COMMON INTEREST GROUP FARMERS' AWARENESS ON CLIMATE CHANGE RESILIENCE STRATEGIES

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-5200

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Student No. 1805304
Semester: July-December

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The Author

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ABSTRACT

The main purpose of the study were to determine the CIG farmers' awareness on climate change resilience strategies,to describe the selected characteristics of the CIG farmers and their relationshipsto their awareness on climate change resilience strategies and to determine the problems faced by the farmers due to climate change with their possible solutions. In this study 300 of the CIG farmers were considered as the population. Data were collected from a sample of 106 CIG farmers from 5 no. Biral union under Biral upazila of Dinajpur district during 02 September to 28 October, 2019 through simple random sampling method. Awareness on climate change resilience strategies of the CIG farmers was considered as the focus issue of the study. Awareness on climate change resilience strategies of the CIG farmers was measured by 4-point rating scale. Findings revealed that, the highest proportion (87.7 percent) of the CIG farmers were moderately aware on climate change resilience strategies; while 10.4 percent were highly aware and only 1.9 percent of the respondents were slightly aware on climate change resilience strategies. On the basis of the Awareness Index (AI) score of CIG farmers, the statements 'agricultural information for adaptation' ranked 1st (AI value 308) and statement 'improvement of soil management' got the lowest score (AI 56) and hence got the lowest (11th) position in the ranked order.Seven out of eleven selected characteristics of the CIG farmers' viz. age, household head's education, average family education, annual family income, agricultural training received, extension media contact and knowledge on climate change had significant positive relationship with their awareness on climate change resilience strategies. Rests of the characteristics viz. family size, farm size, farming experience and innovativeness had no significant relationship with their awareness on climate change resilience strategies at five percent level of significance. 'Outbreak of pests and diseases' was the top ranked problem faced by the farmers due to climate change, while 'increased training facilities according to their needs for increasing their knowledge and skill of awareness on climate change', was the top ranked suggestion given by the farmers to overcome the problems.

CHAPTER 1

INTRODUCTION

1.1 General Background

In a country like Bangladesh, agriculture plays the vital role in capital formation. This is most important sector of Bangladeshi economy, contributing 19.6 percent to the national GDP and providing employment for 63 percent of the population. (BBS, 2019).

Bangladesh is the 3rd most densely populated country in SAARC, 5th in the Asia and 8th in the world (BER,2019). Its population growth rate is 1.03 percent and now its population is 163,046,161 (BBS, 2019). According to World Population Prospects (2019) the population of Bangladesh at 2050 will be 192,567,778. About 85 percent of the total population live in rural area and are directly or indirectly involved in a wide range of agricultural activities (World Bank, 2011).

In Bangladesh, agricultural production is severely affected by climate change. Bangladesh is considered as one of the most vulnerable countries in the world to climate change because of its geographical location, economic dependence on agriculture, and recurrence of natural hazards (Younus and Harvey, 2014).There are a few of the climate change challenges that farmers face in Bangladesh (Molla, 2016). In many parts of the world today, climate change and variability have affected rural livelihoods especially in the developing countries. The increasing severity of droughts, floods and strong winds are at least in some parts due to human activity (IPCC, 2007).

Climate change affects many sectors, like water resources, agriculture, ecosystems, biodiversity, food security, and human health (Biswas *et al.,* 2009).Climate change constitutes a very serious threat to sustainable agricultural production and food security in many parts of the world. Climate change effects on agriculture includes biological effect on crop yield and its resulting effect on prices, production, consumption and the effect on per capita calorie consumption and malnutrition. Research findings have shown that agriculture in developing countries is currently being affected by climate change (FAO, 2007; IFPRI, 2009).Sustainable agriculture is embedded in the relationship between humans and climate, especially in attitudes towards climate change, the rate of changes and the effect of such change on the entire agro-ecosystem, including soils, crops and animals (Kemausuor *et al.*, 2011). Bangladesh would need to prepare for long term adaptation, which could be as drastic as changed sowing dates due to seasonal variations, introducing different varieties and species, to practice novel water supply and irrigation systems.

Common Interest Groups (CIG) farmers are recognised as a group of farmers who are ascribing modern technologies for better agricultural production. As CIG farmers be more progressive than other farmers and climate change resilience is an important issue in the present context, therefore, the researcher intend to measure the CIG farmers' awareness on climate change resilience strategies.

1.2 Statement of the Problems

In Bangladesh climate change is considered as one of the most serious threats to sustainable development with adverse impacts expected on the environment, human health, food security, economic activity, natural resources and physical infrastructure. It has been internationally argued that Bangladesh as a country, may suffer the most severe impacts from climate change (UNFCCC, 2009).

Due to large population, Bangladesh facing losses in arable lands, climate change poses an acute risk to the already malnourished population of Bangladesh. Frequent natural hazards affect agricultural enterprises due to climate change and subsequently, agricultural production activities are also severely affected. Therefore, the present study entitled 'CIG farmers' awareness on climate change resilience strategies' is undertaken to answer the following research questions:

i. To what extent farmers are aware about climate change resilience strategies?
ii. What are the socio-economic characteristics of CIG farmers of the study area?
iii. What are the relationships of the selected characteristics of the CIG farmers to their awareness on climate change resilience strategies?
iv. What are the problems faced by the CIG farmers due to climate change effects and what are their suggestions to solve the problems?

1.3 Objectives of the Study

The overall objective of the research is to determine CIG farmer's awareness on climate change resilience strategies. To achieve this overall objective, the following specific objectives are focused in the research:

1. To determine the extent of awareness on climate change resilience strategies of the CIG farmers.
2. To determine the selected characteristics of the farmers and the characteristics are: age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change.

3. To explore the relationships between the selected characteristics of the CIG farmers and their awareness on climate change resilience strategies.
4. To determine the extent of problems faced by the CIG farmers due to climate change and their suggested solutions to solve the problems.

1.4 Justification of the Study

Bangladesh is one of the victims of climate change among the third world countries. The effects of climate change in Bangladesh are still being understood, but it is likely that changes include higher temperatures throughout the year and problems with rainfall predictability leading to greater shortages in some seasons and flooding in others (Khan *et al*.2011). Climatic conditions influence all aspects of our life and shape. Human activities are influenced to a significant extent by weather and climatic conditions. Bangladesh is one of the poorest countries in the world. Rural people living in the marginalized lands pursuing nature dependant on agriculture are facing barriers and constraints earning well- being in the changing climate. The main focus of the study is to determine the farmers' awareness of climate change resilience strategies on agriculture. Climate change is forcing people to take diversified occupation to maintain their life. The socio-economic conditions of the farmers in Bangladesh are some of the most vulnerable to climate change. Therefore, adaptive processes to the effects of climate change are the priority for Bangladesh and crucial to build resilience into the lives of the farmers. The findings of this research will be acceptable in the selected area. The CIG farmers' awareness on climate change resilience strategies will be visible through this research. This will help the policy planners to formulate appropriate agricultural policies for coping with the climate change. Thus, the findings of the study will have great importance to the agriculture sector of Bangladesh.

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, 1981). An assumption is taken as a fact or believed to be true without proof. The researcher made the following assumptions while undertaken the study.

1. The respondents had enough capability to provide proper response of the questions furnished in the interview schedule.
2. The sample was representative of the whole population of the study area.
3. The responses furnished by the respondents were reliable and valid.
4. The sampling procedures followed for this study, the analysis of data and interpretations etc. were free from biasness.

5. The researcher who has acted as interviewer was well adjusted to the social and cultural environment of the study area. Hence, the data collected by him from the respondents furnished their correct opinions without any hesitations.
6. The information sought reveals the real situation to satisfy the objectives of the study.
7. The findings of the study would give clear concept of the detrimental effect of climate change.

1.6 Limitations of the Study

It is necessary to consider certain limitations to make the research manageable and meaningful. Thus, during the entire research the most challenging limitations were:

1. Several data collecting methods, scales and statistical tests have been used in order to measure awareness of the CIG farmers on climate change resilience strategies over a relatively short period of time.
2. The study was confined in one union of Biral upazila under Dinajpur district.
3. The study was restricted within the CIG farmers who had some cultivable land under their own cultivation.
4. Limited time and funds are also a barrier to conduct the research.
5. This study also suffers from the weakness associated with survey interviews when data accuracy dependent heavily on the respondent's ability to recall past information about the climate and to answer survey questions accurately.
6. For information about the study, the researcher dependent on the data furnished by the selected respondents during their interview with him.

1.7 Definition of the Important Terms

The researcher needs to know the meaning and contents of every term that he uses. A concept is an abstract of observed thing; events or phenomenon. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarification of understanding, a number of key concepts/terms frequently used throughout the study are defined and interpreted as follows:

Climate: Climate is simply the weather that is dominant or normal in a particular region; the term climate includes temperature, rainfall and wind patterns. Geography, global air and sea currents, tree cover, global temperatures and other factors influence the climate of an area, which causes the local weather.

Climate change: Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 1996).

Awareness: Awareness is knowledge or perception of a situation or fact and well-informed interest in a particular situation or development.

CIG farmers: Common Interest Group (CIG) was evolving extension activities of various upazila in Bangladesh by organizing the government. Common Interest Groups are congregations of farmers brought together for the purpose of imparting technologies in order to increase farm productivity.

Resilience: Resilience is the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress, or it is an ability to recover from or adjust easily to misfortune or change.

Strategies: Strategy referred to an elaborate and systematic plan of action designed to achieve a particular goal.

Knowledge on climate change: It is referred as facts, information, and skills acquired through experience or education; the theoretical or practical understanding of farmers toward climate change.

CHAPTER 2

REVIEW OF LITERATURE

The present study deals with the CIG farmers' awareness on climate change resilience strategies. The researcher made an elaborate search of available literature on this context. The researcher intensively searched Internet, websites, available books, journals and printed materials from different sources of home and abroad. The researcher attempted to study the relationships of each of the variables. The Chapter has been divided into four sections on the basis of information related to the study. Concepts of climate change, CIG farmer, awareness and resilience strategies have been presented in the first section, while general reviews on awareness on various aspect of climate change is presented in the second section. The third section deals with literature of reviews on relationships between the selected characteristics of the CIG farmers and their awareness while the fourth section presents the conceptual framework of the study.

2.1 Concepts

Concept of climate change, CIG farmer, awareness and resilience strategies are given below:

2.1.1 Concept of climate change

Intergovernmental Panel on Climate Change (IPCC, 2014) has given a more elaborated definition to climate change stating that climate change is "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."

Some use the term "climate change" is referred to "all forms of climatic inconstancy, regardless of their statistical nature (or physical causes)" (Mitchell *et al.,* 2008).

