

**EFFECT OF TRANSFORMATION OF CROPLAND INTO LITCHI
ORCHARD IN DINAJPUR DISTRICT**

A Thesis

By

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**MASTER OF SCIENCE
IN
AGRICULTURAL EXTENSION**

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

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The Author

Effect of Transformation of Cropland into Litchi Orchard in Dinajpur District

ABSTRACT

The main purpose of this study was to find out the extent and effect of transformation of cropland into litchi orchard, to determine and describe some selected characteristics of the litchi growers, to identify the problems faced by the litchi growers in transformation of cropland into litchi orchard and probable suggestions given by them to overcome the problems. The study was conducted in Sadar and Biral upazila of Dinajpur District. An updated list of (266) litchi growers was collected from Upazila Agriculture Office of respective upazilas. From that list, 80 litchi growers were selected by simple random sampling procedure as sample for this study. A pretested and structured interview schedule was used to collect data from the respondents 15 April to 15 May, 2015. Ten selected characteristics of the litchi growers namely: age, educational qualification, farm size, farming experience, annual family income, extension contact, agricultural knowledge, innovativeness, marketing orientation, and attitude towards technology were investigated. Transformation of cropland into litchi orchard was the focus issue of the study.

During the last 10 years (2005 to 2014) the area of transplanted land was 37.653 ha out of 134.338 ha of total land. The percentage of transformation in the year 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 were 20.62, 36.02, 43.20, 36.30, 16.85, 13.25, 28.37, 62.22, 41.35 and 35.60 percent respectively were replaced by litchi. Farmers of the study area transform their cropland into litchi orchard in the year of 2005 to 2014 were 09.669, 13.198, 02.070, 03.093, 02.098, 01.273, 01.397, 02.228, 01.157 and 01.470 ha respectively. The major crops such as rice, maize and wheat, and some minor crops i.e. potato, vegetable, mustard, garlic, turmeric and napier grass were replaced by litchi. The effect of transformation on economic, environmental, household food security, and social status were considered as medium by 60.00 percent, 70.00 percent, 61.25 percent, and 58.75 percent respectively of the litchi growers. The most important problem identified by the litchi growers was 'getting fair price is difficult due to interfere of middleman' and the least problem was identified by the litchi growers was 'high production cost'. On the other hand, the apex solution suggested by the respondents was 'organizing more training program for the farmers' while the least one was 'appropriate co-ordination among the litchi farmers'.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Land as an entity is limited, while the natural resources it supports can vary over time and according to management conditions and uses. As each nation moves to the next level of development, human requirements and economic activities place ever-increasing pressures on land resources, creating competition and conflicts and resulting non-optimal use of both land and its resources. Land transformation is one of the most important fields of human encouraged ecological transformation, with an extensive history dating back to ancient times (Wolman and Fournier, 1987).

Change is nearly inseparable from human occupation and use, and the goal is to encourage improvement and to counter forces that encourage degradation (Shahab and Amin, 2011). Land use changes are concerning topics in perspective of socio-economic changes of a country; the pattern of its changes in Bangladesh is to meet the dynamic demand of the society that creates pressure on natural environment. Among the changing pattern, the change of agricultural land is remarkable in a country like Bangladesh.

Bangladesh is the most densely populated country in the world with about 1101 people per sq. Km. The total arable land of the country is not more than 0.782 crores ha and per capita land is only 0.0526 ha. (Mahabub, 2003). The country's population will be over around 190 million by 2030 when an extra 25 percent food grains will have to be produced. But the additional harvests will have to be accumulated from a much smaller area of cropland than is now available (Bhuiyan, 2003). Hence, competition between different major land uses, such as forestry, agriculture, fisheries, and industrial and urban development are acute. A National Land Use Policy in Bangladesh is yet to formulate to minimize the competition between the challenging land uses and try to guide the whole nation towards wise use of its limited land resources. In Bangladesh there are wide knowledge gaps regarding conflicting land uses and future consequences (Mohammad, 2009).

Litchi (*Litchi chinensis* Sonn.) is one of the most popular subtropical edible fruits of the Sapindaceae family. It is generally known as litchi and regionally as 'lichi', 'lichee', 'laichi', 'leechee' or 'lychee'. It is originated from China, where it has been cultivated for over 3000 years and was introduced to Myanmar and Indian subcontinent including Bangladesh about 100 years later (Mitra, 2004). The leading litchi growing countries of the world are China, Myanmar, Taiwan, Thailand, Vietnam, Indonesia, India, Pakistan, Philippines, West Indies,

USA, Brazil, Israel, Mauritius, Madagascar, South Africa and Australia (Hossain *et al.*, 2014).

In Bangladesh, litchi is mainly grown in greater Pabna, Dinajpur, Rajshahi, Rangpur, Kustia, Jessore, Magura, Meherpur, Mymensingh and Chittagonj districts. Bangladesh produces 55.3 thousand MT litchi fruit per annum from 1608.50 ha of land (BBS, 2009).

1.1.1 Drives of land use change

Developing countries generally have a high population density and a relatively high percentage of their people must make a living in agriculture. Less than 0.8 ha. arable land is available per economically active person in developing countries compared to more than 12 ha. in developed countries (Graff, 1993). Land use and changes in land cover play an important role in the climate system and have an impact on the interaction between land and atmosphere, contribute to changes in the bio-geochemical cycles of the earth and atmosphere levels of green house gases, and are a major factor in sustainable development (Fresco *et al.*, 1996).

1.1.2 Land use conflicts

Land is the habitat of man and its use is a crucial for the economic, social and environmental advancement indeed for human survival. Policy makers and resources planners, who make decisions about the land, today all have to be taken into greater account about population growth, technological and social hazards, and environmental degradation. Land use is the combined human action affecting land cover. From a global change perspective, land cover is the most important thing, and for the assessment of many aspect of sustainability like biodiversity, nutrient balance, erosion- understanding the linkage between cover and use is essential (Fresco, 1994). Land use conflict is a common phenomenon in most of the developing countries like Bangladesh.

1.1.3 Causes of land transformation

Increasing pressures on agricultural land can be projected to demonstrate that the potential to provide food for future world populations is imperiled. Major technological factors today have a direct influence on the transformation of the land. The direct and indirect factors influencing land transformation are of fundamental importance throughout the world, and illustrate not only the nature of change, but the kinds of changes associated with such practices (Wolman and Fournier, 1987).

Land has been the permanent source of human's food, shelter, clothes, etc. Thus, people have been using lands in many ways according to their changing needs at different times. The rapid increase in World population and the permanent flow of people from rural to urban areas have become common problems for governments and decision-makers in both the developed and the developing countries. Land use changes are the result of broad economic, socio-cultural forces bringing in use and changes in land. In most cases, number of factors are used to represent the underlying causes; for example, population density and availability. These are further differentiated into 'driving' forces and the 'conditioning' factors. Driving forces are expected to change over time, such as population density and land value whereas 'conditioning' factors are relatively stable over time. Conditioning factors are spatially varied, such as physical setting and cultural values. This helps in the land analysis of spatial and temporal prospectus of change.

1.1.4 Agrarian Transformation

As, civilization progressed in different parts of the world the demand for agricultural commodities increased leading to agricultural revolution, and with further progress in technology to industrial revolution. A brief description of these transformations in different countries below shows the uniqueness of each development path (Mohammad, 2009).

- a) **English path:** England being the first home of industrial revolution, whose prelude is often traced in its successful agrarian transformation.
- b) **American path:** Agrarian transformation in the United States assumed the unique form as independent family farmers with a high commercial orientation who had ties with the world market settled it. These farmers had access to a vast stretch of land free from any feudal bondage. As a result, a proliferation of the family farm system in the United States occurred during the 19th century as millions of settlers established their farms over the land.
- c) **Bangladesh situation:** Before the British rule, rights of ownership in the land were neither in the hand of the State nor in the hands of the fiscal agents known as 'Zamindars' but in the hand of cultivating messages. After partition of colonial India in 1947, Eastern Bengal becomes part of Pakistan. One of the most important reform measures adopted by the government of East Bengal was abolition of the Zamindari system through the 'East Bengal State Acquisition and Tenancy Acts' of 1950 in the light of recommendation of 'Land Revenue Commission (1938)'. Then again with the abolition of Zamindari system, a 'Jotedar', rich land owner who rented out land for

cultivation emerged and dominated peasant agriculture. Nowadays, Bangladesh Rural society is characterized by inequalities of land ownership. At the same time there has been an emergence of a huge mass of marginal and landless rural households.

1.2 Statement of the Research Problem

Land is the major capital of rural economy in Bangladesh. But the fragmentation of land holdings and its discriminatory distribution contributed to increase the percentage of landless and land-poor families. Land become a limited resource due to rapid population increase as a result, competition between land uses for agriculture, settlements and other purposes is to extreme. The pervasiveness of poverty and the high population density in Bangladesh make land issues very important for economic growth and poverty reduction. Access to land is essential to reducing poverty because it allows poor farm households to make productive use of family labour, to smooth utilization and to improve their income. The present land utilization systems serve as the main generators of income and employment in rural Bangladesh (Kitamura and Kobayashi, 1993). On the other hand, transformation of agricultural land is due to below-optimum use of agricultural land, poorly constructed road networks, inappropriate land cultivation, government land acquisition, brick making, gas station, rural settlements, riverbank erosion and water logging etc. (Islam, 2014).

Dinajpur district is mainly famous for litchi cultivation. About 80 percent of the people directly or indirectly dependent on crop based agro-economy from 20 years ago, but at present their lives primarily dependent on litchi production related activities. Weather condition of the study area is very much suitable for litchi cultivation. On the contrary, it is very much profitable than other crops. Farmers of the study area are not getting long time profit from growing different crops. But it is possible to get return for several years from the litchi orchard. It requires low cost of production. It is also an environment friendly farming activity. At the early stage of the litchi orchard when the litchi plants are in small size, farmers can grow other crops simultaneously with litchi. It is also profitable for the litchi farmers. Litchi orchard can meet household nutritional demand of the litchi farmers by providing litchi fruit and fuel wood.

Besides these reasons, farmers are somehow motivated by their neighbours those have brought more cropland under litchi cultivation. Thus, transformation of cropland into litchi orchard occurs gradually in the study area. This situation is very much important of the people of the study area because it is assumed that transformation can be helpful for poverty

reduction, maintain balance ecosystem and finally achieve the household food security. The research will help to identify the crucial points that, why land is transforming gradually and the possible contributions of it, which will ultimately help in proper utilization of our land, as well as to improve the economy of our country.

1.3 Objective of the Study

In view of the problems, stated above, the following objectives have been proposed for giving proper direction to the study:

1. To determine and describe some selected characteristics of the litchi growers. The selected characteristics are: age, educational qualification, farm size, farming experience, annual family income, extension contact, agricultural knowledge, innovativeness, marketing orientation, and attitude towards technology.
2. To find out the extent of transformation of cropland into litchi orchard.
3. To find out the effect of transformation of cropland into litchi orchard, and
4. To identify the problems faced by the litchi growers in transformation of cropland into litchi orchard and probable suggestions given by them to overcome the problems.

1.4 Significance of the Study

In the northern region of Bangladesh especially Dinajpur district is famous for litchi cultivation along with other fruit cultivation like mango. Litchi is considered as the high value fruits. Farmers can earn more money from litchi orchard, as it provides long time economical support to the growers. Litchi orchard may be developed in the study area due to favorable weather and climatic condition. Considering the above circumstances and beneficial aspects, land owners transform their cropland into litchi orchard.

Litchi orchard provides many advantages to the growers without causing any damage to the environment. The findings of the study are also expected to be of great value for the researcher, extension agents, students and particularly planners in formulating and designing extension approach. However, very few researches have so far been conducted in Bangladesh in this regards. It is, therefore, necessary to undertake a research study to ascertain 'effect of transformation of cropland into litchi orchard in Dinajpur district'.

1.5 Assumptions of the Study

Assumption is the supposition that an apparent fact or principle is true in the light of available evidence (Goode and Hatt, 1952). The following assumptions are made in conducting the study:

1. The information sought by the researcher revealed the real situation to satisfy the objectives of the study.
2. The data of respective variables were normally and independently distributed.
3. The respondents included as sample for this study were competent enough to furnish proper responses to the questions included in the interview schedule.
4. The researcher was well adjusted to the social and cultural environment of the study area. Hence, the data collected were free from any bias.
5. The responses furnished by the respondents were reliable. They expressed the truth about their convictions and awareness.
6. Views and opinions furnished by the respondents were representative views and opinions of the whole population of the study area.

1.6 Limitations of the Study

Considering the time and other necessary resources available to the researcher it was necessary to impose certain limitations as mentioned below:

1. The study was confined to only two upazilas of Dinajpur district.
2. There are many characteristics of the litchi growers but only ten were selected for this study.
3. The findings of the study were based on the opinion expression capability and ability to recall of the respondents, the study was confined to both their ability to recall and also their sincerity and honesty in providing the needed information.
4. The study was confined mainly to litchi growers.
5. The attitude towards technology and marketing orientation of the respondents was measured on the basis of their responses to the selected statements.
6. Effect of transformation of crop land into litchi orchard was measured by using 4-point rating scale on four dimensions only.

1.7 Definition of Important Terms

The terms which have been frequently used throughout the thesis are defined and interpreted below:

Age of a respondent defined as the span of his life and is measured by the number of years from his birth to the time of interviewing.

Educational qualification referred to the development of desirable knowledge, skill and attitude in an individual through the experience of reading, writing, observation and relative activities.

Farm size means the total area of land on which a farmer's family carries on farming operations in terms of full benefit to the family.

Farming experience means the experience which someone gains in farming. It means the experience of a farmer in years which he gained from direct farming activity.

Annual family income referred to the total annual earnings of all the family members of a respondent from litchi, other fruits, paddy, vegetables, fisheries, livestock, land lease, business, service and other accessible resources.

Extension contact referred to one's becoming accessible to the influence of extension contact through different extension teaching methods or refers to the individual exposure to or contact with information sources.

Agricultural knowledge means knowing or what one knows about a subject, fact, person etc. Agricultural knowledge refers to farmers understanding of the facts, phenomena and methods in different aspects of agriculture practices.

Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system (Rogers, 2003).

Marketing orientation has been defined in the present study as the degree to which a farmer oriented towards purchasing his farm related inputs from open market like seed traders, insect or pest dealers etc.

Attitude towards technology refers to the belief, feeling and action tendencies of the farmers towards technologic innovations regarding crop cultivation and litchi cultivation activities already practiced in the locally.

Litchi orchard refers to the area covered by litchi tree.

Litchi farmers refer to those farmers who produced litchi in the study area. The term was synonymously used as litchi growers/producer. They also cultivate other crops. Actually litchi farmers refer to those farmers who cultivate litchi in orchards.

Respondent referred to the farmers who were involved in transformation of crop land into litchi orchard and were interviewed as a part of the sample of the study.

CHAPTER 2

REVIEW OF LITERAURE

This study is mainly concerned with the extent and effect of transformation of cropland into litchi orchard including its problems and probable suggestions to overcome the problems. The researcher therefore, made an exhaustive effort to collect review but a little research has been conducted in this connection. This Chapter deals with the review of available literature related to different dimensions of the present study. In doing so various books, journals, reports, thesis and web sites were the sources of literature review. However, the researcher tried his best of collected needful information through searching relevant studies. This Chapter consists of three sections in which, first section presents the literatures related definitions and concepts, transformation elements and processes. In the second section reviews of past studies in connection with the causes and benefits of land transformation, land use, land use change, drives of land use change, effect of land use change, and history of land use changes in different countries. Finally, the third section deals with the conceptual framework of the study.

