ADOPTION OF MODERN AGRICULTURAL TECHNOLOGIES AND CLASSIFICATION OF THE ADOPTERS AT RAMRAIL UNION IN BRAHMAN BARIA DISTRICT

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ADOPTION OF MODERN AGRICULTURAL TECHNOLOGIES AND CLASSIFICATION OF THE ADOPTERS AT RAMRAIL UNION IN BRAHMAN BARIA DISTRICT BY

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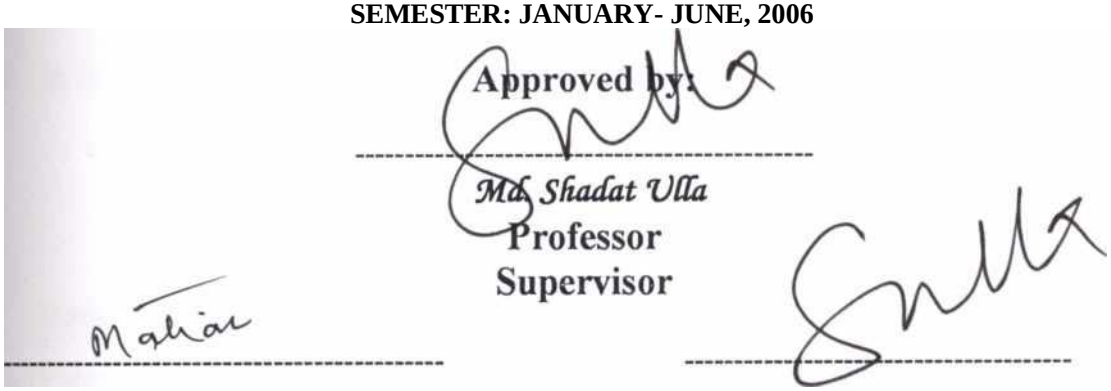

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CERTIFICATE

This is to certify that the thesis entitled, ***"ADOPTION OF MODERN AGRICULTURAL TECHNOLOGIES AND CLASSIFICATION OF THE ADOPTERS AT RAMRAIL UNION IN BRAHMAN BARIA DISTRICT*** " submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCENICE in AGRICULTURAL EXTENSION AND INFORMATION SYSTEM** embodies the result of a piece of bona fide research work carried out by **AMINUL ISLAM KHAN** Registration No. 23870/00141 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. Md. Shadat Ulla)

Supervisor

Dedicated 'To My

Beloved Parents

LIST OF ABBREVIATIONS

Full Word	Abbreviation
And others (at elli)	*et al.*
Department of Agricultural Extension	DAE
Sub. Assistant Agricultural Officer	SAAO
Agricultural Extensiton officer	AEO
Assistant Agricultural officer	AAO
Upazila Agricultural Officer	UAO
Veterinary assistant Surgeon	VAS
Upazilla Livestock Officer	ULO
Upazilla Food Officer	UFO
Hectare	Ha
Etcetera	Etc.
Example	eg-
Agro-Ecological Zone	AEZ
At the rate	@
Percent	%
Total Adoption Period	TAP
Adoption Period Score	APS
Total Adoption Period Score	TAPS

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'First and foremost, we are indebted to Allah, the Almighty, the Merciful, -without whose patronage and 6lessing, this thesis was far away. It is He, who gave us the power of determination, patience, courage and vanquished the stumbling hurdles that we have found on the way.

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Place: Dhaka ***Aminul Islam Khan***

Dated: June, 2006

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ABSTRACT

ADOPTION OF MODERN AGRICULTURAL TECHNOLOGIES AND CLASSIFICATION OF THE ADOPTERS AT RAMRAIL UNION IN BRAHMAN BARIA DISTRICT

BY
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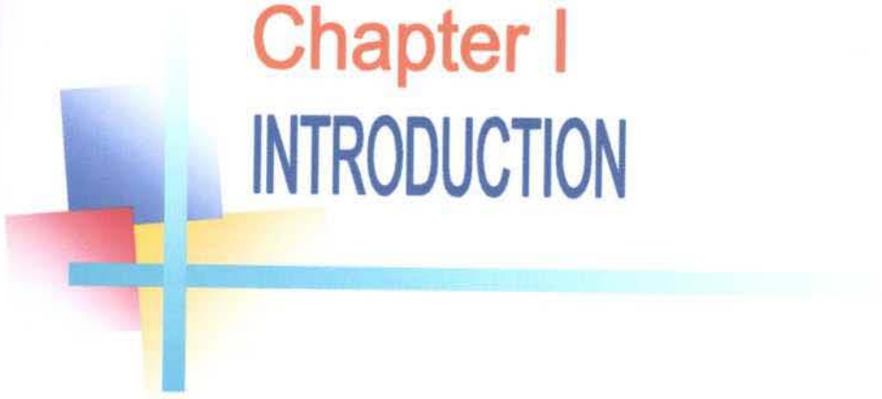
The main objectives of the study were: (i) to describe the selected characteristics of the farmers, (ii) to determine and describe the extent of use of modern technologies,
(iii) to classify the adopters on the basis of adoption of modern technologies, (iv) to explore the relationships of the selected characteristics of the farmers with their adoption of modern technologies. But the specific purpose was "Adoption of Modern Technologies and Classification of the Adopters"

The study was conducted in Sadar Upazila of Brahman Baria district. An interview schedule was used to collect needed information. Sample size of respondents was 90 randomly selected farmers and interviewed by the researcher himself through face to face interview. Statistical measurement like percentage, range, mean and standard deviation were used to interpret the data. Co-efficient of correlation was computed in order to explore the relationships between the concerned factors.

The respondents showed a remarkable individuals difference in their characteristics. The category of respondent having middle age (53.3%), secondary level literacy rate(53.3%), medium family size(56.7%), medium income(46.7%), small farm size(40.0%), medium cosmopoliteness (52.2%), low organizational participation (47.8 %) and medium extension contact(48.9%).

The findings reveals that 3.33% of farmers were innovator, 12.22% were early adopter, 34.44% were early majority, 34.44% were late majority and laggards were 15.57% for overall adoption. But incase of individual technologies the category varies supporting the generalization of one individual may be innovator in one innovation but laggard in another.

Relationship between education, annual income, farm size, cosmopolitenees, organizational participation, extension contact with their adoption of modern technologies was positively significant. . On the other hand, age, family size had insignificant relationship with their adoption of modern technologies.



Chapter I
INTRODUCTION

CHAPTER I

INTRODUCTION

1.1 General Background

Bangladesh is a developing country comprising of total area 147570 sq. km with a total population of 137 million and considered to be the most densely populated country in the world. The total cultivable land is 81,60,728.745 ha. Practically all cultivable lands are under use but due to the pressure of increasing population the average size of farm has been reducing continuously. It was 0.91 ha in 1984 and the same was decreased to 0.8 ha in 2005 (Bangladesh Orthonoitik Somikkha, 2005). Agriculture contributes a lion share in national economy of the country with 21.99 % the Gross Domestic Product (GDP) and employs 62.3 % of the labour forces (Bangladesh Orthonoitik Somikkha, 2005).

Over a period agricultural sector could not produce enough food to feed her population. Agriculture is the only means of livelihood for the vast majority of her population. Though agriculture is the largest segment of Bangladesh economy, she has been over a period of years fails to produce enough food to feed her population. As a result she has to import huge quantities of food grain from abroad at the cost of enormous amount of hard earn foreign exchange. It has, therefore, an abiding impact on the total development program of Bangladesh. If had we been self sufficient in food, the exchange involved in importing food grains could be diverted to accomplish other developing activities . All these facts lead to the contention that efforts for developing agriculture

must be geared up through a well planned agricultural development programs. The questions now arises

How it could be achieved? Obviously the answer is to adopt the technological innovations of agriculture.

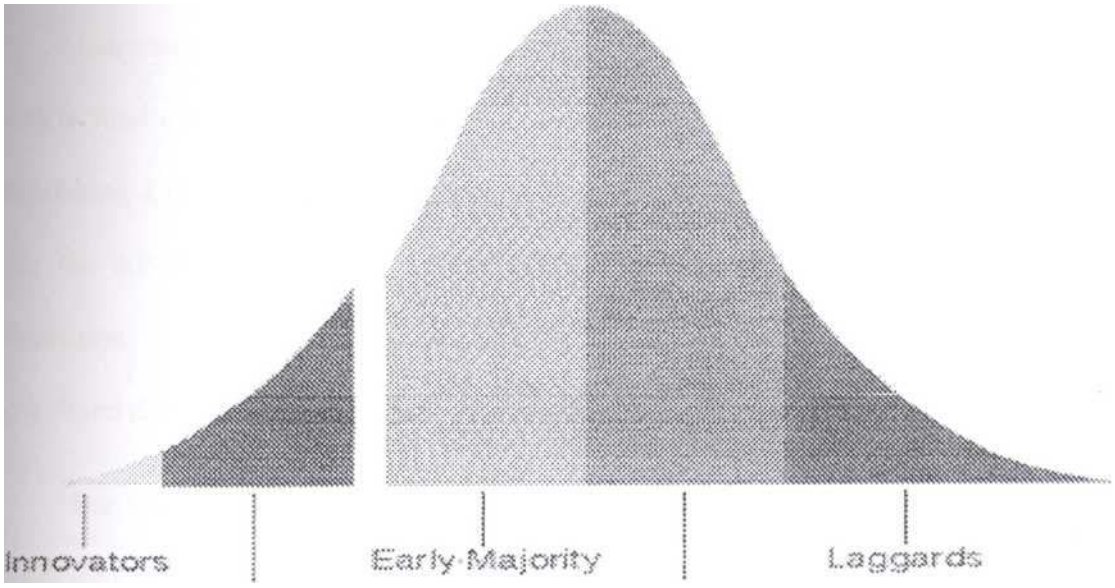
Extension specialists have observed that following traditional agriculture in no way to solve the food problems of Bangladesh. Rather, farming should be modernized with the use of technologies developed by the adurous research. The technologies developed by the research are being not adopting by the farmers. It is reported in **a** workshop conducted by DAE that only 30 % of the modem technologies have been adopted (DAE, 1995). So, it is now the crucial time to disseminate the modern technologies among the farmers through different organizations to achieve the target. Now the question is, how to reach 70 % of farmers (Who are not adopting modern technologies)? There fore, we are to get the answer of the following questions:

► What will be the way to adopt an innovation or modern technologies?

► How an individuals farmers adopt an innovation and when?

To get the answer of these questions Roger's advanced a theory, “Not all individuals in social system adopt an innovation at the same time. Different individuals adopt an innovation at different time.”

On the basis of this concept he divided users into five categories on the basis of innovativeness. The categories are shown in the figure 1.1 at page3 :



Early Adopters Late Majority

Fig. 1.1: ADOPTER CATEGORIES (Roger's 1983)

Roger,s suggested this classification under advanced condition. But whether these classifications is appropriate in underdeveloped condition like ours, is the main theme of this research topic.

The above discussion makes it clear that executing an agriculture development program effectively there is an urgent need to identify the adoption pattern of users and on the basis of this adoption pattern of modem technologies the adopter categories are to be identified. In order to use the adopter categories in the Agricultural Development Programs it is necessary to have a correct understanding of the nature of the adopter categories among the farmers. One also needs to understand the adoption pattern of the modern technologies. But little research has been done in Bangladesh on adopter categories among the farmers on the basis of adoption of modem technologies. Agencies dealing with agriculture development have also not been able to involve adopter categories in a planned way.

Importance of identification of adopter categories of the farmers for extension work in rural areas and lack of adequate information on it, indicate an urgent need for undertaking a research for proper understanding the phenomenon of adopter categories with the adoption of modem technologies. Findings of such research will yield information which will be helpful for proper utilization of adopter categories in agricultural development programs.

For this type of problematic situation the researcher of this study has become keenly interested to undertake this type of study. The researcher of this study conducted this study in two villages Ulchapara & Bijessor under Ramrail Union at Brahman Baria Sadar in Brahman Baria District. Ramrail union is southern part of Brahman Baria and 05 kilometers away from thana headquarter(which is locatcd in methodology). Brahman Baria District is considered as the rice producing zone of the country, where modem technologies: Mechanical Cultivation, HYY Rice, Line transplanting, T-Aman, Top dressing, IPM were a major enterprises. Sadar Thana area, therefore, considered as a most suitable location to study the phenomena of adopter categories on the basis of adoption of modem technologies. Studies on individual, group and society reveal that different adopter categories and adoption are dependent upon many factors. Some of these factors are social, personal, economical and situational. While conducting any study on the adoption of modem technologies and adopter categories, these factors need to be taken into consideration.

1.2 Statement of the problem

When an innovation is introduced to the farmer, it may be readily accepted, partly accepted, completely or partly rejected or sometimes it may so happen that the adoption of innovation is discontinued or totally stopped. These happenings are certainly due to a number of factors. Adoption of modern technologies is influenced by the farmers' demographic and socio economic position. An understanding about the same will be useful to the researchers, planners and extension workers in doing research, planning and execution of extension programs for enhancing adoption of modern technologies. The purpose of this study therefore, was to explore the relationships between different characteristics of the farmers and their adoption of modern technologies and classify the adopter categories. This was done by seeking answers to the following questions:

0. What are the characteristics of the farmers of the village Ulchapara & Bijessor of Ramrail Union in Sadar thana of Brahman Baria ?
1. How and to what extent the modern technologies in cultivation were adopted by the farmers?
2. What are the classes of adopters among the farmers on the basis of extent of use of modern technologies?
3. What are the relationships of the adoption of modern technologies with some selected characteristics of the farmers?

1.3 Objectives of the study

To get the answer of the above questions, the researcher under took a piece of **research** topic entitled on **"Adoption Of Modern Technologies And Classification Of The Adopters"**

The following specific objectives were formulated for giving proper direction to the study:

1. To describe the selected characteristics of the farmers. The selected characteristics were:

i) Age

ii) Education

iii) Family size

iv) Annual income

v) Farm size

vi) Cosmopoliteness

vii) Organizational participation

viii) Extension contact

2. To determine and describe the extent of use of modern technologies by the farmers. The modern technologies were:

i) Mechanical cultivation

ii) Line transplanting

iii) HYV Rice

iv) Top dressing

v) IPM

vi) T-Aman.

