

**ADOPTION OF IMPROVED PRACTICES IN LITCHI CULTIVATION
BY THE LITCHI GROWERS OF DINAJPUR DISTRICT**

A Thesis

By



Mst. Jobaida Khanom



**MASTER OF SCIENCE
IN
AGRICULTURAL EXTENSION**

**Department of Agricultural Extension
Hajee Mohammad Danesh Science and Technology University
Dinajpur**

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The Author



ADOPTION OF IMPROVED PRACTICES IN LITCHI CULTIVATION BY THE LITCHI GROWERS OF DINAJPUR DISTRICT

ABSTRACT

The main purpose of this study was to determine and describe the adoption of improved practices in litchi cultivation by the growers of Biral upazila under Dinajpur district. Attempts were also made to describe some of the selected characteristics of the litchi growers and their relationship with their adoption of improved practices in litchi cultivation. The problems faced by the growers in the adoption of improved practices in litchi cultivation have also been identified. Data were collected from a sample of 102 litchi growers (out of 1000) selected by simple random sampling procedure from eight villages of three unions under Biral upazila of Dinajpur district. A pretested and structured interview schedule was used to collect data from the respondents during 28 March to 2 May 2014. Adoption of improved practices in litchi cultivation was the dependent variable of this study consist of four dimensions (i.e., use of improved varieties, fertilizers, pesticides and intercultural operations). It was examined with 4-point rating scale. Ten selected characteristics of the litchi growers constituted the independent variables (i.e., age, educational qualification, family size, extension contact, cosmopoliteness, farm size, annual income, innovativeness and marketing orientation). Karl Pearson's Product Moment Correlation Coefficient (r) was computed to explore the relationship between dependent and independent variables. The findings revealed that about three-fifths (60.8 percent) of the growers had medium adoption while 13.7 percent had low adoption and 25.5 percent had high adoption of improved practices in litchi cultivation. Correlation analysis indicated that among the selected characteristics, educational qualification, litchi cultivation knowledge, extension media contact, cosmopoliteness, farm size, annual income, innovativeness and marketing orientation had significant and positive relationship with their adoption of improved practices in litchi cultivation. While age and family size of the respondents did not show any significant relationship with their adoption of improved practices in litchi cultivation. The major problems faced by the litchi growers were 'non-availability of training on litchi cultivation from DAE or other organization', 'non-availability of credit in time', 'lack of proper advice from AEOs about insect and disease control of litchi' and 'lack of suggestions from the SAAOs about the timely application of fertilizers in litchi cultivation'.

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CHAPTER 1

INTRODUCTION

1.1 Background Information

Bangladesh is favorite's play ground of nature. It offers a highly congenial environment for the growth of different varieties of fruits like Banana, Papaya, Pineapple, Litchi and Jackfruit which are more nutritious. Litchi (*Litchi chinensis*) belongs to the family Sapindaceae and sub-family Nephleae. It is one of the most important sub-tropical evergreen fruit trees which grow well in Bangladesh. An evergreen tree reaching 10 to 28 meters tall, the litchi bears fleshy fruits that are up to 5 cm long and 4 cm wide varying in shape from round to heart-shaped. The outside of the fruit is covered by a pink-red, roughly textured ring that is inedible but easily removed to expose a layer of sweet, translucent white flesh. Litchi fruit is famous for its excellent quality, juicy, slightly sour and sweetly taste, characterized pleasant flavor and for attractive colour. A bunch of ripen litchi attracts everyone irrespective of all ages.

Litchi is a high priced, popular and major table fruit in Bangladesh. It is commonly sold fresh in Asian markets, and in recent years, also widely in supermarkets worldwide. The red ring turns dark brown when the fruit is refrigerated, but the taste is not affected. It is also sold canned year-round. The fruit can be dried with the rind intact, at which point the flesh shrinks and darkens. It comes to market in the months of May-June. The supply of litchi is insufficient and its availability is only for about 60 days. Litchi contains 77.83 percent water, 6.74 - 20.64 percent sugar, 0.8 - 0.9 percent protein, 0.3 percent fat, mineral specially calcium, phosphorus and iron 0.7 percent and vitamin C 40.2-90 mg/100g of fruits (Bose and Mitra, 1990; and Scanlan, 1995).

No authentic documentation on the history of cultivation of litchi in Bangladesh is available. However, it is believed that litchi came from Burma to Bangladesh sometimes in the early 19th century. Chinese varieties along with Indian cultivars Bombai and Mujaffarpuri were introduced in the early 20th century from West Bengal through the efforts of nurserymen and plant lover (Bose and Mitra 1990). Litchi is widely distributed throughout the world's sub-tropical and tropical regions. Major centers of production are China, India, Vietnam, Taiwan, Thailand, Myanmar, Indonesia, Pakistan, Nepal, Bangladesh, Philippines, West Indies, New Caledonia, Tahiti, USA (Hawaii and Florida), Brazil, Mexico, Israel, Madagascar, South Africa and Australia (Menzell and Simpson, 1986; and Tindall, 1994).

Litchi grows almost all over Bangladesh but the main areas of cultivation are Jessore, Rajshahi, Dinajpur, Khulna, Dhaka, Kustia, Sylhet and Chittagong districts. There are a number of litchi cultivars such as Bedana, Bombai, China-3, Madrajee and Mujaffarpuri are introduced and cultivated in different areas of Bangladesh. Recently BARI litchi-1, 2 and 3 were selected and released for commercial production by Bangladesh Agricultural Research Institute (BARI) as high yielding litchi cultivars.

The area of litchi fruit was 4602 acres and production was 66510 M. Tons (BBS, 2011). It is found that both area and production of litchi cultivation is increasing not only in the whole country but also in Dinajpur district. The yield of litchi is increasing with the production of the increasing area (Table 1.1).

Table 1.1 Areas and production of litchi in different districts of Bangladesh in 2009-2010 to 2010-2011

Region	Area (Acre)		Production (M. Tons)	
	2009-2010	2010-2011	2009-2010	2010-2011
Dinajpur	1087	1420	13226	12387
Pabna	1044	1034	3779	4986
Rajshahi	390	304	9226	7998
Dhaka	164	163	2166	2138
Rangpur	61	80	2886	2858
Jessore	180	203	4811	6241
Khulna	202	177	1385	1374
Kushtia	501	536	3234	4518
Mymensingh	50	20	8665	9187

Source: BBS, 2011

1.2 Statement of the Problem

The success of any technology depends on its dissemination among the potential users which ultimately is measured by the level of adoption of that technology. It is assumed that notable improvements can take place in Bangladesh agriculture, if the available technologies are adopted by the farmers. Generalization from studies conducted by home and abroad regarding the adoption of other technologies may not be always applicable due to considerable variation in attributes of the technologies and for various others factors.

Table 1.2 Areas and production of litchi in Dinajpur district and Bangladesh, 2006-2007 to 2010-2011

Year	Bangladesh		Dinajpur	
	Area (Acre)	Production (M. Tons)	Area (Acre)	Production (M. Tons)
2006-2007	4286	43565	518	9465
2007-2008	5789	43767	870	9245
2008-2009	3973	55288	1001	10191
2009-2010	4259	64995	1087	13226
2010-2011	4602	66510	1420	12387

Source: BBS, 2011

For wider adoption of improved litchi cultivation technologies, it is necessary to have a clear understanding of the present status of adoption of improved litchi cultivation technologies by the litchi growers. An understanding of the relationships of the litchi grower adoption behavior with their selected characteristics as well as the problems faced by the farmers will be helpful to the planners and extension workers for future policy and strategies formulation.

In view of the foregoing discussion, the researcher undertook this piece of research entitled "Adoption of Improved Practices in Litchi Cultivation by the Litchi Growers of Dinajpur District." The main purpose of this study is to have an understanding on the adoption of selected improved litchi cultivation practices by the litchi growers and about some selected factors contributing in the adoption. For conducting the research in a planned and appropriate way, the researcher put forwarded the following questions:

1. What extent the improved practices in litchi cultivation have been adopted by the litchi growers?
2. What are the characteristics of having relationships with the adoption of improved practices in litchi cultivation?
3. To what extent of adoption of improved practices in litchi cultivation has been made by the respondents?
4. What are the problems confronted by the respondents in adoption of improved practices in litchi cultivation?

1.3 Specific Objectives

1. To determine and describe the selected characteristics of the litchi growers. The selected characteristics are: age, educational qualification, family size, litchi cultivation knowledge, extension contact, cosmopolitaness, farm size, annual income, innovativeness and marketing orientation.
2. To determine the extent of adoption of selected improved practices in litchi cultivation by the litchi growers. The practices are:
 - i. Use of improved varieties
 - ii. Use of fertilizers
 - iii. Use of pesticides, and
 - iv. Use of intercultural operations
3. To explore the relationships between selected characteristics of the litchi growers and their adoption of selected improved practices in litchi cultivation.
4. To identify the problems confrontation of the litchi growers in adopting above improved practices in litchi cultivation.

1.4 Justification of the Study

In Bangladesh, the deficit of food is a chronic problem as the pressure of population is massive and increasing. To ensure adequate food supply with limited physical resources, it is necessary to give emphasis to increase crop production using improved agricultural technologies. Agricultural intensification, maximization of production, minimization of crop loss etc. can only be possible when adoption of improved cultivation technologies will take place at farm level.

As the northern region of Bangladesh is treated to food reservoir and very recently the agriculture of this region is facing a transformation from subsistence to commercial cultivation, use of improved cultivation technologies in commercial crops need to be used for gaining the full benefit of transformation. Litchi is the most potential crop in this transformation in Dinajpur district. Different technical, biological, environmental and socio-economic barriers are the main hindrances of technology transfer and adoption of improved agricultural technologies, not exception of litchi growers of Dinajpur district.

It is obviously true that growers are the key elements of adoption of selected improved cultivation technologies for litchi. At present, there is a lack of adequate understanding as to what extent the litchi growers adopted improved cultivation technologies for litchi and how their characteristics influence the adoption. Different constraints faced by the litchi growers also need to investigate to get the complete picture in this regard. Based on the findings of this study, extension workers and policy makers can formulate the strategies to disseminate the improved cultivation technologies for litchi as well as the strategies to solve the problems faced by the litchi grower in adoption of improved cultivation technologies.

1.5 Assumptions of the study

In this study, the researcher had the following assumptions in mind while carrying out this study:

1. The respondents included in the sample were competent enough to furnish proper responses to the items included in the interview schedule.
2. The researcher who also acted as the interviewer was well adjusted to the social environment of the study area. The researcher collected data with utmost care and can be treated as reliable.
3. The responses furnished by the respondents were reliable and they truly expressed their opinion on adoption of selected improved practices in litchi cultivation and their selected characteristics.
4. The sample size was representative of the whole population of the study area.
5. The findings of the study will have general application to other parts of the country with similar socio-economic and cultural characteristics of the litchi growers of the study area.

6. The findings of the study would be useful for planning and execution of the programs in connection with diffusion of improved practices in litchi cultivation.
7. The measures of the adoption of selected improved practices in litchi cultivation by the farmers are normally and independently distributed with their respective means and standard deviation.
8. The adoption of selected improved practices in litchi cultivation by the litchi growers is linearly related with their selected characteristics.

1.6 Limitations of the study

The present study is undertaken with a view to having an understanding on the level of adoption of the selected improved practices in litchi cultivation by the respondents in Dinajpur district. In order to manageable way, it became necessary to impose some limitations in regard to certain aspects of the study. Considering time, money and other necessary resources available to the researcher, the following limitations have been observed throughout the study:

1. The study was confined to Biral upazila under Dinajpur district.
2. The study will focus on adoption of selected improved practices in litchi cultivation which included use of improved varieties, use of fertilizer, use of pesticides and use of intercultural operations.
3. Only four improved practices in litchi cultivation are selected to examine the extent of adoption among the litchi growers of Biral upazila.
4. Only the farmers who cultivated litchi crop were selected for this study.
5. There are many attributers or characteristics of the farmers which are always vary but only ten will be selected for investigation in this study as stated in the objectives. This was done to complete the study within limited resources and time.
6. Population for the present study was kept confined within the heads of litchi growing farms in the study area, because they are the decision makers in their respective improved practices in litchi cultivation.

1.7 Definition of Important Terms

In order to avoid confusion and misunderstanding, certain terms used throughout the study are defined below for greater charity of understanding.

Adoption is the implementation of a decision to continue the use of an innovation. According to Rogers (2003) "Adoption is a decision to make full use of an innovation as the best course of action available". When an individual takes up a new idea as the best course of action and practices it, the phenomenon is known as adoption (Ray, 2006).

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

Education referred to the ability of the respondents to read and write or having formal education received up to a certain standard. Education was measured on the basis of class a farmer had passed from formal educational institution.

Family size refers to the total number of members in the family including the respondents himself, his wife, children and other permanent dependents, who live and ate together as a family unit.

Litchi cultivation knowledge is the extent of basic understanding of the litchi growers in different aspects of litchi related matters i.e. maturation time, weather condition, soil, seed, fertilizer, insects and diseases control, high yielding variety etc.