2.1 Definitions and Concepts of Transformation

2.1.1 Definitions of transformation

The term ‘transformation’ is derived from the Latin roots, trans (across, or to change) and forma (that which shapes, that which has been shaped). Webster (2004) offers a number of definitions; some of them are given below:

- 1. An act, process, or instance of transforming or being transformed; 2a. The operation of changing (by rotation) one configuration or expression into another in accordance with a mathematical rule; 2b. The formula that effects such a change. The act or an instance of transforming. The state of being transformed. A marked change, as in appearance or character, usually for the better. An act, process, or instance of change in structure, appearance, or character. A conversion, revolution, makeover, alteration, or renovation.**

These definitions suggest several aspects of transformation. First, transformation is conceived as a deliberative, conscious act in which ‘one party initiates a process’ for altering the nature of something from one state of being to a vision other state of being (definition 1). The second aspect is the process or act of changing one condition gradually into another, as illustrated by the

Escher prints showing birds gradually transforming into flying fish (World of Escher, 2004) (definition 2a). The final aspect is a formula that can serve as a recipe or guide to change in a specific manner and bounded by specific rules or order (definition 2b).

Other definitions of transformation include the following:

- A qualitative change; A function that changes the position or direction of the axes of a coordinate system (Anonymous, 2004).
- A change in disposition, heart, character, or the like; conversion. The change, as of an equation or quantity, into another form without altering the value (Anonymous, 2003).
- The notion appears to be that transformation is ‘life altering’ to the extent that the results of a transformative process are ingrained deeply imbedded. In contrast, the term ‘change’ has been characterized as an ongoing event wherein transformation marks a ‘choice point’ that may be made in the midst of change that transformation constitutes an invitation to be more than one is, while change has more of a reactive nature to it (Roussin, 2001).

2.1.2 Concepts of transformation

Transformation can be distinguished from ‘reform’ which is ‘to make an improvement, especially in a person's behavior or in the structure of something’ (Free search, 2004), as distinct from the more innovative characteristics of transformation noted above. Alternatively, transformation is imbedded in the unpredictable and the impossible to create something that was not going to happen any way not just more, better, or faster: something completely possible from the perceived impossible (Anonymous, 2000).

Cebrowski (2002) notes that transformation is composed of key concepts, one of which is that it has no destination, ‘no status-quo end state that were going to pour concrete around’. It is not a synonym for ‘modernization: not simple technology insertion or a process of continual improvements to current capabilities, processes, or organization and doctrinal constructs’. Rather, it is ‘a direction written quite broadly’ and a continuing process where in one may try to establish a direction, but one cannot identify a specific destination because it is evolving or emergent behavior in the context of a larger ‘economy’

such as the mental health field, which in and of itself is exhibiting emergent behavior.

Transformation will be accomplished by substantially expanding the boundaries of existing competencies and by developing new competitive areas and competencies to allow fundamental shifts in underlying principles and their application (Cebrowski, 2004).

Norquist writes that, as part of a 'new look', invoking the term 'transformation' as a byword as opposed to 'modernization' or 'reform' must be a conscious choice because it ties policy to a school of thought that posits that technology has dramatically changed the world and will lead to a revolution in practice in many fields.

Transformation has been characterized as a 'quantum change' (Miller and Friesen, 1982), '2nd order change' (Bartunek, 1984), 're-creation' (Tushman and Romanelli, 1985), 'reorientation' (Greenwood and Hinings, 1988), 'frame-breaking' (Nadler and Tushman, 1989), and 'revolutionary change' (Gersick, 1991). Regarding revolutionary change, Toffler and Toffler, (1993) notes that 'A true revolution goes beyond (individual inventions) to change the game itself, including its rules, its equipment, the size and; organization of the 'teams', their training, doctrine, tactics, and just about everything else'.

Transformation 'deals with the deep issues of personal growth, vision, trust, creativity, purpose, leadership, mastery and cultivating organization and individual spirit' (Reid Group, 2001).

Gerard and Tuerfs (1995) have written that examining relationships among people, structure, processes, thinking, and results produces of transformation. It involves facilitated dialogue among parties that is aimed at exploring the nature and power of collective thinking and how it shapes the culture of a group, with dialogue having the primary purpose to effect a transformation in collective consciousness. Through dialogue, community is created and organizational culture transformed in three ways:

- a) Behavioral transformation
 - How to be with each other differently;
 - Practice skills and guidelines that encourage new norms; and

- Leads to actual state of community.
- b) **Experiential transformation**
 - Dialogue establishes conditions of community;
 - Begin to pick up at a tacit level what a culture based on community principles feels like; and
 - Parties then incorporate it at intuitive level.
- c) **Attitudinal transformation**
 - Profound shift occurs at belief and attitude level;
 - Byproduct of the incorporation of new modes of behavior and learning the ‘feel’ of which being in community is like-attitudes of rigid individualism, give way to learning
 - attitudes of collaboration and partnership; and
 - Beliefs strengthen the value of the group as a whole.

2.1.3 Transformation elements and processes

2.1.3.1 Transformation elements

Elements of transformational involve three categories of structured and conscious activity to set a framework within which transformation can occur. These categories may be generic to any transformation effort, and are given as follows:

- a) **Discovery**
 - Finding out what is there;
 - Uncovering the individuals, organizations, or system's representation of the world finding out who one really is; and
 - Determining what kinds of knowledge and perceptions are available to use in assessing the nature of world.
- b) **Clearing**
 - Identifying and neutralizing extraneous, misplaced, or misaligned representations;
 - Finding out ‘wrong’ answers in a person/organization/system's ‘mind’- patterns that have been installed without being fully aligned with one's intentions; and
 - Determining which of this material is in an inappropriate context and then returning everything to its proper context.

- c) **Programming**
 - **Directly setting up representations of the world that serve the person/organization/system best;**
 - **Placing emphasis on what is really desired and creating more of that to become the operating reality; and**
 - **Strengthening the traits and abilities that are most desired.**

To predict what transformation is to accomplish requires seeing the potential of the present from the point of view of the future. However, review related in this regard is given below:

Tlhalefang and Mangadi (2012) reported that agriculture sector witnessed an upward trend during the period of 2006 to 2011. The main contributing factor to this upward trend appears to be good rainfall. The thrust of the quantitative insights emanating from simulations of advancement in farming technologies supports the policy stance that transforming agriculture by raising its productivity levels would lead to improvement in aggregate welfare. A 5 percent increase in Hicks-neutral technological progress in agriculture translates into 0.6 percent improvement in overall economic welfare that is proportionally distributed across rural and urban households. These findings clearly suggest that improve agricultural productivity policy needs to include a component that will allow farm-workers' incomes to increase and prevent inequalities in the distribution of income from increasing as agricultural output expands.

2.1.3.2 Transformational processes

Smith (1994) noted that three distinct stages of activity are involved in transformation:

- a) **Co-invention: Whereby leadership's vision of the future is formulated as strategic intent a revolution in thinking and the shared commitment among leadership;**
- b) **Engagement: In which the entire organization is engaged to participate with a strategic intent based on their own commitments- effects are enrollment, ignition, and a platform for support for change and development activities to engage the organization at large in the strategic intent; and**
- c) **Practice: Where rigor and discipline are brought to have actions be consistent with values and the shared future change from how people have done things to what can be done and how in the future development of change agents and champions for the new culture.**

2.2.1 Causes of land transformation

Land has been the permanent source of man's food, shelter, clothes, etc. Thus, people have been using lands in many ways according to their changing needs at different times. Land use changes are the result of broad economic, socio-cultural forces bringing in use and changes in land. In most cases, number of factors are used to represent the underlying causes; for example, population density and availability. These are further differentiated into 'driving' forces and the 'conditioning' factors. Driving forces are expected to change over time, such as population density and land value whereas 'conditioning' factors are relatively stable over time. Conditioning factors are spatially varied, such as physical setting and cultural values. This helps in the land analysis of spatial and temporal prospectus of change. **However, reviews related in this connection are given below:**

Malik *et al.* (2000) made a study on potentials of increasing farm income and employment through farming system on different sizes of farms. Results revealed that area under paddy (dwarf) in both obtain plants on different sizes of farms decreased because of underground water, infestation of weeds, pests and diseases. The area under high value crops increased and net return from also increased significantly.

Rakib (2002) reported that there were 12 effects of using flood prone lands to mango production as recognized by the mango growers. The most important of them were 'maintain environmental balance', 'earn more money' and 'make bio-fertilizer by the fallen leaf'.

Fan *et al.* (2007) reported that the economic development in the world, population growth, and urbanization, Guangzhou, a major metropolitan in South China, have experienced a dramatic land use and land cover (LULC) change over the past 30 years. Fast LULC change have resulted in degradation of its ecosystems and affected adversely the environment. This study employed two Landsat TM/ETM+ images in the dry season to detect LULC patterns in 1998 and 2003, and to examine LULC changes during the period from 1998 to 2003. The type, rate, and pattern of the changes among five counties of Guangzhou Municipality were analyzed in details by post classification method. LULC conversion matrix was produced for each county in order to explore and explain the urban expansion and cropland loss, the most significant types of LULC change. Land use conversion matrixes of five counties were discussed respectively in order to explore and explain the inherence of land use change. The results showed that urban expansion in these five counties kept an even rate of increase, while substantial amount of cropland vanished during the period.

Majlish (2007) stated that about 59 percent of the respondents had favourable perception while 30 percent and 11 percent of them had moderately favourable

and unfavourable perception of social forestry program respectively. They were moderately more aware of the economic issues of social forestry in comparison to the management and environmental issues.

Fazal and Amin (2011) detected that the points towards unplanned and haphazard urban expansion and transformation. These transformations have firmly destroyed the water bodies both in terms of area as well as its quality.

Islam and Hassan (2011) observed that the land use pattern of Rajshahi District is changing, especially the agricultural land is decreasing in an alarming rate and now it is become more and more vulnerable. The agricultural land of the study area is losing 0.46 percent per year and the area under infrastructure use is increasing 5.86 percent per year. If this rate continues, the agricultural land will be totally eliminated within the next 217 years.

BRRRI (2012) observed that the major crops grown were rice and wheat. The minor crops were potato, tomato, maize, etc. Farmers are also growing short duration rice varieties to escape drought in T. Aman season. Besides, they are growing tomato, mustard, and potato to minimize the need for irrigation water in the dry season. In addition, rice fields are being replaces by mango orchards. Lack of quality seed, inadequate varieties, high pest prevalence, low soil organic matter content, and extreme temperatures are the major problems for agricultural development in the studied areas. Local farmers' demands are for better access to water and drought resistant crop varieties.

2.2.2 Benefits of land transformation

Kurishbayev *et al.* (2001) reported that crop diversification is important to stabilize farm income due to erratic production and conditions. As a result, national or regional agricultural practice policy should address to provide crop and production alternatives for farmers according to their input and marketing logistics and degree of diversification.

Chowdhury (2001) observed that the trend of plantation was found in increasing order in surveying areas. Majority of the respondents opined that afforestation had moderate to highly positive effect on ecological, physio-chemical properties of the soil and on human interest aspects of the Barind Multipurpose Development Authority plantation areas.

Hasanuzzaman (2004) reported that the farmers' emphasized on plantation of fruit trees like Mango and Litchi with agricultural crops like Rice, Wheat, Potato, Brinjal, Winter and Summer vegetables.

Hoque (2011) observed that one-third proportion (30.77 percent) of the respondents were highly improved and only small portion (3.85 percent) of the respondents were slightly improved whereas the highest proportion (65.38 percent) of the respondents were moderately improved on the basis of improvement in socio-economic status due to transformation from crop farming to aquaculture.

2.2.3 Land use

Land use can be defined as the purpose to which humans put land. Land use can also be defined as the human activities that are directly related to land, making use of its resources or having an impact on it through interference in ecological process that determine functioning of land cover (Veldkamp and Fresco, 1997). In other words, land use is the application of human controls, in a relatively systematic manner, to the key elements within any ecosystem, in order to derive any benefit from it. Usually land is use for many purposes; it provides and creates space for agriculture and industrial production, as well as space for settlement. It is also the focus of conflict between a wide range of land uses including agriculture, mining, forestry and nature protection, leisure, human settlement and urban and industrial development.

Land use is a basic human life. Urban and rural uses are major factors in living standards, environmental quality and civilization itself. According to Coleman (1987) a surprisingly large proportion of the world's problems spring from the misuse, disuse, overuse, under use or abuse of land, and wiser policies are constantly being sought. Kitamura and Kobayashi (1993) have pointed out that inappropriate land use has led to serious problems as degradation of tropical forests, deforestation of arable land, and so forth, which concern the survival of human beings. After through searching of literature, both home and abroad, no findings were found on this aspect.

2.2.4 Land use change

Land use change is generally shown in terms of a change in area for a particular land use over a specific period of time (Farrow and Winograd, 2001). Land use change at any place may involve either transfer to a different use. According to Turner and Meyer (1994) land use change is likely to change land cover change, but land cover may change without unaltered existing land use. A proper managed forest steadily shrinks if a constant rate of timber harvesting or shifting cultivation is exceeding.

Again, land use change is a continuous, evolving process, and is the single most important manifestation of human interaction with the biosphere. The scale and rate of change of land use of change of land use is greater now than any other time in history due to rapid population growth and technological change. Human activities are directly involved in land

use change and it plays an important contributory role in the impact on the atmosphere as well as whole biosphere. Most of the competition for space between human and other species is demonstrated by the conversion of land to agriculture, infrastructure, urban development, industry and unsustainable forestry (Adger and Brown, 1994). Through searching of literature, both home and abroad, no findings were found on this aspect.

2.2.5 Drives of land use change

Mohammad (2009) found that the village land use was found to be most important especially for agricultural production as the majority of the rural population depend on it for their survival. Homestead forestry played an important role to substantially increase the total tree cover and is great sources of the country's forest products. However, as the country is slowly advancing towards development, urbanization and industrialization are emerging as major conflicting land uses converting very good agricultural land to non-agricultural purposes. To overcome the losses of these lands farmers are trying to increase food production from the remaining lands without considering the productive capacity of the lands. Land tenure was also found to constrain potential yield. This results in a lack of inspiration and encouragement to produce more food from the land. It is now imperative to adopt a land reform programme providing the farmers with ownership rights over their cultivated land and encouraging every household in the rural areas to plant more trees, to educate the family members more to contribute to the country's economic and environmental development.

Mark and Kudakwashe (2010) observed that the rate of land-cover and land-use change has been significant in Shurugwi district and that the greatest change occurred in 2000-2009. This accelerated change is mainly attributable to cultivation (and related activities) linked to the Fast-Track Land Reform and Resettlement Program, as well as mining and gold panning activities. The study recommends that the Environmental Management Agency (EMA) monitor the cutting down of trees in newly resettled areas through the promotion of tree alternatives for fuel and construction purposes. EMA should also stop panning activities, as well as ensure that all new mines undergo full environmental impact assessments as per EMA statutes in order to reduce land degradation in the district.