3. To classify the adopters on the basis of adoption of modern technologies.

4. To explore the relationships of the selected characteristics of the farmers with their adoption of modern technologies.

1.4 Limitation of the study

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

1. The study was confined in two villages of one union under sadar thana of B.Baria district.
2. Only eight characteristics of the farmers were selected.
3. Population of the study includes only the heads of the farm families.
4. Only six agricultural modern technologies were selected as modern technologies: HYV rice, Line transplanting, Mechanical cultivation, IPM practices, Top dressing, T-Aman rice.
5. The study was confined with the rice growers during June-July of the year 2005.

1.5 Assumptions:

An assumption is “the supposition that an apparent fact of principle is true in the light of the available evidence” (Goode and Hutt, 1945) While undertaking the study the following assumptions were taken into account:

1. The respondents were capable of providing proper responses to the questions included in the instrument.
2. Views and options furnished by farmers included in the sample were the representative views and opinion of the whole population of the study area.

3. The responses furnished by the respondents were reliable i.e. They expressed the truth about their conviction and options

1.6 Definition of related terms

The terms, which used throughout the study are defined below for clarity of understanding

Age: It means the age of a farmer that refers to the period of time from his birth to the time of investigation.

Education: Education referred to the desirable change of human behavior, i. e. change in knowledge, skill and attitude of an individual through reading, writing and other related activities.

Family size: The total members in the family of the respondent were considered as the Family size.

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

Farm size: The term referred to the hectare of land owned by a farmer on which he carried his farming and family business, the area being estimated in terms of full benefit to the farmers.

Cosmopoliteness: It is referred to the degree of external orientation of an individual to his own social system.

Organizational participation: An organization is defined as an association of persons which has a name of regular set of officials and at least one face to face meeting in a year. Participation in an organization by a respondents referred to his taking part in the organization as general member, executive member or office bearer.

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

Modern technologies: The term is used to those recommended practices by some competent authority through which better yield is achieved by various management and inputs. This term could be interchangeably with improved farm practices, selected farm practices, improved technologies etc.

Mechanical Cultivation: It referred to cultivate land by machine or equipment(Tractor/ Power tiller) which does not required more labour and it can cultivate a large field within a short time.

HYV: It refers to the variety (ies) those have the capability of high production per unit area.

Line transplanting: It referred to transplanting seedlings keeping specific distance with a help of rope.

Top Dressing : It referred to application of fertilizer (specially Urea) over the plant after 20-30 days after transplantation.

T-Aman: It referred to Transplanted Aman. Where seedlings are raised in a seedbed and transplanted in the main field.

Integrated Pest Management (IPM): Agricultural Board of National Council in 1971 **has** defined IPM as "An ecological approach to pest management where all available **necessary** techniques are consolidated into a unified program. So that pest populations **can be** managed in such a manner that economic damage is avoided and adverse effects **are** minimized. It includes five components, such as use of (i) Resistant variety,(ii) Cultural practices, (iii) Biological practices,(iv) Mechanical practices, (v) Chemical practices.

Adoption: It is the decision to make full use of an innovation as the best course of action available (Rogers, 1983).

Innovation: An innovation is an idea, practices or object perceived as new by an individual. In this study, modern technologies are treated as innovations.

Adopter categories:

The term adopter categories has been defined variously by different authors but E.M Rogers defined it precisely "Not all individuals in a social system adopt an innovation at the same time". Rather, they adopt in a time sequence and they may be classified into adopter categories on the basis of when they first begin using a new idea. Roger,s classify the adopter in five type. This are:

i) Innovators

ii) Early adopter

iii) Early majority

iv) Late majority

v) Laggard's

Chapter II

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

The researcher made an elaborate search of available literature for this research. Available literatures were extensively reviewed to find out work in Bangladesh as well as abroad. The reviews are conveniently presented based on the major objectives of the study. This chapter is divided into four major sections. The first section deals with the concept of adoption of modern Technologies. The second section deals with concept of the classification of adopter categories. The third section deals with expert opinions and past research findings relating to the relationships of the farmers adoption of modern technologies with their selected characteristics. The fourth section deals with the conceptual framework of the study. There is also a major section dealing some reviews of problem issues with adoption of modern agricultural technologies.

2.1 Concept of Adoption

Adoption is a decision to make full use of innovation as the best course of action available (Ray, 1991). When an individual takes up a new idea as the best course of action and practices it, the phenomenon is known as adoption.

Or

The term adoption has been defined as the “Integration of an innovation into a farmer’s normal farming activity over an extended period of time.”

2.1.1 Review of studies related to the adoption of modern technologies

Kashem *et al.* (1990) stated, “The technologies are of no use unless they are used by their potential users”.

Okoro *et al.* (1992) stated, “Adoption of the new practices tended to be high for less complex and less readily available ones, while low for relatively more complex and expensive practices”.

Hasan (1996) stated, “An increased rate and extent of adoption of selected technologies are vitally important for increasing the yield of field crops, vegetables production and forestry products”.

Islam (1996) stated, “Farmers would show higher interest to those technologies where their economic safety is guaranteed”.

Chowdhury *et al.* (1997) stated that modern varieties of rice so far developed by BRRI and National and International Research Institutes did not suit all production environment which was one of the most important reasons for non adoption of modern rice variety. Therefore, ecosystem oriented research programme should be strengthened.

Karim (1973) carried out a study of the adoption of fertilizers by transplanting Aman growers in Keyotkhali union of Mymensingh district. He investigated the adoption of three fertilizers such as Urea, Triple super phosphate (TSP) and Muriate of Potash (MP). He expressed that 4 percent of the respondent growers had high level of adoption of the fertilizers, 9 percent had medium adoption and 41 percent had low adoption. Forty six percent (46%) of the remaining respondent growers were non-adopters.

Gogoi and Gogoi (1989) conducted a study on adoption of recommended plant protection practices in rice in Jorhat district of Asam State in India. The recommended practices were seed selection, seed treatment, growing of tolerant or resistant variety, prophetic measures and chemical protection measures. The study revealed that among the respondent 50 percent had low level of adoption, 36.36 percent had medium level of adoption and 13.64 percent had high level of adoption of recommended plant protection practices.

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

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.

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

Khan (1993) carried out a research study on adoption of insecticides and related issues in the village of Pachar union, Madaripur district. He observed that among the respondent farmers, 7 percent had no adoption, 57 percent had low adoption, 32 percent had medium adoption and only 4 percent had high adoption of insecticides.

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

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

Islam (1996) carried out a study in farmer use indigenous technical knowledge (ITK) in the context of sustainable agricultural development. He found in the extent the 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 highest user category respectively.

Ali *et al.* (1986) conducted a study on adoption of technology is the function of various factors within which a farmer decides to adopt or reject an innovation.

Halim (1985) stated that several personal, socio-cultural and institutional factors affected the diffusion of innovations of farmers. He also stated that the tendency was for the better educated, younger, owner cultivators and rice farmers to adopt innovations earlier than others. He again observed that the farmers with characteristics of cosmopoliteness, leadership ability and high organizational participation usually adopted innovations earlier.

Saeed (1989) stated that adoption of innovation was more closely related to individual and farm related factors than community and family level variable.

Rogers (1983) reviewed 2,376 past research studies and postulated 31 generalization of innovativeness. This includes among others are personal characteristics and socio-economic characteristics of the farmers. He stated that innovative farmers had more years of education, larger farm size, higher income, more cosmopoliteness, higher organization participation, lower degree of fatalism and higher knowledge in farming. However, age did not yield a consistent relationship with innovation proneness. Hossain *et.al* (1992) indicated similar results.

2.2 The concept of adopter categories

The term adopter categories have been defined variously by different authors but E.M Rogers defined it precisely. Therefore, it is presented here for a clearer understanding of the concept of adopter categories. “Not all individuals in a social system adopt an innovation at the same time”. Rather, they adopt in a time sequence and they may be classified into adopter categories on the basis of when they first begin using a new idea.

Adopter categories

The five adopter categories set forth are ideal types (Rogers, 1983):

(i) Innovators

(ii) Early adopters

(iii) Early majority

(iv) Late majority

(v) Laggards

2.2.1 Review of studies related to the adopter categories

N. S. Shetty (1986) stated percentage distributed of adopter categories for three innovations in India at two Mysore village. For improved seed innovation he got 3.4,11.0, 27.3, 48.3, 10.0, for chemical fertilizer innovation 2.3, 10.0, 28.4, 53.2, 5.1 for Japanese method of rice cultivation 22.1, 19.8, 32.1, 17.3, 8.6 as Innovator, Early adopter, Early majority, Late majority & Laggards.

Modabber (2002) stated percentage distributed of adopter categories in two selected villages of Ghagra union of Mymensing district in respect of Binasail rice variety and he got 5 % of the respondent were innovator, 12 % were early adopter, 36 % early majority, 36 % late majority and 11 % were laggards.

2.3 Adoption of modern technologies and their relationship with their selected characteristics

2.3.1 Age and adoption of modern technologies

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

Pathak *et al*. (1992) observed that there was positive and significant relationship between the age of the marginal farmers and their adoption of jute technologies. Similar finding was observed by Ali *et al.* (1986), Singh and Rajendra (1990), Okoro *et al* (1992) and Hossain *el al.* (1992).

Haque (1993) observed that age had negative relationship with the adoption of insecticides. Kasem (1987) observed similar relationship.

Islam (1993) observed that there was no relationship between the age of respondent potato farmers and their adoption of improved practices in potato cultivation.

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

Mohammad (1974) undertook an investigation on the farmers adoption of insect control measure with related aspects. He found that age, education, family size, farm size, cosmopoliteness of the farmers had no significant correlation with their adoption of their insect control measure. Extension contact, organizational participation had however, significant positive correlations with their adoption of insect control measures.

Muttaleb (1995) reported that age of the farmers had no relationship with overall adoption of potato technologies.

Hossain (1999) conducted a study to determine the farmers' perception of the effects of agro-chemical on environment. He found that age of the farmers had no relationships with their adoption of fertilizer.

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

2.3.2 Education and adoption of modern technologies

Katarya (1989) observed that education of the farmers was positively related to their adoption of wheat technology.

Pal (1995) conducted a study on adoption of recommended sugarcane cultivation practices by the farmers. He found that education had significant and positive relationship with the adoption of recommended sugarcane cultivation practices.

Haque (1984) conducted a study in Jessore district on the adoption of improved practices in sugarcane cultivation. He reported that education, farm size, organizational participation and extension contact of the growers significantly influenced their adoption of the improved practices.

Hasan (1996) conducted a study on adoption of some selected agricultural technologies among the farmers as perceived by the frontline GO and NGO workers. He found that the education had no significant relationship with the perceived adoption of selected agricultural technologies.

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

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

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

2.3.3 Family size and adoption of modern technologies

Hossain (1983) in his study in Bhabakhali union of Mymensingh distract observed that family size of the farmers had no relationship with their adoption of HYV rice as transplanted aman.

Mohammad (1974) undertook an investigation on the farmers adoption of insect control measure with related aspects. He found that age, education, family size, farm size, cosmopoliteness of the farmers had no significant correlation with their adoption of their insect control measure. Extension contact, organizational participation had however, significant positive correlations with their adoption of insect control measures.

Mustafi *et al.* (1987) in their study found that number of family members had no significant effect on adoption of modern varieties of rice in Bangladesh.

Hossain (1991) in his study in Sadar Thana of Jamalpur district obserbed that family size of the farmers had no significant effect on the adoption of improved farm practices.

Pal (1995) carried out a research study on adoption of recommended sugarcane cultivation practices by farmers in two selected centre of North Bengal Sugar Mills. He showed in his findings that family size of the respondent farmers had no significant relationship with their adoption of recommended sugarcane cultivation practices similar findings were observed by Hossain (1991), Bashar (1993) and Islam (1993).

2.3.4 Annual income and adoption of modern technologies

Hossain (1991) conducted a research study on the adoption behaviour of contact wheat growers. In the study, he found that there was no relationship between the income of contact growers and the adoption of improved farm practices in wheat cultivation.

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

Haque (1993) found a significant relationship between farm income and adoption of improved practices in sugarcane cultivation.

Khan (1993) found significant relationship between annual income of the farmers and their adoption of insecticides.

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

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

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

2.3.5 Farm size and adoption of modern technologies

Baadgaonaker (1984) observed that size of land holding was significantly related with the adoption behaviour of groundnut cultivators.

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

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

Haque (1984) conducted a study in Jessore district on the adoption of improved practices in sugarcane cultivation. He reported that education, farm size, organizational participation and extension contact of the growers significantly influenced their adoption of the improved practices.

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

Khan (1993) observed that farm size was positively related to the adoption of insecticides.

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

2.3.6 Cosmopoliteness and adoption of modern technologies

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

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

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

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

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

2.3.7 Organizational participation and adoption of modern technologies

Karim (1973) conducted a study on the adoption of fertilizers in Keyotkhali union of Mymensing district. He found a positive relationship between organizational participation and their adoption of fertilizers.

Mohammad (1974) undertook an investigation on the farmers adoption of insect control measure with related aspects. He found that age, education, family size, farm size, cosmopoliteness of the farmers had no significant correlation with their adoption of their insect control measure. Extension contact, organizational participation had however, significant positive correlations with their adoption of insect control measures.

Haque (1984) conducted a study in Jessore district on the adoption of improved practices in sugarcane cultivation. He reported that education, farm size, organizational participation and extension contact of the growers significantly influenced their adoption of the improved practices.

2.3.8 Extension contact and adoption of modern technologies

Aurangozeb (2002) observed that there was significant relationship between farmer contact with extension media and adoption of integrated homestead farming technologies.

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

Haque (1984) conducted a study in Jessore district on the adoption of improved practices in sugarcane cultivation. He reported that education, farm size, organizational participation and extension contact of the growers significantly influenced their adoption of the improved practices.

Mohammad (1974) undertook an investigation on the farmers adoption of insect control measure with related aspects. He found that age, education, family size, farm size, cosmopoliteness of the farmers had no significant correlation with their adoption of their insect control measure. Extension contact, organizational participation had however, significant positive correlations with their adoption of insect control measures.