IPCC (2007) defined climate change as any change in climate over time, whether due to natural variability or as a result of human activity. It refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land-use.

2.1.2 Concept of Common Interest Group (CIG)

CIG was evolving extension activities of various upazila in Bangladesh by organizing the government. The main activities of CIG are: a) homestead gardening, b)development of field and horticultural crops including fruits and vegetables, c) development of domestic animals and birds, d) vermi-compost, e) seed storage, f) development of fisheries and family welfare, g) HYVs variety cultivation, h) eco-friendly cultivation, i) use of sex pheromone trap, j) organize training program for the farmers etc.

Each of these interventions is expected to have different kinds of impact on farmers socio-economic status. Participation of farmers in CIG activities is expected to bring about positive impact on the status of the farmers. But it is undoubtedly a complex task to determine all the expected impacts, because the developmental goals of CIG are multi-dimensional.

2.1.3 Concept of awareness and resilience strategies

Awareness is the state or ability to perceive, to feel, or to be conscious of events, objects, or sensory patterns. According to Oxford Dictionary ‘knowledge or perception of a situation or fact or concern about and well-informed interest in a particular situation or development’. In biological psychology, awareness is defined as a human's or an animal's perception and cognitive reaction to a condition or event. More broadly, it is the state or quality of being aware of something.

Resilience is the process of adapting well in the face of adversity, trauma, tragedy. threats or significant sources of stress- such as family and relationships problems or workplace and financial stressors. It means ‘bouncing back’ from difficult experience.

Strategy is an action that one takes to attain one or more of his goals. Strategy can also be defined as ‘a general direction set for the company and its various components to achieve a desired state in the future. Strategy results from the detailed strategic planning process’.

2.2 General Review on Awareness on Climate Change Resilience Strategies

Adem (2017) revealed that nearly half of the respondents (56.1percent) had high level of awareness about issues that related to environment, environmental problems and conservation activities in the study area. On the other hand, 20 percent of 330 respondents mean scores showed that they had low level of environmental awareness.

Tonni (2017) found that the farmers had highest awareness on climate change dimension followed by farming practices, land related, greenhouse, environment and global warming dimension. In case of overall awareness, 57.43 percent of the farmers fell in the medium awareness on environmental degradation category; while 25.74 percent had low awareness on

environmental degradation and only 16.83 percent of the respondents were having high awareness on environmental degradation.

Shukla *et al.* (2016) and Mandeni and Amin (2011) both found that 85% of respondents wereaware of climate change.

Umanath *et al.* (2016) reported that only 23 percent of the farmers were highly aware about the environmental degradation created by the indiscriminate application of modern inputs.

Debela *et al*. (2015) stated that increased access to agricultural support services, which improves the availability and the quality of relevant climate information, will further enhance a rural community's awareness of climate change and result in better management of climate-induced risks.

Sarkar and Padaria (2015) in their study revealed that only 22.00 percent respondents knew about climate change, while 43.0 percent respondents had knowledge about the diverse human induced causes of climate change. The study also reveals the low knowledge and awareness level of the sample which suggest need of intensive extension education program for their capacity building and information empowerment.

Mamun (2015) reported that the majority (47.90 percent) of the farmers had low awareness concerning harmful effect of insecticides on environment while 40.34 percent and 11.76 percent of them had medium and high awareness respectively.

Ajayi (2014) reported that mass media played the most significant role in climate change awareness.

Weber (2013) also asserted that personal experience only shapes the beliefs about climate change for individuals with no strong beliefs about the same but is less likely to influence the level of awareness for people with a firm belief on climate change.

Kuri (2013) observed that a vast majority (88.8 percent) of the farmers were moderately aware regarding effects of climate change on entire farm ecosystem, while 11.2 percent were slightly aware and none of the farmers were found with highly aware about effect of climate change of farm ecosystem.

Owolabi *et al.* (2012) also revealed that younger students (below 15 years) are more aware of climate change than older students but their results were not statistically significant.

Adetayo & Owolade (2012) indicated that poor resource farmers (maize farmers) have a low level of climate change awareness. For this reason, awareness creation is a key measure to address the impact of climate change.

Chowdhury (2011) in his study revealed that majority (78.57 percent) of the fish traders had medium awareness as compared to 12.9 percent low and 8.57 percent high awareness on the effect excessive use of chemicals for dry fish storage.

Sujit and Padaria (2010) in India, showed mixed type of result about awareness level of people in relation to climate change. Though some people were fully aware of climate change, but majority of them lacked detailed information about climate change.

Indrani & Purba (2010) expected to lead to widespread awareness campaigns, emphasizing the adverse health disorders as a direct result of climate change and its other adverse impacts on socio-economic activities, and also the individual initiatives that can be taken up as well as what the country can do to adapt effectively and mitigate the impact of climate change .

Taderera (2010) revealed a report on South African awareness of climate change, which stated that Africans have very limited understanding of global climate change, despite their awareness of changing weather patterns.

Shrestha (2010) reported that most of the old farmers are not aware about environmental degradation.

Sampei and Aoyagi-Usui (2009) conducted a study on the influence of media coverage on Japanese public awareness of climate change issues conducted by intense newspaper coverage of global warming issues is associated with an increase in public concern over global warming.

Awareness studies conducted since then, especially in the developed world reveals that climate change awareness level is high in developed countries (Bostrom *et al.*, 1994; Bord, Fisher, and O'Conner, 1998; Pew Research Centre, 2006; Pugliese and Ray, 2009), but still not a priority environmental issue in most of these countries (Leiserowitz Kates and Parris, 2005; Leiserowitz, 2006; Pew Research Centre, 2013).

2.3 Relationships between the Selected Characteristics of the CIG Farmers with their Awareness on Climate Change Resilience Strategies

This section deals with the selected characteristics of the CIG farmers and their awareness on climate change resilience strategies. The available literature regarding relationships between the characteristics of CIG farmers with their awareness are given below:

2.3.1 Age and awareness

Tonni (2017) found in her study that age of the farmers had fail to show any relationship with their awareness on environmental degradation.

Adem (2017) observed that age had statistically significant influence on awareness of framers.

Rongand Juan (2011) in their study observed that there is a positive relationship between age of the respondents with environmental awareness.

Shrestha (2010) reported that there was a negative relationship between age of the farmers with their environmental awareness.

Islam& Amin (2009) revealed that there was a no relationship between age of the farmers with their awareness on environmental degradation.

Jalal (2009) observed that there was positive significant relationship between age and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Sutradhar (2002) found in his study that there was positive insignificant relationship between age and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Islam*et al*. (2002) found that there was a negative insignificant relationship between age of the small farmers and their awareness on environmental pollution.

2.3.2 Household head's education and awareness

Tonni (2017) found in her study that educational qualification of the farmers had positive relationship with their awareness of farmers on environmental degradation.

Adem (2017) observed that educational status had statistically influence on awareness of framers.

Kuri (2013) reported that formal education of the farmers had positive influence on building awareness regarding effect of climate change on farm ecosystem.

Gang and Zeng (2012) found a significant relationship between education and environmental awareness.

Adhikary (2012) observed in his study that there was positive significant relationship between education and their awareness on the environmental pollution caused by the use of pesticides.

Chowdhury (2011) observed that level of education had significant positive relationships with their awareness on the effect of excessive use of chemicals for dry fish storage.

Jalal (2009) observed that there was no significant relationship between education and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Sutradhar (2002) revealed that academic qualification of' the respondents had a significant positive relationship with their awareness of on environmental degradation.

2.3.3 Average family education and awareness

The researcher tried hard but didn't find any review regarding average family education and awareness on climate change resilience strategies.

2.3.4 Family size and awareness

Tonni (2017) found in her study that family size of the farmers had fail to show any relationship with their awareness on environmental degradation.

Bo and Linhai (2010) in this study reported that family size of the farmers had no relationship with the awareness on environment pollution.

Islam & Amin (2009) in his study revealed that there was no relationship between family size and awareness on environmental degradation.

Jalal (2009) observed that there was positive insignificant relationship between family size and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Varkuti*et al.* (2008) in this study observed that there was a significant relationship between family size and awareness about environmental degradation.

Ajayi and Banmeke (2007) reported that family size had a positive relationship of respondents and their awareness on environmental pollution.

2.3.5 Farm size and awareness

Tonni (2017) found in her study that farm size of the farmers had fail to show any relationship with their awareness of farmers on environmental degradation.

Shanto (2011) in his study reported that there was positive significant relationship between farm size and their environmental pollution due to use of pesticides in vegetable cultivation.

Chowdhury (2011) observed that farm size had significant positive relationships with their awareness on the effect of excessive use of chemicals for dry fish storage.

Zaidi *et al*. (2011) in their study reported that farm size of the farmers had negative relationship with the awareness on environmental pollution.

Bo and Linhai (2010) found that size of the farmers had insignificant relationship with the awareness on environmental pollution.

Islam & Amin (2009) in this study revealed that there was a significant relationship between farm size and awareness on environmental degradation.

Jalal (2009) observed that there was positive insignificant relationship between farm size and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Islam *et al*. (2006) revealed that there was a significant positive relationship between farm size and awareness on environmental degradation.

Sutradhar (2002) observed in his study that there was positive significant relationship between farm size of the respondents and their awareness on the environmental degradation caused by the use of pesticides.

2.3.6 Annual family income and awareness

Tonni (2017) found in her study that annual income of the farmers had positive relationship with their awareness of farmers on environmental degradation.

Adhikary (2012) observed in his study that there was insignificant relationship between annual income and their awareness on the environmental pollution caused by the use of pesticides.

Shanto (2011) in his study reported that there was positive significant relationship between annual income and their environmental pollution due to use of pesticides in vegetable cultivation.

Rong and Juan (2011) in his study found there was a positive relationship between annual family income and environmental awareness.

Chowdhury (2011) observed that annual income had significant positive relationships with their awareness on the effect of excessive use of chemicals for dry fish storage.

Bo and Linhai (2010) in his study observed that annual family income had a significant relationship with the awareness on environmental pollution.

Islam & Amin (2009) revealed that there was a significant relationship between annual family income and awareness on environmental degradation.

Jalal (2009) observed that there was no significant relationship between annual income and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Sutradhar (2002) found in his study that there was positive significant relationship between annual income of the respondents and their awareness on the environmental degradation caused by the use of pesticides.

2.3.7 Farming experience and awareness

The researcher tried hard but didn't find any review regarding farming experience and awareness on climate change resilience strategies.

2.3.8 Agricultural training received and awareness

Adhikary (2012) observed in his study that there was positive significant relationship between training on pest management and their awareness on the environmental pollution caused by the use pesticides.

Parveen (2010) observed in his study that there was positive significant relationship between training on pest management and their awareness on the environmental pollution caused by the use of pesticides.