Tsegaye (2014) in his study reported that land use/cover change analysis shown an increase in agricultural land from 36.16 percent in 1973 to 71.6 percent in 2014. Agriculture expanded up to the steepest slopes (>50 percent) at which crop production is not suitable. The increase of agricultural land was mainly at the expense of grassland and grazing land, and in some extent natural forest. Natural forest decreased from 8.49 percent in 1973 to totally no in 2014. Grassland, which was 34.7 percent in 1973 is decreased to 9.3 percent in 2014 and grazing land which was 19.9 percent in 1973 and reduced to 4.8 percent in 2014. A dramatic increment is shown in rock cover, which increases from 0.7 percent in 1973 to 9.8 percent in

2014. Plantation was absent in 1973, but it became 817.2 hectares (2.59 percent) in 1986 and increased to 1852.8 hectares (5.86 percent) in 2014 and shows some decrease (1399.6 or 4.4 percent) in 2014. The causes of land use/land cover changes were population pressure, land tenure shift, land slide and the encouragement of the local people by local authorities to assure food security.

2.2.6 Effect of land use change

Changes in land use reflect the history of mankind. Economic development, population growth, technology and environmental change are directly linked with land use change. Rate of land use changes are often parallel rates of population growth (Houghton, 1994). During the past several thousand years, human have taken an increasingly large role in modification of the global environment. Deforestation, for example, negatively affects soil properties and enhanced land degradation by reducing land productivity (Mohammad, 2009). **However, reviews related in this regard are provided below:**

Arieet *et al.*, (2013) observed that the biggest change in the trend scenario, current situation, would be a decrease in grazing land (19.4 percent) and forestry (8.1 percent) as result from an increase in palm oil plantations. There would be more fragmentation and the region will become more vulnerable to climate change. In the case of the normative scenario we expect a 50.2 percent decrease in extensive livestock activities and an 18.3 percent increase of the broadleaved forest area, making the region less vulnerable to climate change.

Mehri, *et al.*, (2015) in their study showed that land use change from forest to paddy lands, increased soil reaction from 6.43 to 7.52 but change to dry farming had no significant effect on soil reaction. Land use change from forest to dry farming caused decrease in the amount of organic carbon about 46.5 percent which was about 38 percent in paddy lands. Amount of nitrogen was decreased in land use change from forest into dry farming but this decrease was not significant in change from forest to paddy lands. While land use change caused an increase about 4 times in the amount of available phosphorus in dry farming and increased about two times in lands that converted to paddy lands, it had no effect on the amount of available potassium and calcium exchanging capacity. The lowest amount of electrical conductivity was observed in dry farming.

2.2.7 History of land use changes in different countries

Humans have been altering the earth's surface to produce food through agricultural activities for centuries (Reid *et al.*, 2000). A rehabilitation scheme was taken by Bangladesh Government (Former East Pakistan) from 1957 have contributed considerably to

deforestation, as under these schemes 1.6 to 2.4 ha of forestland has been allocated to each settled cultivator who cleared the forests for agricultural uses. A large number of Bengali people along with indigenous people have settled in the Hill Forests under these programs. Because of social, political, infrastructural and economical causes programs were failed (Salam *et al.*, 1999). **However, reviews related in this area are furnished below:**

Anders *et al.*, (2009) in their study the main focus was on identifying and quantifying cultivated and fallow areas. Based on remote sensing alone, it was possible to identify about half of the fallows younger than 20 years of age. Combining remote sensing with field-based methods, however, it was possible to estimate the number and size of cultivated areas, the extent of fallows up to 65 years of age, as well as the rate of old-growth forest loss.

Hooke *et al.*, (2012) observed that in recent decades, changes that human activities have wrought in Earth's life support system have worried many people. The human population has doubled in the past 40 years and is projected to increase by the same amount again in the next 40. The expansion of infrastructure and agriculture necessitated by this population growth has quickened the pace of land transformation and degradation. Humans have modified >50 percent of Earth's land surface. The current rate of land transformation, particularly of agricultural land, is unsustainable.

Olaniyi *et al.*, (2013) conducted a study to describe the historical overview of agricultural land use in Malaysia with the aim of identifying the challenges of agricultural land use in a dynamic economic system. Economic policies were explained with major policies instruments. The effects of these policies on patterns of agricultural land use in 1960 – 2005 were assessed. Findings identified three broad economic eras in Malaysia: Agricultural (1960 - 1974); Industrial (1975-1999) and Urbanization eras (2000-2012). Macroeconomic policies that favored industrialization and urbanization had negative effects on agricultural land use by competing with agricultural sectors for production inputs such as labor and capital because the better conditions of service and higher returns per capital in the industrial sector led to the withdrawal of inputs from the agricultural sectors. Subsequent change in tastes due to increased per capita income resulted to a change in agricultural land use in favor of highly rewarding and better-demanded crops (fruits and vegetables) thus causing agricultural land use dynamics. Sustainable agricultural land use in Malaysia, given scarce resource inputs (labor and capital) trade liberalization and globalization will depend on the ability of the

country to deepen her application of science and technology for automated agricultural practices, diseases and pests control and high yielding varieties and suitable land administration policies for Malaysia to compete favorably with other major low cost producers.

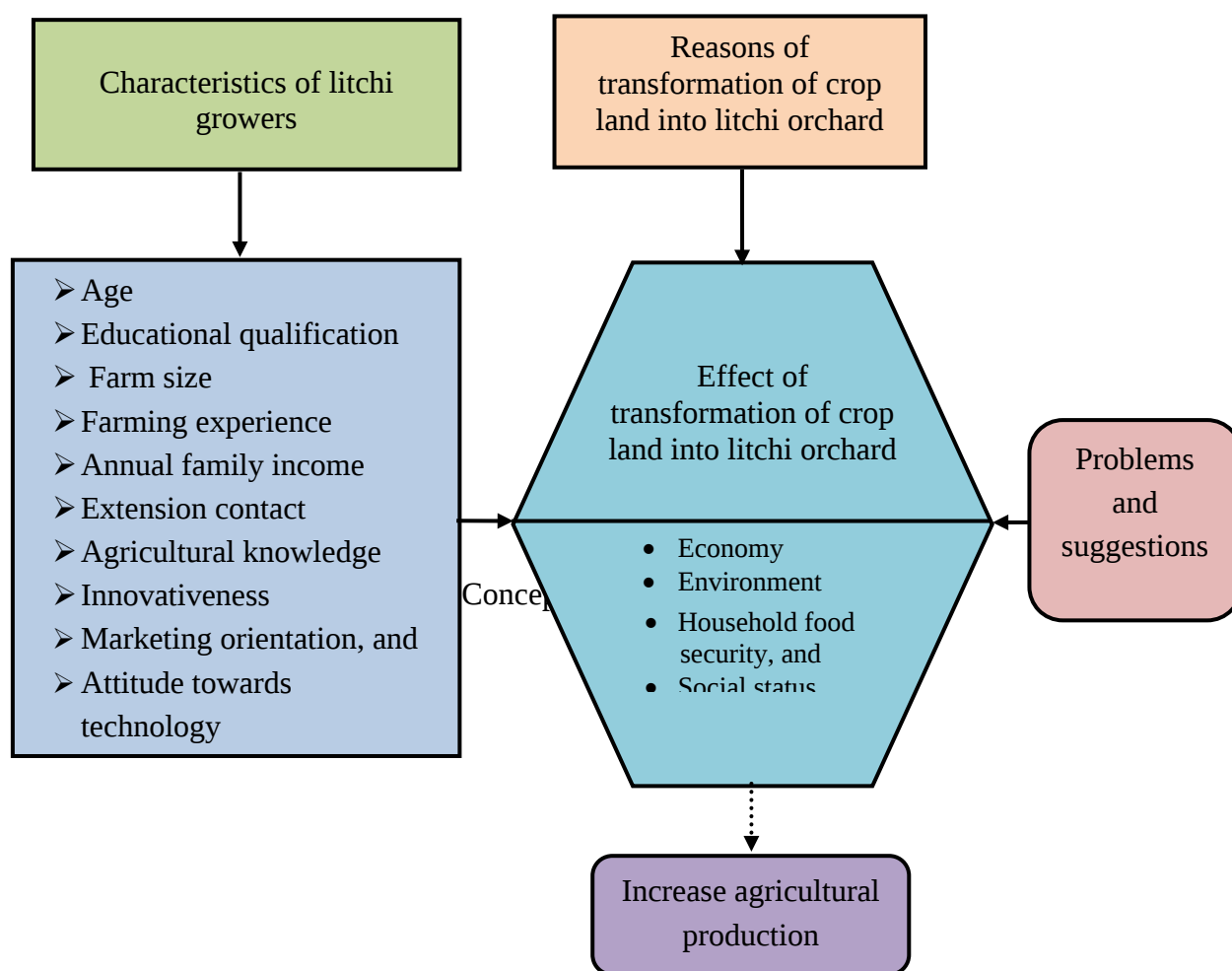
2.3 Conceptual Framework of the Study

Conceptual framework (theoretical framework) is a type of transitional theory that attempt to connect to all features of investigation (e.g. problem definition, purpose, literature review, methodology, data collection and analysis). Conceptual frameworks can act like maps that give consistency to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem (Wikipedia, 2012).

There were several reasons enhancing the transformation of cropland into litchi orchard such as favorable weather condition, litchi provides more earning than field crops, motivated by others, litchi orchard give return for several years, low cost of production, litchi gardening is an environment friendly activity, possible to intercropping during the early stage of litchi plants, can fulfills the nutritional demand etc. The effect of transformation of cropland into litchi orchard on economy was high profitability, due to cost of production, and long time return etc. Transformation effect on environment was to prevent soil erosion, maintain natural balance etc. The effect on household food security was to meet nutritional demand and finally, the transformation effect on social status was to increase social power, interaction with others etc.

There were several problems faced by the litchi growers in using cropland into litchi orchard. These problem are 1) high production cost, 2) lack of disease resistance varieties, 3) non-availability of skilled labor, 4) unavailability of extension service, 5) lack of technological knowledge about litchi cultivation, 6) lack of training on litchi cultivation from DAE or other organization, 7) getting fair price is difficult due to interfere of middleman, 8) Damage caused by the man, rat, bird, fox etc. in litchi, 9) Low co-ordination among litchi growers, and 10) Lack of credit facilities. Conversely, in order to increase the transformation of cropland into litchi orchard, several measures should be taken. If the farmers properly utilize the land through adoption of modern technologies, providing more training facilities arranged by the respective organization and credit at low interest rate, increasing contact with SAAOs,

strengthening litchi growers association etc. as a result, the continuation of transformation of cropland into litchi orchard and production of litchi as well as other crops must be increased. 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 (Figure 2.1). **The solid one-way arrows indicate the cause-effect relationships which have been investigated and dotted one-way arrows indicate the relationship which not been investigated in the present research work.**



CHAPTER 3

METHODOLOGY

In any scientific research, methodology deserves a very careful consideration. Appropriate methodology used in research helps to collect valid and reliable data and analyze the information purposively to arrive at correct decision. This enables the researcher to collect valid and reliable information, which can be analyzed in order to arrive at correct conclusion. The methods and procedures followed in conducting this research have been discussed in this Chapter.

3.1 Research Design of the Study

Research design means the plan, structure and strategy of investigation conceived so as to obtain answer to research question and control variance (Kerlinger, 1996). Designing the research for the study was taken in a scientific method. Firstly, different research themes are collected and analyzed followed by research problem formulation. Reviews were studied to select appropriate variables and preparation of research instrument. Pretesting of the research instrument was done before final data collection. Finally data were collected, analyzed and report was prepared. An explanatory and cross sectional research design was used in this research which has been presented in Figure 3.1.

3.2 Locale of the Study

Considering the litchi growing area the study was conducted in Biral and Sadar Upazila under Dinajpur District. Data were collected from a sample of the litchi growers from four villages under one union in Biral upazila and six villages under two unions in sadar upazila of Dinajpur district. A map of Dinajpur district including its upazilas as well as Bangladesh (inset) and a map of Sadar and Biral upazila of Dinajpur district have been presented in Figure 3.2, 3.3 and 3.4 respectively.

3.3 Population and Sampling

Multistage random sampling procedure was followed in this study. At first Dinajpur district was purposively selected. In the second stage three unions (two from Dinajpur sadar upazila and one union from Biral upazila) namely Chehelgazi, Shekpura and Biral were selected as purposive sampling, where farmers are involved in the litchi cultivation and also transformed their crop land into litchi orchard. An updated list of 266 litchi growers of the study area was collected from the respective Upazila Agriculture Office. The listed 266 litchi growers considered as population of the present study.

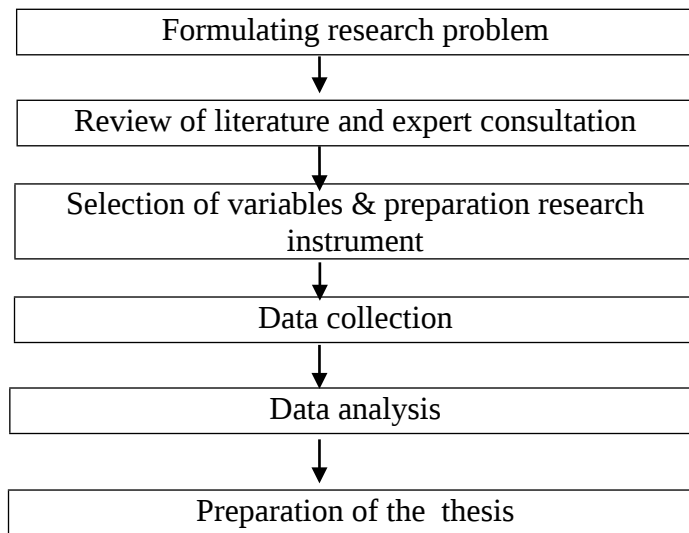


Figure 3.1 Research design of the study.



Figure 3.2 Map of Dinajpur district including its upazilas (Bangladesh inset).



Figure 3.3 Map of Sadar upazila showing the study area.



Figure 3.4 Map of Biral upazila showing the study area.

The selected litchi growers situated in ten villages which were Uttar Gobindopur, Nayanpur, West Sibrapur and Boroil from Chehelgazi union; North Gopalpur and Khamar kantobag from Shekpura union; Buniadpur, Moheshpur, Shibpur and Madhobbaty from Biral union. In the final stage a total of 80 litchi farmers (about 30 percent of the sampling population) were selected as the sample of the present study following random sampling method. Due to the possibility of unavailability of the selected respondent, a reserve list eight litchi growers was made to substitute the missing respondent in the original list (Table 3.1).