Farm size referred to the cultivated area either owned by the farmer or obtained from other on *borga* system, the area being estimated in terms of full benefit and half benefit to the farmer respectively. The self-cultivated owned land and cultivated area taken as lease or mortgage from others was recognized as full benefit.

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

Fertilizer refers all types of nutrient element which are applied for supplying plant nutrients.

Cosmopoliteness is defined as the degree to which an individual's orientation external to a particular social system. Empirically it referred to the number of times a person pays visit to places their then his locality.

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

Farmers/Growers refers to those who cultivate litchi and/or of various other crops.

Improved practices in respect of cultivation of any crop refer of those practices, which are advocated by some competent authority. These technologies, if used, are helpful for improving the yield and/or quality of the crop.

Innovativeness is the degree to which an individual is relatively earlier in adopting agricultural innovation, new ideas, practices and things than the other members of a social system (Rogers, 2003). This was comprehended by the quickness of accepting innovations by an individual in relation to others and was measured on the basis of time dimension.

Marketing orientation has been defined as the degree to which a farmer is oriented towards marketing information related his farm products.

Irrigation generally is defined as the application of water to soil for the purpose of supplying the moisture essential for plant growth.

Problem refers to a difficulty about which something to be done. Problem faced by the farmers in this study is defined as the extent of difficulties faced by growers in the way of adoption of selected improved practices in litchi cultivation.

Respondents: People who will have answer questions by the interviewer under this study. They are the head of the litchi growing farms of Biral upazila under Dinajpur district.

Technology is a design of instrumental action that reduces the uncertainty in the cause-effect relationship involved in achieving a desired outcome (Rogers, 2003).

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

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this Chapter is to review of literature having relevance to the present study. The researcher made an elaborate search of available literature for the above purpose. The litchi growers and relationships with the selected characteristics concern in this study with adoption of improved practices in litchi cultivation. The researcher attempted to search the literatures and observed that a number of studies have been conducted on the adoption of improved practices in litchi cultivation. However, literatures relating to concept of use and past studies exploring relationship of the characteristics of the growers with their adoption of improved practices in litchi cultivation have been cited in this Chapter.

This Chapter is divided into four major sections, the first section deals with the concept of diffusion and adoption of innovations, the second section deals with review of literature on general context of adoption, the third section deals with the relationship between farmers characteristic and their adoption of improved practices in litchi cultivation and the fourth section deals with the conceptual framework of the study.

2.1 Concept of Adoption and Diffusion: This section is divided into the following sub-section:

2.1.1 Adoption, diffusion and adoption process

Adoption is a decision to make full use of an innovation as the best course of action available (Ray, 2006). When an individual takes up a new idea as the best course of action and practice it, the phenomenon is known as adoption.

Diffusion is the process by which an innovation spreads from its sources of invention or creation to its ultimate users or adopters. Four essential elements are involved in the diffusion process. These are: innovation, communication channel, social system and over time.

Rogers and Shoemaker (1971) stated the adoption process as: the traditional view of the innovation decision process, called 'adoption process' was postulated by a committee of rural sociologist in 1955 as consisting of five stages:

Awareness stage: The individual learns of the existence of the new idea but lacks detailed information about it.

Interest stage: The individual develops interest in the innovation and seeks additional information about it.

Evaluation stage: The individual makes mental application of the new idea to his present and anticipated future situation and decide whether or not to try it.

Trial stage: The individual actually applies the new idea on a small scale in order to determine its utility in its own situation.

Adoption stage: The individual uses the new idea continuously on a full scale.

2.1.2 Innovation-decision process

The innovation-decision process is the process through which an individual (or other decision making unit) passes from first knowledge of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of new idea and to confirmation of this decision (Rogers, 2003). This process consists of series of actions and choice over time through which an individual or an organization evaluates a new idea and decides whether or not to incorporate the innovation into ongoing practices. The behavior consists essentially of dealing with the uncertainty that is inherently involved in deciding about a new alternative to those previously in existence. The perceived newness of the innovation and the uncertainty associated with this newness that is a distinctive aspect of innovation-decision making.

An individual's decision about an innovation is not an instantaneous act. Rather, it is a process that occurs overtime and consists of a series of actions and decisions (Rogers, 2003). The model presented of the innovation-decision process (Figure 2.1).

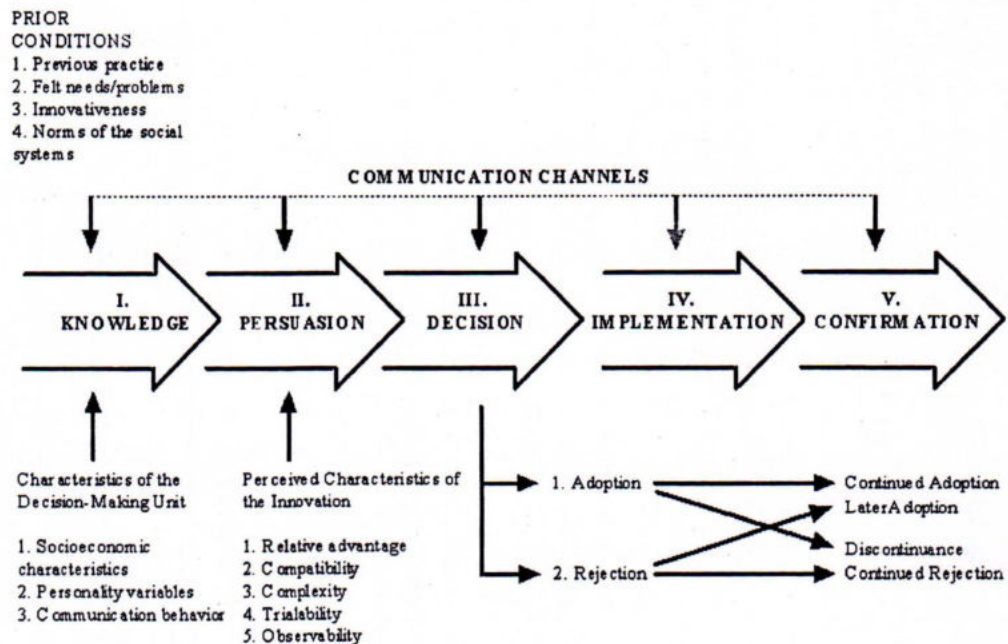


Figure 2.1 Model of stages in the innovation-decision process

According to Rogers (2003) there are five stages in innovation-decision process are:

Knowledge occurs when an individual (or other decision making unit) is exposed to the innovation's existence and gains some understanding of how it functions.

Persuasion occurs when an individual (or some other decision making unit) forms a favorable or unfavorable attitude towards the innovation.

Decision occurs when an individual (or other decision making unit) engages in activities that leads to choice either adoption or rejection of the innovation.

Implementation occurs when an individual (or other decision making unit) puts an innovation into use.

Confirmation occurs when an individual (or some other decision making unit) seeks reinforcement of an innovation decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting message about the innovation.

2.1.3 Adopter categories

There are five adopter categories as suggested by Rogers (2003) based on the innovativeness, where innovativeness is the degree to which an individual is earlier in adoption compared to other units of social system. These categories are (Figure 2.2):

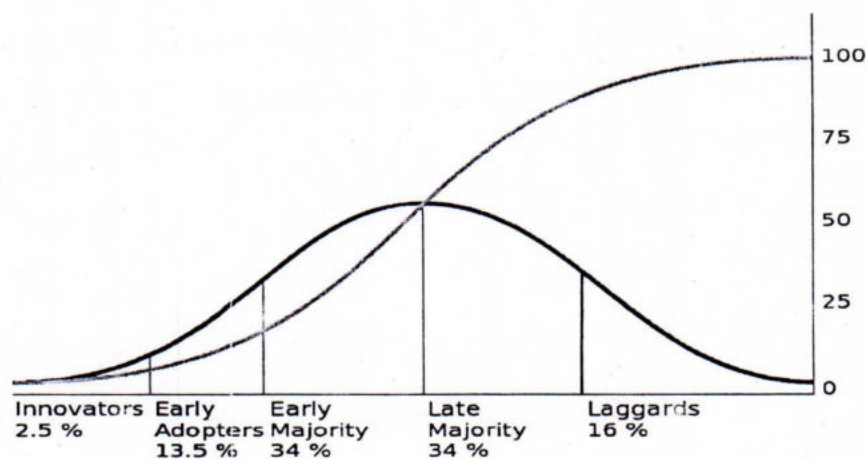


Figure 2.2 Adopter categories on the basis of innovativeness (Rogers, 2003)

2.1.3.1 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 relationship. Communication patterns and friendship among a clique of innovators are common, even though the geographical distance between the innovators may be considerable. The salient value of the 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.

2.1.3.2 Early adopters: respectable

Early adopters are a more integrated part of the local social system than are innovators. Early adopters are localities and this category has the greatest degree of opinion leadership in most social systems. 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. The early adopter is respected by his or her peers. 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.

2.1.3.3 Early majority: deliberate

The early majority adopt new ideas just before the average member of a social system. The early majority adopters interact frequently with their peers but seldom hold positions of opinion leadership in a system. They provide interconnectedness in the system's interpersonal 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.

2.1.3.4 Late majority: skeptical

The late majority adopt new ideas just after the average member of a social system. Adoption may be both an economic necessity for the late majority and the result of increasing network pressures from peers. Innovations are approached with a skeptical way and the majority do not adopt until most others in their social system have done so. They are approximately 34 percent in the society.

2.1.3.5 Laggards: traditional

Laggards are the last in a social system to adopt an innovation. They possess almost no opinion leadership. They are the most locality in their outlook of all categories and many are near insulates in the social networks of their system. Decisions are often made in terms of what has been done in previously and these individuals interact primarily with others who also have relatively traditional values. Laggards tend to be suspicious of innovations and change agents. The innovation-decision process is relatively lengthy, with adoption and use lagging far behind awareness-knowledge of a new idea. They are approximately 16 percent in the social system.

2.2 Review of Literature on General Context of Adoption

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

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

Hasan (2006) reported that about three-fifths 63 percent of the growers had medium adoption while 17 percent had low adoption and 20 percent had high adoption of improved practices in litchi cultivation.

Yadav and Kumar (2006) found that majority (78.75 percent) of the farmers had medium adoption while 12.50 percent had low adoption and only 8.75 percent had high adoption of scientific wheat cultivation technologies.

Nande and Basunathe (2009) revealed that majority (65.12 percent) of the farmers had medium adoption while 18.60 percent had low adoption and 16.28 percent had high adoption of improved dairy cattle management practices.

Singh (2010) observed that majority (58 percent) of the farmers had medium adoption while 24 percent had low adoption and 18 percent had high adoption of recommended potato cultivation practices.

Prasad and Ram (2010) found that majority (50.00 percent) of the farmers had medium adoption while 16.37 percent had low adoption and 33.63 percent had high adoption of improved wheat cultivation technologies.

Ziauddin and Goswami (2010) reported that 38.3 percent of the farmers had medium adoption while 25.8 percent had low adoption and 35.8 percent had high adoption of scientific fish cultivation practices.

Singh (2010) observed that majority (66 percent) of the farmers had medium adoption while 19 percent had low adoption and 15 percent had high adoption of recommended vegetable cultivation practices.

Singh and Priyadarshi (2010) found that majority (59.5 percent) of the farmers had medium adoption while 28 percent had low adoption and 12.5 percent had high adoption of improved mango production practices.

Baruah and Singha (2011) revealed that 58.00 percent of the farmers had medium adoption while 31.11 percent had low adoption and 24.44 percent had high adoption of recommended rice cultivation practices.

Singh and Barman (2011) found that majority (48 percent) of the farmers had medium adoption while 25 percent had low adoption and 27 percent had high adoption of recommended tomato and cauliflower cultivation technologies.

Kumbhare and Singh (2011) observed that majority (53.75 percent) of the farmers had high adoption while 14.5 percent had low adoption and 31.75 percent had medium adoption of improved wheat and paddy production technology.

Yadaw and Sharma (2012) reported that majority (82.5 percent) of the farmers had high adoption while only 5.0 percent had low adoption and 12.50 percent had medium adoption of recommended goat rearing practices.

Mehta and Sonawane (2012) revealed that 73 percent of the farmers had medium adoption while 10 percent had low adoption and 17 percent had high adoption of recommended mango cultivation practices.

Devi (2013) found that majority (59.09 percent) of the farmers had medium adoption while 18.18 percent had low adoption and 22.73 percent had high adoption of dairy farming technologies.

Chouhan and Singh (2013) reported that majority (74.16 percent) of the farmers had medium adoption while 12.50 percent had low adoption and 13.34 percent had high adoption of improved sugarcane cultivation practices.

Rao and Singh (2014) observed that majority (65.33 percent) of the farmers had medium adoption while 10 percent had low adoption and 24.67 percent had high adoption of recommended pineapple cultivation practices.

Deshmukh and Bariya (2014) found that majority (65.83 percent) of the farmers had medium adoption while 19.17 percent had low adoption and 15.00 percent had high adoption of recommended *Kharif* groundnut practices.

2.3 Relationships between Litchi Growers Characteristics and the Adoption of Improved Practices

2.3.1 Age and adoption of improved practices

Ali (2004) found there was no relationship between age of the farmers and adoption of aquaculture technology by them.