Chowdhury (2005) observed a positive relationship between small farmers' training participation and their perception (awareness) of afforestation programme, Barind Multipurpose Development Authority at Barind area. Similar finding was supported by Hossain (2001) in his study.

Sana (2003) found that training exposure of small farmers had a positive significant relationship with their knowledge in shrimp culture

Rahman (2003) observed in his study that there was positive significant relationship between training on pest management and their awareness on the environmental pollution caused by the use of pesticides.

2.3.9 Extension media contact and awareness

Tonni (2017) found in her study that extension media contact of the farmers had positive relationship with their awareness of farmers on environmental degradation.

Adem (2017) observed that information accessibility had statistically significant influence on awareness of framers.

Kuri (2013) reported that access to information source of the farmers had positive influence on building awareness regarding effect of climate change on farm ecosystem.

Savci (2012) found a significant relationship between communication exposure of farmers and environmental awareness.

Adhikary (2012) observed in his study that there was insignificant relationship between extension contact and their awareness on the environmental pollution caused by the use of pesticides.

Shanto (2011) in his study reported that there was positive significant relationship between extension media contact and their environmental pollution due to use of pesticides in vegetable cultivation.

Chowdhury (2011) observed that extension media contact had significant positive relationships with their awareness on the effect of excessive use of chemicals for dry fish storage.

Jalal (2009) observed that there was no significant relationship between extension media contact and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

Sutradhar (2002) observed in his study that there was positive significant relationship between extension contact of the respondents and their awareness on the environmental degradation caused by the use of pesticides.

2.3.10 Innovativeness and awareness

Tonni (2017) found in her study that innovativeness of the farmers had positive relationship with their awareness of farmers on environmental degradation.

Zaidi *et al.* (2011) in their study found that innovativeness of the farmers had positive significant relationship with the awareness on environmental pollution.

Bo and Linhai (2010) found that innovativeness of the farmers had a positive relationship with the awareness with environmental pollution.

Islam & Amin (2009) in his study revealed that there was significant relationship between innovativeness and awareness on environmental degradation.

Adaman and Ozeretan (2007) found that there was a relationship between innovativeness and environment degradation.

Islam *et al.* (2006) in their study observed that there was a significant positive relationship between innovativeness and awareness on environmental degradation.

Farhad *et al.* (2005) revealed that there was no relationship between awareness and environmental degradation.

Sutradhar (2002) observed that innovativeness of farmers had significant positive relationship with their awareness on environmental degradation.

2.3.11 Knowledge on climate change and awareness

Tonni (2017) found in her study that environmental knowledge of the farmers had positive relationship with their awareness of farmers on environmental degradation.

Silva and Abesinghe (2011) has found that, nearly 67% of respondents were aware about climate change and its effect. However, few small farmers (23%) had knowledge about global warming and green-house gasses. Small farmers were asked to indicate their understanding of the phenomenon. Curiously, 69% of respondents reported that they understood climate change as "change in weather".

Talape *et al*. (2011) found significant relationship with knowledge about environmental degradation and environmental awareness.

Chowdhury (2011) observed that knowledge on pesticides regulation had significant positive relationships with their awareness on the effect of excessive use of chemicals for dry fish storage.

Parveen (2010) obtained in his study that there was positive significant relationship between Knowledge on IPM and their awareness on the environmental pollution caused by the use of pesticides.

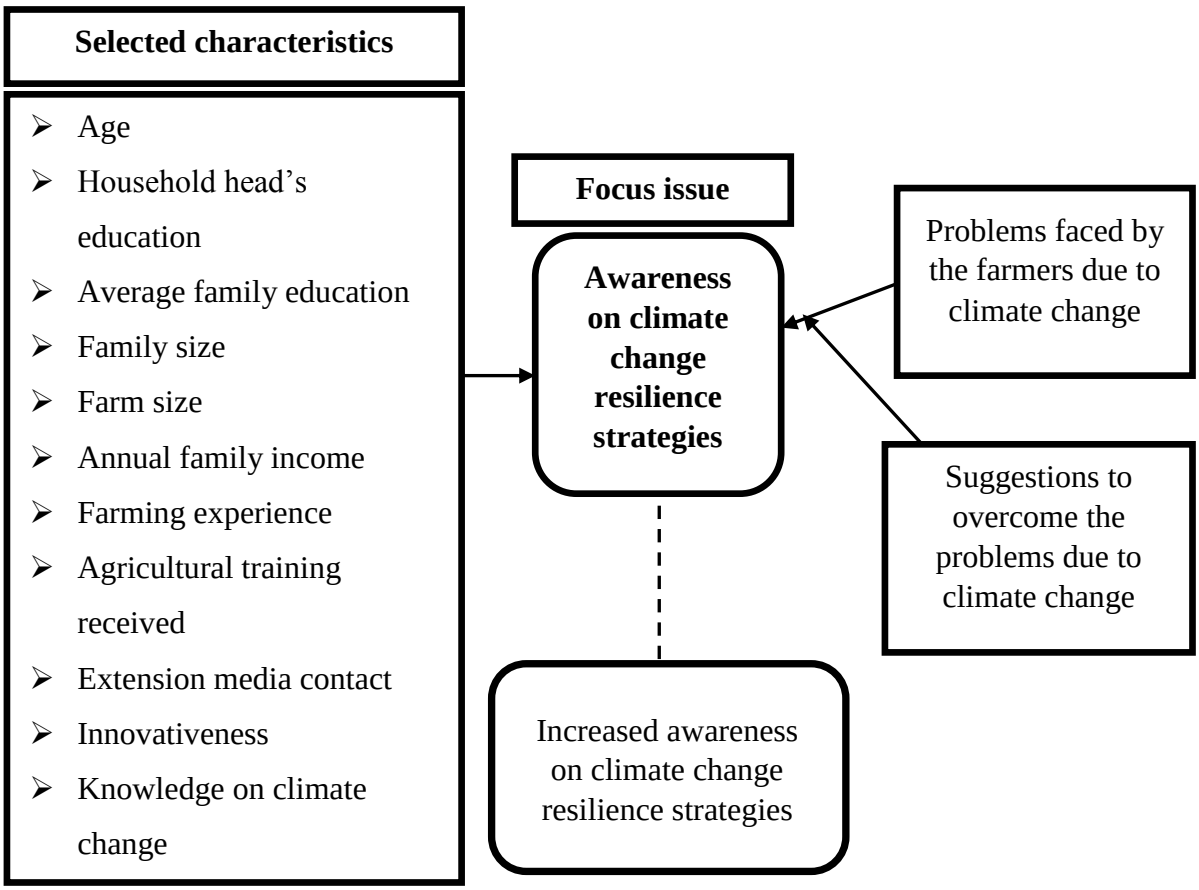
Hong and Mweemba (2010) found positive relationship between knowledge about environmental degradation and environmental awareness.

Ole *et al.* (2009) found that there is a significant positive relationship between knowledge on climate change and awareness of the small farmers on its effect on farm environment.

Jalal (2009) observed that there was positive significant relationship between knowledge on ITKs and their awareness on the environmental degradation caused by the use of modern agricultural technologies.

2.4 Conceptual Framework of the Study

In developing a framework for this study, both conceptual ideas and available empirical studies were taken into consideration. Thus, the extent of awareness on climate change resilience strategies was the focus issue and eleven selected characteristics of the CIG farmers were considered as the explanatory variables. Extent of awareness on climate change resilience strategies of an individual may be affected through interacting forces of many explanatory variables. It is not possible to deal with all explanatory variables in a single study. It was therefore, necessary to limit the explanatory variables, which included age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change. Moreover, problems faced by the farmers due to climate change and suggestions to overcome the problems are also focused on. Increased awareness on climate change resilience strategies is the expected outcome from the study. Considering the above-mentioned discussion, a conceptual framework has been developed for this study (Figure 2.1).



Indicates parameters under investigation

Indicates parameters do not consider under investigation

Figure 2.1 Conceptual framework of the study

CHAPTER 3

METHODOLOGY

Methodology is an integral and important part of a research. Appropriate methodology of any study can help the researcher to collect valid information and to analyze them properly in order to arrive at a meaningful conclusion. The methods and procedures followed in conducting this study have been discussed in this Chapter. Further, this Chapter includes the operational format and comparative reflection of some issues used in this study.

3.1 Research Design of the Study

A research design enables the investigator to answer research questions as objectively, accurately and economically as possible. It sets up a framework for the test of relationship among variables and helps to keep the research in proper direction (Ray and Mondal, 2004). Designing the research for the study was taken in a scientific manner. Firstly, different research themes are collected and analyzed followed by research problem formulation. Reviews were studied to select appropriate issues and preparation of research instrument. Finally, data were collected, analyzed and thesis was prepared.

3.2 Locale of the Study

The study was conducted in Biral Upazila under Dinajpur District. Data were collected from a sample of the CIG farmers from 5 no. Biral union under Biral upazila of Dinajpur district. A map of Dinajpur district including its upazilas as well as Bangladesh (inset) and a map of Biral upazila of Dinajpur district have been presented in Figure 3.1 and 3.2, respectively.

3.3 Population and Sampling

The total numbers of CIG farmers were 300 in the study area. These farmers constituted the population of this study. A total of 106 CIG farmers were randomly selected as sample by using simple random sampling method for the purpose of data collection. Thus, 106 CIG farmers were considered as the sample of the study. Moreover, a reserve list of around 10 percent of the sample that is 10 farmers was prepared in case of unavailability of the sampled farmers.