Table 3.1. Distribution of population and sample of litchi growers from the selected unions in the Dinajpur sadar and Biral upazila

Upazila : Dinajpur Sadar				
Union	Village	Population	Sample size	Reserve list
1.Chehelgazi	1.Uttar Gobindopur	25	8	1
	2.Nayanpur	17	5	0
	3.West Sibrapur	20	6	1
	4. Boroil	30	9	1
2. Shekpura	1.North Gopalpur	25	8	1
	2. Khamar kantobag	18	5	0
Upazila : Biral				
1. Biral	1. Buniadpur	25	8	1
	2. Moheshpur	31	9	1
	3. Shibpur	32	9	1
	4. Madhobbaty	43	13	1
	Total	266	80	08

3.4 Research Instrument

In order to collect relevant data, an interview schedule was carefully prepared, keeping the objectives of the study in mind. The interview schedule contained both open and closed form of questions. The draft interview schedule was pre-tested in actual field situation before using the same for collection of data. This pre-test facilitated the researcher to identify faulty and ambiguous questions. In total ten respondents from different parts of the study area were interviewed for the pre-test. Necessary alteration, additions and adjustments were made in the schedule on the basis of the pre-test result. The interview schedule was then printed in its final form for collection of data.

3.5 Measurement of Different Issues

This section contains procedure for measurement of both characteristics of the litchi growers and the focus issues of the study. According to the relevant research area, the researcher selected 10 characteristics of the litchi growers and transformation of cropland into litchi orchard as the focus issue of the study.

3.5.1 Measurement of characteristics of litchi growers

In total ten selected characteristics of the litchi farmers were considered for the study. These were age, educational qualification, farm size, farming experience, annual family income, extension contact, agricultural knowledge, innovativeness, marketing orientation, and attitude towards technology. The procedures followed for measuring for each of the characteristics are discussed as follows.

3.5.1.1 Age of a litchi grower was measured in terms of complete years from his birth to the time of interview which was found on the basis of response. A unit score was assigned for each year of age. The variable appears in item number 1 (Appendix-A).

3.5.1.2 Educational qualification was measured in terms of one year of schooling. One score was given for passing each level in an educational institution. For example, if a respondent passed the final examination of class V his level of educational score was taken as 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 number 2, Appendix-A).

3.5.1.3. Farm size of a respondent included the areas of homestead, own land under own cultivation, land taken from others on barga, land given to others on barga, land taken from others on lease, pond area, litchi orchard, and others (if any) which could give full benefit to the family and it was expressed in terms of hectares by using the following formula (Hossain, 2010):

$$FS = F_1 + F_2 + \frac{1}{2}(F_3 + F_4) + F_5 + F_6 + F_7 + F_8$$

Where,

FS = Farm size

F₁ = Homestead

F₂ = Own land under cultivation

F₃ = Land taken from others on barga

F₄ = Land given to others on barga

F₅ = Land taken from others on lease

F₆ = Pond area

F₇ = Litchi orchard, and

F₈ = Others (if any)

The data were collected in local unit at the time of data collection and then converted to hectare. This variable has been presented in item number 3 in appendix A.

3.5.1.4. Farming experience mean the experience which was gained by an individual from active farming and it was expressed in years i.e. score 1 was assigned for each year of farming (Kuri, 2013). The characteristic appears in item number 4 of interview schedule as presented in Appendix A.

3.5.1.5. Annual family income of the litchi growers was measured on the basis of his family's yearly earnings from litchi, other fruits, rice, vegetables, fish, livestock, land lease, business, service and others (if any). 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 (Khanom, 2014). The variable appears in item number 5 in the interview schedule (Appendix-A).

3.5.1.6. Extension contact of the litchi growers was measured by computing scores based on his frequency of communication with 15 different media. These are other litchi growers, local leaders, pesticide/insecticide dealers, union information and service center, SAAOs, AEO, UAO, result demonstration meeting, field day, training program, agricultural TV program, newspaper, farm magazine, agricultural poster and agricultural leaflet (Khanom, 2014). This variable has been presented in item number 6 of the interview schedule (Appendix-A). The extension contact was determine using four point scale as 'never', 'somewhat', 'often' and 'regularly' and score was assigned as 0, 1, 2 and 3, respectively. The possible extension contact score could range from 0 to 45, where 0 indicates no extension contact and 45 indicates very high extension contact.

3.5.1.7 Agricultural knowledge: To measure the agricultural knowledge of a respondent the Bloom's Taxonomy of six levels of cognitive domain were kept in mind (Bloom *et al.*, 1964). There were three questions from each level, and thus 18 questions were prepared in the interview schedule. Different scores such as 2 and 3 were assigned against different levels of question (Hossain, 2010). Answering a question correctly of an individual could obtain full score, partial score was given to partial correct answer and zero (0) was assigned for wrong answer. Thus, the agricultural knowledge score of a respondent could range 0 to 48, where 0 indicates no knowledge and 48 indicates very high knowledge. The variable appears in item number 7 (Appendix-A).

3.5.1.8 Innovativeness of a respondent was measured by computing an innovativeness score on the basis of his adoption of 10 selected modern agricultural technologies. Score were 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. Innovativeness was measured according to the methodology followed by Mondol (2009) where score was given to the length of adoption or non-adoption of a new technology as follows:

Adoption length	Score assigned
Do not use	0
Adoption within two years of hearing	1
Adoption within one to two years of hearing	2
Adoption within one year of hearing	3

The score assigned to each of the 10 technologies were added together to obtain the total innovativeness score of a respondent. Thus, the innovativeness scores of the respondents could range from 0 to 30, 0 indicated no innovativeness and 30 indicated very high innovativeness.

3.5.1.9 Marketing orientation of a farmer was measured on six item measuring scale, three of these items being stated positively and other three negatively. Each statement was provided with 4-point response categories. The positive statements scores were given 4, 3, 2 and 1 for ‘strongly agree’, ‘agree’, ‘undecided’, and ‘strongly disagree’. Scoring was reversed for the negative statements. The range of scores for the scale could range from 6 to 24 where 6 indicated low marketing orientation and 24 very high marketing orientations. The marketing orientation score of an individual is the sum of scores for all the statements in the scale. The variable appears in item number 9 (Appendix-A).

3.5.1.10 Attitude towards technology of the respondent was measured by using eight different statements. The statements have been selected based in perception about agricultural activities by the respondents. The selected statements had either positive or negative view. The respondents express their opinion against 5-point Likert scale as ‘strongly agree’, ‘agree’, ‘undecided’, ‘disagree’ and ‘strongly disagree’. The scores were assigned as 5, 4, 3, 2, and 1, respectively for the positive statements and a reverse score was given for all negative statements. Thus, the possible score could range from 8 to 40, while 8 indicated strongly disagree or unfavorable attitude and 40 indicate strongly agree or highly favorable attitude towards technology (Appendix-A).

3.5.2 Measurement of focus issues

The focus issue of the study was extent and effect of transformation of crop land into litchi orchard. The measurement procedure of these focuses issue has been described below:

3.5.2.1 Extent of transformation of crop land into litchi orchard

For measuring the extent of transformation of crop land into litchi orchard, data were collected from the year 2005 to 2014. Year wise total area of crop land and land owners for litchi orchard was also measure at 10 years back in hectare. Then year wise percentage of land conservation in the last 10 years was calculated by using the following formula. Crop replaced by litchi during transformation of crop land into litchi orchard was also identified (Kowsari, 2014).

For example:

$$\text{Percentage of transformation in the year 2005} = \frac{\text{Transformed land in the year 2005} \times 100}{\text{Total area of land in the year 2005}}$$

3.5.2.2 Effect of transformation of cropland into litchi orchard

The effect of transformation of cropland into litchi orchard was measured by using a four point rating scale as 'not agree', 'undecided', 'agree' and 'strongly agree' and weights were assigned to these responses as 0, 1, 2, and 3 respectively. The effect of transformation of cropland into litchi orchard was measured in four different dimensions i.e. 'effect on economy', 'effect on environment', 'effect on household food security' and 'effect on social status'. Thus, the possible score of effect on each dimension could range from 0 to 12. Where 0 indicate no effect and 12 indicate very high effect of transformation of cropland into litchi orchard. On the other hand, the possible range for overall effect of transformation of cropland into litchi orchard score for 16 statements of the four dimensions could range from 0 to 48, while 0 indicate no effect and 48 indicate very high effect of transformation.

Effect of transformation of cropland into litchi orchard was investigated based on the opinion of the farmers who were transforming their crop land into litchi orchard that is the farmers were made-up to give their opinion about the effect of transformation. For determining the effect of individual area rank order was made based on Cumulative Effects Score (CES) of the individual are. The CSE was computed by using the following formula (Kowsari, 2014):

$$\text{CSE} = N_1 \times 0 + N_2 \times 1 + N_3 \times 2 + N_4 \times 3$$

Where,

CSE = Cumulative effect score

N_1 = Number of respondents supposed transformation effect as not agree

N_2 = Number of respondents supposed transformation effect as undecided

N_3 = Number of respondents supposed transformation effect as agree

N_4 = Number of respondents supposed transformation effect as strongly agree

Thus, the CSE of individual effect could range from 0 to 240, where 0 indicating no effect and 240 indicating very high effect of transformation of cropland into litchi orchard.

3.6 Measurement of Problems Faced by the Litchi Growers and Suggestions to Overcome the Problems

Like crop cultivation, farmers face many problems in cultivating litchi. To determine the problem the researcher made discussion with litchi growers of the study area and unit level personnel of DAE ten problems were selected for the study. Each farmer was asked to indicate his opinion as 'no', 'low', 'moderate', and 'severe' regarding each problem and weights were assigned to these responses as 0, 1, 2, and 3 respectively. For obtaining total score the ten problems of the farmers, each item long with rank order was computed by using the following formula (Khan, 2012):

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

Where,

PCI = Problem confrontation index

P_{np} = Number of respondents with no problem

P_{lp} = Number of respondents with low problem

P_{mp} = Number of respondents with moderate problem, and

P_{sp} = Number of respondents with severe problem

The problem confrontation score could range from 0 to 240. In contrast, the farmers were also requested to mention the means to solve these problems an open form of question was used in this regards. Then, suggestions were ranked on the basis of number of citations on the respective areas.

3.7 Data Collection

Data were collected during the period from 15 April to 15 May, 2015. By using the pretested questionnaire, the researchers were first established rapport with the respondents and clearly explain the objectives of the study by using local language as far as possible. As a result, the respondents furnished proper responses to the questions and statements without any hesitation. After completion of interview, it was checked and editing was done as per necessary. The researcher did not face any major problem in collecting data. Excellent cooperation and coordination were extended by the respondents and other concern persons at the time of data collection.

3.8 Data Processing and Analysis

At the end of data collection, the collected data was coded, compiled, tabulated and analyzed. The local units were converted into standard units. The qualitative data was transferred into quantitative data by appropriate scoring technique. The responses were recorded in the interview schedule was transferred into a master sheet for entering the data into the computer. Local units were also converted into standard units.

The SPSS program was used for analyzing the data. Various descriptive statistical measures such as frequency, number, percentage, mean, standard deviation and rank order was used for categorization and describing the variables.

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 and third sections deal with extent and effect of transformation of cropland, respectively and the fourth and last section have been discussed with the problems faced by the farmers on the effect of transformation of cropland into litchi orchard and probable suggestions to overcome these problems.

4.1 Selected Characteristics of the Litchi Growers

The characteristics of an individual are important factor in developing mental make up for transformation of crop land. More particular decisions related to transformation of crop land being influenced largely by different characteristics of the litchi growers. The selected characteristics of the litchi growers included their i) age ii) educational qualification iii) farm size iv) farming experience v) annual family income vi) extension contact vii) agricultural knowledge viii) innovativeness ix) marketing orientation, and x) attitude towards technology. These characteristics of the litchi growers have been described in this section (Table 4.1).

4.1.1 Age

Age of the litchi growers ranged from 27 to 67 years, with a mean of 43.05 years and standard deviation of 8.50. The respondents were classified into three categories viz. young, middle aged and old as shown in Table 4.1.

Data contained in Table 4.1 indicates that about three-fourths (58.75 percent) of the respondents were middle aged category compared to 35.0 percent of them belonged to the old, and only 6.25 percent were in young aged category. Similar results were found by Ahmed (2013), Mondol (2010), Barman *et al.* (2009) and Hasan (2006).

The findings indicate that the majority (65.0 percent) of the respondent were young to middle aged category. It is assume that young and middle aged respondents are more active, energetic and enthusiastic in performing any kind of farming activities. Particularly the middle aged respondents are well experienced and more acquitted with the litchi production activities. Thus, the participation in decision making and income generating activities might be influenced by the young and middle aged litchi growers.

Table 4.1 Salient features of the different characteristics of litchi growers

Characteristics	Scoring method	Range	Categories	Respondents		Mean	SD
		Observed (Possible)		No.	%		
Age	No. of year	27-67 (Unknown)	Young (up to 35)	5	6.25	43.05	8.50
			Middle aged (36-50)	49	58.75		
			Old (>50)	28	35.00		
Educational qualification	Year of schooling	0-16 (Unknown)	Illiterate (0)	10	12.50	8.26	4.31
			Can sign only (0.5)	3	3.75		
			Primary (1-5)	4	5.00		
			Secondary (6-10)	42	52.50		
			Above secondary (>10)	21	26.25		
Farm size	Hectare	0.14-21.17 (Unknown)	Small (0.21-1.0)	07	8.75	1.68	3.21
			Medium (1.01-3.0)	12	15.00		
			Large (>3.0)	61	76.25		
Farming experience	Year	8-45 (Unknown)	Low (8-15)	15	18.75	24.06	8.87
			Medium (16-33)	54	67.50		
			High (>33)	11	13.75		
Annual family income	('000' Tk.)	35-810 (Unknown)	Low income (35-64)	1	01.25	203.81	139.40
			Medium (65-343)	69	86.25		
			High (>343)	10	12.50		
Extension contact	Score	5-38 (0-45)	low (5-9)	12	15.00	17.85	8.86
			Medium (10-27)	52	65.00		
			High (>27)	16	20.00		
Agricultural knowledge	Score	17-44 (0-48)	Poor (17-25)	13	16.25	31.28	6.26
			Good (26-37)	54	67.50		
			Excellent (>37)	13	16.25		
Innovativeness		3-24 (0-30)	low (3-5)	13	16.25	9.74	4.71
			Medium (6-14)	54	67.50		
			High (>14)	13	16.25		
Marketing orientation	Score	12-20 (6-30)	Low (12-15)	26	32.50	16.40	1.77
			Medium (16-18)	45	56.25		
			High (>18)	09	11.25		
Attitude towards technology	Score	17-37 (8-40)	Slightly favorable (17-25)	10	12.50	28.86	3.74
			Moderately favorable (26-32)	53	66.25		
			Highly favorable (>32)	17	21.25		

4.1.2 Educational qualification

The level of educational qualification of the litchi growers ranged from 0 to 16 years of schooling having a mean of 8.26 with a standard deviation of 4.31. Based on educational qualification, the litchi growers were classified into five categories viz. illiterate, can sign only (0.5), primary (1-5), secondary (6-10) and above secondary level (>10) as presented in Table 4.1.

Data furnished in the Table 4.1 reveal that more than half (52.50 percent) of the respondents have secondary education where as 12.50 percent are illiterate, 3.75 percent under can sign only category, 5.0 percent have primary education and 26.25 percent of the litchi growers have above secondary education. The findings indicate the literacy rate of the litchi growers is higher than the national average literacy of 59.8 percent (BBS, 2014). Similar results were found by Muhammad *et al.* (2015), Kowsari (2014), Roy (2014), Khanom (2014), Yesmin (2013) and Mondol_b (2010).