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

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

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

2.4 The Conceptual Framework of the Study

The conceptual framework of Rosenberg and Hovland (1960) was kept in mind while framing the structural arrangement for the dependent and independent variables. This study was concerned with dependent variable adoption of modern agricultural technologies by the farmers and the selected characteristics of farmers as independent variables.

The present study tried to focus two concepts: first farmers' selected characteristics; and the second, adoption of modern agricultural technologies. Adoption

of an individual may be influenced and affected through interacting of many characteristics in his surroundings. It is impossible to deal with all characteristics in a single study. It was therefore, necessary to limit the characteristics which include age, education, family size, annual income, farm size, cosmopoliteness, organizational participation, extension contact. The conceptual model of the study has been presented in fig. 2.1.

Independent variables

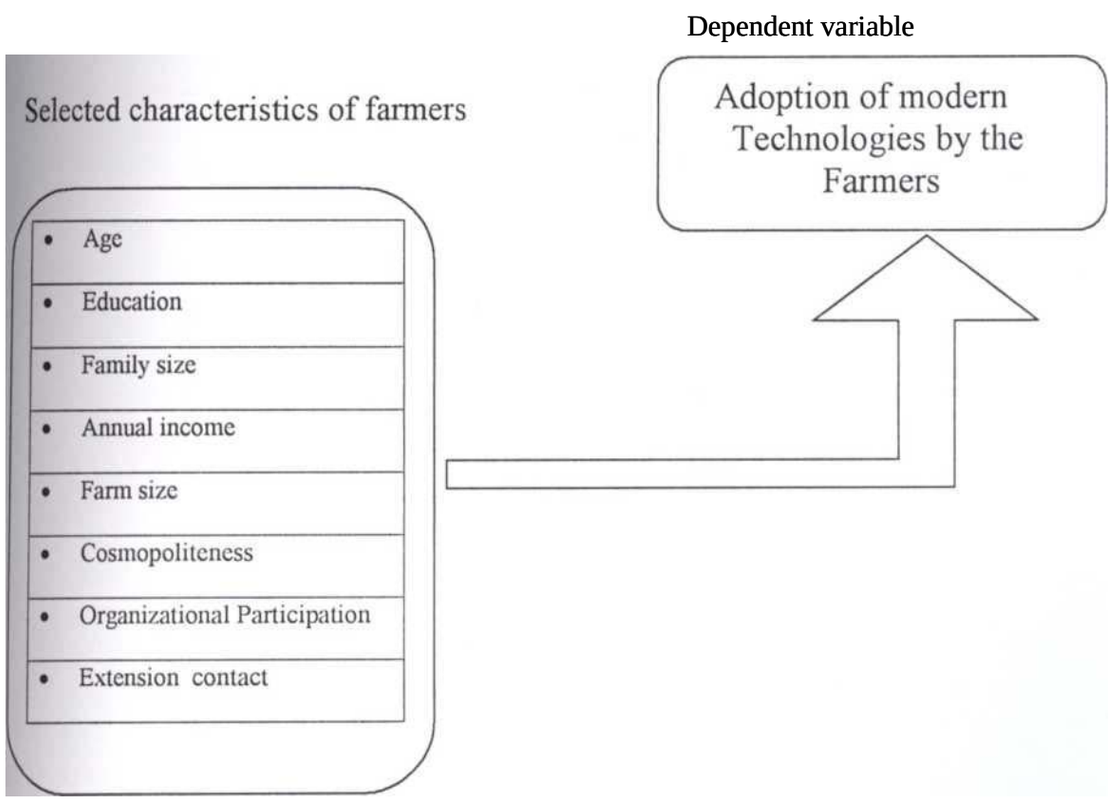


Fig 2.1 A simple conceptual framework for the study.

Chapter III

METHODS AND MATERIALS

RESULT AND DISCUSSION

CHAPTER III

METHODS AND MATERIALS

Methodology refers to the methods and procedures that are used in the research work. For any scientific investigation methods and procedures are very important and require a very careful consideration. The researcher was very much careful for using proper methods in all steps of the investigation. This chapter includes locale of the study, population and sampling design, development of the instrument, data collection procedure, data collection, data processing and analysis, data analysis procedure, variable of the study and statistical treatment. The methods and procedures followed in conducting this research are presented below:

3.1 Locale of the study

The study was conducted at two villages namely Ulchapara and Bijessor in Ramrail union of Sadar thana of Brahman Baria district. In Sadar thana there are 28 unions. Ramrail union is 05 kilometers away from thana headquarter. The sadar thana covers an area of about 440.71 square kilometers having 37,000 hecTAPes of land. Cropping intensity of Sadar thana is 197.30 percent. Ramrail union is well communicated from thana headquarter. The farmers of this union cultivates mainly rice and vegetables. Sadar thana is located in AEZ no.30.

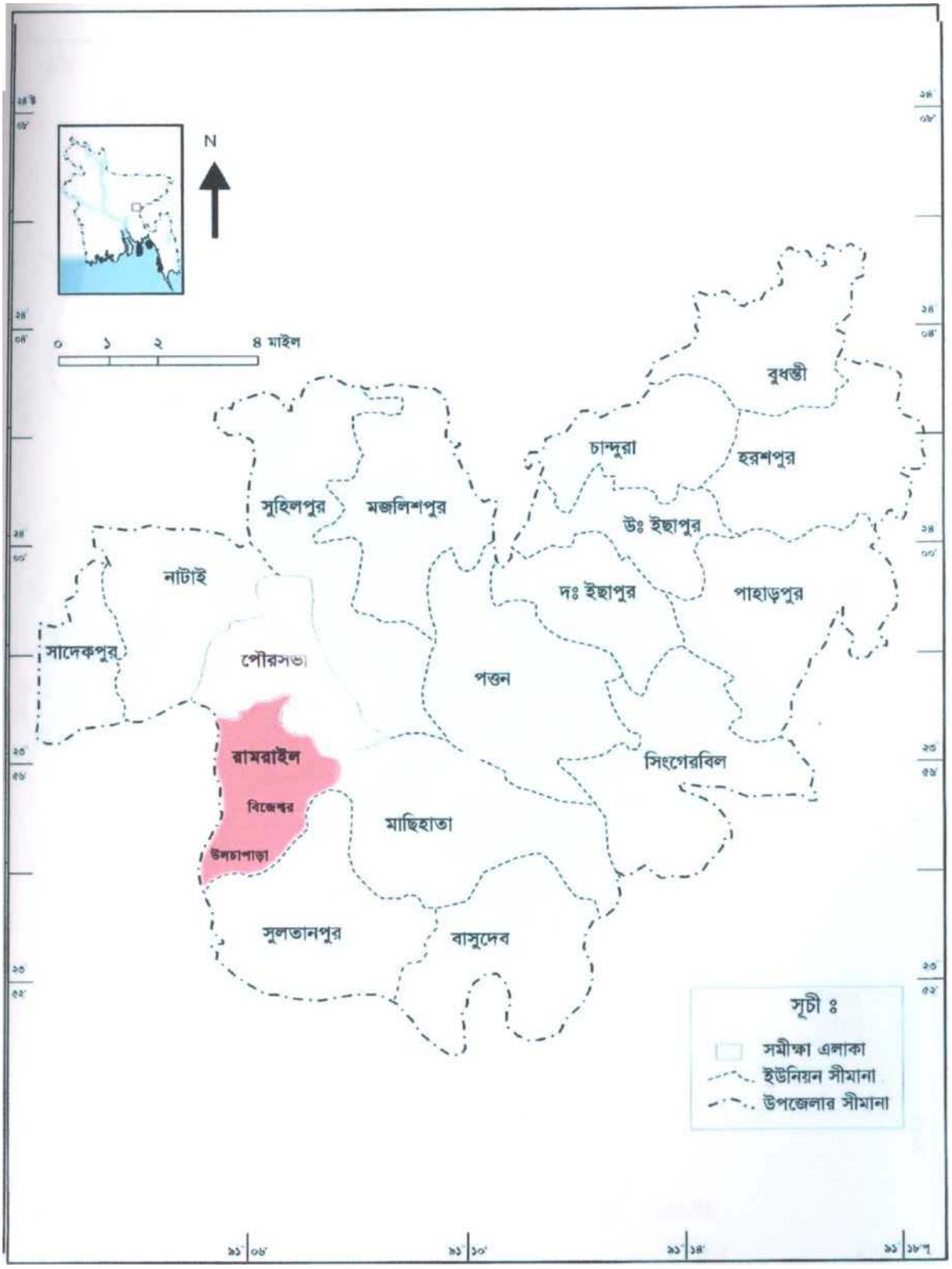


Fig- 3.1: A Map of Brahmanbaria Thana

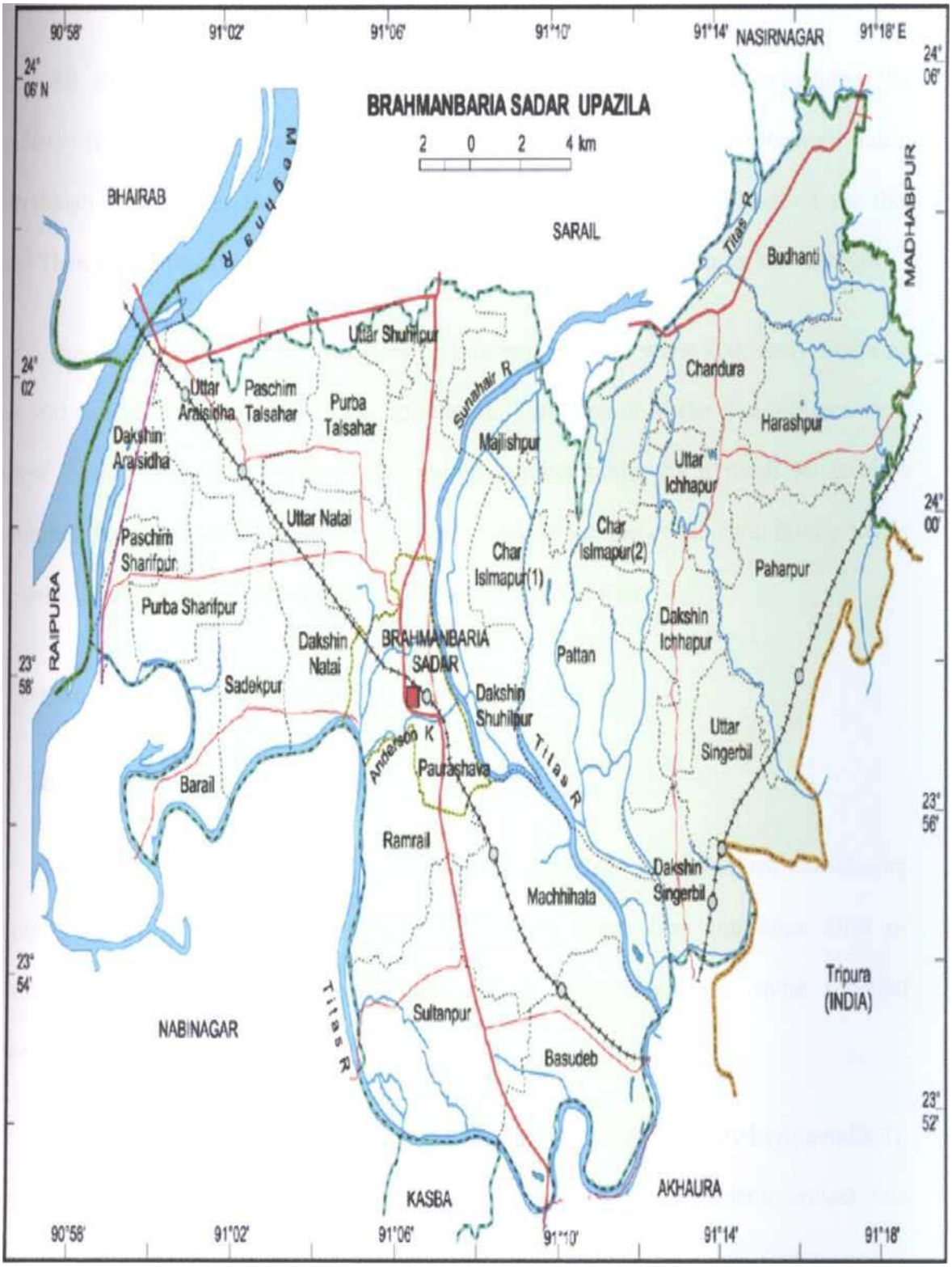


Fig- 3.2: A Map of Brahmanbaria District

3.2 Population and Sampling Design

All the rice growing farm family heads of the study area constituted the population for the study. Two villages namely Ulchapara and Bijessor of Ramrail union of Brahman Baria sadar thana were selected using random sampling method for this study. Then a list of growers of these two villages was made by the help of the SAAO.

The total number of rice growers of this two villages were 900. Only heads of these 900 rice growers constituted the population. Ten percent of the rice growers were selected from each village by using a random number table. As a result 90 farmers constituted the sample size. To make the representative sample of the farm family heads were selected randomly and proportionately from the study area.

3.3 Instrument for data collection

3.3.1 Development of the Instrument

In order to collect information, an interview schedule was developed considering the objectives of the study. The schedule contained both close and open form of questions. Appropriate scales were developed to collect data for some selected characteristics.

The schedules both in Bengali and English version were prepared (Appendix-I). The Bengali versions of the schedule were multiplied as per requirements to collect data from the respondent of the study.

3.3.2 Design of the study

The design of the study was descriptive survey research. It was designed to describe the relationship between selected characteristics of the farmers and their extent adoption of modern technologies. Data were collected from the selected respondents by using an interview schedule.

3.4 Methods of the data collection

3.4.1 Data Collection Procedure

For collecting relevant data an interview schedule was prepared keeping the objectives of the study in mind. The schedule were judged by a panel of experts and also pre-tested to test its suitability. The pre-test helped the researcher to examine the suitability of different questions and statements of the draft schedule. Based on the findings of the pre-test, necessary corrections, additions, and rearrangements were made in the scheduled before the instrument was given final shape for collecting data.

3.4.2 Data Collection

For the study, data were collected by means of interview with sample farmers. The researcher himself collected data with the help of local SAAO established rapport with the respondents and collected the data in a cordial atmosphere.