Hasan (2006) observed that age of the growers did not show any significant relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) reported that age of the farmers show negative and significant relationship with their adoption of dairy farming practices.

Nande and Basunathe (2009) revealed that age of the farmers did not show any significant relationship with their adoption of improved dairy cattle management practices.

Singh (2010) observed that age of the farmers show negative and significant relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) found that age of the farmers show negative and significant relationship with their adoption of scientific fish cultivation practices.

Yadaw and Sharma (2012) revealed that age of the farmers show negative relationship with their adoption of recommended goat rearing practices.

Chander and Akila (2012) reported that age of the farmers did not show any significant relationship with their adoption of draught bullock management.

Narayan and Patil (2012) found that age of the farmers show negative and not significant relationship with their adoption of cashew nut cultivation.

Mehta and Sonawane (2012) revealed that age of the farmers show negative relationship with their adoption of recommended mango cultivation practices.

Chouhan and Singh (2013) reported that age of the farmers show significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) found that age of the farmers did not show any significant relationship with their adoption of dairy farming technologies.

Rao and Singh (2014) observed that age of the farmers show negative and significant relationship with their adoption of pineapple cultivation practices.

2.3.2 Educational qualification and adoption of improved practices

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

Islam (2003) conducted a study on adoption of organic manures. He found that there was a positive and significant positive relationship between education of the farmers and their adoption of organic manures.

Hasan (2006) found that education of the growers showed significant and positive relationship with their adoption of improved practices in litchi cultivation.

Nande and Basunathe (2009) reported that education of the growers showed positive and significant relationship with their adoption of improved dairy cattle management practices.

Singh (2010) observed that education of the farmers showed significant and positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) revealed that education of the farmers did not show any significant relationship with their adoption of scientific fish cultivation practices.

Chander and Akila (2012) found that education of the farmers show positive but not significant relationship with their adoption of draught bullock management.

Yadaw and Sharma (2012) reported that education of the farmers did not show any significant relationship with their adoption of recommended goat rearing practices.

Mehta and Sonawane (2012) observed that education of the farmers showed significant relationship with their adoption of recommended mango cultivation practices.

Chouhan and Singh (2013) revealed that education of the farmers show significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) reported that education of the farmers showed significant relationship with their adoption of dairy farming technologies.

Rao and Singh (2014) found that education of the farmers showed significant and positive relationship with their adoption of pineapple cultivation practices.

2.3.3 Family size and adoption of improved practices

Hasan (2006) found that family size of the growers showed significant and negative relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) reported that family size of the farmers show negative relationship with their adoption of dairy farming practices.

Nande and Basunathe (2009) observed that family size of the farmers did not show any significant relationship with their adoption of improved dairy cattle management practices.

Singh (2010) found that family size of the farmers showed positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) revealed that family size of the farmers show negative and non- significant relationship with their adoption of scientific fish cultivation practices.

Singh and Priyadarshi (2010) reported that family size of the farmers showed negative significant relationship with their adoption of improved mango production practices.

Mehta and Sonawane (2012) found that family size of the farmers showed negative relationship with their adoption of recommended mango cultivation practices.

Yadaw and Sharma (2012) observed that family size of the farmers did not show any significant relationship with their adoption of recommended goat rearing practices.

Chander and Akila (2012) revealed that family size of the farmers showed negative relationship with their adoption of draught bullock management.

Chouhan and Singh (2013) reported that family size of the farmers did not show any significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) found that family size of the farmers did not show any significant relationship with their adoption of dairy farming technologies.

Rao and Singh (2014) observed that family size of the farmers did not show any significant relationship with their adoption of pineapple cultivation practices.

2.3.4 Litchi cultivation knowledge and adoption of improved practices

Hasan (2006) found that knowledge of the growers showed significant and positive relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) observed that knowledge of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Singh (2010) revealed that knowledge of the farmers showed positive and significant relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) reported that knowledge of the farmers show positive and significant relationship with their adoption of scientific fish cultivation practices.

Singh and Barman (2011) observed that knowledge of the farmers showed significant relationship with their adoption of tomato and cauliflower cultivation technologies.

Chander and Akila (2012) found that knowledge of the farmers showed positive and significant relationship with their adoption of draught bullock management.

Yadaw and Sharma (2012) revealed that knowledge of the farmers showed positive and highly significant relationship with their adoption of recommended goat rearing practices.

Mehta and Sonawane (2012) found that knowledge of the farmers show positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Chouhan and Singh (2013) reported that knowledge of the farmers showed significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) found that knowledge of the farmers showed positive and significant relationship with their adoption of dairy farming technologies.

2.3.5 Extension contact and adoption of improved practices

Hasan (2006) observed that extension contact of the growers showed significant relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) found that extension contact of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Nande and Basunathe (2009) reported that extension contact of the growers showed positive and significant relationship with their adoption of improved dairy cattle management practices.

Singh (2010) revealed that extension contact of the farmers showed positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) found that extension contact of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Singh and Barman (2011) observed that extension contact of the farmers showed significant relationship with their adoption of tomato and cauliflower cultivation technologies.

Yadaw and Sharma (2012) reported that extension contact of the farmers showed positive and significant relationship with their adoption of recommended goat rearing practices.

Mehta and Sonawane (2012) found that extension contact of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Chouhan and Singh (2013) revealed that extension contact of the farmers showed significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) reported that extension contact of the farmers showed positive and significant relationship with their adoption of dairy farming technologies.

Rao and Singh (2014) found that extension contact of the farmers showed positive and significant relationship with their adoption of pineapple cultivation practices.

2.3.6 Cosmopoliteness and adoption of improved practices

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

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

Rahman (2003) found that cosmopoliteness of the farmers had significant positive relationship with their adoption of intercropping in pineapple cultivation.

Hasan (2006) observed that cosmopoliteness of the growers showed significant relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) reported that cosmopoliteness of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Singh (2010) found that cosmopoliteness of the farmers showed positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) revealed that cosmopoliteness of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Goswami (2012) found that cosmopoliteness of the farmers had positive and highly significant relationship with their adoption of scientific fish cultivation practices.

Yadaw and Sharma (2012) observed that cosmopoliteness of the farmers had positive and significant relationship with their adoption of recommended goat rearing practices.

2.3.7 Farm size and adoption of improved practices

Hasan (2006) revealed that farm size of the growers showed significant and positive relationship with their adoption of improved practices in litchi cultivation.

Singh (2010) found that farm size of the farmers showed positive relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) observed that farm size of the farmers show positive and significant relationship with their adoption of scientific fish cultivation practices.

Chander and Akila (2012) reported that farm size of the farmers showed positive and significant relationship with their adoption of draught bullock management.

Yadaw and Sharma (2012) found that knowledge of the farm size showed positive and highly significant relationship with their adoption of recommended goat rearing practices.

Chouhan and Singh (2013) observed that farm size of the farmers show significant relationship with their adoption of improved sugarcane cultivation practices.

Devi (2013) found that farm size of the farmers show negative relationship with their adoption of dairy farming technologies.

Rao and Singh (2014) reported that farm size of the farmers showed positive and significant relationship with their adoption of pineapple cultivation practices.

2.3.8 Annual income and adoption of improved practices

Hasan (2006) reported that annual income of the growers showed significant and positive relationship with their adoption of improved practices in litchi cultivation.

Singh (2010) found that annual income of the farmers showed significant relationship with their adoption of potato cultivation practices.

Ziauddin and Goswami (2010) observed that annual income of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Yadaw and Sharma (2012) revealed that annual income of the farmers showed positive and highly significant relationship with their adoption of recommended goat rearing practices.

Mehta and Sonawane (2012) found that annual income of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Chouhan and Singh (2013) observed that annual income of the farmers showed significant relationship with their adoption of improved sugarcane cultivation practices.

Rao and Singh (2014) found that annual income of the farmers had positive and significant relationship with their adoption of pineapple cultivation practices.

2.3.9 Innovativeness and adoption of improved practices

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

Hasan (2006) found that innovativeness of the growers showed significant relationship with their adoption of improved practices in litchi cultivation.

Ghosh and Maitra (2008) observed that innovativeness of the growers showed positive and highly significant relationship with their adoption of dairy farming practices.

Ziauddin and Goswami (2010) reported that innovativeness of the farmers showed positive and significant relationship with their adoption of scientific fish cultivation practices.

Singh and Priyadarshi (2010) revealed that innovativeness of the farmers showed positive and highly significant relationship with their adoption of improved mango production practices.

Mehta and Sonawane (2012) found that innovativeness of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Rao and Singh (2014) reported that innovativeness of the farmers did not show any significant relationship with their adoption of pineapple cultivation practices.

2.3.10 Marketing orientation and adoption of improved practices

Singh (2010) found that marketing orientation of the farmers showed positive relationship with their adoption of potato cultivation practices.

Yadaw and Sharma (2012) reported that marketing orientation of the farmers did not showed any significant relationship with their adoption of recommended goat rearing practices.

Venyo and Sharma (2014) found that marketing orientation of the farmers showed positive and significant relationship with their adoption of potato cultivation practices.

Rao and Singh (2014) revealed that marketing orientation of the farmers showed positive and significant relationship with their adoption of pineapple cultivation practices.

Kumar and Sharma (2014) found that marketing orientation of the farmers showed positive and highly significant relationship on organic cultivation practices.

2.4 The Conceptual Framework of the Study

Conceptual framework is the foundation for understanding the research and linkage among the different variables. It helps as a guiding principle for analyzing the research issues. In this section a brief description on concept of adoption of improved practices in litchi cultivation by the litchi growers and its cause-effect relationship with the selected characteristics of the litchi growers is presented.

It is evident from the past studies that every occurrence of phenomenon is the outcome of a number of variables which may or may not be interdependent or interrelated with each other. In other words, no single variable can contribute wholly to a phenomenon. Variables together are the causes and the resultant phenomenon is effect and thus, there are cause-effect relationships everywhere in the universe. The conceptual framework was kept in mind forming the structural arrangement for the dependent and independent variables. This study was concerned with the adoption of improved practices in litchi cultivation as a dependent variable and the 10 selected characteristics of the litchi growers as independent variables.

It is impossible to deal with all characteristics in a single study. Problems may also affect the adoption of improved practices in litchi cultivation. However, improvement of farm product may occur due to adoption of improved practices. Based on these discussion and review of literature, the conceptual framework of this study has been formulated as (Figure 2.3).

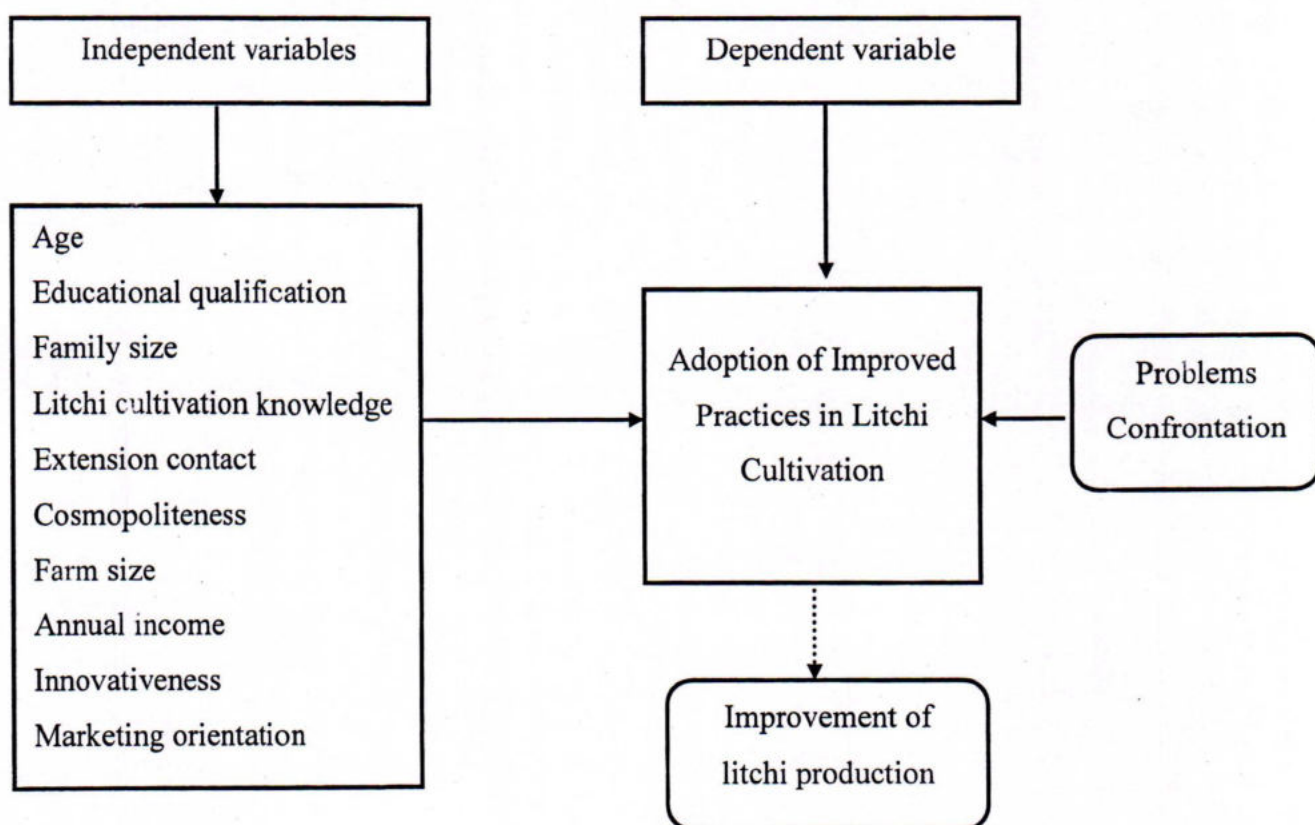


Figure 2.3 Conceptual framework of the study

CHAPTER 3

METHODOLOGY

Methodology deserves a very careful consideration in any scientific research. Importance of methodology in considering any research cannot be neglected. Methodology should be such as would enable the researcher to collect information. Keeping this point in view, the researcher took utmost care for using proper methods in all aspects of this investigation. This Chapter contains the methods and procedures in the present study in accordance with the objectives.