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. Educated respondents may get useful information through reading leaflet, booklet, books, newspaper and other printed materials. It also increases the power of understanding and develops the ability of analyzing facts and situation. The higher level of literacy of the litchi growers in the study area indicates their advancement towards transformation of crop land into litchi orchard.

4.1.3 Farm size

Farm size of the respondents varied from 0.14 to 21.17 hectares. The mean value of farm size was 1.68 hectares with a standard deviation of 3.21. The respondents were classified into three categories i.e. small, medium and large farm (Table 4.1).

Data contained in Table 4.1 indicated that almost three-fourths (76.25 percent) of the respondents had large farm followed by 15.00 percent had medium farm and only 8.75 percent had small farm. Similar results were found by Kowsari (2014), Mahmud *et al.* (2013), Mondol_a (2010), Mondol_b (2010) and Miah *et al.* (2006).

The findings indicate that a notable segment (91.25 percent) of the respondents had medium to large size farm. The average farm size of the respondents was 1.68 hectare which was higher than that of national average (0.81 ha). The findings may be due to the nature of sample of the study. This may indicate that the socio-economic condition of the respondents in the study area is higher than a typical farming community of Bangladesh.

4.1.4 Farming experience

The farming experience score of the litchi growers ranged from 8 to 45 year with a mean of 24.06 year and standard deviation of 8.87. The respondents were classified into three categories such as low, medium and high farming experience as shown in Table 4.1.

The highest proportion (67.50percent) of the respondents had medium farming experience while 18.75 percent had low experience and 13.75 percent having high farming experience. Similar result was found by Kowsari (2014).

The findings indicated that about four-fifths (81.25 percent) of the respondents possessed medium to high farming experience. The result may due to the reason that most of the respondents starting their farming as the preliminary occupation from their young age level.

4.1.5 Annual family income

Annual family income of the respondents ranged from 35 to 810 with the mean value of 203.81 and standard deviation of 139.40. On the basis of their annual family income scores, the respondents were classified into three categories as low, medium and high income (Table 4.1).

Data furnished in Table 4.1 revealed that 86.25 percent of the respondents had medium annual family income, compared to 12.5 percent had high and only 1.25 percent had low annual family income. Similar results were found by Yesmin (2013) and Mondol (2009).

The findings indicated that remarkable segment (98.75 percent) of the litchi growers had medium to high family income. This may be due to the reason that 67.5 percent of the respondents had medium farm and thus, they got a huge income from their farm.

4.1.6 Extension contact

Extension contact scores of the respondents ranged from 5 to 38 with an average of 17.85 and standard deviation of 8.86. On the basis of extension contact scores, the respondents were classified into three categories viz. low, medium and high extension contact as shown in Table 4.1.

Data presented in Table 4.1 shows that the more than three-fifths (65.00 percent) of the respondents had the medium extension contact, while 15.00 percent had low extension contact and 20.00 percent had high extension contact. Similar result was found by Miah *et al.* (2006).

Extension contact affects to one's contact with different source of knowledge and information. This results in cognitive change of the users with an ultimate change in behavior. The findings of the study indicate that most of the respondents (85.00 percent) had high to medium extension contact with various communication channels. This may be due to the literacy of the litchi grower.

4.1.7 Agricultural knowledge

Agricultural knowledge of the respondents ranged from 17 to 44 with the mean of 31.28 and standard deviation 6.26. On the basis of agricultural knowledge scores the respondents were classified into three categories i.e. poor, good and excellent agricultural knowledge as presented in Table 4.1.

Data furnished in Table 4.1 revealed that more than three-fifths (67.50 percent) of the respondents had good knowledge followed by 16.25 percent of them had excellent as well as poor agricultural knowledge.

The result indicates that more than four-fifths portion (83.75 percent) of the respondents had well to excellent agricultural knowledge. It is quite understandable that the respondents having high level educational qualification, medium to high exposure to extension contact will have good agricultural knowledge. It is very rational to think that the respondent's having agricultural knowledge and farming experience will help to develop highly positive attitude towards modern technology adoption.

4.1.8 Innovativeness

The innovativeness scores of the litchi growers ranged from 3 to 24, against the possible score of 0 to 30. The mean and standard deviation were 9.74 and 4.7, respectively. Based on innovativeness scores, the respondents were classified into three categories such as low, medium and high (Table 4.1).

The computed data indicated that 67.5 percent of the respondents had medium innovativeness compared with jointly 16.25 percent had high and low innovativeness. Findings of the study had similarity with the study of Muhammad *et al.* (2015) and Islam (2014).

The findings of the study revealed that about four-fifths (83.75 percent) of the respondents had medium to high innovativeness on modern agricultural technology. This means that majority of the respondents of the study area were medium to high innovativeness towards the adoption of improved farming practices in terms of duration of practicing improved farming.

4.1.9 Marketing Orientation

Marketing orientation scores of the respondents were ranged from 12 to 20, against the possible range of 6 to 30. The mean and standard deviation were 16.40 and 1.77, respectively. Based on marketing orientation scores the respondents were classified into three categories i.e. low, medium and high (Table 4.1).

From the Table 4.1, it is found the highest proportion (56.25 percent) of the litchi growers had medium marketing orientation while 32.50 percent of them low high orientation and only 11.25 percent had high marketing orientation. Similar results were found by Muhammad *et al.* (2015), Parul (2014), Khanom (2014) and Mondol (2009).

The findings revealed that the overwhelming majority (67.50 percent) of the litchi growers had medium to high marketing orientation. This means that the respondents in the study area conscious about buying their farm inputs as well as selling their farm product. This may be due to the improvement of the telecommunication facilities specially use of mobile phone in obtaining market news in different local and national market by the farmer in the study area.

4.1.10 Attitude towards technology

Attitude scores of the litchi growers were varied from 17 to 37 against the possible range of 8 to 40, with a mean of 28.86 and standard deviation of 3.74. On the basis of the observed attitude score, the respondents were classified into three categories as shown in Table 4.1.

The majority (66.25 percent) of the respondents had moderately favorable attitude towards technology whereas 21.25 percent had highly favorable and 12.50 percent had slightly favorable attitude towards technology.

The findings indicated that 87.50 percent of the respondents had moderately favorable to highly favorable attitudes towards technology. Under this circumstance, the respondents might have preference towards modern agricultural practices and want to use modern agricultural technology for their economic development. Agricultural extension agencies should organize this unique client group by offering them innovative type of farming information by using different types of communication sources.

4.2 Extent of Transformation of Cropland into Litchi Orchard

Extent of transformation of cropland into litchi orchard was the focus issue of this study. In total 134.338 hectares of land was under crop cultivation out of which 37.653 hectares have been transformed into litchi orchard during the years 2005 to 2014. Area of cropland, transformed land, percentage of transformed land and crops which replaced by litchi have been shown in Table 4.2.

Table 4.2 Distribution of land according to extent of transformation

Year	Area of crop land (ha)	Area of transformed land (ha)	Transformed land (%)	Crop replaced by litchi
2005	46.898	09.669	20.62	Rice, maize, wheat, potato, mustard, garlic and turmeric
2006	36.635	13.198	36.02	Rice, maize, wheat, potato, tomato and turmeric
2007	04.792	02.070	43.20	Rice, maize, potato and vegetable
2008	08.520	03.093	36.30	Rice, maize, wheat, potato, bean and Napier
2009	12.451	02.098	16.85	Rice, wheat and potato
2010	09.608	01.273	13.25	Rice, wheat, potato and turmeric
2011	04.925	01.397	28.37	Rice, maize, wheat, vegetable and turmeric
2012	03.581	02.228	62.22	Rice, maize, potato, onion and turmeric
2013	02.798	01.157	41.35	Rice, maize, wheat, mustard and vegetable
2014	04.130	01.470	35.60	Rice, maize, potato, zinger and turmeric
Total	134.338	37.653	Average=33.38	

Data contained in the Table 4.2 revealed that the average of transformed land was 33.38 percent during the year of 2005 to 2014. The percentage of transformation in the year 2005,2006,2007,2008,2009,2010,2011,2012, 2013 and 2014 were 20.62, 36.02, 43.20, 36.30, 16.85, 13.25, 28.37, 62.22, 41.35 and 35.60 percent, respectively were replaced by litchi. In case of land transformation, some major crops such as rice, maize and wheat, and some minor crops i.e. potato, vegetable, mustard, garlic, turmeric and Napier grass were replaced by litchi.

The findings also indicate that the area of crop land from the year of 2005 to 2014 were 46.898, 36.635, 04.792, 08.520, 12.451, 09.608, 04.925, 03.581, 02.798 and 04.130 hectare, respectively. Thus, total crop land of the farmers during the last 10 years was 134.338 hectare. Farmers of the study area transform their cropland into litchi orchard in the year of 2005 to 2014 were 9.669, 13.198, 2.070, 3.093, 2.098, 1.273, 1.397, 2.228, 1.157 and 1.470 hectare, respectively.

In the year of 2007, 2012 and 2013 percentage of transformation of cropland into litchi was high. The reason behind higher transformation may be higher profitability, less laborious, less time consuming in intercultural operation, low production and harvesting cost, long turn returns, having opportunity to possible inter cropping and so on.

On the other hand, in the year of 2005, 2009 and 2010 the percentage of transformation of cropland into litchi orchard was less than the year of 2007, 2012 and 2013. The result may be due to that lack of training facilities, having interest on subsistence agriculture, unavailability of credit, low dissemination of technology, lack of knowledge regarding selection of litchi varieties and so forth.

4.3 Effect of Transformation of Cropland into Litchi Orchard

Effect of transformation of cropland into litchi orchard was another focus issue of this study. An attempt was made to ascertain this issue; four dimension such as effect on ‘economy’, ‘environment’, ‘household food security’ and ‘social status’ were considered in this regard. The findings of the above dimensions have been described below.

4.3.1 Effect of transformation of cropland into litchi orchard on economy

Effect of transformation of cropland into litchi orchard on economy possesses several effects in varying degrees. Farmers were classified into four such as ‘not agree’, ‘undecided’, ‘agree’, and ‘strongly agree’ on the basis of their nature of opinion regarding economic effect. Cumulative Effect Score (CSE) were computed which ranged from 146 to 208 against the possible range of 0 to 240. The rank order of each statement of the effect of transformation on cropland into litchi orchard on economy was made on the basis of CES score (Table 4.3).

Table 4.3 Distribution of the litchi growers according to economic effect on transformation of cropland (N=80)

Sl. No.	Economic effect	Nature of opinion				CES	RO
		NA	U	A	SA		
1.	Litchi cultivation is more profitable than crops	01	01	51	27	184	2
2.	Harvesting cost is low	00	00	32	48	208	1
3.	It gives return for several years	01	22	47	10	146	4
4.	Create earnings opportunities	00	22	49	09	147	3

NA= Not agree, U= Undecided, A = Agree, SA = Strongly agree, CES = Cumulative effects score, and RO= Rank Order

Data contained in Table 4.3 revealed that the statement ‘harvesting cost is low’ obtained the highest score (CES=208) and thus considered the 1st rank as the effect of transformation of crop land on economy. It may be due to that harvesting and training of litchi cultivation is done at the same time. Second ranked statement was ‘litchi cultivation is more profitable than crops’, (CES=184). Litchi is a profitable fruit and hence, farmers are interested to cultivate litchi rather than other crops. The farmer can earn more money at a time from litchi orchard than other crops.

The 3rd ranked statement was ‘create earnings opportunity’. Litchi cultivation requires least labor and thus growers can earn more. The fourth and last statement is ‘it gives return for several years’. Litchi orchard survives for many years with minimum intercultural operations. As a result, farmers can get benefit for long time from the orchard.

4.3.1.1 Overall effect of transformation of cropland into litchi orchard on economy

The effect of total economic scores of the farmer ranged from 6 to 12 against the possible range of 0 to 12. The average effect on economy was 8.56 with standard deviation of 1.66. The farmers were classified into three categories namely ‘low’, ‘medium’, and ‘high’ (Table 4.4).

Table 4.4 Distribution of the respondents according to their overall economic effect of transformation of cropland

Categories	Respondents		Range	Mean	SD
	Number	Percentage	Observed (Possible)		
Low (6-7)	24	30.00	6-12 (0-12)	8.56	1.66
Medium (8-10)	48	60.00			
High(>10)	08	10.00			
Total	80	100.00			

The data furnished in Table 4.4 revealed that three-fifths (60.0 percent) of the litchi growers had medium, while 30.0 percent had low and 10.0 percent had high effect on economy caused by transformation of cropland into litchi orchard. The finding is quite logical because litchi cultivation is cost-effective due to low production cost and long term profit.

4.3.2 Effect of transformation of cropland into litchi orchard on environment

Effect on transformation of cropland into litchi orchard on environment possesses several effects in varying degrees. Farmers are classified into four categories such as ‘not agree’, ‘undecided’, ‘agree’, and ‘strongly agree’ on the basis of their nature of opinion regarding environmental effect. The CES score were computed which ranged from 96 to 171 against the possible range of 0 to 240. The rank order of each statement on the effect of transformation of cropland into litchi orchard on environment was made on the basis of CES value (Table 4.5).

Table 4.5 Distribution of the litchi growers according to environmental effect on transformation of cropland (N=80)

Sl. No.	Environmental effect	Nature of opinion				CES	RO
		NA	U	A	SA		
1.	Maintain environmental balance	00	13	50	17	164	2
2.	Improve soil organic matter	00	24	50	06	142	3
3.	Reduce climatic hazard	00	24	24	08	096	4
4.	Increase aforestation	00	14	41	25	171	1

NA= Not agree, U= Undecided, A = Agree, SA = Strongly agree, CES = Cumulative effects score, and RO= Rank Order

Data contained in Table 4.5 revealed that the highest proportion of the farmers opined ‘increase aforestation’ (CES=171). Transformation of cropland into litchi orchard increases the aforestation by considering number of trees. The statement ‘maintain ecological balance’ got the score 164 and thus considered as the 2nd ranked as the effect of transformation of cropland into litchi orchard on environment. Litchi plant receives harmful CO₂ and release essential O₂ and thus, maintain environmental balance. The 3rd statement is ‘improve soil organic matter’. Organic matter is very useful for the soil. Fallen leaves add organic matter after become rotten into the soil.

4.3.2.1 Overall effect of transformation of cropland into litchi orchard on environment

The total environmental effect scores of the farmer ranged from 4 to 12 against the possible ranged of 0 to 12. The average effect on environment was 7.46 with a SD of 1.86. The farmers were classified into three categories namely ‘low’, ‘medium’, and ‘high’ (Table 4.6).

Table 4.6 Distribution of the respondents according to their overall environmental effect on transformation of cropland

Categories	Respondents		Range Observed (Possible)	Mean	SD
	Number	Percentage			
Low (4-5)	14	17.50	4-12 (0-12)	7.46	1.86
Medium (6-9)	56	70.00			
High(>9)	10	12.50			
Total	80	100.00			

The data furnished in Table 4.6 revealed that majority (70.0 percent) of the respondents considered transformation had medium effect on environment, compared to 17.50 percent had low and 12.50 percent had high effect on environment caused by transformation of cropland into litchi orchard. It may be due to litchi orchard maintain environmental balance and add organic matter to soil.