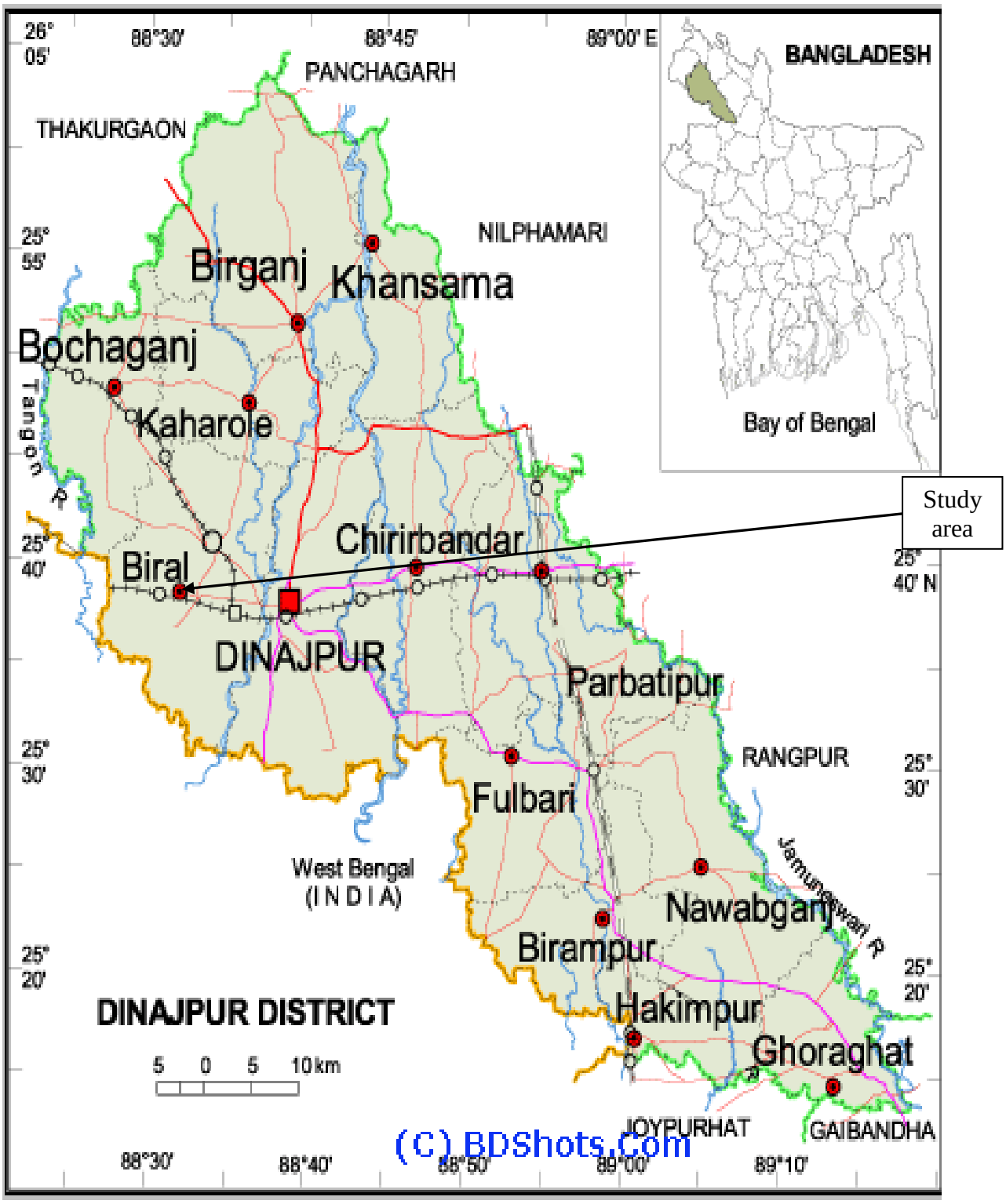


Figure 3.1 Map of Dinajpur district showing Biral upazila (Bangladesh inset)

Figure 3.2 Map of Biral upazila showing the study area

3.4 Research Instrument

In order to collect relevant data for the study, a well-structured interview schedule was carefully prepared keeping the research objectives in mind. The questions in the schedule were formulated in a simple and unambiguous way and arranged in a logical order to make it more attractive and easily understandable to the respondents. The interview schedule contained both open and closed form of questions. The survey instrument was initially developed in English and later it was translated into Bengali for the convenience of the interviewer during data collection. An English version of the interview schedule has been attached in *Appendix A.*

3.5 Measurement of the Selected Characteristics of the CIG Farmers

In total eleven selected characteristics of the CIG farmers were considered for the study. These were age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change. The procedures followed for measuring each of the characteristics are discussed as follows.

3.5.1 Age

The age of a respondent is referred to the period of time from his/her birth to the time of interview. The age was measured in complete years as reported by the respondents. A score of one (1) was assigned for each year of his/her age. This variable appears in item number 1 of interview schedule as presented in *Appendix A.*

3.5.2 Household head's education

Household head's education was measured in terms of one year of schooling. 1 score was given for passing each level in an educational institution. For example, if a respondent passed the final examination of class V, his/her level of educational score was taken as 5. If a respondent did not know how to read and write, his/her educational score was given as '0'. A score of 0.5 was given to that respondent who could sign his/her name only. This variable appears in item number 1 of interview schedule as presented in *Appendix A.*

3.5.3 Average family education

Average family education was measured in terms of year of schooling. 1 score was given for passing each level in an educational institution. For example, if a respondent passed the final examination of class V his/her level of educational score was taken as 5. If a respondent did not know how to read and write, his/her educational score was given as '0'. A score of 0.5 was given to that respondent who could sign his name only. Then the educational score of all

the family members were added and divided by the household size to get the average family education score of the household. This variable is calculated from the education data obtained from item number 1 of interview schedule as presented in *Appendix A*

3.5.4 Family size

Family size was measured by the total number of members in the family of a respondent. The family members included household head and other dependent members like wife/husband, children, father, mother etc. who lived and ate together. A unit score 1 was assigned for each member of the family. If a respondent had five members in his/her family, his/her family size score was given as 5. This variable is calculated from the item number 1 of interview schedule as presented in *Appendix A.*

3.5.5 Farm size

Farm size of a respondent included the areas of homestead, own land under own cultivation, land given to others on sharecropping (*borga*), land taken from others on sharecropping (*borga*), land taken from others on lease and others (pond, poultry yard etc.) which could give full benefit to the family and it was expresses in terms of hectares by using the following formula:

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

Where,

FS = Farm size

F_1= Homestead

F_2 = Own land under cultivation

F_3 = Land given to others on sharecropping (*borga*)

F_4 = Land taken from others on sharecropping (*borga*)

F_5= Land taken from others on lease

F_6= Others (pond, poultry yard etc.)

The data were collected in local unit at the time of data collection and then converted to hectare. This variable appears in item number 2 of interview schedule as presented in *Appendix A.*

3.5.6 Annual family income

Annual family income is referred to the annual gross income of a respondent's both from agricultural sector (rice, maize, potato, vegetables, fruits, dairy, poultry, fisheries and others) and non-agricultural sector (service, business and others) in the year of 2018. The income was expressed in thousand taka ('000'Tk). This variable appears in item number 3 of interview schedule as presented in *Appendix A.*

3.5.7 Farming experience

For measuring farming experience, a score of one (1) was assigned for each year of working experience of a respondent either in his/her owns farm or his/her parents farm. This variable appears in item number 4 of interview schedule as presented in *Appendix A.*

3.5.8 Agricultural training received

Agricultural training received of a respondent was measured by the total number of days a respondent attended training program in his/her entire life on agricultural issues. Score of 1 was assigned for each days of training. This variable appears in item number 5 of interview schedule as presented in *Appendix A.*

3.5.9 Extension media contact

Extension media contact was measured by computing extension media contact score on the basis of a respondent's extent of contact with 13 selected media as obtained in response to item number 6 of the interview schedule (*Appendix A*). Each respondent was asked to indicate the degree of his/her contact with each of the selected media with four alternative responses as 'frequently', 'occasionally', 'rarely', 'not at all' basis and weights were assigned as 3,2,1 and 0 respectively. Logical frequencies were assigned for each alternative response for each of the 13 selected items. The extension media contact score of a respondent was determined by summing up his/her scores for contact with all the selected media.The possible extension media contact could range from 0 to 39, where 0 indicated no extension media contact and 39 indicated the highest level of extension media contact.

3.5.10 Innovativeness

Innovativeness of a respondent was measured by computing an innovativeness score on the basis of his/her adoption of 10 selected modern agricultural technologies. Score were assigned on the basis of time dimension for his/her 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 Islam (2015) where score was given to the length of adoption or non-adoption of a new technology as follows:

Adoption length	Score assigned
Adoption above 2 years	3
Adoption within 2 year	2
Adoption within 1 years	1
Do not use	0

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. This variable appears in item number 7 of interview schedule as presented in *Appendix A.*

3.5.11 Knowledge on climate change

After thorough consultation with relevant experts and reviewing of related literature, nine questions regarding knowledge on climate change were selected and asked to the farmers to determine their extent of knowledge on climate change. Different scores such as 2 and 3 were assigned against different levels difficulty 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 from 0 to 22, where 0 indicates no knowledge and 22 indicates excellent knowledge. This variable appears in item number8 of interview schedule as presented in *Appendix A.*

3.6 Measurement of Focus Issue

The focus issue of the study was ‘awareness of the CIG farmers on climate change resilience strategies’. It was measured on the basis of the extent of awareness of the CIG farmers on climate change resilience strategies. A four-point rating scale such as high, medium, low and not at all was used in this regard. The used scale and assigned scores are given as follows:

Extent of awareness	**Score assigned**
High	3
Medium	2
Low	1
Not at all	0

The weights against each of the responses of a respondent was added together to obtain respondents' awareness score. Thus, the awareness score of an individual CIG farmer could range from 0 to 33, where 0 indicates 'no awareness' and 33 indicates 'high awareness' on climate change resilience strategies.

Moreover, Awareness Index (AI) of the eleven individual statements was computed and rank order of the statements was done based on their AI score. The AI was computed by using the following formula:

$$AI = N_1 \times 3 + N_2 \times 2 + N_3 \times 1 + N_4 \times 0$$

Where,

AI= Awareness Index

N_1= Number of respondents having 'high' awareness regarding individual statement

N_2= Number of respondents having 'medium' awareness regarding individual statement

N_3= Number of respondents having 'low' awareness regarding individual statement

N_4= Number of respondents having 'not at all' awareness regarding individual statement

Thus, the AI of individual statement could range from 0 to 318, where0 indicates not at all awareness and 318 indicates high awareness regarding the individual statement on climate change resilience strategies.

3.7 Problems faced by the CIG Farmers due to Climate Change

Farmers were asked to mention the problems they faced due to climate change. Ten problems related to climate change issues were selected. The problems were measured by following the extent of the problems faced by the respondent. The scoring was done in the following manner

Extent of severity	Assigned scores
High	3
Medium	2
Low	1
No	0

Problem Facing Index (PFI) was computed for each of the respondents. Rank order of each of the problems was done based on the respondents obtained PFI score. The Problem Faced Index (PFI) was computed by using the following formula:

$$\textit{Problem Faced Index (PFI)} = (P_n \times 0) + (P_l \times 1) + (P_m \times 2) + (P_h \times 3)$$

Where,

P_n= Number of respondents with 'no' problem

P_l = Number of respondents with 'low' problem

P_m = Number of respondents with 'medium' problem

P_h = Number of respondents with 'high' problem

Thus, Problem Faced Index (PFI) of the CIG farmers due to climate change ranged from 0 to 318, where 0 indicates no problem and 318 indicates high problem. This variable appears in item no. 10 of interview schedule as presented in *Appendix A.*

3.8 Probable Suggestions of the Problems as Mentioned by the CIG Farmers

Suggestions of the problems faced by the farmers due to change of climate were also identified during the interview by the CIG farmers. From the identified suggestions rank order was made based on the number of responses given by the CIG farmers. This item appears in item number 11 of interview schedule as presented in *Appendix A.*

3.9 Data Collection

Data were collected personally by the researcher himself through face to face interview. To familiarize with the study area and for getting local support, the researcher took help from the local leaders and the SAAOs of Upazila Agriculture Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to interview and the objectives were clearly explained by using local language as far as possible. After completion of interview, it was checked and editing was done as per necessity. The researcher did not face any major problem in collecting data. Excellent cooperation and coordination were extended by the respondents and other concern personnel at the time of data collectionduring 02 September to 28 October, 2019.