3.1 Locale of the Study

Considering the litchi growing area, the study was conducted in Biral upazila of Dinajpur district. Dinajpur is the northern district in Bangladesh and stands on the river Punarbhaba. Dinajpur is very well known district in Bangladesh for litchi cultivation. Data were collected from a sample of the litchi growers from seven villages under three unions in Biral upazila of Dinajpur district. The geographical location of the study area is at 25°45' N and 89°14' E. A map of Dinajpur district including its upazilas as well as Bangladesh (inset) and a map of Biral upazila show the sampling area (Figure 3.1 and Figure 3.2 respectively) is given.

3.2 Population and Sample Size

The litchi growers of Biral upazila were the target population of the study. Three union of Biral upazila namely Vandara, Biral and Sohogram were selected by random sampling procedure from ten unions. These unions consist of 26 villages among which seven villages were purposively selected due to considerable percent and area of litchi orchard. The total number of household was 2500 among them 1000 household possessed litchi orchard. This list of litchi orchard household of the selected village was collected from Upazila Agriculture Office. About 10 percent of them were selected randomly.

Due to the possibility of unavailability of the selected respondents, a reserve list of 16 litchi growers was made to substitute the missing respondents in the original list (Table 3.1). All possible measures were taken to avoid bias in data collection.

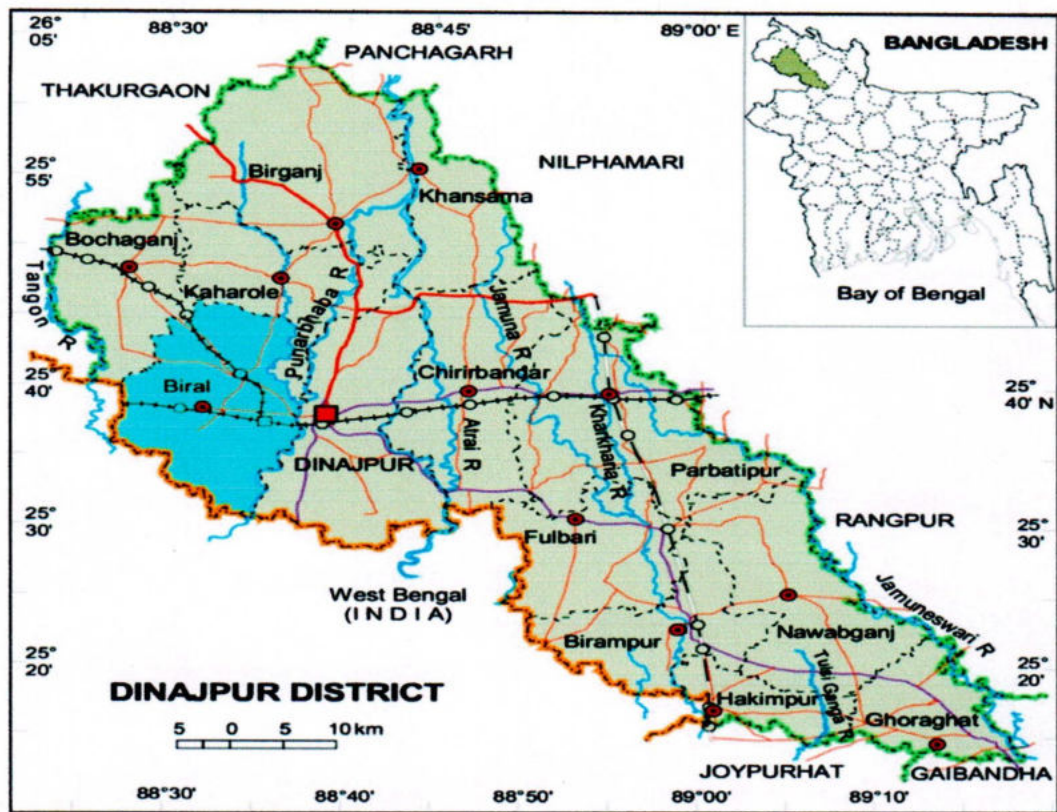


Figure 3.1 Map of Dinajpur district including its upazilas (Bangladesh inset)



Figure 3.2 Map of Biral upazila showing the study area

Table 3.1 Distribution of population and sample in the study area

Name of the union	Village	Population	Sample	Reserve list
1. Vandara	1. Rampur	100	10	2
	2. Varadangi	100	10	2
2. Biral	1. Robipur	100	10	2
	2. Madhobbati	260	26	3
	3. Buniyadpur	250	25	3
3. Sohorgram	1. Okra	110	11	2
	2. Fotehat	80	10	2
Total		1000	102	16

3.3 Variables of the Study and their Measurement

In social research like extension education, the selection and measurement of variables constitute a major task. In this connection, the researcher reviewed literature as far as possible to widen her understanding about the nature and scope of the variables relevant to this research. A variable is any measurable characteristics, which can assume varying or different values in successive individual cases (Ezekiel and Fox, 1959). A well-organized piece of research usually contains at least two important elements, viz. an independent variable and a dependent variable. An independent variable is that factor which is manipulated by the researcher to ascertain its relationships to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variables (Townsend, 1953). The dependent variable is often called the 'criterion' or 'predicted variable' where as the independent variables called treatment, experimental or antecedent variable (Deobold, 1973).

3.3.1 Measurement of independent variables

The selected individual characteristics of the litchi growers namely; age, educational qualification, family size, litchi cultivation knowledge, extension contact, cosmopolitaness, farm size, annual income, innovativeness and marketing orientation were the independent variables for this study. The ten selected characteristics of the litchi growers constitute the independent variables have been operationalized as follows:

3.3.1.1 Age

The age of the respondents was measured in terms of actual years from his birth to the time of interview. The respondents were asked to mention their age in terms of completed years. One score was given for one completed year of age (item no. 1, Appendix-A).

3.3.1.2 Educational qualification

Education was measured as the ability of an individual litchi grower to read and write or formal education received up to a certain standard. Educational qualification of the respondents was measured in terms of one's year of schooling. One score was given for passing each level in an educational institution (Mondol, 2009). For example, if a

respondent passed the final examination of class V his level of educational score was taken as five (5). If a respondent did not know how to read and write, his educational score was given as '0'. A score of 0.5 was given to that respondent who could sign his name only (item no. 2, Appendix-A).

3.3.1.3 Family size

The family size of the respondent was determined on the basis of the number of members in his family including himself, his wife, children and other dependents, living in a family. A unit score was assigned for each member of the family. If a respondent had five members in his family, his family size score was given as 5. The variable has been presented in item no. 3, Appendix-A.

3.3.1.4 Litchi cultivation knowledge

Litchi cultivation knowledge was measured by asking ten questions to the respondents. The assigned score for all the questions was 25. Full score i.e. 2 or 3 are assigned for each correct answer and zero for totally wrong answer. However, for correct responses to all questions, a respondent could get a total score of 25 while for wrong answer to all the questions he could get 0, indicating no knowledge on litchi cultivation and 25 indicating very high knowledge. The variable appears in item number 4 of the interview schedule presented in Appendix A.

3.3.1.5 Extension contact

Extension contact of the litchi growers was measured by computing scores based on his frequency of communication with 12 different media. These are ideal farmers, local leaders, NGOs workers, Sub-Assistant Agriculture Officer, Agriculture Extension Officers, Upazila Agricultural Officers, participation in result demonstration meeting, participation in farmers field day, participation in agricultural training, watching agricultural TV program, reading agriculture related books and reading agricultural poster, booklet and bulletin. This variable has been presented in item no. 5 of the interview schedule (Appendix-A). The extension contact was determine using four point scale as not at all, rarely, occasionally and regularly score was assigned as 0, 1, 2 and 3 respectively. The extension contact score could range from 0 to 36, where 0 indicates no extension contact and 36 indicates very high extension contact.

3.3.1.6 Cosmopoliteness

A cosmopoliteness score was computed for each respondent to determine the degree of his exposure on the basis of his number of visit to different types of places. Each respondent was asked to indicate the number of visit to six different types of places according to the frequency of his to each type of places by checking any of four responses, not at all, rarely, occasionally, and regularly. Score assigned to his responses were 0, 1, 2 and 3 respectively according to the extent of visits as presented below:

Sl. No.	Place of visit	Nature of visit	Score assigned
1	Visit friends /relatives houses	Not even once	0
		1-2 times / Month	1
		3-4 times / Month	2
		>5 times / Month	3
2	Visit union parisad office	Do	Do
3	Visit own upazila head quater	Not even once	0
		1-2 times / Season	1
		3-4 times / Season	2
		>5 times / Season	3
4	Visit own district town	Do	Do
5	Visit other district town	Not even once	0
		1-2 times /Year	1
		3-4 times / Year	2
		>5times / Year	3
6	Visit division or capital city	Do	Do

The possible range of scores could vary from 0 to 18, where 0 indicates no cosmopoliteness and 18 indicates very high cosmopoliteness. This variable has been presented in item no. 6 of the interview schedule (Appendix-A).

3.3.1.7 Farm size

Farm size of a respondent was determined as the total area of his farm on which he continued his farming operations during the period of his study. The area was being estimated in terms of full benefits to the litchi growers and the unit of measurement in hectare. The total area of land thus obtained has been considered as farm size of the grower (item no. 7, Appendix-A). It was measured using the following formula (Mondol, 2009):

$$\text{Farm size} = A + B + \frac{1}{2} (C + D) + E$$

3.3.1.8 Annual income

The annual income of the litchi growers was measured on the basis of his family's yearly earnings from fruits (litchi and other fruit), crops (rice, wheat, maize, potato), fish farm, livestock, business, service and others. The annual income was expressed in Taka. In measuring the variable, total earning in Taka of a respondent was converted into unit score. A score of one (1) was assigned for each '1000' Taka of the annual income of a respondent (Waheduzzaman, 2004, and Mondol, 2009). The variable appears in item number 8 in the interview schedule (Appendix-A).

3.3.1.9 Innovativeness

Innovativeness of a respondent was measured by computing an innovativeness score on the basis of his adoption of 10 selected agricultural technologies. Score was assigned on the basis of time dimension for his adoption of a particular technology. Since the exact date of introduction of the selected technologies in the study area was not known, the relative

earliness of the adoption of a particular technology by a respondent was ascertained by considering how long since the date of interview he first adopted that technology. The variable appears in item number 9 in the interview schedule (Appendix-A). Where score was given to the length of adoption or non-adoption of a new technology as follows:

Period of adoption	Score assigned
Not adopted at all	0
Adopted within 1 year	3
Adopted within 1-2 years	2
Adopted above 2 years	1

The innovativeness scores of the respondents could range from 0 to 30, 0 indicated no innovativeness and 30 indicated very high innovativeness.

3.3.1.10 Marketing orientation

The marketing orientation of a farmer was measured on 5 items measuring scale, two of these items being stated positively and other three negatively. Each statement was provided with 4-point response categories. The positive statements were given scores for strongly agree 4, agree 3, disagree 2, and strongly disagree 1. Scoring was reversed for the negative statements. The range of scores for the scale could range from 5 to 20 where 5 indicated low marketing orientation and 20 very high marketing orientations. The marketing orientation score of an individual is the sum of scores for all the statements in the scale (Mondol, 2009). The variable appears in item number 10 in the interview schedule (Appendix-A).

3.3.2 Measurement of dependent variable

Adoption of improved practices in litchi cultivation was the dependent variable of this study. A total of 20 selected practices were constructed to measure each litchi grower's adoption in litchi cultivation. A four-point scale was used to measure the opinion of the respondent against each item.

The dependent variable consists of four selected improved practices in litchi cultivation namely use of improved varieties, use of fertilizers, use of pesticides and use of intercultural operation. Four varieties such as Madraji, Bombai, China-3 and Bedana were included under improved varieties. Under fertilizers ten items namely cow dung, ash, urea, TSP, MOP, borax, zinc sulphate, flora, planofix and naphthalene were also included. Three pesticides namely ripcord, kalthane or omite and salphotox were included under use of pesticides. Under intercultural operations, three operations namely weeding, drainage management and mulching were included.