4.3.3 Effect of transformation of cropland into litchi orchard on homestead food security

Effect of transformation of cropland into litchi orchard on homestead food security also possesses several effects in varying degrees. The litchi growers were classified into four such as 'not agree', 'undecided', 'agree', and 'strongly agree' on the basis of their nature of opinion regarding homestead food security. The CSE score were computed which regard from 110 to 147 against the possible range of 0 to 240. The rank order of each of the effect of transformation of cropland into litchi orchard on homestead food security was made on the basis of CES value (Table 4.7).

Table 4.7 Distribution of the litchi growers according to household food security effect on transformation of cropland (N=80)

Sl. No.	Household food security effect	Nature of opinion				CES	RO
		NA	U	A	SA		
1.	Increase income	00	22	49	09	147	1
2.	Opportunities to better lifestyle	01	46	26	07	119	2
3.	Nutritional energy availability	02	44	29	05	117	3
4.	Increase purchase capacity of food	03	48	25	04	110	4

NA= Not agree, U= Undecided, A = Agree, SA = Strongly agree, CES = Cumulative effects score, and RO= Rank Order

Data in Table 4.7 indicated that the statement 'increase income' obtained the highest score of 147 and thus considered as the 1st rank. Most of the farmers in the study are used to cultivate rice and some of them are transform their land into litchi orchard. They can get their food from the income of litchi orchard. The 2nd statement is 'opportunities to better lifestyle'. The respondents can get chance to get more income by transforming their crop land into litchi orchard. 'Nutritional energy availability' is the 3rd rank. Litchi fruit is rich with numerous of nutrient. As a result, by consuming it people can meet their nutritional demand.

4.3.3.1 Overall effect of transformation of cropland into litchi orchard on homestead food security

The effect on total homestead food security scores of the farmers ranged from 1 to 11 against the possible range of 0 to 12. The average effect on homestead food security was 6.16 with a standard deviation of 2.07. Based on effect of transformation of cropland into litchi orchard on homestead food security the respondents were classified into three categories i.e. 'low', 'medium', and 'high' (Table 4.8).

Table 4.8 Distribution of the respondents according to their overall homestead food security effect on transformation of cropland

Categories	Respondents		Range	Mean	SD
	Number	Percentage	Observed (Possible)		
Low(1-4)	19	23.75	1-11 (0-12)	6.16	2.07
Medium (5-8)	49	61.25			
High (>8)	12	15.00			
Total	80	100.00			

The data furnished in Table 4.8 revealed that about three-fifths (61.00 percent) of the litchi growers had medium, while 23.75 percent had low and 15 percent had high effect on homestead food security due to transformation of cropland into litchi orchard.

4.3.4 Effect of transformation of cropland into litchi orchard on social status

Effect of transformation of cropland into litchi orchard on social status possesses several effects in varying degrees. Farmers are classified into four such as ‘not agree’, ‘undecided’, ‘agree’, and ‘strongly agree’ on the basis of their nature of opinion regarding environmental effect. The CSE were computed which regard from 116 to 156 against the possible range of 0 to 240. The rank order of each of the effect of transformation of cropland into litchi orchard on social status was made on the basis of CES value (Table 4.9).

Table 4.9 Distribution of the litchi growers according to social status effect on transformation of cropland (N=80)

Sl. No.	Social status effect	Nature of opinion				CES	RO
		NA	U	A	SA		
1.	Improve social status	01	15	51	13	156	1
2.	Influence of community involvement	01	24	46	09	143	2
3.	Increase interaction with extension worker and businessmen	01	43	28	08	123	3
4.	Get respect from others	04	45	22	09	116	4

NA= Not agree, U= Undecided, A = Agree, SA = Strongly agree, CES = Cumulative effects score, and RO= Rank Order

From the rank order it was found that ‘improve social status’ was 1st position. By cultivating litchi farmers can improve their economic condition and change their life-style and thus their social status may increase. The statement ‘influence of community involvement’ ranked as 2nd. The litchi growers collect modern information from personal communication sources as a result their community involvement may increase. The 3rd statement is ‘increase interaction

with extension worker and businessmen'. The respondents can collect information on modern production technologies on litchi cultivation from extension workers while for marketing of litchi they can interact with businessmen. The last ranked statement was 'get respect from others'. Litchi gardening is a good job and provide farmers social status and economic benefit; as a result the farmers can get respect from others.

4.3.4.1 Overall effect of transformation of cropland into litchi orchard on social status

The total social status effect scores of the farmer ranged from 0 to 11 against the possible range of 0 to 12. The average effect on environment was 6.72 with a standard deviation of 2.14. The respondents were classified into three categories namely 'low', 'medium', and 'high' (Table 4.10).

Table 4.10 Distribution of the respondents according to their overall social status effect on transformation of cropland

Categories	Respondents		Range	Mean	SD
	Number	Percentage	Observed (Possible)		
Low (up to 5)	24	30.00	0-11 (0-12)	6.72	2.14
Medium (6-9)	47	58.75			
High (>9)	09	11.25			
Total	80	100.00			

The data furnished in Table 4.10 revealed that near about three-fifths (58.75 percent) of the litchi growers had medium, while 30.00 percent had low and 11.25 percent had high effect on social status due to transformation of cropland into litchi orchard. It may be due to practicing transformation of cropland the farmers' interaction with neighbor, friends, businessmen and extension agents are increases. It is assumed that social status is associated with economic condition, as a result increases social status.

4.3.5 Overall effect of transformation of cropland into litchi orchard

The overall effect of transformation of cropland into litchi orchard on the 16 selected statements considering four dimensions were selected. The possible overall effect scores could range from 0 to 48, where 0 indication no effect and 48 indicating high effect. Meanwhile, the observe scores were ranged from 15 to 42. The average effect on transformation of cropland into litchi orchard was 28.91 with a SD of 6.10. Based on the overall effect score the litchi growers were classified into three categories such as 'low', 'medium', and 'high' (Table 4.11).

Table 4.11 Distribution of the respondents according to their effect of transformation of cropland into litchi orchard

Categories	Respondents		Range	Mean	SD
	Number	Percentage	Observed (Possible)		
Low (15-23)	15	18.75	15-42 (0-48)	28.91	6.10
Medium (24-35)	47	58.75			
High (>35)	18	22.50			
Total	80	100.00			

The data furnished in Table 4.11 revealed that about three-fifths (58.75 percent) of the farmers had medium, while 18.75 percent had low and 22.50 percent had high effect on overall cropland transformation into litchi orchard. The overall effect of transformation was opined by the farmers as medium to high thus, it may be beneficial for the litchi growers in all selected four dimensions of effect of transformation of cropland into litchi orchard.

4.4 Problems Confrontation

4.4.1 Problems faced by the farmers in transformation of cropland into litchi orchard

The purpose of this section is to have clear understanding about the problems faced by the farmers on their litchi cultivation activities. In total 10 problems were selected in connection with transformation of cropland into litchi orchard and related activities. The Problem Confrontation Index (PCI) of the selected problems. The total PCI score range from 72 to 181 with possible range of 0 to 240 (Table 4.12).

Table 4.12 Rank order of problems faced by the farmers on transformation of cropland into litchi orchard

Sl. No.	Problem	PCI	Rank order
1.	High production cost	072	10
2.	Lack of disease resistance varieties	151	4
3.	Non-availability of skilled labor	88	9
4.	Unavailability of extension service	127	7
5.	Lack of technological knowledge about litchi cultivation	095	8
6.	Lack of training on litchi cultivation from DAE or other organizations	168	2
7.	Getting fair price is difficult due to interference of middleman	181	1
8.	Damage caused by the man, rat, bird, fox etc. in litchi orchard	166	3
9.	Low co-ordination among litchi growers	143	5
10.	Lack of credit facilities	142	6

A critical examination of data in Table 4.12 showed that the statement ‘getting fair price is difficult due to interfere of middleman’ got the highest problem confrontation scores (181) and stood the first rank. In Bangladesh, litchi marketing system is held by the involvement of

middlemen at different stages (orchard, local market, national market etc.) and thus, the of orchard owner get less price than that of actual price of their product.

‘Lack of training on litchi cultivation from DAE or other organization’ was the second most problem perceived by the farmers. The study area is very important for litchi production in our country so that the DAE and other organization should arrange training program for the litchi farmers but in reality there is provision to arrange training.

‘Damage caused by the man, rat, bird, fox etc. in litchi’ was the third most important problem supposed by the farmers. The farmers are busy with their farming activities and sometimes they are failure to provide full time watch man to protect orchard due to labor crisis. The statement ‘high production cost’ is the least important problem faced by the farmers. This might be due to the fact that many inputs have fixed price and some have not fixed. The input dealers take advantage of this and take higher price from the farmers.

4.4.2 Suggestions offered by the farmers to overcome the problems

The litchi growers also provided some suggestions for minimizing the above mentioned problems. In this connection an open-ended question was used. Many suggestions were offered by the farmers to overcome the problems on transformation of cropland into litchi orchard (Table 4.13).

Table 4.13 Suggestions cited by the farmers to minimize the problems on transformation of cropland into litchi orchard

Suggestions	No. of citation	Rank Order
Organizing more training program for the litchi farmers	55	1
Initiatives taken by the government for input price fixation	48	2
Provide more technological knowledge to the farmers	38	3
Strengthening extension services	37	4
Arrange credit facilities at low interest	33	5
Appropriate co-ordination among the litchi farmers	29	6

It is evident from the data contained in Table 4.13 that ‘organizing more training program for the farmers’ was the most important suggestion offered by the farmers. This implies that training programs could enable the farmers to obtain the latest information and equip them self with necessary knowledge and skill related to modern technologies. ‘Initiatives taken by the government for input price fixation’ was the second important suggestion as cited by the respondent. If the input price is rational the production cost may reduce. Provide more technological knowledge to the farmers was another suggestion as cited by the litchi growers. The farmers are not skilled enough to cultivate litchi by using modern technologies and thus, it is necessary to develop their knowledge and skill by providing special training on litchi cultivation.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

5.1.1 Selected characteristics of the litchi growers

Age of the litchi growers observed from 27 to 67 years, with a mean of 43.05 years and Standard Deviation (SD) of 8.50. About three-fourths (58.75 percent) of the respondents were middle aged category compared to 35 percent old, and only 6.25 percent were in young aged category. The level of **educational qualification** of the litchi growers ranged from 0 to 16 years of schooling having a mean of 8.26 with a SD of 4.31. More than half (52.50 percent) of the respondents had secondary education where as 12.50 percent had illiterate, 3.75 percent had can sign only, 5.0 percent had primary education and 26.25 percent of the litchi growers had above secondary education. The findings indicate the literacy rate of the litchi growers is higher than the national average literacy rate.

Farm size of the respondents varied from 0.14 to 21.17 hectares. The mean value of farm size was 1.68 hectares with a SD of 3.21. The highest proportion (76.25 percent) of the respondents had large farm followed by 15.00 percent had medium farm and only 8.75 percent had small farm. The **farming experience** score of the litchi growers observed from 8 to 45 year with a mean of 24.06 year and SD of 8.87. The highest proportion (67.50 percent) of the respondents had medium farming experience while 18.75 percent had low farming experience and 13.75 percent having high farming experience. **Annual family income** of the respondents varied from 35 to 810 with the mean value of 203.81 and SD of 139.40. The highest proportion (86.25 percent) of the respondents had medium annual family income, compared to 12.5 percent had high and only 1.25 percent had low annual family income.

The observed score of **extension contact** of the respondents ranged from 5 to 38 with an average of 17.85 and SD of 8.86. The highest proportion (65.00 percent) of the respondents had medium extension contact, compared to 15.00 percent had low and 20.00 percent had high extension contact. **Agricultural knowledge** of the respondents ranged from 17 to 44 with the mean of 31.28 and SD 6.26. More than three-fifths (67.50 percent) of the respondents had good knowledge followed by 16.25 percent of them had excellent as well as poor agricultural knowledge. The **innovativeness** scores of the litchi growers observed from 3 to 24, against the possible range of 0 to 30. The mean and SD were 13.26 and 2.07 respectively. The highest proportion (67.5 percent) of the respondents had medium innovativeness compared with jointly 16.25 percent had high and low innovativeness.

Marketing orientation scores of the respondents were varied from 12 to 20, against the possible range of 6 to 30. The mean and SD were 16.40 and 1.77 respectively. The highest proportion (56.25 percent) of the litchi growers had medium marketing orientation, compared to 32.50 percent of them had high and only 11.25 percent had low marketing orientation. **Attitude towards technology** scores of the respondents were observed from 17 to 37 against the possible range of 8 to 40, with a mean of 28.86 and SD 3.74. Majority (66.25 percent) of the respondents had moderately favorable attitude towards technology whereas 21.25 percent had highly favorable and 12.50 percent had slightly favorable attitude towards technology.

5.1.2 Extent of transformation of cropland into litchi orchard

In total 134.338 hectares of land was under crop cultivation out of which 37.653 hectares have been transformed into litchi orchard during the year 2005 to 2014. As a result major crops such as rice, maize and wheat, and some minor crops i.e. potato, vegetable, mustard, garlic, turmeric and Napier grass were replaced by litchi. The percentage of transformation in the year 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 were 20.62, 36.02, 43.20, 36.30, 16.85, 13.25, 28.37, 62.22, 41.35 and 35.60 percent respectively were replaced by litchi. Farmers of the study area transform their cropland into litchi orchard in the year of 2005 to 2014 were 09.669, 13.198, 02.070, 03.093, 02.098, 01.273, 01.397, 02.228, 01.157 and 01.470 hectare respectively. In the year of 2007, 2012 and 2013 transformation of cropland into litchi was too much high. Conversely, in the year of 2005, 2009 and 2010 the percentage of transformation of cropland into litchi orchard was less than the year of 2007, 2012 and 2013.

5.1.3 Effect of transformation of cropland into litchi orchard

Transformation effect was analyzed according to the four dimension selected dimensions i.e. 'economy', 'environment', 'household food security' and 'social status' were considered in this regard. The findings of these dimensions were: **Effect on economy:** Cumulative effect score (CSE) was computed which ranged from 146 to 208 against the possible range of 0 to 240. The statement 'harvesting cost is low' obtained the highest score (CES=208) and thus considered the 1st rank as the effect of transformation of crop land on economy. The fourth and last statement is 'it gives return for several years'. The effect on **total economic** scores of the farmer ranged from 6 to 12 against the possible range of 0 to 12. The average effect on economy was 8.56 with SD of 1.66. Among the respondents 60.00 percent had medium, while 30.00 percent had low and 10 percent had high effect on economy caused by transformation of cropland into litchi orchard.

Effect on environment: The CES values were ranged from 96 to 171 against the possible range of 0 to 240. The statement ‘increase afforestation’ (CES=171) considered as 1st rank and ‘reduce climatic hazard’ (CES=096) was obtained last and 4th rank. The total environmental effect scores of the farmer ranged from 4 to 12 against the possible range of 0 to 12. The average effect on environment was 7.46 with a SD of 1.86. More than three-fourths (70 percent) of the respondents considered transformation had medium effect on environment, compared to 17.50 percent had low and 12.50 percent had high effect on environment caused by transformation of cropland into litchi orchard.