3.10 Statement of Hypothesis

As defined by Goode and Hatt (1952) 'A hypothesis is a proposition, which can be put to a test to determine its validity.' It may prove correct or incorrect of a proposition. In any event, however, it leads to an empirical test. Hypotheses are always in declarative sentence form and they relate either generally of specifically variables to sentence form and they relate either generally or specifically variables to variables. Hypothesis may be broadly divided into two categories, namely, research hypothesis and null hypothesis.

3.10.1 Research hypothesis

Research hypothesis (Ha) states anticipated relationships between concerned variables. Based on review of literature and development of conceptual framework, the research hypothesis was ‘there were relationships between age, household head’s education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change with their awareness on climate change resilience strategies’.

3.10.2 Null hypothesis

Null hypothesis (Ho) states that there is no relationship between the concerned variables. Therefore, the null hypothesis developed for this study is ‘there were no relationships between age, household head’s education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change with their awareness on climate change resilience strategies’.

3.11 Data Processing and Analysis

After completion of data collection, all the data were coded, compiled and tabulated according to the objectives of the study. Local units were converted into standard units. The responses to the questions in the interview schedule were incorporated in SPSS (Statistical Package for Social Science) data sheet to facilitate tabulation and categorization. Qualitative data were converted into quantitative form whenever necessary. The data were analyzed in accordance with the objectives of the study. Qualitative data were converted into quantitative data by means of suitable scoring techniques wherever necessary. Pearson’s Product Moment Coefficient of Correlation (r) was used in order to explore the relationships between the concerned variables. Five percent (0.05) and one percent (0.01) level of probability was the basis for rejecting any null hypothesis throughout the study. The SPSS computer package was used to perform data analysis. Descriptive analysis such as mean, range, number, percentage and standard deviation were used whenever necessary. For clarity of understanding, tables were used in presenting data.

CHAPTER 4

RESULTS AND DISCUSSION

The findings of the study and discussion of the results have been presented in this Chapter. These are presented in four sections according to the objectives of the study. The first section focused on the CIG farmers' awareness on climate change resilience strategies. The second section deals with the selected personal characteristics of the CIG farmers. The third section deals with the relationships between the selected characteristics and focus issue. The fourth and last section deals with the problems faced by the farmers due to climate change and the suggestions opined by the CIG farmers to overcome them.

4.1 CIG Farmers Awareness on Climate Change Resilience Strategies

4.1.1 Overall awareness on climate change resilience strategies

The overall awareness on climate change resilience strategies score of the CIG farmers varied from 8 to 26, against the possible range of 0 to 33 with a mean of 19.83 and standard deviation of 2.44. The respondents are classified into three categories i.e. slightly aware (≤11), moderately aware (11-22) and highly aware (≥22) based on their possible awareness on climate change scores (Table 4.1).

Table 4.1 Distribution of the CIG farmers according to their overall awareness on climate change resilience strategies

Possible range	Observed range	Categories	Farmers		Mean	SD
			Frequency	Percent		
0-33	8-26	Slightly aware (≤11)	2	1.9	19.83	2.44
		Moderately aware (11-22)	93	87.7		
		Highly aware (≥22)	11	10.4		

Data contained in Table 4.1 shows that the major proportion (87.7 percent) of the farmers are in the moderately aware category; while 10.4 percent are highly aware on climate change and only 1.9 percent of the respondents are slightly aware on climate change resilience strategies. However, overwhelming majority (98.1 percent) of the farmers are moderately to highly aware on climate change resilience strategies. The result may be due to that CIG farmers are always in touch with the DAE officers. Therefore, they are getting various training and information on the climate issues.

4.1.2 Statement-wise rank order of the CIG farmers awareness on climate change resilience strategies

CIG farmers' awareness on climate change resilience strategies was the focus issue of the study. Based on the Awareness Index (AI) score of CIG farmers, eleven selected statements were also arranged and rank order was done as shown in the Table 4.2. Awareness Index (AI) of CIG farmers was ranged from 56 to 308 against the possible range of 0 to 318.

Table 4.2 Rank order of the statements of CIG farmers' awareness on climate change resilience strategies

Sl. No.	Statements	Level of awareness				AI	Rank order
		High	Medium	Low	Not at all		
1.	Changing cultivation practices (early or late planting)	50	46	10	0	252	5th
2.	Improvement of soil management	2	12	26	66	56	11th
3.	Switching to drought tolerant varieties	2	7	64	33	84	10th
4.	Change in cropping pattern for productivity improvement	74	25	5	2	277	2nd
5.	Prevention and care of heat stress from extreme high temperature (like mulching, earthing-up etc.)	4	81	19	2	193	6th
6.	Agricultural information for adaptation	99	4	3	0	308	1st
7.	Forecasting, monitoring and information of weather indicators	62	38	5	1	267	3rd
8.	Improved water management	17	35	50	4	171	7th
9.	Altering cropping patterns	60	38	7	1	263	4th
10.	Diversified cropping system (Rice-fish culture, Rice-fish-vegetables cultivation)	4	38	49	15	137	8th
11.	Agro-forestation	0	7	80	19	94	9th

Note: AI= Awareness Index

The result of Table 4.2 shows that the statement 'Agricultural information for adaptation' ranked 1st (AI value 308) followed by 'Change in cropping pattern for productivity improvement' ranking 2nd (AI value 277) and 'Forecasting, monitoring and information of weather indicators' ranked 3rd (AI value 267). Climate change resilience strategies sstatement 'Improvement of soil management', 'Switching to drought tolerant varieties' and 'Agro-forestation' got the last three position in the rank Table with AI value of 56, 84 and 94, respectively.

4.2 Selected Characteristics of the CIG Farmers

The selected characteristics of the respondents have been described in this section.

Table 4.3 Salient features of the selected characteristics of the farmers (n=106)

Characteristics	Scoring method	Range	Categories	Respondents		Mean (Std. dev.)
		Possible (Observed)		No.	Percent	
Age	No. of year	Unknown (25-75)	Young (<36)	22	20.7	49.41 (12.78)
			Middle aged (36-50)	34	32.1	
			Old (>50)	50	47.2	
Household head's education	Year of schooling	Unknown (0-15)	Can't read and write (0)	8	7.5	4.20 (4.36)
			Can sign only (0.5)	42	39.6	
			Primary level (1 to 5)	21	19.9	
			Secondary level (6 to 10)	24	22.6	
			Above secondary level (above 10)	11	10.4	
Average family education	Year of schooling	Unknown (0.38-13.33)	Fairly educated (<6)	62	58.5	5.78 (3.17)
			Highly educated (6-10)	33	31.1	
			Very highly educated (>10)	11	10.4	
Family size	No. of Members	Unknown (2-6)	Small (up to 3)	26	24.5	3.97 (0.77)
			Medium (4-5)	77	72.6	
			Large (above 5)	3	2.8	
Farm size	Hectare	Unknown (0.05-8.77)	Marginal (0.021-0.200)	11	10.4	0.62 (0.52)
			Small (0.201-1.000)	76	71.7	
			Medium (1.001-3.000)	19	17.9	
Annual family income	'000' Taka	Unknown (27-515)	Low (up to 100.000)	45	42.5	142.62 (95.52)
			Medium (100.001-300.000)	53	50.0	
			High (>300.000)	8	7.5	
Farming experience	No. of year	Unknown (4-40)	One decade (up to 10)	26	24.5	19.67 (9.62)
			Two decade (11-20)	43	40.6	
			Three decade and above (above 20)	37	34.9	
Agricultural training received	No. of days	Unknown (0-12)	No training (0)	78	73.6	1.03 (2.45)
			Day long training (1)	6	5.7	
			Above day long training (above 1)	22	20.8	
Extension media contact	Score	0-39 (4-30)	Low (up to 13)	79	74.5	11.99 (5.07)
			Medium (14-26)	24	22.6	
			High (>26)	3	2.8	
Innovativeness	Score	0-30 (3-26)	Low (upto 10)	98	92.5	7.98 (3.87)
			Medium (11-20)	4	3.8	
			High (>20)	4	3.8	
Knowledge on climate change	Score	0-22 (7-16)	Fair (up to 7)	9	8.5	9.83 (2.32)
			Good (8-14)	88	83.0	
			Excellent (>14)	9	8.5	

In total eleven selected characteristics namely: age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change were selected for this study.

4.2.1 Age

The observed age of the CIG farmers ranged from 25 to 75 years. The mean age is 49.41 years and standard deviation is 12.78. On the basis of age, farmers were classified into three categories, such as 'young' (<36 years), 'middle aged' (36-50 years) and 'old' (> 50 years) as shown in Table 4.3.

The data presented in Table 4.3 indicates that about 20.7 percent of the farmers in the study area is under young aged category, while 32.1 percent belonged to middle aged category and 47.2 percent belonged to old aged category. However, data also revealed that 79.3 percent of the CIG farmers of the study area were middle aged to old aged.

4.2.2 Household head's education

The household head's education ranged from 0 to 15. The mean score is 4.20 and the standard deviation is 4.36. Based on their level of education, the farmers were grouped into five categories: 'can't read and write' (0), 'can sign only' (0.5), 'primary level' (1-5), 'secondary level' (6-10), and 'above secondary level' (>10) as shown in Table 4.3.

Data presented in Table 4.3 indicate that a large proportion (39.6 percent) of the respondents fell under category of 'can sign only' compared to 7.5 percent in 'can't read and write' category, 22.6 percent in 'secondary education' category, 19.9 percent in the 'primary education' category and 10.4 percent in 'above secondary education' category. This means 92.5 percent of the CIG farmers have varying extent of education. It is assumed that the more education of the CIG farmers the higher would be their awareness about various aspects of climate change.

4.2.3 Average family education

The observed average family education of the respondents ranged from 0.38 to 13.33 with a mean value of 5.78 and standard deviation 3.17. Average family education of the respondents is classified into three categories i.e. 'fairly educated' (<6), 'highly educated' (6-10), 'very highly educated' (>10).