The scales used for computing the extent of adoption of improved practices in litchi cultivation were 0, 1, 2 and 3 for not adopted, low moderate and high respectively. The score obtained by the respondents on adoption of improved practices score, which could range

from 0 to 60. Again, Agricultural Adoption Index (AAI) was calculated by using the following formula:

$$AAI = N_{NA} \times 0 + N_{LA} \times 1 + N_{MA} \times 2 + N_{HA} \times 3$$

Where,

N_{NA} = Total number of respondents expressed 'not adopted at all'

N_{LA} = Total number of respondents expressed 'low adopted'

N_{MA} = Total number of respondents expressed 'moderate adopted'

N_{HA} = Total number of respondents expressed 'high adopted'

Thus, AAI could be ranged from 0 to 306 where 0 indicating not adopted and 306 indicating high adopted. AAI on each of the improved practices activities of four improved practices and rank order were computed for each selected improved practices.

3.3.2.1 Overall adoption score of improved litchi cultivation practices

A score for overall adoption of improved litchi cultivation practices was computed for each litchi growers by adding his scores for four practices.

Practices	Score range
Use of improved varieties	0-12
Use of fertilizers	0-30
Use of pesticides	0-9
Use of Intercultural operations	0-9
Overall	0-60

Thus the overall adoption score of the respondents could range from 0 to 60, 0 indicated absolute non-adoption and 60 indicated high adoption of improved litchi cultivation practices by the growers.

3.4 Measurement of Problems Confrontation of the Growers in Litchi Cultivation

Problems was measured by using of closed form of questions (item No.12 Appendix-A). The growers were asked to give their opinion on 10 selected problems which were identified during pre-testing of the questionnaire in the adoption of improved practices in litchi cultivation. A four point modified Likert scale was used for computing the problem confrontation score. Weights on responses against the 10 problems of the litchi growers were assigned as 0 for 'not at all', 1 for 'low', 2 for medium, and 3 for 'high'. The weights of responses of all the problems faced by the respondents were added together to obtain the problem confrontation score. Thus, the possible problems confrontation score of the respondents could range from 0 to 30, where 0 indicating no problems confrontation while 30 indicating high problems confrontation in litchi cultivation by the litchi growers.

To ascertain the comparison among the problems, Problems Confrontation Index (PCI) was computed by using the following formula:

$$PCI = P_{np} \times 0 + P_{lp} \times 1 + P_{mp} \times 2 + P_{hp} \times 3$$

Where,

P_n = Frequency of respondent mention the problem as 'not at all'

P_l = Frequency of respondent mention the problem as 'low'

P_m = Frequency of respondent mention the problem as 'medium'

P_h = Frequency of respondent mention the problem as 'high'

3.5 Statement of Hypothesis

In order to guide relevant data collection, analysis and interpretation of data, a set of hypothesis would be formulated for empirical testing. Hypotheses are always in declarative sentence form and they are related, either generally or specifically from variables to variables. In broad sense hypothesis are divided into two categories: (a) Research hypothesis, and (b) Null-hypothesis.

3.5.1 Research hypothesis

Research hypothesis (H_a) states anticipated relationships between concerned variables. Based on review of literature and conceptual framework, the research hypothesis was 'there were relationships between selected ten characteristics of the litchi growers with their adoption of improved practices in litchi cultivation'.

3.5.2 Null hypothesis

Null hypothesis (H_0) states that there is no relationship between the concerned variables. The null hypothesis developed for this study 'there were no relationships between selected ten characteristics of the litchi growers with their adoption of improved practices in litchi cultivation'.

3.6 Instrument for Collection of Data

In order to collect desired information, an interview schedule was prepared keeping the objectives of the research in mind. The schedule was prepared in *Bangla* (English version of the interview schedule is enclosed in Appendix-A) for clear understanding of the respondents. Farmers opinion based question have been included in the schedule along with the selected characteristics of the respondents. The schedules were pre-tested in actual field situation before using the same for final collection of data among 16 respondents of the study area. Necessary correction, additions and alternations were made in the interview schedule on the basis of results of pre-test. The interview schedule was then printed in its final form.

The researcher made all possible efforts to establish rapport with the respondents so that they could feel free to respond to the questions and their answers were recorded sincerely. The respondents did not keep records of annual or daily transaction of many of their activities.

Hence, it was very difficult to collect actual data and the researcher had to rely on the memory of the farmers.

3.7 Data Collection

Data were collected by the researcher herself from the sample by using interview schedule. Researcher established desired rapport with the respondents before explaining the purpose of the research and collection of data. Collection of data were started on 28 March 2014 and completed on 2 May 2014. Necessary co-ordination was obtained from the Sub-Assistant Agriculture Officers (SAAOs) of Biral upazila. In order to minimize error, the information of the respondent was carefully recorded and duly checked. Data obtained from the respondents were transferred to master sheet and then compiled to facilitate tabulation. The qualitative data were converted into quantitative data by means of suitable scoring techniques.

3.8 Data Processing and Analysis

The collected data was compiled, tabulated, coded and analyzed for statistical analysis according to the objectives of the research. Descriptive statistic such as range, mean, number, percentage, standard deviation and rank order was used wherever necessary in describing the selected variables. Pearson's Product Moment Correlation Co-efficient (r) was used to examine the relationships of characteristics (independent variables) of the respondents with their adoption of improved practices in litchi cultivation (dependent variables). The soft-wares: Excels and SPSS were used to analyze the data.

Correlation matrix was also computed to determine the inter-relationships among the variables. Five percent (0.05) and one percent (0.01) levels of significance were used as the basis of statistical significance.

CHAPTER 4

RESULTS AND DISCUSSION

The results of the study are presented in this Chapter with the help of proper statistical analysis along with their logical interpretations. This study has been conveniently presented in four sections according to the objectives. The first section deals with the selected characteristics of the litchi growers have been discussed. The second section deals with litchi grower adoption of improved practices, the third section deals with the relationships between the selected characteristics of the litchi growers and their adoption of improved practices. And the fourth section deals with the problems confrontation of the growers in litchi cultivation have been discussed.

4.1 Selected Characteristics of the Litchi Growers

The characteristics of an individual are an important factor in developing mental makes up for making decisions about various issues of adoption. More particular decisions related to farming activities are being influenced largely by different characteristics of an individual. The characteristics of the respondents were selected to find out their relationship with the adoption of improved practices. The selected characteristics included their age, educational qualification, family size, litchi cultivation knowledge, extension contact, cosmopolitaness, farm size, annual income, innovativeness and marketing orientation. These characteristics of the growers have been described in this section. Distribution of the growers according to their different selected characteristics has been shown in Table 4.1.

4.1.1 Age

According to Smith and Zope (1970) an individual's age is one of the most important factors pertaining to his personality makeup, since his need and the way in which he thinks and behaves are all closely related to the number of years she has lived.

Age of the litchi growers ranged from 35 to 65 years, with a mean of 46.06 years and standard deviation of 7.50. For the purpose of analysis, respondents were classified into three categories viz. young, middle aged and old (Table 4.1). Data contained in Table 4.1 indicates that that near about three-fourths (72.6 percent) of the respondents were middle aged compared to 23.5 percent of the respondents belonged to the old aged categories, while only 3.9 percent were in the young aged category. These findings indicate that the majority of the farmers were middle aged. The findings may be due to the reason of nature of the population of this study. Middle aged people are generally energetic and they are most productive group in the adoption of innovation and they can take easily any decision.

Table 4.1 Main features and categorization of litchi growers (N=102)

Characteristics	Scoring method	Range		Categories	Respondents		Mean	SD
		Possible	Observed		No.	%		
Age	No. of year	Unknown	35-65	Young(up to 35)	4	3.9	46.06	7.50
				Middle aged (36-50)	74	72.6		
				Old(>50)	24	23.5		
Educational qualification	Year of schooling	Unknown	5-16	Primary (≤ 5)	11	10.8	8.52	2.34
				Secondary (6-10)	78	76.5		
				Higher (>10)	13	12.7		
Family size	No. of members	Unknown	4-8	Small (≤ 5)	26	25.5	6.03	0.95
				Medium (6-7)	72	70.6		
				Large (> 7)	4	3.9		
Litchi cultivation knowledge	Score	0-25	16-24	Good (≤ 18)	47	46.1	19.06	1.75
				Very good (19-22)	51	50.0		
				Excellent (>22)	4	3.9		
Extension contact	Score	0-36	8-20	Low (≤ 12)	35	34.3	13.96	2.49
				Medium (13-16)	57	55.9		
				High (>17)	10	9.8		
Cosmopolitaness	Score	0-18	5-13	Low (≤ 7)	47	46.1	7.80	1.65
				Medium (8-10)	49	48.0		
				High (>10)	6	5.9		
Farm size	Hectare	Unknown	0.55-3.09	Small (0.21-1.0)	23	22.5	1.18	0.43
				Medium (1.01-3.0)	75	73.6		
				Large (>3.0)	4	3.9		
Annual income	('000' Tk.)	Unknown	100-450	Low (≤ 195)	20	19.6	258.49	68.41
				Medium (196-250)	26	25.5		
				High (≥ 251)	56	54.9		
Innovativeness	Score	0-30	9-20	Low (≤ 11)	13	12.7	13.26	2.07
				Medium (12-14)	66	64.8		
				High (≥ 15)	25	22.5		
Marketing orientation	Score	5-20	15-18	Low (≤ 15)	4	3.9	17.09	0.71
				Medium (16-17)	72	70.6		
				High (>17)	26	25.5		

4.1.2 Educational qualification

Exposure to formal education is very important for shaping-up the behavior of an individual. Education compels an individual to seek, accumulate as well as assimilate knowledge for appropriate uses. The level of education of the respondent ranged from 5 to 16 years of schooling having a mean of 8.52 with a standard deviation of 2.34. On the basis of their level of educational qualification, the litchi growers were classified into three categories viz. primary, secondary and higher are presented in Table 4.1.

Data furnished in the Table 4.1 reveal that majority (76.5 percent) of the respondents education level was in secondary level whereas 10.8 percent in primary level and 12.7 percent in higher level. There was a striking and noticeable incidence that no one was found illiterate in the study. The findings indicate the literacy rate of the litchi growers is greater than the national average literacy of 59.8 percent (BBS, 2014). It can be assumed that the educational qualification of the litchi growers may be higher rather than their neighbors.

4.1.3 Family size

High population density is a normal feature of Bangladesh. However, the family size scores of the respondents were found to be 4 to 8, the mean being 6.03 and standard deviation 0.95. On the basis of their family size scores, the litchi growers were also classified into three categories viz. small, medium and large (Table 4.1).

Data presented in Table 4.1 reveal that the highest proportion (70.6 percent) of the growers fell under the medium family category where 25.5 percent of the growers had small family size and only 3.9 of the respondents had large family size. The data indicate that the average family size (6.03 percent) of the respondents in the study area was higher than the national average of 4.85 (BBS, 2014). This may be due to the lack of proper adoption of family planning knowledge about family planning among the respondents or the prevalence of joint family planning area. Another reason may be that the national average was concerned with rural and urban families, but the present study is concerned with the rural families only.

4.1.4 Litchi cultivation knowledge

Litchi cultivation knowledge of the litchi growers is the foundation of his farming business. Litchi cultivation knowledge scores of the growers varied from 16 to 24 against a possible range of 0 to 25. The average litchi cultivation knowledge score was found to be 19.06 and standard deviation was 1.75. Based on the observed overall knowledge scores, the respondents were classified into three categories as good, very good and excellent (Table 4.1).

Data presented in Table 4.1 shows that exactly half (50.0 percent) of the growers had very good litchi cultivation knowledge compared to 46.1 percent had good litchi cultivation knowledge and only 3.9 percent had excellent litchi cultivation knowledge. A litchi growers who receives high level of education but less involvement in farming might possess lower litchi cultivation knowledge than the growers who is actively involved in farming for a long period of time.

4.1.5 Extension contact

Extension contact refers to aim an individual's contact with different extension media channels for receiving modern agricultural information. Extension contact scores of the respondents ranged from 8 to 20 with an average 13.96 and standard deviation of 2.49. On the basis of extension contact scores, the respondents were classified into three categories viz. low, medium and high (Table 4.1).

Data presented in Table 4.1 shows that the highest proportion (55.9 percent) of the respondents of the study area had the medium extension contact, while 34.3 percent had low extension contact and 9.8 percent had high extension contact. The findings of the study indicate that most of the respondents (90.2 percent) had low to medium extension contact with various information sources.

4.1.6 Cosmopolitaness

People differ in their traveling behavior; some enjoy traveling to different places while others confine themselves within a limited boundary. Those peoples who are outward- going by nature come into contact with different people, see new things, get new experiences and ideas. These people liberate themselves from limited attitudes and develop within themselves a pliant attitude. These people exhibit different attitude and behavior in many aspects of daily life compared to the others.