Effect on homestead food security: The CSE values were observed from 110 to 147 against the possible range of 0 to 240. The statement ‘increase sources of food’ obtained the highest score of 147 and thus considered as the 1st rank. ‘Increase purchase capacity of food’ (CSE=110) is the last and fourth rank. The effect on total homestead food security scores of the farmers ranged from 1 to 11 against the possible range of 0 to 12. The average effect on homestead food security was 6.16 with a SD of 2.07. About three-fifths (61.00 percent) of the litchi growers had medium, while 23.75 percent had low and 15 percent had high effect on homestead food security due to transformation of cropland into litchi orchard.

Effect on social status: The observed CSE score were 116 to 156 against the possible range of 0 to 240. From the rank order it was found that ‘improve social status’ got first position. The last ranked statement was ‘get respect from others’ (CSE=116). The total social status effect scores of the farmer ranged from 0 to 11 against the possible range of 0 to 12. The average effect on environment was 6.72 with a SD of 2.14. Almost three-fifths of the respondent had medium, while 30.00 percent had low and 11.25 percent had high effect on social status due to transformation of cropland into litchi orchard.

Effect of transformation of cropland into litchi orchard: The effect of transformation of cropland into litchi orchard on the 16 selected statements considering four dimensions were selected. The possible overall effect scores could range from 0 to 48, where 0 indication no effect and 48 indicating high effect. The average overall effect on transformation of cropland into litchi orchard was 28.91 with a SD of 6.10. Based on the overall effect score the litchi growers were classified into three categories such as ‘low’, ‘medium’, and ‘high’. About three-fifths (58.75 percent) of the farmers had medium, while 18.75 percent had low and 22.50 percent had high effect on overall cropland transformation into litchi orchard.

5.1.4 Problems and suggestions given by them to overcome the problems

Problem confrontation: In total 10 problems in connection with transformation of cropland into litchi orchard and related activities. The problem confrontation index (PCI) of the 10 selected problems. The total PCI score range from 72 to 181 with possible range of 0 to 240. The statement 'getting fair price is difficult due to interfere of middleman' got the highest PCI (181) and stood the first rank. 'Lack of training on litchi cultivation from DAE or other organization' was the second most problem perceived by the farmers. 'Damage caused by the man, rat, bird, fox etc. in litchi' was the third most important problem supposed by the farmers. The statement 'high production cost' (PCI=72) was the least important problem faced by the farmers.

Suggestions: There were six suggestions mentioned by the farmers during cropland transformation. The most important solutions were 'organizing more training program for the farmers' followed by 'initiatives taken by the government for input prize fixation', 'provide more technological knowledge to the farmers' and so on. However, the last solution was 'appropriate co-ordination among the litchi farmers'.

5.2 Conclusions

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

1. Out of total 134.338 ha of total cropland, 37.653 hectares of cropland was transformed into litchi orchard during the last 10 years. Such high rates of transformation lead to the conclusion that it may be a profitable business for the litchi growers.

Due to transformation of cropland different crops such as rice, wheat, maize, potato, tomato, vegetables, mustard, bean, turmeric and Napier were replaced by litchi. Thus, it can be concluded that shade loving crops such as aroids, zinger etc. can be grown in the new litchi orchard.

2. The effect of transformation of cropland into litchi orchard was opined by the farmers as medium to high. It may be concluded that the effect of transformation of cropland into litchi orchard is positive and the farmers will be benefited through litchi cultivation.

3. The litchi growers were provided different types of ranking against the 10 selected problems and also cited six suggestions to overcome these problems related to transformation of cropland into litchi orchard. Therefore, it may be concluded that the farmers were relatively conscious of their farming problems as well as provide suggestions to overcome these problems.

5.3 Recommendations: Based on the findings and conclusions of the study the following recommendations are propose:

5.3.1 Recommendations for policy implications

1. Cropland transformation rate into litchi orchard during the last 10 years of study area was high. It is, therefore, recommended that necessary steps to be undertaken by GOs like Horticulture centre, BARI and NGOs like BRAC to facilitate the transformation process efficiently and usefully.
2. Rice, wheat, maize, potato, tomato, vegetables, mustard, bean, turmeric and Napier grass were replaced by the litchi during transformation of cropland. But these crops can be grown as intercropping at the early stage of litchi orchard due to enough space for crops grown are available. It may also be recommended that steps should be taken by the extension service providers for motivating farmers towards practicing intercropping in the litchi orchard.
3. Transformation of cropland into litchi orchard had some positive effect on economy, environment, household food security and social status of the litchi farmers. It is, therefore, recommended that extension services can be strengthened for motivation of the farmers in the study area so that farmers can give more emphasis on effective transformation of crop land into litchi orchard.
4. In the view of the imperative need for minimizing the various problems the concerned GOs and NGOs could address the major problems faced by the litchi farmers through providing training, proper suggestions and create provision of credit at low interest rate.

5.3.2 Recommendations for further study

In review of literature it is not possible to collect review on all considering areas. Further research may be conducted to collect review on that area which is not possible in this research.

1. The present study was conducted in some selected area under Dinajpur district. But with this small part of research work generalization of the overall transformation is difficult.

Hence, similar studies can be undertaken in other parts of the country where the cropland transformation is so intense to litchi orchard, which could be more helpful for understanding and generalization of the overall transformation.

2. The present study was conducted by considering four dimensions on the effect of transformation of cropland into litchi orchard. On the other hand four statements were also considered against each of the dimensions. Further research may be conducted by selecting other dimensions as well as statements on each of the dimension.
3. The present study was conducted in two unions from Sadar upazila and one union of Birol upazila under Dinajpur district. Similar study may be conducted by selecting other unions of the above upazila as well as other upazila of Dinajpur district.
4. The present study was concerned to profile characteristics of the litchi growers and two main focus issues. Further research may be conducted by selecting other characteristics as well as main focus issues.
5. In the present study problem faced by the litchi growers by using close form question. Therefore, it may be recommended that the further study may be conducted by using open form of question in this regard.

BIBLIOGRAPHY

- Adger, W.N. and K. Brown, 1994. *Land Use and the Changes of Global Warming*, John Willey, Chichester.
- Ahmed, F. 2013. Attitude of Farmers Towards Thai Koi Farming. *M.S. Thesis*, Department of Agricultural Extension Education (Ag. Ext. Ed.), Bangladesh Agricultural University (BAU), Mymensingh.
- Anders H., Sire'n and E.S. Brondizio, 2009. Detecting Subtle Land Use Change in Tropical Forests. *Applied Geography*, 29: 201-211. Journal homepage: www.elsevier.com/locate/apgeog.
- Anonymous, 2000. Learning About and Receiving the World. Retrieved from [http://www.leadership.innovations.com/Handouts/Change % 20 to % 20Transformation.html](http://www.leadership.innovations.com/Handouts/Change%20to%20Transformation.html).
- Anonymous, 2003. Definition of the Term 'Change'. Retrieved from [http://www.brainydictionary.com/ words/transformation 231751.html](http://www.brainydictionary.com/words/transformation231751.html).
- Anonymous, 2004. Definition of the term 'transformation'. Retrieved from [http://dictionary.com.reference.com /search?q= transformation](http://dictionary.reference.com/search?q=transformation).
- Barman, K.S., M.A. Kashem, M. Z. Rahman and M.A.S. Mondol, 2009. Use of Mobile Phone by the Farmers in Receiving Agricultural Information from the Input Dealers. *Bangladesh Journal of Extension Education*, 21 (1&2): 89-95.
- Bartunek, J. M. 1984. Changing Interpretive Schemes and Organizational Restructuring: The Example of a Religious Order. *Administrative Science Quarterly*, 29: 355–372.
- BBS. 2009. Monthly Statistical Bulletin, Bangladesh. Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh.
- BBS. 2014. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh.
- Bhuiyan, M. 2003. Has Urbanization Caused Agricultural Land Loss? The Daily Star, November.
- Blaikie, P. and H. C. Brookfield, 1987. *Land Degradation and Society*. Methuen, London.
- Bloom, B. S., B. B. Mesia and D. R. Krathwohi. 1964. *Taxonomy of Educational Objectives* (Two Volumes: The Affective Domain and the Cognitive Domain). New York: David Mcky.
- BRRI. 2012. Farmers Group Discussion in Drought Study Area of Rajshahi and Chapai Nawabganj District. Bangladesh Rice Research Institute, Gazipur-1701, Bangladesh.
- Cebrowski, A. 2002. What is Transformation? Washington, DC: Military Reform Project—Center for Defense Information.
- Cebrowski, A. 2004. Transcript of Vice Admiral Cebrowski's Presentation at the NASMHPD Research Institute's Change Management Meeting on October 8, 2004. Alexandria, VA: NASMHPD Research Institute, Inc.
- Chowdhury, M.F. 2001. Farmer's Perception of Afforestation Programe at Barind Area of Rajshahi District. *M.S. Thesis*, (Ag. Ext. Ed.), BAU, Mymensingh.
- Coleman, A. 1987. The Distinctive Role of Land Use Policy. *Land Use Policy*, 4 (1): 2-4.
- Fan, F., Q. Weng and Y. Wang. 2007. Land Use and Land Cover Change in Guangzhou, China, from 1998 to 2003, Based on Landsat TM /ETM+. *Imagery Sensors*: 7:1323-1342. Available at [www.mdpi.org/ Sensors](http://www.mdpi.org/Sensors).

- Farrow , A. and M. Winograd, 2001. Land Use Modeling at the Regional Scale: An Input to Rural Sustainability Indicators for Central America. *Agriculture, Ecosystem and Environment*, 85: 249-268.
- Fazal S. and A. Amin, 2011. Impact of Urban Land Transformation on Water Bodies in Srinagar City, India. *Journal of Environmental Protection*, 2:142-153.
- Fresco, L.O. 1994. Imaginable Futures: A Contribution to Thinking about Land Use Planning. Pages 1-8 in L.O. Fresco, L. Stroosijder, J. Bouma and H. van Keulen (eds.), *the future of the land-obilizing and integrating knowledge for land use options*, John Willey, Chichester.
- Fresco, L.O., R. Leemans, and R.A.E. Zeijl, 1996. The Dynamics of Land use Change: Land use and Cover Change. *Land use Policy*, 13(4): 332-334.
- Gerard, G., and L. Tuerfs, 1995. Dialogue and Organizational Transformation. See *Community Building: Renewing Spirit and Learning in Business*. New Leaders Press. Retrieved from <http://www.vision-nest.copm/cbw/Dialogue.html>.
- Gersick, C.J.G. 1991. Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm. *Academy of Management Review*, 16(1): 421-423.
- Goode, W.J. and P.K. Hatt, 1952. *Methods in Social Research*. New York: McGraw-Hill Book Company, Inc.
- Graff, J. De. 1993 *Soil conservation and sustainable land use: An Economic Approach*. Royal Tropical Institute, Amsterdam.
- Greenwood, R., and C.R. Hining, 1988. Organization Design Types, Tracks, and the Dynamics of Strategic Change. *Organization Science*, 9 (3): 293–296.
- Hasan, M.K. 2006. Participation in Farming Activities by Conventional and Organic Farmers. M.S. Thesis (Ag. Ext. Ed.), BAU, Mymensingh.
- Hasanuzzaman, M. 2004. Studies on the Trends of Tree Orchard Based Agroforestry Practices in Croplands of Rajshahi District. M.S. Thesis (Ag. Ext. Ed.), BAU, Mymensingh.
- Hooke, R.B., Martín-Duque, J.F. and J. Pedraza, 2012. Land transformation by Humans: A Review. *GSA Today*, 22 (12): 4-10. Available at www.geosociety.org/pubs/ft2012.htm.
- Hoque, M.Z. 2011. Improvement of Socio-economic Status of the Commercial Fish Farmer's Due to Transformation from Crop Farming to Aquaculture. *M.S. Thesis*, (Ag.Ext. Ed), BAU, Mymensingh.
- Hossain, M.K. 2010. Use of Communication Media by the Farmers in Receiving Rice-Cum-Fish Culture. *M.S. Thesis*, (Ag.Ext. Ed), BAU, Mymensingh.
- Hossain, M., M.S. Hossain and M.M. Islam, 2014. Fruit Setting, Cracking and Quality of Litchi (*Litchi chinensis* Sonn.) as Influenced by Foliar Spray of Different Nutrient Solutions During Fruit Growth and Development. *Journal of Agricultural Technology*, 10(3): 717-731.
- Houghton, R. A. (1994). The Worldwide Land Use Change. *Bio Science*, 44(5): 305-313.
- Islam, M.M. 2014. Contribution of Palli Daridro Mimochon Foundation. *Ph. D. Thesis*, Department of Crop Science and Technology, University of Rajshahi.
- Islam, M.R. and M.Z. Hassan, 2011. Land Use Changing Pattern and Challenges for Agricultural Land: A Study on Rajshahi District. *J. Life Earth Sci.*, Vol. 6: 69-74, <http://banglajol.info/index.php/JLES>.
- Kerlinger, F.N. 1996. *Foundations of Behavioral Research* (2nd Edition). Delhi: Surjeet Publication.

- Khan, M.M.A. 2012. Farmers, Attitude towards Jujube Cultivation. *M.S. Thesis*, (Ag.Ext. Ed), BAU, Mymensingh.
- Khanom, M.J. 2014. Adoption of Improved Practices in Litchi Cultivation by the Litchi Growers of Dinajpur District. *M. S. Thesis*, Agricultural Extension (Ag. Ext.), HSTU, Dinajpur.
- Kitamura, T. and S. Kobayashi, 1993. Rural Land Use in the Asia Region II: Towards Sustainable Land use. Pages 91-109, in Rural Land Use in Asia and the Pacific. Report of an Asian Productivity Organization (APO) Symposium, 29th September to 6th October 1992, Tokyo, Japan.
- Kowsari, M.S. 2014. Effect of Transformation of Crop Land into Mango Orchard in a Selected Area of Nawabganj District. *M.S. Thesis*, (Ag. Ext. Ed), BAU, Mymensingh.
- Kuri, S.K. 2013. Awareness of the Small Farmers Regarding Effect of Climate Change on Farm Ecosystem. *M.S. Thesis*, (Ag. Ext. Ed), BAU, Mymensingh.
- Kurishbayev, A.K., Torres, L. Brenities, and V. Maartintez, 2001. A Strategy for Soil Conservation Farming in Northern Kazakhstan. Proceeding of First World Congress on Conservation Agriculture, 1-5 Oct. 2001. Madrid, Spain.
- Mahabub, A. 2003. Agricultural Land Loss and Food Security: An Assessment. IRRI, Manila, the Philippines.
- Mahmud, A.B.M.S., M.A.S., Mondol and M. Nuruzzaman, 2013. Adoption of Modern Wheat Cultivation Technologies by the Farmers of Birganj Upazila under Dinajpur District. *Bangladesh Journal of Environmental Science*, 4 (1): 97-101.
- Majlish, S.A.K. 2007. Perception of Participant Women on Social Forestry Program of BRAC. *M.S. Thesis*, (Ag. Ext. Ed), BAU, Mymensingh.
- Malik, D.P., I.J. Sing, and K.N. Rai, 2000. Diversification through High Value Crops in Irrigated Tract of Haryana. *Journal of Haryana Agricultural University*, 18(2): 43-47.
- Mark, M. and M. Kudakwashe, 2010. Rate of Land-Use/ Land-Cover Changes in Shurugwi District, Zimbabwe: Drivers for Change. *Journal of Sustainable Development in Africa*, 12 (3): 107-121.
- Mehri, B., G.S. Mehdi, B.M. Ali and S.G. Soroosh, 2015. Evaluation of the Effect of Land Use Change from Forest Lands into Agricultural Lands on Some Chemical Properties of Soil (Case Study: Zarin Abad, Sari, Iran). *GIMAR*, 1: 148-152; Available online at www.globalilluminators.org.
- Miah, M.M.U., M.A.S. Mondol, M.S.I. Sarker and M.A. Khatun, 2006. Relative Prefalance and Species Richness of Tree Species and Their Effects on Understorey Crops in Homestead and Cropland Agroforestry Systems in Dinajpur District. *Journal of Science and Technology*, 4: 82-89.
- Miller, D and P. Friesen, 1982. The Longitudinal Analysis of Organizations. A Methodological Perspective. *Management Science*, 28 (7):1013-1034.
- Mitra, S.K. 2004. Sustainable Litchi (*Litchi chinensis* Sonn.) Production in West Bengal, India.
- Mohammad, M. 2009. Drivers of Land Use Change in Bangladesh Perspective. Master's Thesis, Department of Real Estate and Construction Management, Royal Institute of Technology (KTH).
- Mondol, M.A.S. 2009. Use of Communication Channel by the Farmers in Receiving Farm Information. *Ph.D. Thesis*, Department of Agricultural Extension. HSTU, Dinajpur.
- Mondol, M.A.S., M.F. Choudhury and M.M. Bahadur, 2005. Effect of Existing Homestead Agroforestry on the Socio-economic Development in two Selected Upazillas of Dinajpur District. *Bangladesh Journal of Training and Development*, 18 (1&2):79-86.