Data presented in Table 4.3 indicate that a large proportion (58.5 percent) of the respondent are fairly educated compared to 31.1 percent being highly educated and 10.4 percent being very highly educated. The results indicate that overwhelming majority (89.6 percent) of the respondents of the study area is fairly to highly educated.

4.2.4 Family size

The observed family size of the respondents ranged from 2 to 6 with a mean value of 3.97 and standard deviation 0.77. Based on the family size score, the respondents are classified into three categories such as small (up to3), medium (4-5) and large (>5) following the classification of social standard. The categories and distribution of respondents are shown in Table 4.3.

Data contained in Table 4.3 shows that, most (72.6 percent) of the farmers have medium family compared to 24.5 percent having small family and only 2.8 of the farmers having large family. The data also indicates that the average family size (3.97 percent) of the farmers is slightly lower than the national average of 4.30 percent (BBS, 2017). The data indicates that majority (97.1 percent) of the farmers had medium to small family in the study area.

4.2.5 Farm size

Farm size of the respondents in the study area ranged from 0.05 to 8.77 ha. The average farm size was 0.62 ha. with the standard deviation 0.52. The respondents are classified into three categories such as marginal (0.021- 0.200), small (0.201-1.000) and medium (1.001-3.000) on the basis of their farm holdings (Table 4.3).

Results of Table 4.3 reveal that more than two-third (71.1 percent) of the respondents have small farm while 17.9 percent have medium farm, and only 10.4 percent have marginal farm. The findings reveal that majority (89 percent) of the respondents have small to medium farm size.

4.2.6 Annual family income

Annual family income of the respondents ranged from Tk. 27 to 515 thousand. The average annual income was Tk. 142.62 thousand with the standard deviation 95.52. Based on annual family income, the CIG farmers are classified into three categories namely: low (up to 100.000), medium (100.001-300.000) and high (>300.000) as shown in Table 4.3.

Data presented in Table 4.3 indicates that half (50.0 percent) of the respondents have medium annual income compared to 42.5 percent having low income and 7.5 percent having high annual income. Thus, the overwhelming majority (93.4 percent) of the respondents had medium to low annual income.

4.2.7 Farming experience

Farming experience of the farmers ranged from 4 to 40 years, with an average of 19.67 years and standard deviation of 9.62. On the basis of their experience, the farmers were classified into three categories i.e. 'One decade' (up to 10), 'Two decade' (11-20) and 'Three decade and above' (above 20). Data presented in Table 4.3 show that less than half of the farmers (40.6 percent) had two-decade of farming experience, while 24.5 percent and34.9 percent of them had one decade and three decade and above farming experience, respectively. The findings of the study indicate that the majority (75.5 percent) of the CIG farmers possessed either two decades or three decades and above of farming experience. The farming experience is a factor that might have influence in acquiring awareness about changes taken place in farming activities in response to climate variability and changes.

4.2.8 Agricultural training received

Training received for on different agricultural issues of the respondents ranged from 0 to 12 days with an average 1.03 days and standard deviation 2.45. On the basis of scores, the respondents were classified into three categories i.e. 'no training' (0), 'day long training' (1) and 'above day long training' (above 1) as shown in Table 4.3.

Data presented in Table 4.3 indicate that 73.6 percent of the CIG farmers have no training but they attend meetings several times in a month, 5.7 percent have day long training and 20.8 percent have above day long training. The findings of the study indicate that majority (73.6 percent) of the respondents of the study area had the no training. So, there is a need of agricultural training for the CIG farmers to improve their knowledge and awareness about climate change.

4.2.9 Extension media contact

Extension media contact is a very powerful and effective source of receiving information about various modern technologies. Extension media contact scores of the farmers ranged from 4 to 30 against the possible range from 0 to 39. The average score was 11.99 with the standard deviation 5.07. The respondents are classified into three categories such as 'low' (up to13), 'medium' (14-26) and 'high' (>26) based on their possible extension media contact scores. The categories and distribution of the respondents are shown in Table 4.3.

Data presented in Table 4.3 indicate that about three-fourths (74.5 percent) of the farmers have low extension media contact, 22.6 percent have medium extension media contact and only 2.8 percent have high extension media contact. Thus, majority (97.1 percent) of the

farmer had low to medium extension contact. It indicates that there is need of increasing CIG farmers contact with extension media like agriculture extension officer, upazila agricultural officer specially SAAOs, TV, radio etc. to get different information including environment and climate change.

4.2.10 Innovativeness

The innovativeness score of the respondents ranged from 3 to 26 against the possible range from 0 to 30. The average innovativeness score is 7.98 with the standard deviation 3.87. Based on the possible innovativeness score, the respondents were classified into three categories i.e. 'low' (up to 10), 'medium' (11-20) and 'high' (>20). The categories and the distribution of the respondents are shown in Table 4.3.

Data presented in Table 4.3 indicates that 92.5 percent of the farmers were low innovativeness, while 3.8 percent of them have medium and 3.8 percent have high innovativeness. However, in respect of innovativeness the overwhelming majority (92.5 percent) of the farmers of the study area have low innovativeness towards climate change and it should be increased to develop resilience strategies.

4.2.11 Knowledge on climate change

The knowledge on climate change scores of the respondents ranged from 7 to 16 against the possible range from 0 to 22 with an average 9.83 and standard deviation of 2.32. On the basis of agricultural knowledge of the CIG farmers, they are classified into three categories i.e. 'fair'(upto7), 'good'(8-14) and 'excellent'(>14) as shown in Table 4.3.

Data presented in Table 4.3 indicate that, 83.0 percent have good knowledge while 8.5 percent of the respondents have fair knowledge of climate change and 8.5 percent of them have excellent knowledge. Better knowledge on climate change is helpful to make the farmers to be aware of their farming practices. In respect of the knowledge on climate change, the majority (91.5 percent) of the farmers have good to fair knowledge.

4.3 Relationships between the Selected Characteristics and Focus Issue

This section deals with the findings of the relationships between the selected characteristics and the focus issue of the study. The selected characteristics of the farmers are: age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change. The focus issue is awareness on climate change resilience strategies. Pearson's Product Moment Correlation of Co-efficient (r) was

used to determine the relationships between the selected characteristics and focus issue and to accept or reject the null hypothesis five percent (0.05) and one percent (0.01) level of significance was used. A summary of the correlation analysis is presented in Table 4.3 and the correlation matrix in the *Appendix B.*

Table 4.4 Relationships between the selected characteristics and focus issue

Focus issue	Selected characteristics	Pearson's correlation co-efficient (r) with d.f. =104	Tabulated correlation co-efficient	
			0.05 level	0.01 level
Awareness on climate change resilience strategies	Age	0.196*	± 0.191	± 0.250
	Household head's education	0.259**		
	Average family education	0.226*		
	Family size	-0.008		
	Farm size	-0.093		
	Annual family income	0.194*		
	Farming experience	-0.068		
	Agricultural training received	0.197*		
	Extension media contact	0.223*		
	Innovativeness	0.025		
	Knowledge on climate change	0.266**		

* Correlation is significant at the 0.05 level and ** Correlation is significant at the 0.01 level

4.3.1 Relationship between age and awareness on climate change resilience strategies

The computed correlation coefficient between age of the CIG farmers and their awareness on climate change resilience strategies is 0.196 (Table 4.4). Based on the computed 'r' value we can say that the relationship between age of the CIG farmers and their awareness on climate change resilience strategies is significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. Thus, the researcher concluded that age had significant positive relationship with awareness on climate change resilience strategies.

4.3.2 Relationship between household head's education and awareness on climate change resilience strategies

The computed correlation coefficient between household head's education of the CIG farmers and their awareness on climate change resilience strategies is 0.259 (Table 4.4). Based on the computed 'r' value we can say that the relationship between household head's education of the CIG farmers and their awareness on climate change resilience strategies is

significant at one percent level of significance. Hence, the concerned null hypothesis could be rejected. Thus, the researcher concluded that household head's education had significant positive relationship with awareness on climate change resilience strategies.

4.3.3 Relationship between average family education and awareness on climate change resilience strategies

The computed correlation coefficient between average family education of the CIG farmers and their awareness on climate change resilience strategies is 0.226 (Table 4.4). Based on the computed 'r' value we can say that the relationship between average family education of the CIG farmers and their awareness on climate change resilience strategies is significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. Thus, the researcher concluded that household head's education had significant positive relationship with awareness on climate change resilience strategies.

4.3.4 Relationship between family size and awareness on climate change resilience strategies

The computed correlation coefficient between family size of the CIG farmers and their awareness on climate change resilience strategies is -0.008 (Table 4.4). Based on the computed 'r' value we can say that the relationship between family size of the CIG farmers and their awareness on climate change resilience strategies is not significant. Hence, the concerned null hypothesis could not be rejected. Thus, the researcher concluded that family size had no significant relationship with awareness on climate change resilience strategies at five percent level of significance.

4.3.5 Relationship between farm size and awareness on climate change resilience strategies

The computed correlation coefficient between farm size of the CIG farmers and their awareness on climate change resilience strategies is -0.093 (Table 4.4). Based on the computed 'r' value we can say that the relationship between farm size of the CIG farmers and their awareness on climate change resilience strategies is not significant. Hence, the concerned null hypothesis could not be rejected. Thus, the researcher concluded that farm size had no significant relationship with awareness on climate change resilience strategies at five percent level of significance.

4.3.6 Relationship between annual family income and awareness on climate change resilience strategies

The computed correlation coefficient between annual income of the CIG farmers and their awareness on climate change resilience strategies is 0.194 (Table 4.4). Based on the computed ‘r’ value we can say that the relationship between annual income of the CIG farmers and their awareness on climate change resilience strategies is significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. Thus, the researcher concluded that annual income had significant positive relationship with awareness on climate change resilience strategies.

4.3.7 Relationship between farming experience and awareness on climate change resilience strategies

The computed correlation coefficient between farming experience of the CIG farmers and their awareness on climate change resilience strategies is -0.068 (Table 4.4). Based on the computed ‘r’ value we can say that the relationship between farming experience of the CIG farmers and their awareness on climate change resilience strategies is not significant. Hence, the concerned null hypothesis could not be rejected. Thus, the researcher concluded that farming experience had no significant relationship with awareness on climate change resilience strategies at five percent level of significance.

4.3.8 Relationship between agricultural training received and awareness on climate change resilience strategies

The computed correlation coefficient between agricultural training received of the CIG farmers and their awareness on climate change resilience strategies is 0.197 (Table 4.4). Based on the computed ‘r’ value the relationship between agricultural training received of the CIG farmers and their awareness on climate change resilience strategies is significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. Thus, the researcher concluded that agricultural training received had significant positive relationship with awareness on climate change resilience strategies.