3.4.3 Data Analysis Procedure

Collected data from the respondents were complied, coded, tabulated and analyzed in accordance with the objective of the study. The SPSS/PC+ computer

programs were used to perform the data analysis. For describing the various independents and dependent variables, the respondents were classified into several categories in respect of each variable. These categories were developed by considering the nature of distribution of the data and the general consideration prevailing in the social system.

3.4.4 Data Processing and Analysis

After collection of data, all information contained in the interview schedule were edited. Data were transferred to coding sheet with numerical scores given to each question. Simple statistics like frequency counts, percentage, mean and standard deviation were used in the interpretation of the descriptive data.

3.5 Statement of hypothesis

3.5.1 Hypotheses

Defined by Goode and hatt (1945), a hypothesis is “a proposition which can be put to a test to determine its validity. It may be seen contrary to, or in accordance with common sense. It may prove to be correct or incorrect. In any event however, it leads to an empirical test”. However, to test the relationship between the variables, the researcher advanced the following null hypothesis.

1. There is no relationship between age of the farmers and adoption of innovation
2. There is no relationship between formal education of the farmers and adoption of innovation
3. There is no relationship between family size of the farmers and adoption of innovation
4. There is no relationship between annual income of the farmers and adoption of innovation

5. There is no relationship between land owner of the farmers and adoption of innovation
6. There is no relationship between cosmopoliteness of the farmers and adoption of innovation
7. There is no relationship between organizational participation of the farmers and adoption of innovation
8. There is no relationship between extension contacts of the farmers and adoption of innovation

3.6 Statistical Treatment

Statistical measures, such as frequency, percentage, range, mean, standard deviation were used for the descriptive data. For clarity of understanding tables and figures were used when necessary for visual presentation of data. Correlation of coefficient test was used to determine the relationship between and among the categories of farmers with regard to their adoption of modern technologies based on selected characteristics. Throughout the study 0.01 level of probability was used as the basis for rejected or accepting a null hypothesis. If the computed value of 'r' was equal to or greater than the table value of 'r' at 0.01 level for the relevant degrees of freedom, the null hypothesis was rejected and vice-versa for acceptance.

3.7 Selection of the Variables of the study

3.7.1 Selecting the independent variables

In a descriptive survey research, the selection and measurement of the variables constitute an important task. A research hypothesis contains at least two elements: an independent variable and a dependent variable. An independent variable is the factor that

is manipulated by experimenters to ascertain its relationship to an observed phenomenon. **A** dependent variable is the factor that appears, disappears or varies with the variation of **the** independent variable (Townsends, 1953)

The independent variables of this study were: Age, Education, Family size, Annual income, Farm size, Cosmopoliteness, Organizational participation, Extension contact.

The dependent variable was adoption of modern technologies of rice cultivation. Modern technologies were (Mechanical cultivation, Line transplanting, High yielding variety (HYV) practice, T-Aman practices, Top Dressing practices, Integrated Pest Management (IPM) practices).

3.8 Measurement of the variables

In order to conduct the study in accordance with the objectives it was necessary to measure the selected variables. The procedure for measurement of selected independent and dependent variables have been described in this section.

3.8.1 Measurement of the independent variables

The 8 selected characteristics of the respondents constituted the independent variables of the study. The independent variable were measured given as follows:

3.8.1.1 Age

The age of the each respondents was measured by counting the actual years from his birth to the time of interview on the basis of his statement. It was expressed in terms of years. No fraction of year was considered. A score of one (1) was assigned for each years of his age.

3.8.1.2 Education

The education of a respondent was measured by the number of years of schooling. Score of one (1) was given for each year of schooling completed. For example, if a respondent was illiterate, his education score was zero. While score of 1 was given to that respondent who could sign only. If a respondent passed class V, his education was considered as 5. If a respondent did not go to school but studied at home and if his knowledge status was equivalent to the student of class five, then his score was 5. According to the education score, the respondents were classified in the above categories.

3.8.I.3 **Family size**

Family size refers to the total number of family member of the respondents' family. Score 1 was given for each and every member of the family. Family size was classified in the following categories:

Family Categories	Family size
Small family	1-4 members
Medium family	5-8 members
Large family	9 and above members

3.8.1.4 **Annual income**

Family income of a respondent was measured by taking sum of income earned by the respondent himself and other members of his/her family in a year from such sources as: crop sector, livestock and fisheries sector and non-agricultural sector. It was expressed in thousand taka. Score 1 was assigned for each thousand taka. Based on the annual income the respondents were classified into the following:

Categories	Income Score
Very low income	Up to 50
Low income	51 to 100
Medium income	101 to 150
High income	151 and above

3.8.1.5**Farm size**

Farm size was estimated on the basis of cultivated area either owned by a farmer or cultivated on share cropping. The farm size was measured in terms of hectre by using the following formula:

Farm size = A+B+l/2 (C+D) - F

Where,

A= Own land under own cultivation B= Land taken on lease from others C= Land given to other on share cropping (borga)

D= Land taken from other on share cropping (borga)

F= Land given on lease to others.

One score was assigned for each hecTAPe of land of a respondent. Based on the farm size, the respondents were classified into following categories:

Categories	Land
Marginal	Up to 0.5 ha or <0.51 ha
Small	0.51 - 1.0 ha
Medium	1.01-3.0 ha
Large	>3.0 ha

Cosmopoliteness of the respondents were measured on the basis of their visit to **six** different places out side their home. These six different places were: (i) visit to outside of his village (ii) visit to thana headquarter (iii) visit to other thana head quater **(iv)** visit to own district town (v) visit to other district (vi) visit to cities. Respondents **were** asked whether they visited these places frequently, occasionally, rarely or not at all. Score was given as 0 for not at all, 1 for rarely, 2 for occasionally and 3 for frequently of visiting those places respectively. The score could range from 0 to 18.

3.8.1.7 Organizational participation

Organizational participation of a respondent was measured by his membership in different organization for particular period of time. These different organization were (i) Union porishod (ii) co-operative society (iii) NGO (specific) (iv) youth club (v) irrigation committee (vi) argil, co-operative committee (vii) school committee (viii) madrasa committee (ix) bazar committee (x) farmers association (xi) others. For participation weight was assigned as 0, 1, 2, & 3 for not at all, General member, Executive member, and Office bearer respectively (chairman /president & secreTAPies). Organizational participation could range from zero to 33; zero indicates the no organizational participation and 33 indicate high organizational participation.

3.8.1.8 Extension contact

Here Extension Contact score of the respondents was computed based on his extent of contact with ten extension agents, namely village leader, SAAO, AEO, AAO, UAO, VAS, ULO, UFO, NGO officer and other officers, visit to thana agril. Office and

others. The respondents were asked whether they contacted those sources for getting necessary information regarding Agricultural and non-farm activities. The extent of their contact was frequently, sometime, rarely and not at all and the assigned score was 3, 2, 1 and 0 respectively. Extension contact could range from zero to 15; zero indicates the no extension contact and 15 indicate high extension contact.

Level of contact with extension agents was classified into the following categories with the appropriate score assigned for each contact:

Level of contact	**Score**
a) Not at all	0
b) Rarely (Once/3 month)	1
c) Sometime (Once a month)	2
d) Frequently (minimum twice a month)	3

3.8.2 Measurement of dependent variable

Adoption period of selected modern technologies for rice production was the dependent variables of the study. The selected technologies were: Mechanical Cultivation (MC), High yielding variety (HYV) practice, Line transplanting (LT), Top Dressing practices(TD), T-Aman practices (T-A), Integrated Pest Management (IPM) practices. Adoption period can be measured in various ways. A review of literature indicates that researcher in India used at least eight different measures of adoption. They are as follows:

SI. No.	Measured of adoption
1	Adoption and non-adoption
2	Number of practices adopted
3	Percent of Applicable practices adopted
4	Years of use of adopted practices
5	Innovativeness scale
6	Guttman scale of adoption
7	Trace line scale of adoption
8	Adoption quotient

For this study years of use of adopted practices was chosen for measuring the adoption period for selected modern technologies.

3.8.2.1 Years of use of adopted technologies

For this study the length of the period of use of the innovation was taken into consideration. For example, if a farmer has adopted the technologies for 2,3,4,5 and 6 years respectively then his adoption period score (APS) will be (2+3+4+5+6) = 20. Following this procedure, the adoption rate score for this study was measured by using the following formula:

$$APS = AP_{MC} + AP_{HYV} + AP_{LT} + AP_{TD} + AP_{T\text{-}A} + AP_{IPM}$$

Where,

APS = Adoption Period Score

AP_{MC} - Adoption Period for Mechanical Cultivation

AP_{HYV}= Adoption Period for High Yielding Variety

AP_{LT} - Adoption Period for Line transplanting

AP_{TD} = Adoption Period for Top Dressing

$AP_{T\text{-}A}$ = Adoption Period for T-Aman Cultivation

AP_{IPM} - Adoption Period for Integrated Pest Management

Following the above formula the researcher tried to calculate adoption Period for single technology by considering the total number of years. One has been given for one year of adoption. After calculating the adopting Period for all the technologies individually than the researcher added all the scores which made Adoption Period Score for a farmer. Then all the scores of the respondents were added together that made Total Adoption Period Score (TAPS). On the other hand, after calculating the adoption period for all the farmers for single technology and added all then makes total adoption period (TAP)for single technology.

RESULT AND DISCUSSION

3.9 Selected Characteristics of the Farmers

This section deals with the classification of the farmers according to their various characteristics. Behavior of an individual is largely determined by his characteristics. These characteristics of an individual contribute to a great extent in the matter of shaping of his behavior. Therefore, the major hypothesis of the study was that the adoption of modern technologies would also be influenced by various characteristics of the farmers.

Farmers' eight selected characteristics which also constituted the independent variables were: age, educational qualification, family size, annual income, farm size, cosmopoliteness, organizational participation, extension contact. A systematic and needed discussion on the findings in connection with the selected characteristics is presented below:

3.9.1 Age

The age of the respondents ranged from 23 to 65 years with an average and standard deviation being 40.6444 and 10.5589 respectively. On the basis of their age, the farmers were classified into three categories such as young, middle aged and old aged as shown below:

Table 3.9.1 Classification of the Respondents according to their Age

Categories (years)	Farmers (N=100)		Mean	Standard deviation
	Number	Percent		
Young (below 30)	20	22.2	40.6444	10.5589
Middle aged (31 to 50)	48	53.3		
Old (above 51)	22	24.4		
Total	90	100		

Data contained in table 3.9.1 show that the highest proportion (53.3%) of the respondents belonged to middle-aged category as compared to 22.2 percent being young and 24.4 percent old aged. This leads to understanding that the phenomena with regard to the adoption of modern technologies in rice production and other related factors would be reflected more by the middle aged group in the present study. So it reveals that greater number of respondents were within the age range of the study area. As a large section (53.3%) of the respondents were found middle aged farmers. The development as well as extension agencies should pay a clear attention to the lion section of the farmers who are perceptive and productive for the adoption of modern technologies. Basher (1993), Hussen (2001), Sarkar (2002), Islam (2002) and Seal (2002) also found the similar findings in their studies.

3.9.2 Education

Education of the respondents ranged from 0 to 18 years of schooling in the study area having an average and standard deviation being 4.9333 and 4.2606 respectively. On the basis of their education, the farmers were classified into four categories as shown in table

Table3.9.2 Classification of the Respondents according to their Education

Categories (schooling years)	Farmers (N=90)		Mean	Standard Deviation
	Number	Percent		
Illiterate (0)	8	8.9	4.9333	4.2606
Primary education (1 to 5)	48	53.3		
Secondary education (6 to 10)	24	26.7		
Above secondary education (above 10)	10	11.1		
Total	90	100		

Data presented in table 3.9.2 reveal that the highest proportion (53.3%) of the farmers was primary educated. In case of secondary level of education, the proportion was 26.7 percent. From the table it is revealed that 11.1 percent had above secondary level of education and 8.9 percent respondents were illiterate. The overwhelming majority (91.1%) of the respondents were found literate. These findings also indicated that the respondents had higher literacy than the national average which is 64.9 percent (Bangladesh Orthonoutik Somikkha, 2005). This may be due to inclusion of only male farmer in the present study. This finding was supported by chowdhury (1997), Sarkar (1997), Islam (2002), Aurangozeb (2002) and many others.

An educated individual is likely to be more receptive to the modern facts and ideas. They have much mental strength in deciding on a matter related to problem solving or adoption of technologies in their every day life. Such a farming community in the study area may be well considered as a suitable ground for the adoption of technologies or execution of change program whatever needed.

3.9.3 Family size

Family size of a respondents was measured in terms of actual number of members in his family (including himself) during the interview period. Farmers' family members ranged from 2 to 12. The mean and standard deviation being 5.8222 and 2.2010 respectively. On the basis of family size the respondents were classified into three categories.

Table3.9.3 Classification of the Respondents according to their Family Size

Categories (number)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Small family (up to 4)	24	26.7	5.8222	2.2010
Medium family (5 to 8)	51	56.6		
Large family (above 9)	15	16.7		
Total	90	100		

Data presented in the Table 3.9.3 show that the highest proportion (56.7%) of the farmers had medium family compared to 16.7 percent large family and 26.7 percent of the farmers had small family. Thus, majority (56.7%) of the farmer were in the category of medium farm family. Government extension agencies and NGO should pay attention to take steps for small and medium family holders on the priority basis. Similar findings (in respect of highest proportion) were also reported by Ali (1993), Basher (1993) and Seal (2002).

3.9.4 Annual income

The observed annual family income of the respondents ranged from 30 thousand taka to 318 thousand taka, the average being 113077.8 taka and standard deviation 69535.25taka. On the basis of their annual family income, the respondents were classified into three categories as shown in table 3.9.4

Table 3.9.4 Classification of the Respondents according to their Annual Income

Categories (‘000 TK.)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Very Low income (up to 50)	22	24.4	113077.80	69535.25
Low income (51 to 100)	26	28.9		
Medium income (101 to 150)	25	27.8		
High income (15 land above)	17	18.9		
Total	90	100		

Data presented in the table 3.9.4 indicate that the highest proportion (46.7%) of the farmers belonged to medium & high family income groups as compared to 24.4 percent very low and 28.9 percent low income group. The average income of the farmers of the study area is much higher than the average per capita income of the country i. e. 470 U.S. dollar (BBS, 2005), which is approximately equivalent to TK. 29383/- as current exchange rate. This might be due to the fact that the farmers of the study area were not engaged in agriculture only. They earned from other sources such as service, business etc. because B.Baria town is near to the study area and also there is a smooth high way connection facilities with the town that may effect on higher income. The findings provide a rational ground for the adoption of modern technologies for maximizing agricultural production as well as maximizing profit. Haque (1984) and Basher (1993) also reported similar findings (in respect of highest proportion).