- Mondol_a, M.A.S. 2010. Use of Interpersonal Communication Source by the Farmers in Receiving Agricultural Information. *Journal of Agroforestry and Environment*, 4 (1): 129-134.
- Mondol_b, M.A.S., 2010. Use of Mobile Phone by the Farmers in Receiving Farm Information from the Sub-Assistant Agricultural Officers. *Bangladesh Journal of Environmental Science*. 18: 62-66.
- Muhammad N., M.A.S. Mondol, and M. F. Hasan, 2015. Effectiveness of Union Information and service Center in Utilization of Farm Information. *International Journal of Agricultural Extension*, 03(01): 37-45; Available online at <http://www.escijournals.net/IJAE>.
- Nadler, D. and M. Tushman, 1989. Organizational Framebending. *Academy of Management Executives*, 3 (3):194-202.
- Olaniyi, A. O., A. M. Abdullah, M.F. Ramli and A.M. Sood, 2013. Agricultural Land Use in Malaysia: An Historical Overview and Implications for Food Security. *Bulgarian Journal of Agricultural Science*, 19 (1), 60-69.
- Parul, U.K. 2014. Participation of RDRS Women Beneficiaries in Agricultural Activities Under Rangpur District. *M.S. Thesis*, Department of Agricultural Extension. HSTU, Dinajpur.
- Population of Bangladesh 2016. Worldometers. Retrieved from <http://www.worldometers.info/world-population/bangladesh-population/>
- Rakib, M.A. 2002. Transformation of Flood Prone Lands to Mango Production in Shibganj Upazila Under Nawabganj District: The Mango Growers' Perception. *M.S. Thesis*, (Ag.Ext. Ed), BAU, Mymensingh.
- Reid Group. (2001). The transformational leader. The Reid Group eletter Broadcast, 4(10), May 20. Retrieved from ed.). New Delhi: Kalyani Publishers. <http://lists.webvalence.com/sites/TheReidGroupEletter/Broadcast.D20010520.html>.
- Reid, R.S., R.L., Kruska, N. Muthui, A. Taye, S. Wotton, C. Wilson, and W. Mulatu, 2000. Land-use and land-cover dynamics in response to changes in climatic, biological and socio-political forces: the case of Southwestern Ethiopia. *Landscape Ecology*, 15: 339-355.
- Rogers, E.M. 2003. *Diffusion of Innovation*. 5th ed. New York: The Free Press.
- Roussin, J. 2001. Remarks at Minnesota Staff Development Council Forum March 29 on Transformation Versus Change. Available at www.mn-sdc.org/_Discussion/00000023.html.
- Roy, R.K. 2014. Constraints and Perceived Scope for Practicing Small Scale Aquaculture. *M.S. Thesis*, Department of Agricultural Extension. HSTU, Dinajpur.
- Salam, M.A., T. Noguchi, and M. Koike, 1999. The Causes of Forest Cover Loss in the Hill Forests in Bangladesh. *Geo Journal*, 47: 539-549.
- Sanders, Arie, Denisse McLean, and Alexandra Manueles, 2013. Assessment of Land Use Effect on Climate Change Sensitivity on the Northern Coastal Zone of Honduras (Working Paper). Lincoln Institute of Land Policy 113 Brattle Street, Cambridge, MA 02138-3400 USA.
- Shahab, F. and A. Amin. 2011. Impact of Urban Land Transformation on Water Bodies in Srinagar City, India. *Journal of Environmental Protection*, 2: 142-153.
- Smith, C.E. 1994. The Merlin Factor: Leadership and Strategic Intent. *Business Strategy Review*, 5(1).

- Tlhalefang, J. and K. Mangadi. 2012. Potential Welfare Benefits of Agricultural Transformation in Botswana: A Computable General Equilibrium Model Analysis. *Botswana Journal of African Studies*, 26(1): 25-28.
- Toffler, H., and A. Toffler, 1993. War and Anti-war. Boston: Little, Brown. Quoted in Norquist (2002). The defense budget, quotes p. 20.
- Tsegaye, L. 2014. Analysis of Land Use and Land Cover Change and its Drivers Using GIS and Remote Sensing: The Case of West Guna Mountain, Ethiopia. *International Journal of Remote Sensing and GIS*, 3 L(3); 53-63.
- Turner, B.L., and W.B. Meyer, 1994. Global land use and land cover change: an overview. Page 3-10 in W.B. Meyer and B.L. Turner II (eds.). *Changes in land use and land cover: a global perspective*. Cambridge University Press, Cambridge, UK.
- Tushman, M.L. and E. Romanelli, 1985. Organizational Evolution: A Metamorphosis Model of Convergence and Reorientation. In L. L. Cummings & B. Staw (eds.), *Research in Organizational Behavior*, 7: 171–222.
- Veldkamp, A. and L.O. Fresco, 1997. Exploring Land Use Scenarios, an Alternative Approach Based on Actual Land Use. *Agricultural System*, 55(1): 1-17.
- Webster's English Dictionary, 2004. Definition of the term 'transformation'. Available at <http://www.math.chalmers.se/~hallgren/wget.cgi?transformation>.
- Wikipedia, 2012. Conceptual Framework. Retrieved from http://en.wikipedia.org/wiki/Conceptual_framework.
- Wolman, M.G. and F.G.A. Fournier, 1987. *Introduction to Land Transformation in Agriculture*. A Reference Manual, (ed); Published by John Wiley & Sons Ltd.
- World of Escher. 2004. *Transformational Processing*. Retrieved from <http://www2.worldoescher.com/gallery/A41.html>.
- Yesmin, M.S. 2013. Training Need of the Integrated Fish Farmers on Integrated Fish Farming. *M.S. Thesis* (Ag. Ext. Ed.), BAU, Mymensingh.

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An Interview Schedule of the Research on
Effect of Transformation of Cropland into Litchi Orchard in Dinajpur District

Date:

Sl. No.

Name of Respondent: Father's Name:

Village: Union:

(Please answer the following questions)

1. Age: How old are you? Years.

2. Educational qualification: Please mention of your educational qualification according to following areas.

a. Do not read or write

b. Can sign name only

c. I have passed class

3. Farm size: Please mention the land area in your possession based on the following land use pattern.

Sl. No.	Type of land	Area	
		Local unit	Hectare
1.	Homestead		
2.	Own land under own cultivation		
3.	Land taken from others on barga		
4.	Land given to others on barga		
5.	Land taken from others on lease		
6.	Pond area		
7.	Litchi orchard		
8.	Others (if any)		
Total			

4. Farming experience: How long have you been actively involved in farming activities?

Years.

5. Annual family income: Please mention of your annual family income from the following sources.

Sl. No.	Source of income	Production (Local unit)	Income (Tk.)	
			Seasonally	Annually
1.	Litchi			
2.	Other fruits			
3.	Rice			
4.	Vegetables			
5.	Fish			
6.	Livestock			
7.	Land lease			
8.	Business			
9.	Service			
10.	Others (if any)			
Total				

6. Extension contact: Please mention your incidence of contact with the following information source.

Sl. No.	Information sources	Extent of contact			
		Never	Somewhat	Often	Regularly
A. Individual contact					
1.	Other litchi growers (times/year)	0	1-3	4-6	≥7
2.	Local leaders (times/year)	0	Do	Do	Do
3.	Pesticide/Insecticide dealers (times/season)	0	Do	Do	Do
4.	Union information & service center (times/season)	0	1	2-3	≥4
5.	SAAOs (times/season)	0	1-2	3-4	≥5
6.	AEO (times/year)	0	1	2-3	≥4
7.	UAO (times/year)	0	1	2	≥3
B. Group contact					
1.	Result demonstration meeting (times/year)	0	1	2	≥3
2.	Field day (times/year)	0	Do	Do	Do
3.	Training program (times/year)	0	Do	Do	Do
C. Mass contact					
1.	Agricultural TV program (times/week)	0	1-3	4-5	≥5
2.	Newspaper (times/week)	0	Do	Do	Do
3.	Farm magazine (times/year)	0	Do	Do	Do
4.	Agricultural Poster (times/year)	0	Do	Do	Do
5.	Agricultural Leaflet (times/year)	0	Do	Do	Do

7. Agricultural knowledge: Please answer the following questions

Sl. No.	Questions	Assigned score	Obtained score
A. Remembering			
1.	Name two diseases of litchi.	2	
2.	Name two harmful insects of litchi.	2	
3.	Name two pesticides of litchi.	2	
B. Understanding			
1.	State your information about litchi orchard.	2	
2.	State the suitable weather condition for litchi flowering.	2	
3.	State the maturity symptom of litchi.	2	
C. Applying			
1.	Which type of soil is favorable for litchi cultivation?	3	
2.	What is the appropriate time of spraying of pesticide?	3	
3.	What is the necessity of fertilizer application in pit for litchi orchard?	3	
D. Analyzing			
1.	Why burning symptom of litchi is happened?	3	
2.	Why the intercultural practice of air layering is done?	3	
3.	For what reasons the litchi production is reduced?	3	
E. Evaluating			
1.	What will happen if proper spray doesn't apply during flowering stage of litchi?	3	
2.	What measures taken for protecting litchi fruits from birds?	3	
3.	Is the fruit flies are the main cause of death of litchi fruits?	3	
F. Creating			
1.	Mention the strategies for quality litchi production.	3	
2.	Enumerate the important concern of harvesting litchi fruits.	3	
3.	How can you prevent the litchi mould disease?	3	
Total		48	

8.0 Innovativeness: Give your opinion in respect to adoption of the following technologies.

Sl. No.	Name of technologies	Nature of adoption			
		0	1	2	3
1.	Use of integrated nutrient of litchi orchard				
2.	Cultivation of China-3 variety of litchi				
3.	Appropriate protection measure of litchi orchard				
4.	Use of balance fertilizer in the orchard				
5.	Culture of honey bees near the garden				
6.	Use of hormones in litchi orchard				
7.	Use of compost in crop cultivation				
8.	Use of IPM in crop cultivation				
9.	Use of BADC seed in crop cultivation				
10.	Cultivation of hybrid variety of rice				

0= Do not use, 1= After 2 years of hearing, 2= Within 1-2 years of hearing, and 3= Within 1 year of hearing

9.0 Marketing Orientation: Please state the degree of your agreement or disagreement to each of the statements.

Sl. No.	Statements	Nature of opinion			
		SA	A	U	SD
1. (+)	Market related news is beneficial to litchi growers				
2. (-)	Litchi growers can not get high price by grading their litchi				
3. (+)	One should grow modern varieties which have additional market demand				
4. (-)	One should sell his litchi to the nearest market / middleman irrespective of price				
5. (+)	Mobile phone helps to justify price in the course of procurement and retailing				
6. (-)	One should purchase his inputs from the shop, where his other relatives are purchase				

SA= Strongly agree, A=Agree, U=Undecided and SD= Strongly disagree

10. Attitude towards technology: Please indicate your opinion about the following modern agricultural technologies.

Sl. No.	Statements	Extent of opinion				
		SA	A	U	D	SD
1.(+)	I like litchi cultivation because it is profitable than crop cultivation					
2.(-)	Due to many risk factor farmer should not go for commercial litchi cultivation					
3.(+)	Socio-economic conditions of the farmers are changing through litchi cultivation					
4.(-)	I do not like litchi cultivation because it is easy to be infected by insects than other fruits					
5.(+)	As I have no problem with litchi cultivation, I shall transfer more crop land into litchi orchard in future					
6.(-)	Due to many problems I am not willing to continue with litchi cultivation in future					
7.(+)	I believe that cultivation of modern aromatic rice is suitable for this area					
8.(-)	There is no need to irrigate maize crop in Rabi season					

SA= Strongly agree, A=Agree, U=Undecided, D= Disagree and SD= Strongly disagree

11. Extent of transformation of crop land into litchi orchard: Please mention yearly transformation of cropland into litchi orchard according to the subsequent years.

Year	Area under crop land		Crop land replaced by litchi
	Local unit	Hectare	
2005			
2006			
2007			
2008			
2009			
2010			
2011			
2012			
2013			
2014			
Total			

12. Effect of transformation of cropland into litchi orchard: Give your opinion about the following areas or issues.

Sl. No.	Areas of effect	Nature of opinion			
		Not agree	Undecided	Agree	Strongly agree
A.	Effect on economy				
1.	Litchi cultivation is more profitable				
2.	Harvesting cost of litchi is low				
3.	It gives return for several years				
4.	Create earnings opportunity				
B.	Effect on environment				
1.	Maintain environmental balance				
2.	Improve soil organic matter				
3.	Reduce climatic hazard				
4.	Increase afforestation				
C.	Effect on household food security				
1.	Increase sources of food				
2.	Opportunities to better lifestyle				
3.	Nutritional energy availability				
4.	Increase purchase capacity of food				
D.	Effect on social status				
1.	Improve social status				
2.	Influence of community involvement				
3.	Increase interaction with extension worker and businessmen				
4.	Get respect from others				

13.1 Problem confrontation: Please mention the frequency of confronted problems into transforming cropland into litchi orchard

Sl. No	Problems	Extent of problem confronted			
		No	Low	Moderate	Severe
1.	High production cost.				
2.	Lack of disease resistance varieties.				
3.	Non-availability of skilled labor.				
4.	Unavailability of extension service.				
5.	Lack of technological knowledge about litchi cultivation.				
6.	Lack of training on litchi cultivation from DAE or other organization.				
7.	Getting fair price is difficult due to interfere of middleman.				
8.	Damage caused by the man, rat, bird, fox etc. in litchi.				
9.	Low co-ordination among litchi growers.				
10.	Lack of credit facilities.				

13.2 Suggestions: Please suggest measures to minimize the above problems.

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____

Thank you for your kind information and co-operation.

Signature of the interviewer