4.3.9 Relationship between extension media contact and awareness on climate change resilience strategies

The computed correlation coefficient between extension media contact of the CIG farmers and awareness on climate change resilience strategies is 0.223 (Table 4.4). Based on the computed ‘r’ value the relationship between extension media contact and awareness on

climate change resilience strategies was significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. The researcher concluded that extension media contact had significant positive relationship with awareness on climate change resilience strategies.

4.3.10 Relationship between innovativeness and awareness on climate change resilience strategies

The computed correlation coefficient between innovativeness of the CIG farmers and awareness on climate change resilience strategies was 0.025 (Table 4.4). Based on the computed 'r' value the relationship between innovativeness and awareness on climate change resilience strategies was significant at five percent level of significance. Hence, the concerned null hypothesis could be rejected. The researcher concluded that innovativeness had significantly positive relationship with awareness on climate change resilience strategies.

4.3.11 Relationship between knowledge on climate change and awareness on climate change resilience strategies

The computed correlation coefficient between knowledge on climate change of the CIG farmers and awareness on climate change resilience strategies is 0.266 (Table 4.4). Based on the computed 'r' value the relationship between knowledge on climate change and awareness on climate change resilience strategies was significant at one percent level of significance. Hence, the concerned null hypothesis could be rejected. The researcher concluded that knowledge on climate change had significant positive relationship with awareness on climate change resilience strategies.

4.4 Problems Faced by the CIG Farmers due to Climate Change and their Suggested Solutions to Overcome the Problems

4.4.1 Problems faced by the farmers due to climate change

Distribution of the CIG farmers according to their problems due to climate change in different degrees has been showed in the Table 4.5 along with Problem Faced Index (PFI) and their rank order. Problem Faced Index (PCI) of the CIG farmers due to climate change ranged from 45 to 311 (Table 4.5).

Table 4.5 Distribution of the CIG farmers according to their problem faced index and rank order

Sl. No.	Problems	High (3)	Medium (2)	Low (1)	Not at all (0)	PFI	Rank
1.	Lack of available irrigation and drinking water	6	8	55	37	89	8th
2.	Lack of knowledge on climate change adaptation	71	29	4	2	275	4th
3.	Summer temperature increase	89	1	4	2	273	5th
4.	Unpredicted monsoon	2	5	44	54	60	9th
5.	Poor crop production	17	81	7	1	220	6th
6.	Outbreak of pests and diseases	102	2	1	1	311	1st
7.	Lack of training facilities for adaptation technologies	84	14	3	5	283	3rd
8.	Increase in household food insecurity	2	7	25	71	45	10th
9.	Working at crop field has become difficult due to hotness	93	11	1	1	302	2nd
10.	Public health problems	2	10	83	11	109	7th

Note: PFI= Problem Faced Index

The results revealed that most severe problem faced by the CIG farmers due to climate change is 'Outbreak of pests and diseases'with Problem Faced Index (PFI) of 311. Pest and diseases are the foremost hindrance in cultivation of crops. So, the farmers faced such problems mostly.

The second ranked problem faced by the CIG farmers due to climate change is 'Working at crop field has become difficult due to hotness' with the PFI of 302. The result might be due that Bangladesh is one of the tropical countries of the world where the sunshine directly falls on the soil followed by it becomes hot ultimately intercultural operation in the crop field become very difficult.

The third ranked problem faced by the CIG farmers due to climate change is observed on 'lack of training facilities for adaptation technologies' with the PFI of 283.

The least ranked problem faced by the CIG farmers due to climate change is found on 'increase in household food insecurity' with the PFI of 45.

4.4.2 Suggestions offered by the CIG farmers to overcome the climate change problems

The suggestions offered by the CIG farmers to overcome the climate change problems are given in table 4.6 with their citations and rank order.

Table 4.6 Suggestions offered by the CIG farmers to overcome the climate change problems

Sl. No.	Suggestions	No. of citation	Rank order
1.	Increased training facilities according to their needs for increasing their knowledge and skill regarding awareness on climate change	65	1st
2.	Massive afforestation and reforestation programs should be conducted and deforestation should be stopped	60	2nd
3.	Enhancing publication related to climate change problems and solutions to overcome the problems	57	3rd
4.	Public awareness should be increased in all concerns about climate change	53	4th
5.	Sustainable management and rational use of natural resources	49	5th
6.	Uniformity of views among local and national stakeholders should be built for climate change policies and actions	41	6th

The findings reveal that the top ranked suggestion given by the CIG farmers is 'Increased training facilities according to their needs for increasing their knowledge and skill of awareness on climate change'. It is anticipated that the more the training facilities the more awareness will be grown among the CIG farmers.

'Massive afforestation and reforestation programs should be conducted and deforestation should be stopped' is found as second most important suggestion opined by the CIG farmers. The reasons might be clear that forests are considered as lungs of environment which receive carbon dioxide (CO_2) and release oxygen (O_2) to make environmental balance. Tree plantations protect our environment from degradation ultimately decrease climate change effects.

'Uniformity of views among local and national stakeholders should be built for climate change policies and actions' is found as the last suggestion offered by the CIG farmers to overcome the climate change problems.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This Chapter deals with the summary of findings, conclusions and recommendations are chronologically given as below:

5.1 Summary of Findings

The study was undertaken to determine the awareness of the CIG farmers on climate change resilience strategies, to determine and describe the selected characteristics of the CIG farmers and to explore the relationship between the selected characteristics of the CIG farmers with their awareness on climate change resilience strategies. The study was conducted in Biral 5 no. union of Biral upazila under Dinajpur district. The total number of CIG farmers was 300 which constituted the population of the study. A total of 106 farmers (35.33 percent of the population) were selected as sample by using simple random sampling method. Data were collected by the researcher himself during 02 September to 28 October, 2019. In this study, awareness on climate change resilience strategies of the CIG farmers was the focus issue. The selected characteristics of those farmers were: age, household head's education, average family education, family size, farm size, annual family income, farming experience, agricultural training received, extension media contact, innovativeness and knowledge on climate change.

5.1.1 Farmers awareness on climate change resilience strategies

Awareness on climate change resilience strategies by the CIG farmers was the focus issue of the study which ranged from 8 to 26, against the possible range of 0 to 33 with an average 19.83 and standard deviation 2.44. It was observed that the highest proportion (87.7 percent) of the farmers were moderately aware on climate change; while 10.4 percent were highly awareness on climate change and only 1.9 percent of the respondents were slightly aware on climate change. However, almost (98.1 percent) of the respondent farmers were moderately to highly aware on climate change.

On the basis of the Awareness Index (AI) score of CIG farmers, the statements 'Agricultural information for adaptation' ranked 1st (AI value 308) followed by 'Change in cropping pattern for productivity improvement' ranked 2nd (AI value 277) and 'Forecasting, monitoring and information of weather indicators' ranked 3rd (AI value 267). Statement 'improvement of soil management' got the lowest score (AI 56) and hence got the lowest (11th) position in the ranked order.

5.1.2 Selected characteristics of the CIG farmers

It was found that 32.1 percent of the farmers fell in the middle-aged category, whiles 20.7 percent fell in the young aged category and 47.2 percent in the old aged category. Considering household head's education, 39.6 percent farmers were under can sign only category, 7.5percent in can't read and write category, 19.9 percent in primary education level category, 22.6 percent in secondary education level category. Considering average family education, large proportions (58.5 percent) of the respondent were fairly educated compared to 31.1 percent being highly educated and 10.4 percent being very highly educated. Considering family size, the highest proportion (72.6 percent) of the farmers had medium family size, compared to 24.5 percent of them having small family size and 2.8 percent of them having large family size. In case of farm size, more than two-third (71.7 percent) of the respondents had small farm while 17.9 percent had medium farm and only 10.4 percent had marginal farm. The findings revealed that highest (89.6 percent) proportion of the respondents had small to medium farm size.

Regarding annual family income, the highest proportion (42.5 percent) of the respondents had low annual family income compared to 50.0 percent having medium income and 7.5 percent having high annual family income. The majority (92.5 percent) of the respondents had low to medium annual income. Considering farming experience, less than half of the farmers (40.6 percent) had two-decades of farming experience, while 24.5 percent and 34.9 percent of them had one decade and three decades and above farming experience, respectively. The findings of the study indicate that the majority (75.5 percent) of the CIG farmers possessed either two or three decade and above farming experience. In case of agricultural training received, it was found that 73.6 percent of the CIG farmers had received no training, 5.7 percent had received daylong training and 20.8percent had received above day long training.

Considering extension media contact, it was found that about three-fourths (74.5 percent) of the farmers had low extension media contact, 22.6 percent had medium extension media contact and only 2.8 percent had high extension media contact. Considering innovativeness, it was observed that 92.5 percent of the farmers had low innovativeness, while 3.8 percent and 3.8 percent of them had medium and high innovativeness. In respect to knowledge of climate change, it was found that 83.0 percent had good knowledge while 8.5 percent of the respondents had fair knowledge on climate change and 8.5 percent of them had excellent knowledge. Regarding the knowledge on climate change, the overwhelming majority (91.5 percent) of the farmers had good knowledge.

5.1.3 Relationships between the selected characteristics of the CIG farmers and their awareness on climate change resilience strategies

To find out the relationships between the selected characteristics of the CIG farmers and their awareness on climate change resilience strategies, Pearson's Product Moment Co-efficient of Correlation (r) was computed. It was found that seven out of eleven selected characteristics of the CIG farmer's age, household head's education, average family education, annual family income, agricultural training received, extension media contact and knowledge on climate change had significant positive relationships with their awareness on climate change resilience strategies. Family size, farm size, farming experience and innovativeness had no significant relationships with their awareness on climate change resilience strategies.

5.1.4 Problems faced by the CIG farmers due to climate change and their suggested solutions to overcome the problems

The Problem Faced Index (PFI) due to climate change ranged from 45 to 311. The most severe problem faced by the CIG farmers due to climate change was 'Outbreak of pests and diseases' (PFI= 311). The second ranked problem was 'Working at crop field has become difficult due to hotness' with the PFI of 302. The third ranked problem was 'Lack of training facilities for adaptation technologies' with the PFI of 283. The least ranked problem faced by the CIG farmers due to climate change was 'Increase in household food insecurity' with the PFI of 45.

The top ranked suggestion given by the CIG farmers is 'Increased training facilities according to their needs for increasing their knowledge and skill of awareness on climate change'. 'Massive afforestation and reforestation programs should be conducted and deforestation should be stopped' is found as second most important suggestion opined by the CIG farmers. 'Uniformity of views among local and national stakeholders should be built for climate change policies and actions' is found as the last suggestion offered by the CIG farmers to overcome the climate change problems.