3.9.5 Farm size

The farm size of the respondents of the study area ranged from 0.18 to 3.97 hecTAPes with an average and standard deviation being 1.4036 and 1.0281 respectively. Depending on the farm size the farmers were classified into four categories adopting DAE's classification (DAE, 1995b).

Table 3.9.5 Classification of the Respondents according to their Farm Size

Categories (hecTAPes)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Marginal farm(up to 0.5)	6	6.7	1.4036	1.0281
Small farm(0.51 to 1.0)	36	40.0		
Medium farm(1.01 to 3.0)	34	37.7		
Large farm(3.01and above)	14	15.6		
Total	90	100		

Data presented in the Table 3.9.5 show that the highest proportion (40.0%) of the farmers had small farm compared to 37.8 percent medium farm and 6.7percent of the farmers had marginal farm and 15.6 percent of the farmers had large farm. Thus, majority (40.0%) of the farmers were in the category of small to medium farm size. Government extension agencies and NGO should pay attention to take steps for small and medium farm holders on the priority basis. Similar findings (in respect of highest proportion) were also reported by Ali (1993), Basher (1993) and Seal (2002).

3.9.6 Cosmopolitenss

The cosmopoliteness scores of the farmers of the study area ranged from 3 to 13 against the possible scores 0 to 18. The mean and standard deviation were 7.1667 and 2.9116 respectively. Based on the observed cosmopoliteness scores, the respondents were classified into three categories as shown in table 3.9.6

Table 3.9.6 Classification of the Respondents according to their Cosmopoliteness

Categories (scores)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Low cosmopoliteness (up to 5)	32	35.6	7.1667	2.9116
Medium cosmopoliteness (6 to 10)	47	52.2		
High cosmopoliteness (1 land above)	11	12.2		
Total	90	100		

Data from Table 3.9.6 reveal that the highest proportion (52.2 %) of the farmers had medium cosmopoliteness as compared to 35.6 percent having low cosmopoliteness and 12.2 percent high cosmopoliteness. Data also reveal that majority (52.2%) of the farmers were under medium to high cosmopoliteness. Such a finding may be due to the less distance from B.Baria town and a smooth high way connection with the study area. Chowdhury (1997), Rahman (2001), Seal (2002) and Islam (2002) also observed the similar findings.

3.9.7 0rganizational participation

The Organizational participation scores of the farmers of the study area ranged from 1 to 11 against the possible scores 0 to 33. The mean and standard deviation were 4.3000 and 2.7002 respectively. Based on the observed organizational participation scores, the respondents were classified into three categories as shown in table 3.9.7

Table 3.9.7 Classification of the Respondents according to their Organizational Participation

Categories (scores)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Low participation (up to 3)	43	47.8	4.3000	2.7002
Medium participation (4 to 6)	30	33.3		
High participation (7and above)	17	18.9		
Total	90	100		

Data from Table 3.9.7 reveal that the highest proportion (47.8%) of the farmers had low participation as compared to 33.3 percent having medium participation and 18.9 percent high participation. Data also reveal that majority (81.1%) of the farmers were under low to medium participation. Such a finding may be due to the very small distance from B. Baria town and a smooth high way connection with the study area. So that the farmers can easily go to B. Baria town and solve their problems from there that's why farmer's participation is comparatively low.

3.9.8 Extension contacts

The extension contact scores of the farmers of the study area ranged from 2 to 10 against the possible scores 0 to 15. The mean and standard deviation were 5.0889 and 2.1962 respectively. Based on the observed extension contact scores, the respondents were classified into three categories as shown in table 3.9.8

Table 3.9.8 Classification of the Respondents according to their Extension Contact

Categories (scores)	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Low extension contact (up to 4)	34	37.8	5.0889	2.1962
Medium extension contact (5 to 7)	44	48.9		
High extension contact (8 and above)	12	13.3		
Total	90	100		

Data presented in Table 3.9.8 indicate that the highest proportion (48.9 %) of the farmers of the study area had medium extension contact as compared to 37.8percent having low extension contact and 13.3 percent high extension contact. Such a situation presents a very gloomy picture, as far as the extension contact of the farmers in the study area is concerned. The fact may be that the extension worker's did not live in the study area because the study area is very near to the B. Baria town. They reside in the B. Baria town so, local farmer cannot contact with them. Authority of the Extension Organization should give proper attention to the fact.

3.10 Adoption of Modern Technologies

3.10.1 Mechanical cultivation

The **TAPMC** of the respondents range from 0-22 with the mean and standard deviation being 7.8556 and 4.5257 respectively. On the basis of their **TAPMC** the farmers were classified in to five categories adopted as Roger's(1983) as shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	2	2.22	7.8556	4.5257
Early adopters	15	16.67		
Early majority	22	24.45		
Late majority	39	43.33		
Laggards	12	13.33		
Total	90	100		

Data contained in the table 3.10.1 show that the highest proportion (43.33%) of the respondents belongs to late majority category as compared to 24.4 percent being Early majority, 16.67 percent Early adopters, 13.33 percent Laggards and lastly 2.22 percent Innovators which is almost similar to Roger's classification. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various sources. Rahman (1993), Haque (1993) and N. S. Shetty (1968) observed the similar findings in their studies.

3.10.2 HYV Rice cultivation

The TAP$_{HYV}$ of the respondents range from 7-30 with the mean and standard deviation being 14.30 and 4.5257 respectively. On the basis of their TAP$_{HYV}$ the farmers were classified in to five categories adopted as Roger's (1983) as shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	4	4.44	14.30	4.5257
Early adopters	8	8.89		
Early majority	30	33.33		
Late majority	40	44.45		
Laggards	8	8.89		
Total	90	100		

Data contained in the table 3.10.2 show that the highest proportion (44.45) of the respondents belongs to late majority category as compared to 33.33 percent being Early majority, 8.89 percent Early adopters, 8.89 percent Laggards and lastly 4.44 percent Innovators which is slightly related to Roger's classification. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various sources. Rahman (1993), Hossain (1991), Gogoi (1989) and N. S. Shetty (1968) observed the similar findings in their studies

3.10.3 Line Transplanting practices

The TAP_{LT} of the respondents range from 6-35 with the mean and standard deviation being 17.1889 and 6.1350 respectively. On the basis of their TAP_{LT} the farmers were classified in to five categories adopted as Roger's (1983) as shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	1	1.11	17.1889	6.1350
Early adopters	11	12.22		
Early majority	34	37.78		
Late majority	24	26.67		
Laggards	20	22.22		
Total	90	100		

Data contained in the table 3.10.3 show that the highest proportion (37.78) of the respondents belongs to early majority category as compared to 26.67 percent being late majority, 22.22 percent Laggards, 12.22 percent Early adopters, and lastly 1.11 percent Innovators which is slightly related to Roger's classification. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various sources. Roy (1997) and N. S. Shetty (1968) observed the similar findings in their studies

3.10.4 Top Dressing

The TAPTD of the respondents range from 4-35 with the mean and standard deviation being 17.3778 and 6.4921 respectively. On the basis of their TAPTD the farmers were classified in to five categories adopted as Roger's (1983) as shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	2	2.22	17.3778	6.4921
Early adopters	13	14.44		
Early majority	30	33.33		
Late majority	28	31.12		
Laggards	17	18.89		
Total	90	100		

Data contained in the table 3.10.4 show that the highest proportion (33.33) of the respondents belongs to early majority category as compared to 31.12 percent being late majority, 18.89 percent Laggards, 14.44 percent Early adopters and lastly 2.22 percent Innovators which is nearly related to Roger,s classification. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various sources. Gogoi (1989) observed the similar findings in their study.

3.10.5 T-Aman cultivation

The TAPTA of the respondents range from 3-20 with the mean and standard deviation being 9.80 and 3.5481 respectively. On the basis of their TAPTA the farmers were classified in to five categories as adopted as Roger's (1983) shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	5	5.55	9.80	3.5481
Early adopters	5	5.55		
Early majority	33	36.67		
Late majority	32	35.56		
Laggards	15	16.67		
Total	90	100		

Data contained in the table 3.10.5 show that the highest proportion (36.67) of the respondents belongs to early majority category as compared to 35.56 percent being late majority, 16.67 percent Laggards, 5.55 percent Early adopters and lastly 5.55 percent Innovators which is nearly related to Roger's classification. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various sources. Kher (1992) observed the similar findings in their study.

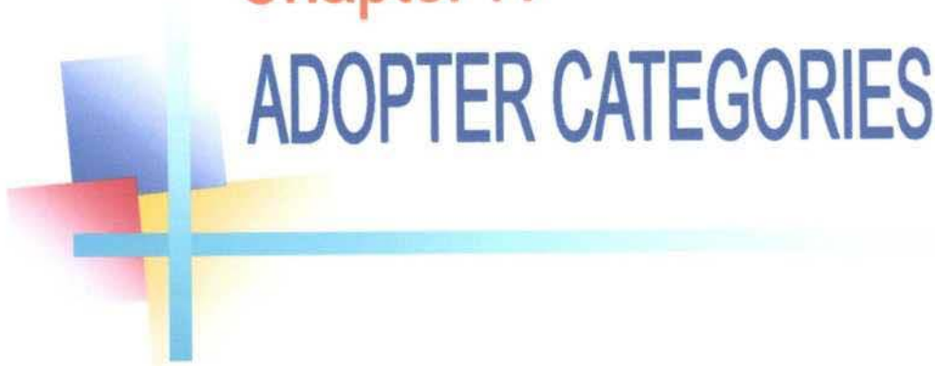
3.10.6 IPM Practices

The TAP$_{IPM}$ of the respondents range from 0-11 with the mean and standard deviation being 1.853 and 0.925 respectively. On the basis of their of their TAP$_{IPM}$ the farmers were classified in to three categories as N. S. Shetty (1986) as shown below:

Categories	Farmers (N=90)		Mean	Standard deviation
	Number	Percent		
Innovators	3	3.33	1.853	0.925
Early adopters	3	3.33		
Early majority	14	15.56		
Late majority	14	15.56		
Laggards	56	62.22		
Total	90	100		

Data contained in the table 3.10.6 show that the highest proportion (62.22) of the respondents belongs to laggards & non-adopter category as compared to 15.56 percent being Early majority, 15.56 percent late majority, 3.33 percent early adopter and lastly percent Innovators which is totally different from Roger's classification. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion didn't properly disseminate information about innovation and farmers also didn't seek information properly from various sources. The fact may be that the extension worker's did not live in the study area because the study area is very near to the B. Baria town. They reside in the Brahman Baria town so, local farmer cannot contact with them. Authority of the Extension Organization should give proper attention to the fact. Islam (1993) and Karim (1973) observed the similar findings in their studies.

Chapter IV



ADOPTER CATEGORIES

CHAPTER IV

ADOPTER CATEGORIES AMONG THE FARMERS

The primary purpose of this chapter is to describe the adopter categories exhibited **by** the farmers of Brahman Baria District. However, the study on adopter categories being a relatively new field of investigation, it was considered worthwhile to present a brief discussion on the concept of adopter categories as well as on the procedure for measurement of adopter categories. Two aspects of adopter categories of the farmers has been observed and described in this study. One aspect is over all adoption rate for the modern technologies and the other is the adoption of individual technologies.

Presentation will be made in this chapter in three sections. The first section contained a discussion on the concept of adopter categories, second section were procedure/formula for measuring adopter categories and category of the adopters discussed in the third section.

4.1 Concept of adopter categories

The term adopter categories have been defined variously by different authors but E.M Rogers defined it precisely. Therefore, it is presented here for a clearer understanding of the concept of adopter categories. “Not all individuals in a social system adopt an innovation at the same time”. Rather, they adopt in a time sequence and they may be classified into adopter categories on the basis of when they first begin using a new idea. Rogers categorize the following five types of adopter categorization on the basis of time of adoption which he referred as innovativeness (shown in the figure: 1.1 at page: 3).

4.1.1 Adopter categories

The five adopter categories set forth are ideal types (Rogers, 1983):

Innovators: Venturesome

Venturesome is almost an obsession with innovators. They are very eager to try new ideas. This interest leads them out of local circle of peer networks and into more cosmopolite social relationships. Communication patterns and friendship among an innovator is venturesome. The innovator plays a gate-keeping role in the flow of new ideas into a social system. They are 2.5 percent in the society.

Early adopters: Respectable

Early adopters are a more integrated part of the local system that is innovators. Early adopters are localites and this category has the greatest degree of opinion leadership in most social system. Potential adopters look to early adopters for advice and information about the innovation. The early adopters are considered by many as the individual to check with before using the new idea. This adopter category is generally sought by change agents to be a local missionary for speeding the diffusion process. The early adopters are approximately 13.5 percent in the society.

Early majority

The early majority adopt new ideas just before the average member of a social system. The early majority interacts frequently with their peers but seldom hold leadership position. They provide interconnectedness in the systems networks.

The early majority may deliberate for sometime before completely adopting new idea. Their innovation decision period is relatively longer than that of the innovator and the early adopter. They are approximately 34 percent in the society.

Late majority

The late majority adopt new ideas just after the average member of a social system. Adoption may be both in economic necessity and the answer to increasing network pressures. Innovations are approached with a skeptical and cautious air and the late majority does not adopt until most others in their social system have done so. They are approximately 34 percent in the society.

Laggards

Laggard is the last in a social system to adopt an innovation. They posses almost no opinion leadership. They are almost localite in their outlook of all adopter categories: many are near isolates in social network. Decisions are often made in terms of what has been done in previous generations and these individuals interact primarily with others who also have relatively traditional values. When laggards finally adopt an innovation, it has already been superseded by another more recent idea the innovators. Laggards tend to be frankly suspicious of innovations and change agents. They are approximately 16 percent in the society.