The cosmopolitaness scores of the respondents ranged from 5 to 13, against the possible score of 0 to 18. The mean and standard deviation were 7.80 and 1.65 respectively. On the basis of overall scores of cosmopolitaness, the respondents were classified into three categories viz. low, medium and high as shown in Table 4.1. Data presented in Table 4.1 indicates that the highest proportion (48.0 percent) of the respondents had medium cosmopolitaness compared to 5.9 percent had high cosmopolitaness and 46.1 percent had low cosmopolitaness. Despite the innate characteristic of traveling behavior, actually most people, now a day, in the rural community are very much concerned about their basic needs and they do not have enough money and time to spend on traveling.

4.1.7 Farm size

The most important production factor of a farmer is the land. It is a scarce resource in Bangladesh. The farm size is the main indicator of holding farming status by the farmers. The farm size of the respondents varied from 0.55 to 3.09 hectare. The average farm size was 1.18 and SD of 0.43. The farm size of farmers were classified into four categories viz. marginal farm, small farm, medium and large farm but as in the study, there were no marginal and large farm category (DAE, 1999). The farmers were classified into three categories as small farm, medium farm and large farm holding groups (Table 4.1). The study revealed that the highest proportion (73.6 percent) of the litchi growers had medium farm size, while 22.5 percent of them had small farm size and only 3.9 percent had large farm size. Thus most of the growers were in possession in small and medium farm and it also might be an indication that the small and medium farm holders were more interested in litchi cultivation.

4.1.8 Annual income

Annual income of the litchi growers were ranged from 100 to 450 thousand taka with an average of 258.49 and standard deviation of 68.41. The respondents were classified into three categories as low, medium and high depending on the annual income (Table 4.1). Data presented in Table 4.1 indicate that the highest proportion (54.9 percent) of the respondents had high income group compared to 25.5 percent had medium income group and 19.6 percent under low income group. The findings indicate that majority of the respondents had high income. It may be due to the fact that the litchi cultivation is a profitable business and the price of litchi fruits is well in market.

4.1.9 Innovativeness

Innovativeness is a desirable characteristic of a farmer that helps to consider and accept new technologies earlier than other members of his society. The innovativeness scores of the litchi growers ranged from 9 to 20, against the possible score of 0 to 30. The mean and standard deviation were 13.26 and 2.07 respectively. On the basis of overall scores of innovativeness, the respondents were classified into three categories such as low, medium and high as shown in Table 4.1.

It was found that majority (64.8 percent) of the farmers had medium innovativeness, 22.5 percent had high innovativeness and only 12.7 percent had low innovativeness. The findings of the study revealed that more than three-fourths (87.3 percent) of the farmers had medium to high innovativeness towards the adoption of improved practices.

4.1.10 Marketing Orientation

Marketing orientation has been defined as the degree to which a farmer is oriented towards marketing information related his farm products. The marketing orientation scores of the litchi growers were ranged from 15 to 18, against the possible range of 5 to 20. The mean and standard deviation were 17.09 and 0.71 respectively. Based on marketing orientation scores the farmers were classified into three categories low, medium and high as shown in Table 4.1.

The highest proportion (70.6 percent) of the litchi growers had medium marketing orientation while 25.5 percent of them had high orientation and only 3.9 percent had low marketing orientation. The findings revealed that majority (96.1 percent) of the litchi growers had medium to high marketing orientation. This may be due to litchi growers in receiving market price of their products at different local markets.

4.2 Adoption of Improved Litchi Cultivation Practices by the Litchi Growers

Adoption of improved litchi cultivation practices by the litchi growers was the dependent variable of this study. Among the practices, main focus was given on the adoption of four selected improved practices in litchi cultivation. The practices were improved varieties, use of fertilizers, use of pesticides and intercultural operations. The ways and means used for describing the findings in adoption of improved practices by the litchi growers were frequency distribution of all activities for statistical measures and Agricultural Adoption Index (AAI) in adoption of improved practices of individual aspects. The adoption of each of the practices and that of the overall adoption of improved practices in litchi cultivation as follows:

4.2.1 Adoption of improved varieties

This subsection deals with the findings of adoption of four selected improved varieties in litchi cultivation by the litchi growers. The growers were classified into four categories such as not cultivated, low, moderate and high. In order to obtain rank order AAI were computed against each of the improved varieties. The AAI values of each of the improved varieties ranged from 92 to 216 against the possible range of 0 to 306 (Table 4.2).

The findings show that the adoption of improved varieties in litchi cultivation by the litchi growers varied. The highest portion of the litchi growers cultivated Bombai variety of litchi, followed by Chaina-3, Madraji and Bedana varieties of litchi. Mentioning the advantages of improved varieties of litchi by the AEOs and SAAOs the adoption of improved varieties may be increased. High price of improved varieties was the reason for low adoption of improved varieties.

Table 4.2 Distribution of the litchi growers according to their adoption of improved varieties

Sl. No.	Name of varieties	Frequency of growers				AAI	Rank order
		Not cultivated	Low	Moderate	High		
1.	Madraji	66	2	12	22	92	3 rd
2.	Bombai	31	1	14	56	197	2 nd
3.	China-3	25	3	9	65	216	1 st
4.	Bedana	67	0	13	22	92	3 rd

4.2.2 Adoption of fertilizers

This subsection deals with the findings of adoption of ten selected fertilizers in litchi cultivation by the litchi growers. The growers were classified into four categories such as not used, low, moderate and high. In order to obtain rank order AAI were computed against each of the fertilizers. The AAI values of each of the improved varieties ranged from 74 to 231 against the possible range of 0 to 306 (Table 4.3).

The findings show that the adoption of fertilizers in litchi cultivation by most of the litchi growers varied from low to moderate. The highest portion of the litchi growers used Borax and Flora in their litchi orchard, followed by Cow dung, MOP, Urea, TSP, Ash, Naphthalene Acetic Acid, Zinc Sulphate and Planofix. Lack of awareness, lack of appropriate knowledge of fertilizers and overdose of fertilizers were the reasons for low adoption of fertilizers. For higher adoption of fertilizers different training and agricultural extension planning programs should be taken by DAE.

Table 4.3 Distribution of the litchi growers according to their adoption of fertilizers

Sl. No.	Name of fertilizers	Frequency of growers				AAI	Rank order
		Not applicable	Low	Moderate	High		
1.	Cow dung	0	35	67	0	169	3 rd
2.	Ash	11	77	14	0	105	7 th
3.	Urea	0	83	19	0	121	5 th
4.	TSP	1	86	15	0	116	6 th
5.	MOP	1	81	18	2	123	4 th
6.	Borax	1	1	52	42	231	1 st
7.	Zinc Sulphate	33	65	2	2	75	9 th
8.	Flora	0	2	60	30	212	2 nd
9.	Planofix	36	58	8	0	74	10 th
10.	Naphthalene	31	66	5	0	76	8 th

4.2.3 Adoption of pesticides

This subsection deals with the findings of adoption of three selected pesticides in litchi cultivation by the litchi growers. The growers were classified into four categories such as not used, low, moderate and high. In order to obtain rank order AAI were computed against each of the pesticides. The AAI values of each of the improved varieties ranged from 174 to 231 against the possible range of 0 to 306 (Table 4.4).

Table 4.4 Distribution of the litchi growers according to their adoption of pesticides

Sl. No.	Name of the pesticides	Frequency of growers				AAI	Rank order
		Not used	Low	Moderate	High		
1.	Ripcord	0	1	73	28	231	1 st
2.	Kalthane or Omite	1	2	83	16	216	2 nd
3.	Salphotox	2	56	41	3	147	3 rd

The findings showed that moderate numbers of the litchi growers used the three selected pesticides in litchi cultivation. The highest portion of the litchi growers used Ripcord in their litchi orchard, followed by Kalthane or Omite and Salphotox. In the study area most of the litchi growers were aware about their litchi production and they were knowledgeable about pesticides and their uses.

4.2.4 Adoption of intercultural operations

This subsection deals with the findings of adoption of three selected intercultural operations in litchi cultivation by the litchi growers. The growers were classified into four categories such as not used, low, moderate and high. In order to obtain rank order AAI were computed against each of the intercultural operations. The AAI values of each of the improved varieties ranged from 140 to 221 against the possible range of 0 to 306 (Table 4.5).

The findings show that moderate numbers of the litchi growers adopt the selected three intercultural operations in litchi cultivation. Intercultural operations may be useful in better production of litchi. Due to lack of awareness and knowledge were the reasons for low adoption of intercultural operations.

Table 4.5 Distribution of the litchi growers according to their adoption of intercultural operations

Sl. No.	Name of operations	Frequency of growers				AAI	Rank order
		Not used	Low	Moderate	High		
1.	Weeding	0	1	86	15	218	2 nd
2.	Drainage management	0	10	65	27	221	1 st
3.	Mulching	12	41	48	1	140	3 rd

4.2.5 Overall adoption of improved litchi cultivation practices

In order to have clear understanding of the adoption of four improved practices in litchi cultivation, all the four sub-scores were added together. The computed overall adoption scores of the respondents ranged from 20 to 42 against the possible range of 0-60 with an average of 30.54 and the standard deviation 3.83. The possible range was 0 to 60. Based on their overall scores, the respondents were classified into three categories: low adoption, medium adoption and high adoption. The distribution of the respondents according to their overall adoption of improved litchi cultivation practices is shown in Table 4.6.

Data presented in the Table no.4.6 indicate that three-fifths (60.8 percent) of the respondents had medium adoption of improved litchi cultivation practices compared to 13.7 percent had low adoption and 25.5 percent had high adoption.

Table 4.6 Distribution of the litchi growers according to their adoption of improved practices in litchi cultivation

Categories	Growers		Observed range	Mean	SD
	Number	Percent			
Low adoption (≤ 27)	14	13.7	20-42	30.54	3.83
Medium adoption (28-32)	62	60.8			
High adoption (≥ 33)	26	25.5			
Total	102	100.00			

Hasan (2006), Nande and Basunathe (2009), Singh and Priyadarshi (2010), Singh (2010), Kumbhare and Singh (2011), Singha and Baruah (2011), Mehta and Sonawane (2012), Yadaw and Sharma (2012), Chouhan and Singh (2013), Mehta and Thakor (2013), Devi (2013), Deshmukh and Bariya (2014) and Rao and Singh (2014) also found the similar findings. The observed result showed that medium to high adoption was the highest (86.3 percent) among adoption of modern agricultural technologies. There is still scope of

extension work for dissemination more information about improved litchi cultivation practices to increase litchi production. Effort of the concerned agricultural extension department has full adoption of all the improved practices.

4.3 Relationships between the Selected Characteristics of the Litchi Growers and their Adoption of Improved Practices in Litchi Cultivation

This section deals with the relationships of the 10 selected characteristics of the growers and their adoption of improved litchi cultivation practices. The selected characteristics constituted independent variables and the dependent variable considered is the adoption of improved litchi cultivation practices. The purpose of this section is examining the relationships of each of the independent variables with the dependent variable.

Pearson's Product Moment Correlation Co-Efficient 'r' has been used to test the hypothesis concerning the relationships between two variables. Summary result of the correlation co-efficient (r) between the selected characteristics of the litchi growers and their adoption of improved litchi cultivation practices has been presented in Table 4.7.

4.3.1 Age and adoption of improved practices in litchi cultivation

The relationship between age of the growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between age of the growers and their adoption of improved practices in litchi cultivation was 0.026 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.026) was smaller than the tabulated value ($r = 0.195$) with 100 degree of freedom at 0.05 level of probability.

On the basis of above findings, the null hypothesis could not be rejected that means the relationship between age and extent of adoption of improved practices was non- significant. Hence, that may be concluded that age of the growers had no significant relationship with their adoption of improved practices. Similar findings were also observed by Hossain (2003), Hasan (2006), Nande and Basunathe (2009), Chander and Akila (2012) and Devi (2013).

4.3.2 Educational qualification and adoption of improved practices in litchi cultivation

The relationship between educational qualification of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between educational qualification of the litchi growers and their adoption of improved practices was 0.262 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.262) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between educational qualification and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that educational qualification of the growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Nande and Basunathe (2009), Singh (2010), Sivashankar and Shashidhar (2011), Yadaw and Sharma (2012), Devi (2013) and Rao and Singh (2014).

Table 4.7 Correlation co-efficient between the selected characteristics of the growers and their adoption of improved practices in litchi cultivation

Dependent variable	Independent variables	Computed values of 'r' with 100 d.f.	Tabulated value of 'r'	
			0.05 level	0.01 level
Adoption of improved practices in litchi cultivation	Age	0.026 ^{NS}	± 0.195	±0.254
	Educational qualification	0.262**		
	Family size	-0.234*		
	Litchi cultivation knowledge	0.388**		
	Extension contact	0.247*		
	Cosmopolitaness	0.251*		
	Farm size	0.284**		
	Annual income	0.574**		
	Innovativeness	0.304**		
	Marketing orientation	0.263**		

* = Correlation is significant at the 0.05 level

** = Correlation is significant at the 0.01 level

NS = Not significant

4.3.3 Family size and adoption of improved practices in litchi cultivation

The relationship between family size of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between family size of the litchi growers and their adoption of improved practices was -0.234 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a negative trend.
- The computed value of 'r' (-0.234) was larger than the tabulated value ($r = 0.195$) with 100 degree of freedom at 0.05 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between family size and extent of adoption of improved practices was significant. Hence, the researcher concluded that family size of the growers had significant and negative relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ghosh and Maitra (2008), Ziauddin and Goswami (2010), Chauhan and Singh (2010), Singh and Priyadarshi (2010), Mehta and Sonawane (2012) and Chander and Akila (2012).