5.2 Conclusions

On the basis of findings of the research and logical interpretation of their meaning in the light of other relevant facts, the following conclusions were drawn:

1. Almost 98.1 percent of the respondent CIG farmers were moderate to highly aware on climate change resilience strategies. Thus, it could be concluded that the farmers in the study area had concern awareness on climate change resilience strategies.

2. Among the eleven selected characteristics of the CIG farmer's seven of them had positive relationship with their awareness on climate change resilience strategies. It may, therefore be concluded that certain characteristics of the CIG farmers have significance to make known on climate change resilience strategies.
3. The most severe problem faced by the CIG farmers due to climate change was found 'Outbreak of pests and diseases' and the lowest problem faced by the CIG farmers due to climate change was found 'increase in household food insecurity'. Therefore, it may be concluded that the respondents of the study area still facing various problems in various extent.
4. The top ranked suggestion given by the CIG farmers was 'Increased training facilities according to their needs for increasing their knowledge and skill of awareness on climate change'. It may therefore be concluded that they have the knowledge and options to combat the problems which they are facing.

5.3 Recommendations

5.3.1 Recommendations for policy implications

The following recommendations were made on the basis of the findings and their logical interpretations:

1. As the respondents of the study area have necessary awareness on climate change resilience strategies so, it should be recommended that proper authority like DAE should monitor it in certain interval so that it can be sustainable. Time to time updated and recent information regarding climate change resilience strategies should be disseminated in this area so that the present scenarios remain all the same in all the time.
2. Education of the CIG farmers had significant and positive relationship with their awareness on climate change resilience strategies and a considerable amount (39.6 %) of the CIG farmers 'can sign only' category. So, it may be recommended that arrangement should be made for increasing the literacy level of the CIG farmers through the establishment of night school or adult education centre.
3. Majority (73.6percent) of the CIG farmers had no training experience. Hence the concern authorities should take necessary steps to arrange more training programs for the CIG farmers for increase their agricultural knowledge.

4. The study indicates that knowledge on climate change had significant positive relationship with their awareness on climate change resilience strategies; therefore it is recommended that concerned public sector extension agencies (DAE) should initiate appropriate training programs for the CIG farmers of the study area.
5. Special initiatives need to be taken like counselling, supervision and advocacy program by the government concerned authority like DAE to ensure the fulfilment of awareness on climate change of the CIG farmers about their agricultural program.

5.3.2 Recommendations for further study

The study conducted in some specific location can't provide all the information for proper understanding about CIG farmers' awareness on climate change resilience strategies and related matters. The following recommendations are suggested for further study in this connection:

1. The present study was conducted in Biral upazila under Dinajpur district of Bangladesh. Findings of this study should be verified by similar research in other areas.
2. The present study was conducted taking eleven characteristics of the CIG farmers. Further study may be conducted considering other characteristics of the CIG farmers.
3. In this study, it has been carried out at CIG farmers to determine their awareness on climate change resilience strategies. Similar study could be conducted with other farmers.
4. In this study, only eleven selected statements of awareness on climate change resilience strategies were measured. So, it is recommended that further study may be conducted including other more statements to determine the awareness on climate change resilience strategies.
5. More intensive research should be undertaken to identify the problems which respondents faced during agricultural activities along with their suggestions to overcome the same.

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Appendix-A

Department of Agricultural Extension

Hajee Mohammad Danesh Science and Technology University, Dinajpur

An English Version of the Interview Schedule on

Common Interest Group Farmers' Awareness on Climate Change Resilience Strategies

Serial No.: Date…….…….…….

Name of the respondent: ……...…… Father's name……

Cell No.: ……Village: ……. Union: ……...…. ……...

(Please provide necessary information for the following issues and put tick (√) whenever necessary)

1. Personal information:

Please provide following information

Sl. No.	**Entitle**	**Age**	**Education**
1.	Household head		
2.	Head's spouse		
3.	Head's……		
4.	Head's……		
5.	Head's……		
6.	Head's……		
7.	Head's……		

Education: 0=Can't read and write, 0.5=Can sign name only, 1to…=Have passed class

2. Farm size:

Please mention your farm size for crop production

Sl. No.	**Types of land**	**Land area**	
		In local unit	**In hectare**
F_1	Homestead		
F_2	Own land under own cultivation		
F_3	Land given to others on sharecropping (*borga*)		
F_4	Land taken from others on sharecropping (*borga*)		
F_5	Land taken from others on lease		
F_6	Others (pond, poultry yard etc.)		
	Total:		

3. Annual family income:

Please answer the following sources according to your annual family income

Sources of income		Production (Local unit)	Market Price (Tk./Local unit)	Total (Tk.)
Agricultural Sector	Rice			
	Maize			
	Potato			
	Vegetables			
	Fruits			
	Dairy			
	Poultry			
	Fisheries			
	Others, (if any)			
Non-Agricultural Sector	Service			
	Business			
	Others, (if any)			
Total=				

4. Farming experience: …….. Years

5. Agricultural training received

Have you been participated in any training programme?

No ……. Yes…… ☐ days

6. Extension media contact:

Please indicate your extent of contact with following sources

Sl. No.	Extension media	Extent of contact			
		Frequently	Occasionally	Rarely	Not at all
Individual contact					
1.	Upazila Agriculture Officer (UAO)	≥6 times /year	2-3 times /year	1 time /year	0 times
2.	Agricultural Extension Officer (AEO)	≥5 times /year	3-4 times /year	1 time /year	0 times
3.	SAAOs	≥5 times /3 months	3-4 times /3 months	1-2 time/3 months	0 times
4.	NGO Personnel	≥5 times /months	3-4 times /months	1-2 time /months	0 times
5.	Inputs dealers	≥6 times / season	4-5times / season	1-3 time /season	0 times
6.	Model farmers	≥5 times /months	3-4 times /months	1-2 time /months	0 times
Group contact					
7.	Group discussion	≥4 times /year	2-3 times /year	1 time /year	0 times
8.	Participation in result demonstration meeting	≥5 times /year	3-4 times /year	1-2 time /year	0 times

Contd.

Mass contact					
9.	Poster/Leaflet/Folder	≥4 times /year	2-3 times /year	1 time /year	0 times
10.	Receiving information by social media	≥3 times /week	2 times /week	1 time /week	0 times
11.	Watching agricultural TV programs	≥3 times /week	2 times /week	1 time /week	0 times
12.	Reading newspaper for agricultural information	≥4 times /week	2-3 times /week	1 time /week	0 times
13.	Agricultural fair	≥4 times /year	2-3 times /year	1 time /year	0 times

7. Innovativeness:

Please mention the information about the extent of use of the following practices

Sl. No.	**Name of technologies**	**Duration of adoption**			**Do not use**
		Above 2 years	**Within 2 years**	**Within 1 year**	
1.	Soil test for fertilizer dose determination				
2.	Cultivation of short duration crop variety				
3.	Cultivation of hybrid variety of rice				
4.	Use of BADC seed in crop cultivation				
5.	Cultivation of green manuring crops				
6.	Crop rotation				
7.	Mixed cropping				
8.	Late cropping				
9.	Relay cropping				
10.	Protection of seedling during cold wave				

8. Knowledge on climate change:

Please answer the following questions

Sl. No.	**Questions**	**Score**	
		Assigned	**Obtained**
1.	What do you mean by climate change?	2	
2.	Mention two names of the climatic hazards that frequently occur in your locality?	2	
3.	How temperature rise adversely affect agriculture?	2	
4.	How can we adapt to climate change in crop production?	2	
5.	Why chemical pesticides are more harmful to our environment?	3	
6.	Why chemical fertilizers are more harmful to our environment?	3	
7.	What preventive measures should you take to reduce crop loss due to climate change?	3	
8.	What are the risk of climate change?	2	
9.	Why organic fertilizers are more beneficial for environment compared to chemical fertilizers?	3	
	Total=	22	

9. Awareness on climate change resilience strategies:

Please give your opinion regarding the following issues of climate change

Sl. No.	Statements	Extent of awareness			
		High	Medium	Low	Not at all
1.	Changing cultivation practices (early or late planting)				
2.	Improvement of soil management				
3.	Switching to drought tolerant varieties				
4.	Change in cropping pattern for productivity improvement				
5.	Prevention and care of heat stress from extreme high temperature (like mulching, earthing-up etc.)				
6.	Agricultural information for adaptation				
7.	Forecasting, monitoring and information of weather indicators				
8.	Improved water management				
9.	Altering cropping patterns				
10.	Diversified cropping system (Rice-fish culture, Rice-fish-vegetables cultivation)				
11.	Agro-forestation				

10. Problems faced by the farmers due to climate change:

Please express your opinion of the following problems as per extent of severity

Sl. No.	Problems	Extent of severity			
		High (3)	Medium (2)	Low (1)	No (0)
1.	Lack of available irrigation and drinking water				
2.	Lack of knowledge on climate change adaptation				
3.	Summer temperature increase				
4.	Unpredicted monsoon				
5.	Poor crop production				
6.	Outbreak of pests and diseases				
7.	Lack of training facilities for adaptation technologies				
8.	Increase in household food insecurity				
9.	Working at crop field has become difficult due to hotness				
10.	Public health problems				

11. Suggestions: Please provide some suggestions against the above-mentioned problem

Thank you for your kind cooperation

……
Signature of the interviewer
Date:

Appendix B

Correlation matrix between selected characteristics and focus issue

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
X_1	1										
X_2	0.05	1									
X_3	0.22*	0.77**	1								
X_4	0.10	0.05	0.04	1							
X_5	0.12	0.24*	0.29**	0.24*	1						
X_6	0.14	0.37**	0.36**	0.08	0.56**	1					
X_7	0.58**	-0.13	0.03	0.10	0.18	0.16	1				
X_8	0.16	0.29**	0.29**	0.19*	0.15	0.30**	0.10	1			
X_9	0.11	0.48**	0.44**	0.28**	0.49**	0.52**	0.03	0.30**	1		
X_{10}	-0.02	0.04	0.06	0.25**	0.17	0.13	0.09	0.24*	0.11	1	
X_{11}	0.20*	0.40**	0.36**	0.34**	0.24*	0.35**	-0.04	0.28**	0.61**	0.19*	1
Y	0.19*	0.25**	0.22*	-0.00	-0.09	0.19*	-0.06	0.19*	0.22*	0.02	0.26**

Notes: ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

X_1 =Age
X_2 = Household head's education
X_3 = Average family education
X_4 = Family size
X_5 = Farm size
X_6 = Annual family income
X_7 = Farming experience
X_8 = Agricultural training received
X_9 = Extension media contact
X_{10}= Innovativeness
X_{11} = Knowledge of climate change
Y= Awareness on climate change resilience strategies