 NS	.457**	.164 NS	.447**	1					
X6	-.037 NS	.555**	.199*	.366**	.658**	1				
X7	-.026 NS	.674**	.201*	.281**	.601**	.825**	1			
X8	.295**	.204*	.030 NS	.478**	.420**	.153 NS	.170 NS	1		
X9	.092 NS	.472**	.184 NS	.471**	.658**	.626**	.717**	.373**	1	
Y	-.098 NS	.286**	.155 NS	.104 NS	.529**	.227*	.205*	.181 NS	.379**	1

NS = Correlation is not significant
* = Correlation is significant at the 0.05 level
** = Correlation is significant at the 0.01 level

87 (07) Agri. Ext.
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X1 = AGE
X2 = EDUCATION
X3 = FARM SIZE
X4 = ANNUAL FAMILY INCOME
X5 = VEGETABLE CULTIVATION KNOWLEDGE
X6 = COSMOPOLITENESS
X7 = EXTENSION MEDIA CONTACT
X8 = ORGANIZATIONAL PARTICIPATION
X9 = INNOVATIVENESS
Y = ADOPTION OF IMPROVED PRACTICES IN VEGETABLE CULTIVATION