4.2 Procedure/ formula for measuring adopter categories on the basis of adoption period

4.2.1 Measurement of Adopter Categories

Before measuring the adopter categories the researcher added all Adoption Period Score (APS) of individual modern technology of all respondents and summation of all scores made the TAPS (Total Adoption Period Score). The adopter categorization on the basis of TAPS diving the bell-shaped curve into five areas by using its two parameters (mean and standard deviation). After assigning TAPS for all farmers according to the

4.2.1.2 Integrated Pest Management

Integrated Pest Management adoption Period was measured on the basis of one's adoption Period for the technology but it is a little bit different from above all innovations. In this study the researcher added all adoption Period which were collected from the all farmers, TAP_{IPM} (Total Adoption Period for Integrated Pest Management). After assigning TAP_{ipm} non-adopters considered as laggards and adopters divided into four categories according to their time of adoption. For all farmers according to the adoption Period of all the farmers were calculated as follows:

Innovators= above (x - 2sd)

Early adopter = (x -2sd) to (x -1 sd)

Early majority = (x -lsd) to (x)

Late majority = (x) to (x +1 sd)

Laggards & non-adopters = (x + 1 sd) to (x +2sd)

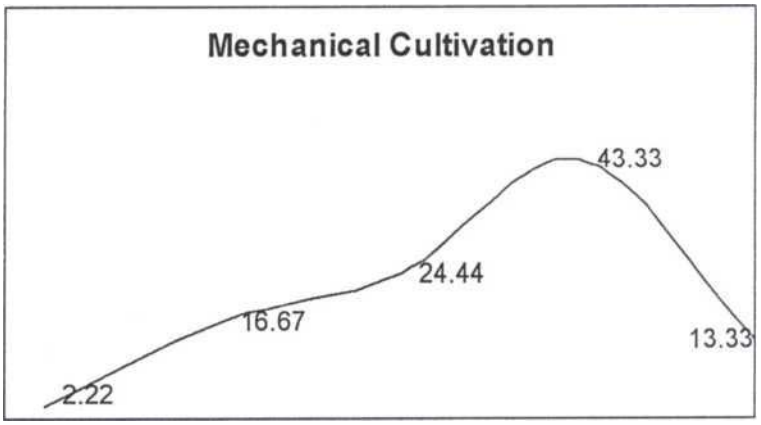
The measure of adoption used and the procedure followed to classify adopters where 1st group were innovator and then early adopter, early majority, late majority & last group considered as laggards. The majority of Indian researchers used this type of category.

4.3 Classification of Adopters among the farmers of Brahman Baria District

4.3.1 Mechanical cultivation

The innovation dimension, as measured by the time at which an individuals adopts an innovation, is continuous. This variable, however, may be partitioned into five adopter categories by laying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

Figure 4.3.1 Classification of farmers on the basis of Total Adoption Period for Mechanical Cultivation



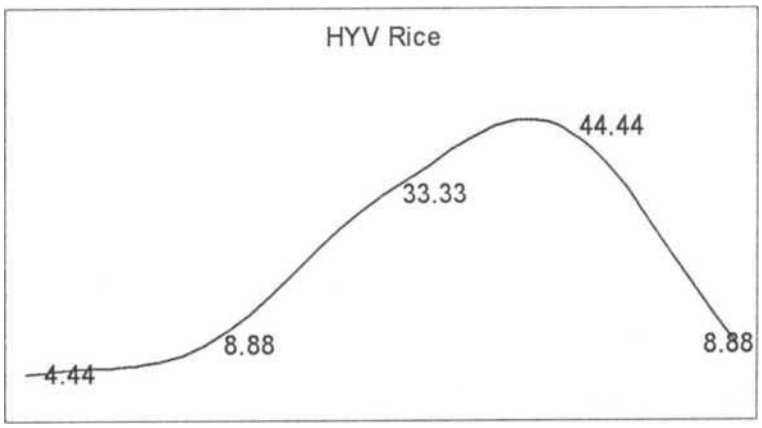
Data presented in figure 4.3.1 indicate that 2.22% of the respondent farmers were innovators, 16.67% early adopters, early majority 24.44%, 43.33% were late majority & last category was laggards 13.33%.It may be stated that farmers used this technology for a long time for this reason late majority were high. This category almost same as Roger's category and this type of category support Roger's category. From this figure it may be says that this type of technology had been properly diffused by the diffusion channel and farmers got sufficient information about this technology. It also says that Roger's classification holds good to our environment. Rahman (1993), Haque (1993) and N. S.

Shetty (1968) observed the similar findings in their studies. Therefore, extension effort should be concentrated to early & late majority.

4.3.2 High yielding variety (HYV)

The innovation dimension, as measured by the time at which an individual adopt an innovation, is continuous. This variable, however, may be partitioned into five adopter categories by lying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

Figure 4.3.2 Classification of farmers on the basis of Total Adoption Period for High yielding variety (HYV) practicc in Rice Production



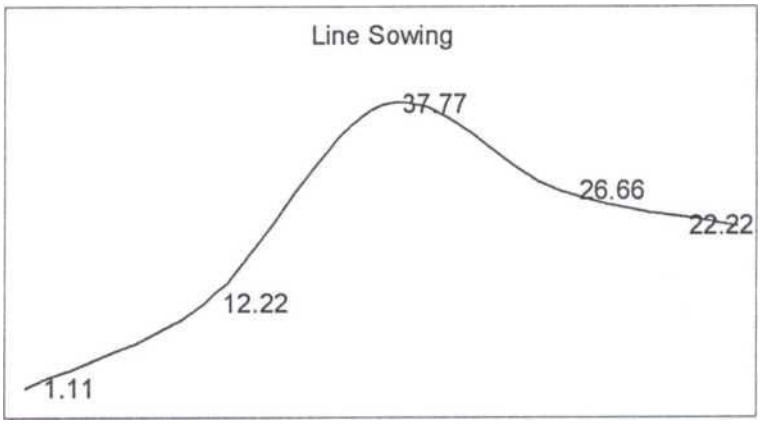
Data presented in figure 4.3.2 indicate that 4.44% of the respondent farmers were innovators, 8.88% early adopters, early majority 33.33%, 44.44% were late majority & last category was laggards 8.88%.It may be stated that farmers used this technology for a long time for this reason early & late majority were high. This category almost same as Roger's category and this type of category support to Roger's category. From this figure it may be said that this type of technology had been properly diffused by the diffusion

channel and farmers got sufficient information about this technology. It also says that Roger's findings regarding adopter category are almost similar to our environment. Rahman (1993), Hossain (1991), Gogoi (1989) and N. S. Shetty (1968) observed the similar findings in their studies.

4.3.3. Line Transplanting

The innovation dimension, as measured by the time at which an individual adopts an innovation, is continuous. This variable, however, may be partitioned into five adopter categories by laying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

Figure 4.3.3 Classification of farmers on the basis of Total Adoption Period for Line Transplanting in Rice Production



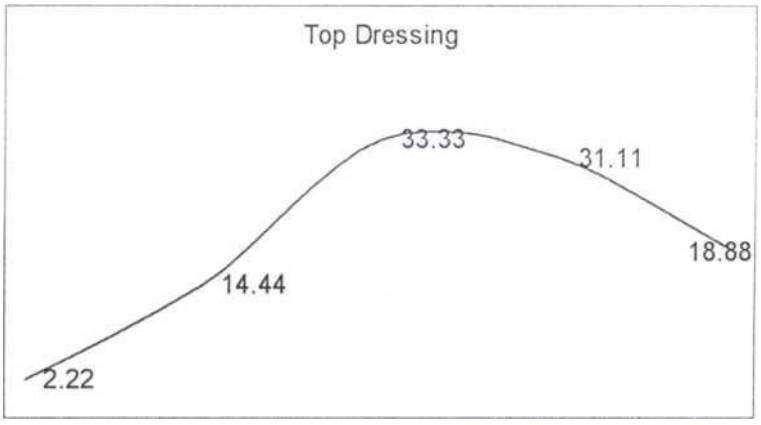
Data presented in figure 4.3.3 indicate that 1.11% of the respondent farmers were innovators, 12.22% early adopters, early majority 37.77%, 26.66% were late majority & last category was laggards 22.22%.It may be stated that farmers used this technology for a long time. This category related to the Roger's category and this type of category support the Roger's category. From this figure it may be said that this type of technology

had been diffused by the diffusion channel/process and farmers got information about this technology. It also says that Roger's findings regarding the adopter category can slightly differ to our environment but N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek.

4.3.4 **Top Dressing**

The innovation dimension, as measured by the time at which an individuals adopts an innovation, is continuous. This variable, however, may be partitioned into five adopter categories by laying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

Figure 4.3.4 Classification of farmers on the basis of Total Adoption Period for Top Dressing practices in Rice Production



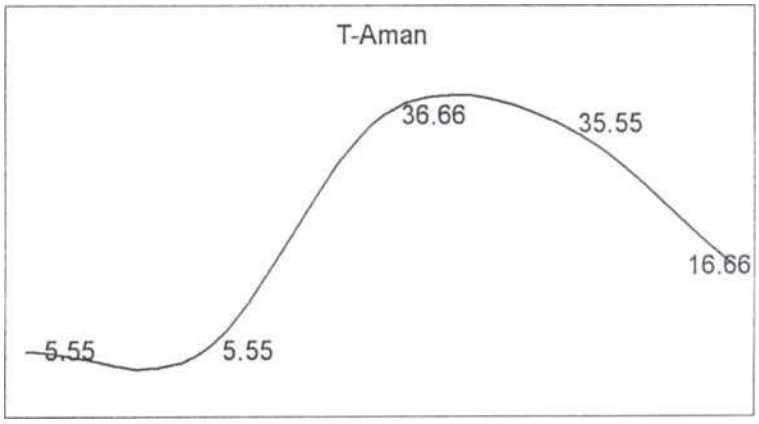
Data presented in figure 4.3.4 indicate that 2.22% of the respondent farmers were innovators, 14.44% early adopters, early majority 33.33%, 31.11% were late majority & last category was laggards 18.88%.It may be stated that farmers used this technology for a long time. This category slightly same as Roger's category and this type of category

support the Roger's classification of adopters. From this figure it may be interpreted that this type of technology had been highly transmitted through the diffusion channel/process and farmers got excess information about this technology. It also says that Roger's adopter category can slightly support to our environment. N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various source. Gogoi (1989) observed the similar findings in their study.

4.3.5 T-Aman

The innovation dimension, as measured by the time at which an individual adopts an innovation, is continuous. This variable, however, may be partitioned into five adopter categories by laying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

Figure 4.3.5 Classification of farmers on the basis of Total Adoption Period for T-Aman practices in Rice Production

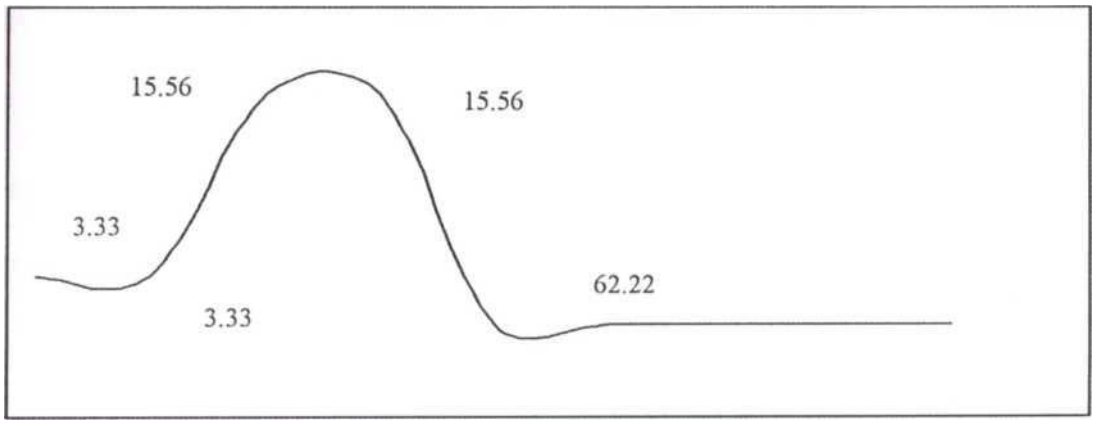


Data presented in figure 4.3.5 indicate that 5.55% of the respondent farmers were innovators, 5.55% early adopters, early majority 36.66%, 35.55% were late majority & last category was laggards 16.66%.It may be stated that farmers used this technology for a long time. This category almost same as Roger's category early majority, late majority & laggards but little bit differ in innovator & early adopters. This type of category support the Roger's category. From this figure it may be interpreted that this type of technology had been properly transmitted through the diffusion channel and farmers got sufficient information about this technology. Rahman (1993), Haque (1993) and N. S. Shetty (1968) observed the similar findings in their studies. Therefore, extension effort concentrated to early & late majority.N. S. Shetty also found similar findings in the adoption of chemical fertilizer in his study. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various source. Kher (1992) observed the similar findings in their study.

4.3.6. Integrated Pest Management (IPM)

The innovation dimension, as measured by the time at which an individuals adopts an innovation, is continuous. This variable, however, may be partitioned into three adopter categories by laying off standard deviation from the mean time of adoption. Adopter categories on the basis of the adoption of modern technologies.