4.3.4 Litchi cultivation knowledge and adoption of improved practices in litchi cultivation

The relationship between family size of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between litchi cultivation knowledge of the litchi growers and their adoption of improved practices was 0.388 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.388) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between litchi cultivation knowledge and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that litchi cultivation knowledge of the litchi growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ghosh and Maitra (2008), Singh (2010), Singh and Barma (2011), Chander and Akila (2012), Yadaw and Sharma (2012), Chouhan and Singh (2013) and Devi (2013).

4.3.5 Extension contact and adoption of improved practices in litchi cultivation

The relationship between extension contact of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between extension contact of the litchi growers and their adoption of improved practices was 0.247 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.247) was larger than the tabulated value ($r = 0.195$) with 100 degree of freedom at 0.05 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between extension contact and extent of adoption of improved practices was significant. Hence, the researcher concluded that extension contact of the litchi growers had significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ghosh and Maitra (2008), Nande and Basunathe (2009), Singh (2010), Singh and Barma (2011), Yadaw and Sharma (2012), Chouhan and Singh (2013), Rao and Singh (2014) and Deshmukh and Bariya (2014).

4.3.6 Cosmopoliteness and adoption of improved practices in litchi cultivation

The relationship between cosmopoliteness of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between cosmopoliteness of the litchi growers and their adoption of improved practices was 0.251 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.251) was larger than the tabulated value ($r = 0.195$) with 100 degree of freedom at 0.05 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between cosmopoliteness and extent of adoption of improved practices was significant. Hence, the researcher concluded that cosmopoliteness of the litchi growers had significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ghosh and Maitra (2008), Singh (2010), Goswami (2012), Yadav and Sharma (2012) and Deshmukh and Bariya (2014).

4.3.7 Farm size and adoption of improved practices in litchi cultivation

The relationship between farm size of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between farm size of the litchi growers and their adoption of improved practices was 0.284 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.284) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between farm size and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that farm size of the litchi growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ziauddin and Goswami (2010), Chander and Akila (2012), Chouhan and Singh (2013), Rao and Singh (2014) and Deshmukh and Bariya (2014).

4.3.8 Annual income and adoption of improved practices in litchi cultivation

The relationship between annual income of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between annual income of the litchi growers and their adoption of improved practices was 0.574 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.574) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between annual income and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that annual income of the growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ziauddin and Goswami (2010), Yadaw and Sharma (2012), Mehta and Sonawane (2012), Chouhan and Singh (2013), Rao and Singh (2014) and Deshmukh and Bariya (2014).

4.3.9 Innovativeness and adoption of improved practices in litchi cultivation

The relationship between innovativeness of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between innovativeness of the litchi growers and their adoption of improved practices was 0.304 (Table 4.7). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.304) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between innovativeness and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that innovativeness of the litchi growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Hasan (2006), Ghosh and Maitra (2008), Singh and Priyadarshi (2010), Mehta and Sonawane (2012), Rao and Singh (2014) and Deshmukh and Bariya (2014).

4.3.10 Marketing orientation and adoption of improved practices in litchi cultivation

The relationship between marketing orientation of the litchi growers and their adoption of improved practices was examined by testing the concerned null hypothesis. The correlation coefficient between marketing orientation of the litchi growers and their adoption of improved practices was 0.263 (Table 4.9). This led to the following observation regarding the relationship between the two variables under consideration.

- The relationship showed a positive trend.
- The computed value of 'r' (0.263) was larger than the tabulated value ($r = 0.254$) with 100 degree of freedom at 0.01 level of probability.

On the basis of above findings, the null hypothesis could be rejected that means the relationship between marketing orientation and extent of adoption of improved practices was highly significant. Hence, the researcher concluded that marketing orientation of the litchi growers had highly significant and positive relationship with their adoption of improved practices. Similar findings were also observed by Singh (2010), Venyo and Sharma (2014), Rao and Singh (2014) and Kumar and Sharma (2014).

4.4 Problems Confrontation by the Growers in Litchi Cultivation

The observed problems confrontation scores of the growers ranged from 11 to 22 against the possible problems confrontation scores were 0 to 30 with an average of 13.79 and the standard deviation 2.08. On the basis of problems confrontation scores, the growers were distributed into three categories as low, medium and high (Table 4.8).

Data contained in the Table 4.7 reveals that the highest proportion (60.8 percent) of the litchi growers had medium problems confrontation as compared to 30.4 percent low and only 8.8 percent had high problems confrontation regarding the adoption of litchi cultivation.

The findings of the study indicated that over whelming majority (69.6 percent) of the respondents had problems confrontation ranging from medium to high. This may affect the rate of use of adoption of improved practices in litchi as well as its cultivation.

Table 4.8 Distribution of the litchi growers according to their problems confrontation

Categories	Growers		Observed range	Mean	SD
	Number	Percent			
Low problems (≤ 12)	31	30.4	11-22	13.79	2.08
Medium problems (13-16)	62	60.8			
High problems (≥ 17)	9	8.8			
Total	102	100.00			

4.4.1 Rank order of problems confrontation by the litchi growers

The litchi growers were asked to mention the specific problems concerned by them in litchi cultivation. The problems identified by the litchi growers are listed below according to their importance (Table 4.9).

Table 4.9 Rank order of problems confrontation

Sl. No.	Problems	Extent of problems				PCI	Rank order
		Not at all	Low	Medium	High		
1.	Unavailability of improved variety	12	72	17	1	109	8 th
2.	Unavailability of skilled labor	13	71	15	3	110	7 th
3.	Non-availability of organic fertilizers	72	29	1	0	31	10 th
4.	Lack of suggestions from the SAAOs about the timely application of fertilizers	0	43	59	0	161	4 th
5.	Non-availability of training on litchi cultivation from DAE or other organization	0	4	80	18	218	1 st

Contd.

Sl. No.	Problems	Extent of problems				PCI	Rank order
		Not at all	Low	Medium	High		
6.	Lack of technological knowledge about litchi cultivation	0	52	45	5	157	5 th
7.	Lack of proper advice from AEOs about insect and disease control of litchi	0	43	52	7	168	3 rd
8.	Getting fair price is difficult due to interfere of middleman	0	64	27	11	151	6 th
9.	Damage caused by the man, rat, bird, fox etc. in litchi	14	72	14	2	106	9 th
10.	Non-availability of credit in time	0	23	63	16	197	2 nd

The total Problems Confrontation Index (PCI) ranged from 31 to 218 with possible range of 0 to 306. Data presented above showed that the extent of adoption of improved practices was mostly hindered due to non-availability of credit in time, non-availability of training and lack of proper advice from Agriculture Extension Officers (AEOs) and Department of Agriculture Extension (DAE), lack of technological knowledge, interfere of middleman, unavailability of skilled labor and improved variety, damage caused by the man, rat, bird, fox etc., non-availability of organic fertilizers in litchi cultivation.

In view of the urgent need for increasing litchi cultivation, adequate steps should be taken on a priority basis to remove various problems causing hindrance to the cultivation practices. Utmost effort should be made to take action to remove or minimize these problems.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study was undertaken to determine the extent of adoption of selected improved practices in litchi cultivation by the litchi growers. The study was conducted in Biral upazila of Dinajpur district. Data were collected from 102 litchi growers by using random sampling procedure. This Chapter presented the summary of the findings, conclusion and recommendations for the study:

5.1 Summary of the Findings: The major findings of the study have been summarized in the following sections:

5.1.1 Selected characteristics of the litchi growers

Age of the litchi growers ranged from 35 to 65, the average age being 46.06 years and standard deviation (SD) of 7.50. It revealed from the findings that the highest proportions (72.6 percent) were middle aged, 23.5 were percent old aged and only 3.9 percent were young. **Educational qualification** of the litchi growers ranged from 5 to 16 years of schooling, the average being 8.52 years of schooling and SD of 2.32. Data indicate that maximum (76.5 percent) of the litchi growers had secondary level education, 12.7 percent had higher education and 10.8 percent farmers had primary level education.

Family size of the growers ranged from 4 to 8 with an average being 6.03 and SD of 0.95. It revealed from the findings that the highest proportions (70.6 percent) of those growers were found to had medium family compared to 3.9 percent had large family and 25.5 percent had large family size categories. **Litchi cultivation knowledge** of the growers ranged from 16 to 24 with an average being 19.06 and SD of 1.75. It revealed from the findings that the highest proportions (50.0 percent) of the growers had very good litchi cultivation knowledge compared to 46.1 percent had good litchi cultivation knowledge and only 3.9 percent had excellent litchi cultivation knowledge.

Extension contact scores of the litchi growers ranged from 8, to 20 possible rang 0-36 with a mean of 13.96 and SD of 2.49. Data showed that the highest proportion (55.9 percent) of the respondents of the study area had the medium extension contact, while 34.3 percent had low extension contact and 9.8 percent had high extension media contact. **Cosmopoliteness** scores of the growers ranged from 5 to 13 possible rang 0-18 with a mean of 7.80 and SD of 1.65. Data reveal that the highest proportion (48.0 percent) of the respondents had medium cosmopoliteness compared to 5.9 percent who had high cosmopoliteness and 46.1 percent had low cosmopoliteness.

Farm size of the litchi growers ranged from 0.55 to 3.09, the average being 1.18 hectare and SD of 0.43. Data reveal that the highest proportion (73.6 percent) of the litchi growers had medium farm size, while 22.5 percent of the litchi growers had small farm size and only 3.9 percent of the litchi growers had large farm size. **Annual income** of the litchi growers ranged

from 100 to 450 thousand taka with an average of 258.49 and standard deviation of 68.41. Data reveal that the highest proportion (54.9 percent) of the respondents had high income group compared to 25.5 percent had medium income group and 19.6 percent under low income group.

Innovativeness of the litchi growers ranged from 9 to 20 possible rang 0-30 with an average of 13.26 and SD of 2.07. Data reveal that the majority (64.8 percent) of the farmers had medium adoption, 22.5 percent had high adoption and 12.7 percent had low adoption. **Marketing orientation** of the litchi growers ranged from 15 to 18 possible rang 5-20 with an average of 17.09 and SD of 0.71. Data reveal that the highest proportion (70.6 percent) of the litchi growers had medium marketing orientation while 25.5 percent of them had high orientation and only 3.9 percent had low marketing orientation.

5.1.2 Adoption of improved practices in litchi cultivation: The findings in each four selected improved practices in litchi cultivation have been presented in this section.

Adoption of improved varieties: This subsection deals with the findings of adoption of 4 selected improved varieties in litchi cultivation by the litchi growers. The Agricultural Adoption Index (AAI) values of each of the improved varieties ranged from 92 to 216. Out of 4 improved varieties first variety in rank order was Bombai (216) and third varieties were jointly Madraji (92) and Bedana (92) respectively.

Adoption of fertilizers: This subsection deals with the findings of adoption of 10 selected fertilizers in litchi cultivation by the litchi growers. The AAI ranged from 74 to 231. Out of 10 selected fertilizers the top three fertilizers in rank order with AAI were Borax (231), Flora (212), Cow dung (169) and Planofix (74) had ranked last three positions.

Adoption of pesticides: This subsection deals with the findings of adoption of three selected pesticides in litchi cultivation by the litchi growers. The AAI ranged from 174 to 231. Out of three (3) selected pesticides first in rank order were Ripcord (231) and third Salphotox (174).

Adoption of intercultural operations: This subsection deals with the findings of adoption of three (3) selected intercultural operations in litchi cultivation by the litchi growers. The AAI ranged from 140 to 221. Out of three (3) selected intercultural operations first in rank order drainage management (221), second weeding (218) and third mulching (140).

Overall adoption of improved practices in litchi cultivation: The scores of adoption of improved litchi cultivation practices by the litchi growers ranged from 20 to 42, against a possible score of 0 to 60. The mean and SD were 30.54 and 3.83 respectively. It revealed from the findings that three-fifths (60.8 percent) of the respondents had medium adoption of improved litchi cultivation practices compared to 13.7 percent had low adoption and 25.5 percent had high adoption. The findings also revealed that 86.3 percent of the litchi growers had medium to high adoption.

5.1.3 Relationships between the selected characteristics of the growers with their adoption of improved practices in litchi cultivation

According to the computed value of 'r' among the 10 selected characteristics of growers, age had no relationship and family size showed negatively significant relationship with their adoption of improved practices in litchi cultivation. Others eight characteristics such as educational qualification, litchi cultivation knowledge, extension contact, cosmopolitaness, farm size, annual income, innovativeness and marketing orientation showed significant and positive relationship with their adoption of improved practices in litchi cultivation.

5.1.4 Problems confrontation by the growers in adoption of improved practices in litchi cultivation

The Problems Confrontation Index (PCI) of total 10 problems ranged from 31 to 218 with possible range of 0 to 306. The top three problems was non-availability of training on litchi cultivation from DAE or other organization (PCI=218), non-availability of credit in time (PCI=197), lack of proper advice from AEOs about insect and disease control of litchi (PCI=168). Unavailability of improved variety (PCI=109), damage caused by the man, rat, bird, fox (PCI=106) etc. in litchi and non-availability of organic fertilizers (PCI=31) had ranked last three positions.