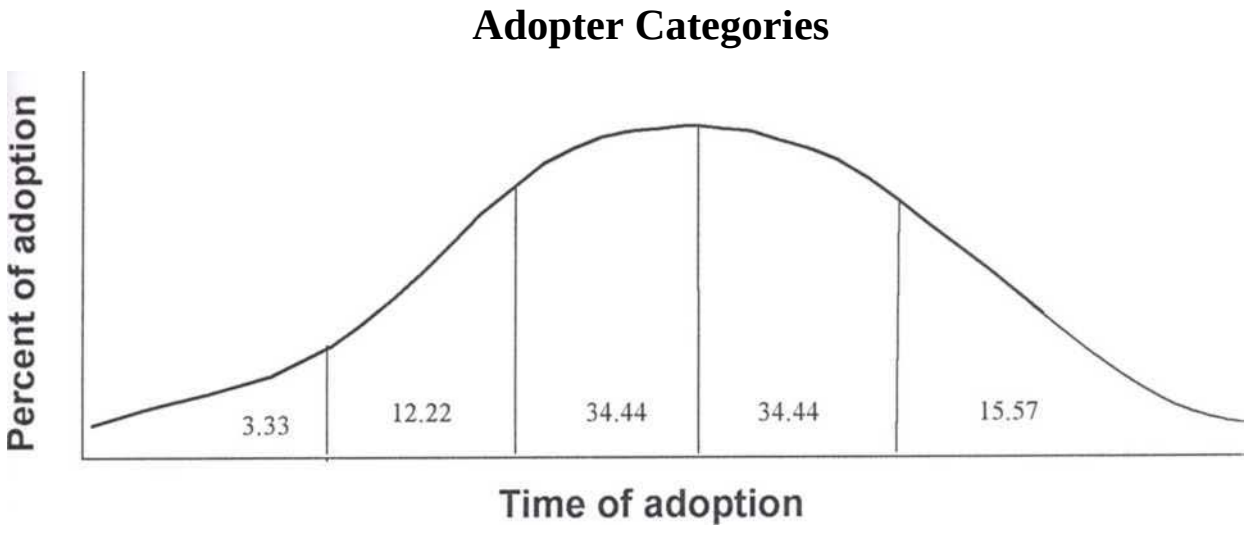
Figure 4.3.6 Classification of farmers on the basis of Total Adoption Period for Integrated Pest Management (IPM) practices in Rice Production



Data presented in figure 4.3.6 indicate that 3.33% of the respondent farmers were innovators, 3.33% early adopters, early majority 15.56%, 15.56% were late majority & last category were laggards & non-adopters 62.22%. It may be stated that farmers did not use this technology for a long time. This category does not support the Roger's category. From this figure it may be interpreted that this type of technology had been not-properly transmitted through the diffusion channel and farmers got insufficient information about this technology. The fact may be that Govt, agencies, NGOs, Opinion leader and other person who are related to the Innovation Diffusion didn't properly disseminate information about innovation and farmers also didn't seek information properly from various sources. The fact may be that the extension worker's did not live in the study area because the study area is very near to the B. Baria town. They reside in the Brahman Baria town so, local farmer cannot contact with them. Authority of the Extension Organization should give proper attention to the fact. Islam(1993) and Karim(1973) observed the similar findings in their studies.

The innovation dimension, as measured by the time at which an individual adopt innovations, is continuous. This variable, however, may be partitioned into five adopter categories by laying off standard deviation from the mean time of adoption.

Figure 4.3.7 Classification of farmers on the basis of Adoption Period Score for overall adoption in Rice Production



Data presented in figure 4.3.7 indicate that 3.33% of the respondent farmers were innovators, 12.22% early adopters, early majority 34.44%, 34.44% were late majority & last categoty was laggards 15.57%. This category almost similar as Roger's category and this type of category support the Roger's classification of adopters. From this figure it may be interpreted that technologies had been highly transmitted through the diffusion channel/process and farmers got excess information about this technologies. It also says that Roger's adopter category can support to our environment. N. S. Shetty also found similar findings in his study. The fact may be that Govt, agencies, NGOs, Opinion leader

and other person who were related to the Innovation Diffusion properly disseminate information about innovation and farmers also seek information properly from various source. Gogoi (1989) observed the similar findings in their study.

4.4 Comparative adoption of the selected modern technologies by the farmers

Comparative adoption of the selected modern technologies measured by the following:

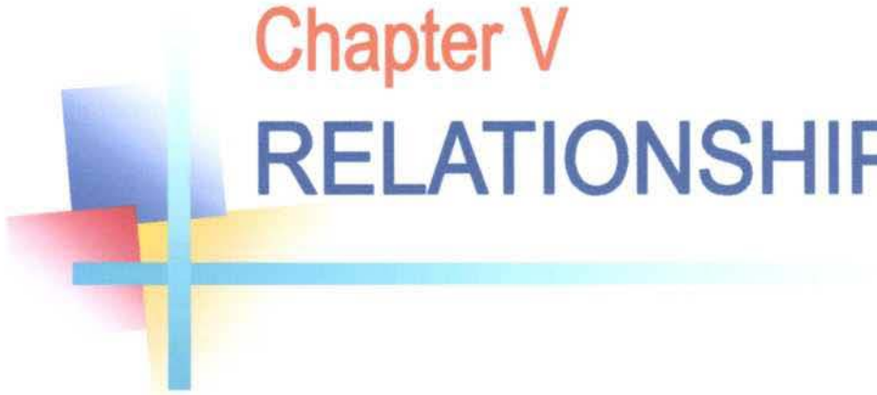
Table 4.4: Adopter categorization of six modern technologies on the basis of adoption of modern technologies

Categories	Mechanical Cultivation	HYV Rice Cultivation	Line Transplanting Practices	Top Dressing	T-Aman Cultivation	IPM Practices	Over
Innovator	2.22	4.44	1.11	2.22	5.55	3.33	3.33
Early Adopter	16.67	8.89	12.22	14.44	5.55	J. J J	12.22
Early Majority	24.45	33.33	37.78	j j. 3 J	36.67	15.56	34.44
Late Majority	43.33	44.45	26.67	31.12	35.56	15.56	34.44
Laggards	13.33	8.89	22.22	18.89	16.67	62.22	15.57
Total	100	100	100	100	100	100	100

Data represented in the table 4.4 indicate that innovators for first five modern technologies were 2.22%, 4.44%, 1.11%, 2.22%, and 5.55% which showed that all

individual did not adopt all innovation at the same time and all innovators were not innovator for all technologies. This observation also follows for early adopters, early majority, late majority and laggards. In IPM practices non-adopters were majority (62.22%) as compared to 15.56 percent being late majority, 15.56 percent Early majority, 3.33 percent Early adopters and lastly 3.33 percent Innovators which indicate that this technology may be new than the other technology. So, non-adopter group were high for this technology.

From this table it is observed that farmers' percent of adoption for different technologies varies. Therefore, it may be concluded that each farmer does not adopt all innovation at the same time. Moreover, a farmer may be innovator for an innovation on the other hand; he/she may be laggards for the other innovation. This statement is supported by Roger's (1983), N.S. Shetty(1986).



Chapter V
RELATIONSHIP

CHAPTER V

Relationship between farmers adoption of modern technology in Rice production and their selected characteristics

The purpose of this section is to examine the relationship of farmer's adoption of modern technology with their eight selected characteristics. The characteristics include: age, education, family size, annual income, farm size, cosmopoliteness, organizational participation, extension contact. Each of the characteristics constituted an independent variable, while the dependent variable was Mechanical cultivation, High yielding variety (HYV) practice, Line showing, Top Dressing practices, T-Aman practices, Integrated Pest Management (IPM) practices.

The relationships have been described in eight sub-section, each dealing with the relationship one of eight characteristics of the farmers with their composite adoption of modern technologies.

The procedures followed in measuring the dependent and independent variables have already been discussed in chapter III. Null hypothesis has been stated in chapter III for testing the relationships of the farmers selected characteristics with their composite adoption of modern technologies. For clarity of understanding, relevant null hypothesis has been re-stated in course of discussion of each of the eight relationships. Pearson's Correlation Co-efficient was used to examine the relationships of eight characteristics with farmer's composite adoption of modern technologies

Throughout the study, a five- percent (0.05) level of probability was used as the basis for rejecting any null hypothesis. Values of correlation co-efficient (r) were compared with the relevant table values in order to determine whether relations between the concerned variables were significant or not. The computed values of co-efficient of correlation (r) have been in table 5.1 showing the relationships of selected characteristics with farmers' composite adoption.

Table (5.1) Relationships between the Farmers Selected Characteristics and Their Composite Adoption of modern technologies

SI. No.	Farmers selected characteristics (Independent variables)	Dependent variable	Computed 'r' values
1	Age	Farmers Adoption of modern technologies	0.001
2	Education		0.368**
3	Family size		0.019
4	Annual income		0.347**
5	Farm size		0.325**
6	Cosmopoliteness		0.359**
7	Organizational participation		0.414**
8	Extension contact		0.414**

NS	Not significant
*	Significant at 0.05 level of probability
**	Significant at 0.01 level of probability

5.1.1 Relationship of age with adoption

The null hypothesis was “There is no relationship between farmer’s age and their adoption of modern technologies”.

The calculated value of‘r’ was .001 (Table 5.1), which indicated a insignificant relationship at 0.01 level of probability. The null hypothesis was accepted and it is concluded that there was no relationship between the age of the respondents and their adoption of modern technologies. Singh and Rajendra (1990), Sarker (1997), Mohammad (1974), Muttaleb (1995) and Hossain (1999) observed the similar findings in their studies.

5.1.2 Relationship of education with adoption

The null hypothesis was “There is no relationship between the education of the respondents and their adoption of modern technologies.

The calculated value of ‘r’ was 0.368** (Table 5.1) at 0.01 level of probability, which indicated that there was a significant and positive relationship. Thus null hypothesis was rejected and it could be concluded that there was positively significant relationship between the education of the respondents and their extent adoption of modern technologies. These findings indicated that more education of the farmers had a tendency towards less adoption of modern technologies. Katarya (1989), Haque (1984), Alam (1997), Sarkar (1997), Aurangozeb (2002) Pal (1995) and many others also found a insignificant relationship between farmers education and their adoption of technologies.

5.1.3 Relationship of family size with adoption

The null hypothesis “There is no relationship between farmers family size and their adoption of modern technologies”.

The calculated value of the correlation co-efficient was 0.019 (Table 5.1) at 0.01 level of probability, which indicated insignificant relationship. Therefore, the null hypothesis was accepted and it is concluded that there was no relationship between the family size of the respondents and their adoption of modern technologies. It means that farmers with larger family were more likely to have more adoption. Hossain (1983), Mohammad (1974), Mustafi *et al.* (1987), Hossain (1991), Bashar (1993) and Islam (1993). and pal (1995) also found the similar results in their studies.

5.1.4 Relationship of annual income with adoption

The null hypothesis: “There is no relationship between annual income of the respondents and their extent adoption of modern technologies”.

The calculated value of ‘r’ was 0.347** (Table 5.1) at 0.01 level of probability, which indicated that there was a significant and positive relationship. Thus, the null hypothesis was rejected and the researcher concluded that the annual income of the respondents had a positively significant relationship with their adoption of modern technologies. It means that farmers having higher annual income were likely to have more adoption of modern technologies. Khan (1993), pal (1995), Chowdhury (1997), Aurangozeb (2002) and many others found the similar results in their studies.

5.1.5 Relationship of Farm size with adoption

The null hypothesis: “There is no relationship between farm size of the respondents and their adoption of organic manure”

The calculated value of ‘r’ was 0.325** (Table 5.1) at 0.01 level of probability, which indicated that there was a significant and positive relationship. Thus, the null hypothesis was rejected and it could be concluded that there was positively significant relationship between the farm size of the respondent and their adoption of modern technologies. It means that farmers with larger farm size were more likely to have more adoption. Baadgaonaker (1984), Haque (1984) khan (1993) and Muttalab (1995) also found the similar results in their studies.

5.1.6 Relationship of cosmopolieness with adoption

The null hypothesis was “There is no relationship between farmer cosmopoliteness and their adoption of modern technologies”.

The calculated value of ‘r’ was .359** (Table 5.1) at 0.01 level of probability, which indicated that there was a significant and positive relationship. Therefore, the null hypothesis was rejected and the researcher concluded that there was significant positive relationship between the cosmopoliteness of the respondents with their adoption of modern technologies. It means that the higher cosmopolite farmers were more likely to have more adoption of modern technologies. It also means that possession of cosmopoliteness will be helpful to enhance farmer adoption of modern technologies.

Islam (1993), Pal (1995), Hossain (1999), Rahman (2001), and many others also found similar findings in their studies.

5.1.7 Relationship of organizational participation with adoption

The null hypothesis was “There is no relationship between farmer organizational participation and their adoption of modern technologies”.

The calculated value of‘r’ .414** (Table 5.1) at 0.01 level of probability, which indicated that there was a significant and positive relationship. Therefore, the null hypothesis was rejected and it may be concluded that there was significant positive relationship between the organizational participation of the farmers and their adoption of modern technologies. It means that farmers with highly organizational participation were more likely to have more adoption. Mohammad (1974), Haque (1984), Karim (1973) also found the similar results in their studies.

5.1.8 Relationship of extension contact with adoption

The null hypothesis was “There is no relationship between farmer extension contact and their adoption of modern technologies”.

The calculated value of ‘r’ was .414** (Table 5.1) at 0.01 level of probability, which indicated a positive and significant relationship with their adoption of modern technologies. Therefore, the null hypothesis was rejected and the researcher concluded that the extension contact of the respondents had a positive and significant relationship with their adoption of modern technologies. It means that the higher extension contact of farmers were more likely to have more adoption of modern technologies. Sarkar (1997),

Rahman (1999), Rahman (2001), Aurangozeb (2002), Haque (1984), Mohammad (1974) and many others also found similar findings in their studies.

Contribution of Farmers Selected Characteristics to the adoption of modern technologies for Rice Production. For the present study, 8 characteristics of the farmers were selected. The selected characteristics were age, education, family size, annual income, farm size, cosmopoliteness, organizational participation and extension contact. Each of the characteristics of the farmers was treated as independent variable. The dependent variable for this study was the farmer adoption of modem technologies for rice production. The procedure followed for the measurement of dependent and independent variables have already been described in chapter III. The contribution of the dependent variable to adoption of modem technologies of the farmers has been discussed in this chapter. The independent variables in isolation will not give a comprehensive picture of the effects of independent variables on adoption of modem technologies. The different characteristics of the respondents may interact together to contribute a combined effect on the adoption. Keeping this fact in view, correlation co-efficient analysis was used to assess the contributions of the independent variables to adoption of modem technologies.

As regards correlation results, out of eight independent variables, six independent variables were found to be significant. Other two variables were deleted as their 'F* values or tolerance was too small to continue.

Chapter VI

SUMMARY AND CONCLUSION

CHAPTER VI

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

The adoption of modern technologies among the rice growers depend upon a numbers of factors including farmer characteristics. An understanding of the factors influencing this adoption behavior of the farmers is necessary to know to help farmers' to adopt modern technologies.