5.2 Conclusions

The conclusion on findings and their interpretation in the light of objectives are presented below:

1. The findings indicate that 87.3 percent of the respondent educational qualification varied from primary to secondary level. This concluded that educational foundation of the study area provides a unique opportunity which is essential for greater adoption of improved practices in litchi cultivation. Exactly half (50.0 percent) of the growers had very good knowledge in litchi cultivation. Through litchi cultivation knowledge, an individual grower becomes aware of the recent information on various aspects of improved practices in litchi cultivation.

The findings indicate that 90.2 percent and 94.1 percent of the respondent had low to medium level of extension contact and cosmopolitaness. It concluded that adoption of improved practices in litchi cultivation may be increased, if the growers are highly exposed to different information sources.

The findings also indicate that 96.1 percent of the respondent had small to medium farm size and 80.4 percent of the litchi grower had medium to high income. This concluded that small to medium farms acted as both direct and indirect barrier to the adoption of improved practices and more income of the growers, the higher may be their adoption of improved practices in litchi cultivation.

The findings indicate that 77.5 percent and 74.5 percent of the respondent had low to medium level of innovativeness and marketing orientation. This means that with increase of innovativeness and marketing orientation, the rate of adoption also increases.

2. For increasing the production of litchi, the growers need to adopt all the improved practices to a higher extent. The adoption of improved varieties and fertilizers were not so high as well as to the expected level. The extent of the adoption of overall four improved practices was not also satisfactory to the expected level. Only 25.5 percent of the growers were high adopters. Majority 60.8 percent of them were medium adopters and 13.7 percent were low adopters. The findings lead to the conclude that efforts of Government Organization (GO) and Non-Government Organization (NGO) workers has to be intensified to convene the growers about the need for the full adoption of all the improved practices to get the expected results.
3. Among the 10 selected characteristics of the litchi growers, eight (8) characteristics namely educational qualification, litchi cultivation knowledge, extension contact, cosmopoliteness, farm size, annual income, innovativeness and marketing orientation showed significant and positive relationship with their adoption of improved practices in litchi cultivation. Thus, those are the important determining factors in adoption of improved practices in litchi cultivation. While age of the litchi growers had no significant relationship in adoption of improved practices in litchi cultivation. This indicate that adoption of improved practices in litchi cultivation and above characteristics of the growers are independent to each other.
4. Problems Confrontation Index (PCI) computed for 10 items of problems confrontation in adoption of improved practices in litchi cultivation ranged from 31 to 218 with possible range of 0 to 306. The litchi growers provided different types of ranking against the 10 selected problems. Therefore, it may be concluded that the litchi growers will continue to face considerable problems in adoption of improved practices in litchi cultivation unless steps are taken to identify different kinds of problems in various aspects and action taken to remove or minimize them.

5.3 Recommendations

5.3.1 Recommendations for policy implications

On the basis of findings and conclusions of the present study, the following recommendations are proposed below:

1. The level of adoption of improved practices in litchi cultivation was encouraging. However, there is a need of efforts by DAE and other NGO for wide adoption of improved practices in litchi cultivation by the growers.
2. In view of the absence of any relationship between age of the growers and their adoption of improved practices in litchi cultivation, it is recommended that the extension workers

should work with the growers of all age groups to promote the adoption of improved practices in litchi cultivation.

3. Educational qualification and litchi cultivation knowledge had significant and positive relationship with their adoption of improved practices in litchi cultivation. It indicates the importance of education on cultivation knowledge of the growers for rapid adoption of improved practices in litchi cultivation. Also the annual income of the growers had significant and positive relationship with their adoption of improved practices in litchi cultivation. It is a fact that if income were increased, grower receptive capacity to adoption of improved practices in litchi cultivation will be increased.
4. Extension contact of the growers had significant and positive relationship with their adoption of improved practices in litchi cultivation. Hence, concerned authority should take cognizance of these facts and should take necessary steps to increase the frequency of extension contact of the growers. Innovativeness of the growers also had significant and positive relationship with their adoption of improved practices in litchi cultivation. So extension providers should take necessary steps to increase innovativeness of the growers for better adoption of improved practices in litchi cultivation.

5.3.2 Recommendations for future study

A small piece of study as has been conducted cannot provide all the information for the proper understanding of the growers towards the adoption of improved practices in litchi cultivation. Therefore, the following recommendations were made for further study:

1. The present study was conducted in Biral upazila under Dinajpur district. It is recommended that similar studies may conduct in other litchi growing areas of Bangladesh.
2. Relationships of ten characteristics of the litchi growers with their adoption of improved practices in litchi cultivation have been investigated in this study. Future research should be conducted to investigate other characteristics of the litchi grower adoption in some other improved practices.
3. In the present study age had no significant relationship with their adoption of improved practices in litchi cultivation. Moreover, cosmopolitaness had significant relationship with their adoption of improved practices in litchi cultivation. In this connection, further verification is necessary.
4. Research should be undertaken to identify the factors causing hindrance towards the adoption of improved practices in litchi cultivation.

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APPENDIX-A

An English Version of Interview Schedule for a Research Study on the Adoption of Improved Practices in Litchi Cultivation by the Litchi Growers of Dinajpur District

Date: -----

Serial No.

Name of Respondent ----- Father's Name -----

Village: ----- Union: -----

(Please answer the following questions)

1.0 Age: How old are you? Years

2.0 Educational qualification: Mention of your educational qualification.

- a) Do not read and write ☐
- b) Can sign name only ☐
- c) Can read and write ☐
- d) Read up to class
- e) class passed

3.0 Family size: Please mention of your family members including you.

a) Male =		b) Female=		Total=	
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4.0 Litchi cultivation knowledge: Please reply the following questions.

Sl. No.	Questions	Full mark	Mark obtained
1.	Which soil is suitable for litchi cultivation?	3	
2.	Mention the favorable weather for flowering of litchi.	3	
3.	Name three modern varieties of litchi.	2	
4.	What do you mean by air layering?	3	
5.	What fertilizers need to use in pit for litchi plantation?	3	
6.	Name three harmful insects of litchi.	2	
7.	What measures can be taken for protecting litchi fruits from birds?	3	
8.	Why litchi fruit crack?	2	
9.	Name two intercrops which are cultivate in litchi garden.	2	
10.	Mention the harvest period of litchi.	2	
Total		25	

5.0 Extension Contact: Please indicate your frequency of contact with the following communication sources.

Sl. No.	Name of sources	Extent of contact			
		Not at all	Rarely	Occasionally	Regularly
A. Individual contact					
1.	Ideal farmers		1 time/week	2-3 times/week	>3 times/week
2.	Local leaders		Do	Do	Do
3.	NGOs workers		1 time/month	2-3 times/month	>3 times/ month
4.	Sub-Assistant Agriculture Officer		Do	Do	Do
5.	Agriculture Extension Officers		1 times/ season	2-3 times/season	>3 times/season
6.	Upazila Agriculture Officers		Do	Do	Do
B. Group contact					
1.	Participation in Result Demonstration meeting		1 time/year	2 times/ year	>2 times/ year
2.	Participation in farmers field day		Do	Do	Do
3.	Participation in agricultural training		Do	Do	Do
C. Mass contact					
1.	Watching agricultural TV program		1 day/week	2-3 days/ week	4-7 days/week
2.	Reading agriculture related books		1 copy/year	1 copy/season	1 copy/month
3.	Reading agricultural poster, booklet and bulletin		Do	Do	Do

6.0 Cosmopolitaness: State your extent of visit of the following places.

Sl. No.	Places of visit	Extent of visit (times)			
		Not at all	Rarely	Occasionally	Regularly
1.	Visit friends or relatives houses		1-2 times/month	3-4 times/month	>5times/month
2.	Visit union parisad office		Do	Do	Do
3.	Visit own upazila head quarter		1-2 times/season	3 times/season	>5times/season
4.	Visit own district town		Do	Do	Do
5.	Visit other district town		1-2 times/year	3-4 times/year	>5times/year
6.	Visit division or capital city		Do	Do	Do

7.0 Farm size: Please indicate the area of land in your possession.

Sl. No.	Nature of use	Area	
		Local unit	Hectare
1.	Homestead		
2.	Own land under own cultivation		
3.	Land taken from others on motgage		
4.	Land given to others on motgage		
Garden area			
5.	Litchi garden area		
Total			

10. Marketing orientation: Please state the degree of your agreement or disagreement to each of the following statement.

Sl. No.	Statements	Level of agreement/disagreement			
		SA	A	D	SD
1. (+)	Market related information is not so useful to litchi growers				
2. (-)	Litchi growers can get satisfactory price by grading their products				
3. (+)	One should grow those litchi varieties which have more market demand				
4. (-)	One should sell his litchi to the nearest market /middlemen irrespective of price				
5. (-)	One should purchase his inputs from the shop, where his other relatives purchase				

SA= Strongly Agree, A=Agree, D= Disagree and SD= Strongly Disagree

11. Adoption of Improved Practices in Litchi Cultivation

11.1 Use of improved varieties: Please state of your opinion regarding the cultivation of the following litchi varieties.

Sl. No.	Name of varieties	Not cultivated	Duration of cultivation (years)		
			Low (1-2)	Moderate (3-4)	High (>4)
1.	Madraji				
2.	Bombai				
3.	China-3				
4.	Bedana				

11.2 Use of fertilizers: State the amount of the following fertilizers you have been applying in your litchi garden.

Sl. No.	Name of fertilizers	Not applicable	Extent of adoption		
			Low	Moderate	High
1.	Cow dung (30-45 Kg./tree)		1 time/year	2 times/year	>2 times/year
2.	Ash (8.0 Kg./tree)		Do	Do	Do
3.	Urea (1.0-1.5 Kg./tree)		Do	Do	Do
4.	TSP (0.75-1.5 Kg./tree)		Do	Do	Do
5.	MOP (0.6-1.0 Kg./tree)		Do	Do	Do
6.	Borax (4g/1L)		1 time/season	2 times/season	>2 times/season
7.	Zinc Sulphate (2mg/1L)		Do	Do	Do
8.	Flora (2ml/1L)		Do	Do	Do
9.	Planofix (2ml/5L)		Do	Do	Do
10.	Naphthalene (20mg/1L)		Do	Do	Do

11.3 Use of pesticides: Please mention the extent of the following pesticides in your litchi orchard.

Sl. No.	Name of the pesticides	Not used	Extent of adoption		
			Low	Moderate	High
1.	Ripcord (1 ml/ 1L)		1time/season	2times/season	>2times/season
2.	Kalthane or Omite (3 ml/ 1L)		Do	Do	Do
3.	Salphotox (3mg/1L)		Do	Do	Do

11.4 Intercultural operations: Mention the extent of the following intercultural operations in your litchi garden.

Sl. No.	Name of operations	Not used	Extent of adoption		
			Low	Moderate	High
1.	Weeding				
2.	Drainage management				
3.	Mulching				

12. Problems Confrontation: Please indicate the extent of problems that you face in litchi cultivation.

Sl. No.	Problems	Extent of problems			
		Not at all	Low	Medium	High
1.	Unavailability of improved variety				
2.	Unavailability of skilled labor				
3.	Non-availability of organic fertilizers				
4.	Lack of suggestions from the SAAOs about application of fertilizers				
5.	Non-availability of training on litchi cultivation from DAE or other organization				
6.	Lack of technological knowledge about litchi cultivation				
7.	Lack of proper advice from AEOs about insect and disease control of litchi				
8.	Getting fair price is difficult due to interfere of middleman				
9.	Damage caused by the man, rat, bird, fox etc. in litchi				
10.	Non-availability of credit in time				

Thank you for your cooperation and giving me your time.

Signature of the Examiner

APPENDIX-B

Correlation matrix of the dependent and independent variables

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	Y
X ₁	1										
X ₂	-0.436**	1									
X ₃	-0.043	-0.216*	1								
X ₄	-0.119	0.184	-0.193	1							
X ₅	-0.279**	0.290**	-0.159	0.139	1						
X ₆	0.107	0.083	-0.266**	-0.040	0.205*	1					
X ₇	0.024	0.131	-0.017	0.044	0.037	-0.007	1				
X ₈	0.175	0.024	-0.172	0.162	0.081	0.196	0.653**	1			
X ₉	0.068	0.249*	-0.214*	0.215*	0.298**	0.148	0.176	0.463**	1		
X ₁₀	0.090	0.051	-0.149	0.078	0.052	0.173	0.247*	0.325**	0.214*	1	
Y	0.026	0.262**	-0.234*	0.388**	0.247*	0.251**	0.284**	0.574**	0.304**	0.263**	1

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

X₁ = Age

X₂ = Educational qualification

X₃ = Family size

X₄ = Litchi cultivation knowledge

X₅ = Extension contact

X₆ = Cosmopolitaness

X₇ = Farm size

X₈ = Annual income

X₉ = Innovativeness

X₁₀ = Marketing orientation

Y = Adoption of improved practices in litchi cultivation