The study was conducted in two villages of Ramrail union of Sadar Upazilla under Brahman Baria district. From a population of 900, a total number of 90 rice growers were selected for interview. Data collected by using an interview schedule. Collected data were coded, complied, tabulated, and analyzed in accordance with the objectives of the study. Statistical measures such as percentage distribution, range, mean, standard deviation and Total Adoption Score were used to determine the adoption of modern technologies by the farmers and their selected characteristics. The researcher classified the adopter categories on the basis of the total adoption score. Researcher categorized the individual adopter categories to compare with the total adopter categories. Coefficient of correlation was calculated to explore the relationship between the selected characteristics and the adoption of modern technologies.

6.1 Major findings

According to the objectives of the study, the findings were summarized as follows:

6.1.1 Selected characteristic of the farmers

6.1.1.1 Age

The age of the respondent farmers ranged from 23 to 65 years with the average and standard deviation being 40.6444 and 10.5589 respectively. Highest proportion (53.3%) of the respondents belonged to middle-aged category as compared to and 24.4 percent being old and 22.2 percent young aged.

6.1.1.2 Education

Education of the respondent farmers ranged from 0 to 18 years schooling in the study area having an average and standard deviation being 4.9333 and 4.2606 respectively. Highest proportion (53.3%) of the farmers was primary educated. In case of secondary level of education, the proportion was 26.7 percent. The data also presented that ll.lpercent had above secondary level of education and 8.9 percent respondents were illiterate. The over whelming majority (91.1%) of the respondents was found primary education (from illiterate to secondary education). These findings also indicated that the respondents had higher literacy than the national average which is 64.9 percent (Bangladesh Orthonoutik Somikkha, 2005).

6.1.1.3 Family size

Farmer's family members ranged from 2 to 12. The mean and standard deviation were 5.8222 and 2.2010 respectively. Highest proportion (56.7%) of the farmers had medium family compared to 26.7 percent of the farmers had small family and 16.7 percent large family.

6.1.1.4 Annual Income

The observed annual family income of the respondents ranged from30 thousand taka to 318 thousand taka, the average being 113077.8 thousand taka and standard deviation 69535.25. It was observed that highest proportion (46.7%) of the farmers belonged to medium & high family income groups as compared to 28.9 percent low family income group and 24.4 percent very low. This might be due to the fact that the farmers of the study area were not engaged in agriculture only. They earned from other sources such as service, business etc. because Brahman Baria town are near to the study area and also a smooth high way connection facilitates them for higher income.

6.1.1.5 **Farm size**

The farm size was respondents of the study area ranged from 0.18 to 3.97 hectares with an average of hectares and standard deviation being 1.4036 and 1.0281 respectively. Highest proportion (40.0%) of the farmers had small farm compared to 37.8 percent medium farm, 15.6 percent of the farmers had large farm and 6.7 percent of the farmers had marginal farm. Thus, majority (40.0%) of the farmer was in the category of small to medium farm.

6.1.1.6 **Cosmopoliteness**

The cosmopoliteness scores of the farmers of the study area ranged from 3 to 13 against the possible scores 0 to 18. The mean and standard deviation were 7.1667 and 2.9116 respectively. Highest proportion (52.2%) of the farmers had medium cosmopoliteness as compared to 35.6 percent having low cosmopoliteness and 12.2 percent high cosmopoliteness. Data also reveal that majority (64.4%) of the farmers were under medium to high cosmopoliteness.

6.1.1.7 Organizational participation

The Organizational participation scores of the farmers of the study area ranged from lto 11 against the possible scores 0 to 33. The mean and standard deviation were 4.3000 and 2.7002 respectively. Highest proportion (47.8%) of the farmers had low participation as compared to 33.3 percent having medium participation and 18.9 percent high participation. Data also reveal that majority (81.1%) of the farmers were under low to medium participation. Such a finding may be due to the distance from B. Baria town and a smooth high way connection with the study area. So that the farmers can easily go to Brahman Baria town and meet their needs from there that's why farmers participation is comparatively low.

6.1.1.8 **Extension contact**

The extension contact scores of the farmers of the study area ranged from 2 to 10 against the possible scores 0 to 15. The mean and standard deviation were 5.0889 and 2.1962 respectively. Highest proportion (48.9 %) of the farmers of the study area had medium extension contact as compared to 37.8 percent having low extension contact and

13.3 percent high extension contact.

6.1.2. Farmers adoption of modern technologies for rice production

It was found that farmers adopted either one or more of six selected modern technologies. It was also found that one respondents did not adopt all technology at the same time. One respondents was innovator for one technology and may be laggards or late majority or early majority for other technology. Adoption of modern technology depends on availability of information.

6.1.3 Classify the adopters on the basis of modern technologies

Classify the adopters on the basis of modern technologies one for overall adopter categories and another for individual adopter categories.

6.1.3.1 Individual Modern Technology

6.1.3.1.1 Mechanical cultivation

For mechanical cultivation Innovator, Early adopter, Early majority, Late majority and laggards were 2.22%, 16.67%, 24.45%, 43.33% and 13.33% respectively.

6.1.3.1.2 HYV Rice Cultivation

For HYV rice cultivation Innovator, Early adopter, Early majority, Late majority and laggards were 4.44%, 8.89%, 33.33%, 44.45% and 8.89% respectively.

6.1.3.1.3 Line Transplanting

For Line Transplanting Innovator, Early adopter, Early majority, Late majority and laggards were 1.11%, 12.22%, 37.78%, 26.67% and 22.22% respectively.

6.1.3.1.4 Top Dressing Practices

For Top dressing practices Innovator, Early adopter, Early majority, Late majority and laggards were 2.22%, 14.44%, 33.33%, 31.12% and 18.89% respectively.

6.1.3.1.5 T-Aman Cultivation

For T-aman cultivation Innovator, Early adopter, Early majority, Late majority and laggards were 5.55%, 5.55%, 36.67%, 35.56% and 16.67% respectively.

6.1.3.1.6 IPM Practices

For IPM Practices Innovator, Early adopter, Early majority, Late majority and lastly Laggards & non-adopters were 3.33%, 3.33%, 15.56%, 15.56 and 62.22% respectively.

6.1.3.1.7 Overall adopter categories

In the overall adopter categories Innovator, Early adopter, Early majority, Late majority and laggards were 3.33%, 12.22%, 34.44%, 34.44% and 15.57% respectively.

6.1.4 Relationship between farmers adoption of modern technology for rice production and their selected characteristics

Null hypothesis were developed and tested to explore the relationship between eight selected characteristics of the respondent farmers and their adoption of modern technology for rice production. The results of the tested hypothesis were summarized and presented below:

6.1.4.1 Relationship of age with adoption

The age of the respondent farmers had insignificant relationship with their adoption of modern technology at 0.01 level of probability

6.1.4.2 Relationship of education with adoption

There was significant and positive relationship between the education of the farmers and their adoption of modern technology at 0.01 level of probability

6.1.4.3 Relationship of family size with adoption

The family size of the respondent farmers had insignificant relationship with their adoption of modern technology at 0.01 level of probability

6.1.4.4 Relationship of annual income with adoption

The annual income of the respondent farmers had a positive and significant relationship with their adoption of modern technology at 0.01 level of probability.

6.1.4.5 Relationship of Farm size with adoption

There was significant and positive relationship between the land size of the farmers and their adoption of modern technology at 0.01 level of probability.

6.1.4.6 Relationship of cosmopoliteness with adoption

The cosmopoliteness of the respondent farmers had a positive and significant relationship with their adoption of modern technology at 0.01 level of probability.

6.1.4.7 Relationship of Organizational participation with adoption

There was positive and significant relationship between the Organizational participation of the respondent farmers and their adoption of modern technology at 0.01 level of probability.

6.1.4.8 Relationship of extension contact with adoption

There was positive and significant relationship between the extension contact of the respondent farmers and their adoption of modern technology at 0.01 level of probability.

CONCLUDING STATEMENTS

On the basis of the findings of the study and the interpretation, the following conclusions have emerged:

1. Adopter categories on the basis of the adoption of modern technologies which is almost similar to Roger's category.
2. In respect of individual technology, adoption such as Mechanical Cultivation, HYV rice it showed that the percentage of adopters in different categories are nearly similar to percent of Roger's adopters. But incase of Line Transplanting, Top dressing, T-Aman and IPM are lower than the percent of Roger's.
3. Farmers' level of education, Annual income, Farm size, cosmopoliteness,

Organizational participation and extension contact significantly influenced but age and family size insignificantly influenced their adoption of modern technologies.

RECOMMENDATIONS

The following recommendations were made based on the findings of this study:

1. Rice growers should be provided with needful skill through appropriate training programmes on different modern practices of rice cultivation.
2. Extension experts and workers should utilize their effort to introduce modern technologies among small and large farmers.
3. Arrangement should be made to educate rice growers through extension contact those have no schooling.
4. The extension workers should utilize the farmer with high cosmopoliteness in the extension education programmes through more extension contact with the farmer in order to facilitate introduction of modem technologies and also should take necessary steps to increase cosmopoliteness of rice growers through field visits and research station visit.

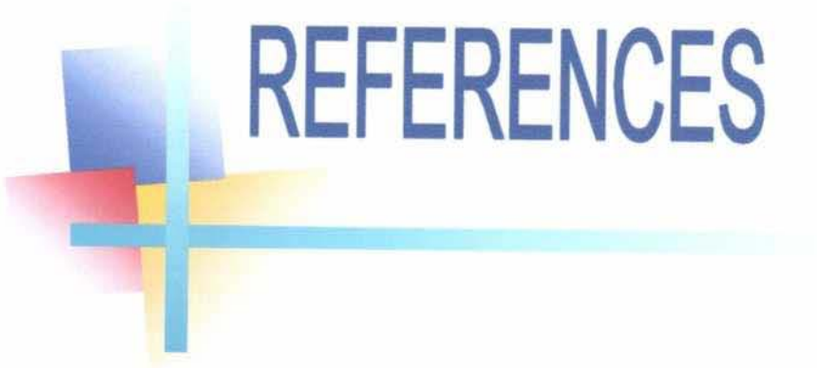
RECOMMENDATIONS FOR FURTHER RESEARCH

Future research thrust should be given on:

1. The present research is the first of its kind as regards its scope coverage in the project area since its inception. It is therefore, suggested that the Department of Agricultural Extension should under take research not only in the field of adopter categories but also in other fields of extension, so that the department can evaluate its achievement and develop future programme.

2. The present investigation explored the relationships between some selected personal, economical characteristics to adopter categories. Besides these, there are other characteristics which may influence adopter categories. It is, therefore, suggested to select those factors that were not included in the present study and under take more researches to explore how these factors are related to adopter categories.

3. This kind of study should be replicated in other areas of Bangladesh to provide further valuable information to draw generalization pertaining to the adoption of modern technologies for rice cultivation.



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APPENDIX-I

DEPARTMENT OF AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

SHER-E-BANGLA AGRICULTURAL UNIVERSITY DHAKA-1207 FOR THE STUDY OF ADOPTION OF MODERN TECHNOLOGIES AND CLASSIFICATION OF THE ADOPTERS AT RAMRAIL UNION IN BRAHMAN BARIA DISTRICT

INTERVIEW SCHEDULE

SI. No. : ..... Date: .....

Name of the respondent: ..... Village .....

Thana / Upazila ..... Post Office:.....

District: .....

Please answer the following questions

1. Age

How old are you? ..... Years

2. Education

Please state your educational level.

a) No read or write

b) Read only

c) Read & Write only

d) I ..... read up toClass

* What is your marital status? Married / Unmarried If married, please tell the number of son/ daughter No. of Son ..... No. of daughter .....

3. Family size

Your family have ..... members (With self)

4. Annual income

Please mention your annual income from the following source

SI. No	Source of income	Taka
1	Service or others profession	
2	Income from crop(Field crops, Vegetables, Fruits)	
3	Income from Veterinary, Poultry & Fish	
4	Income from Business	
5	Others	

5. Farm Size

Please mention your land size from the following table

SI. No.	**Land type**	**Total Land (decimal)**		
		Local unit		**Hectare**
1	Homestead area			
2	Own land under own cultivation			
3	Land given / taken from others on share cropping (borga)	a)	b)	
4	Land taken / given to others on lease	a)	b)	
5	Pond / Garden			
6	Others			

6. Cosmopoliteness

Are you visit in the following places?

If the answer is yes, Please mention the type of visit

SI. No.	Place of visit	Extent of visit			
		frequently	Sometimes	Rarely	Not at all
1	Visit to out side of your own village				
2	Visit to own Upazilla town				
3	Visit to other Upazilla towns				
4	Visit to own District town				
5	Visit to other District town				
6	Visit to Dhaka capital city or other divisional town				

7. Organizational participation

Are you related with the following organization?

If the answer is yes, Please mention the type of relation

SI no.	Name of organization	Chairmen/ president	Executive member	General member	Nothing
1	Union porisod				
2	Co-operative society				
3	NGO(Specific)				
4	Youth Club				
5	Irrigation society				
6	Agril. Co-operative society				
7	School committee				
8	Madrasa committee				
9	Market committee				
10	Agril. Society				
11	Others				

8. Extension contact

Do you communicate with the extension worker/ organization?

If the answer is yes, Please indicate the nature of your extension contact

SI. No.	Extension Personnel/Organization	Extent of contact			
		frequently	Sometimes	Rarely	Not at all
1	Any extension officer(UAO, AAO, AEO, SAAO)				
2	To go upazilla agril. Office & others				
3	Others Extension officer(ULO, UFO, VAS)				
4	NGO officer & office				
5	Others				

NEW TECHNOLOGY

*** Have you adopted the following new technologies?** Yes/ No

If the answer is yes & continued it till now, when adopted please mention in the following question

(a) Use of Mechanical cultivation from .....years

(b) Use of High Yielding Variety (HYV) seed from.....years

(c) Practice of Line Transplanting from.....years

(d) Application of Top Dressing from .....years

(e) Practice of T-Aman from.....years

(f) Use .....of Integrated Pest Management (IPM) from years

Thank you for your nice cooperation.

Signature of the inter viewer and date