FARMERS' ATTITUDE TOWARDS CLIMATE SMART AGRICULTURE

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CERTIFICATE

This is to certify that the thesis entitled **"Farmers' Attitude towards Climate Smart Agriculture"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension,** embodies the result of a piece of bona fide research work carried out by **MAKSUDA KHANAM NISHAT**, Registration No. 18-09272under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated: December, 2020
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DEDICATED TO

MY

BELOVED PARENTS

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The Author

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Acronyms

BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
CSA	Climate-Smart Agriculture
CCAFS	Climate Change, Agriculture and Food Security
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse gas
DAE	Department Of Agriculture Extension
IFDC	International Fertilizer Development Center
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-government Organization
UNDP	United Nations Development Program
WB	World Bank

FARMERS' ATTITUDE TOWARDS CLIMATE SMART AGRICULTURE

ABSTRACT

Climate change is already influencing crop production and distribution,and exacerbating the risks associated with farming.Climate Smart Agriculture (CSA) has therefore been presented as an alternative form of agriculture that can help to improve food security and reduce poverty, especially in developing countries.In this backdrop, the objectives of this study were to determine farmers' attitude towards climate smart agriculture; to describe the selected characteristics of the farmers and to identify the factors that influence farmers' attitude towards climate smart agriculture.The study was conducted in Babuganj Upazila under Barishal district. Farmers of Rakudia and Baherchor villages of Dehergati union constituted the population of the study. A well-structured interview schedule was developed based on objectives of the study for collecting information. The researcher herself collected data through personal contact. Data were collected by using interview schedule from the randomly selected 110 respondents during 2nd February to 28th March, 2020. Descriptive statistics, linear regressions (B) were used for data analysis. The interview survey revealed thatthe overwhelming majority (80.9 percent) of the farmers belong to the group of favorable attitude towards CSA followed by 19.1 percent in unfavorable attitude group. Age,educational qualification, farm size and credit access of the farmershad significant positive relationships with their attitude towards CSA. It is recommended that DAE, and other related NGOs should take necessary steps considering the significant variables with a view to motivating farmers towards on CSA practices.

CHAPTER I

INTRODUCTION

1.1 General Background

Climate change is emerging as a major threat on agriculture, food security and livelihood of millions of people in many places of the world (IPCC, 2014). Several studies indicate that agriculture production could be significantly impacted due to increase in temperature (Lobell et al., 2012; Aggarwal et al., 2009), changes in rainfall patterns (Prasanna, 2014; Mall et al., 2006) and variations in frequency and intensity of extreme climatic events such as floods and droughts (Brida and Owiyo, 2013; Singh et al., 2013). Changes in weather patterns have reduced crop harvest, increased food insecurity and malnutrition as well as poverty (Gwambene, 2011). Its impacts are experienced through an increasing number of seasons without enough rainfall, rainfall peak season ending earlier than normal, poor rainfall distribution within the seasons and change in temperature (Aune, 2012; Philip et al., 2015; Coulibaly et al., 2015). There are several potential adaptation options to reduce moderate to severe climatic risks in agriculture.

Adaptation options that sustainablyincrease productivity, enhance resilience to climatic stresses, and reducegreenhouse gas emissions are known as climate-smart agricultural (CSA)technologies, practices and services (FAO, 2010). Broadly, CSA focuseson developing resilient food production systems that lead to food andincome security under progressive climate change and variability(Vermeulen et al., 2012; Lipper et al., 2014).Many agricultural practicesand technologies such as minimumtillage, different methods of crop establishment,nutrient and irrigation management and residue incorporationcan improve crop yields, water and nutrient use efficiency andreduce Greenhouse Gas (GHG) emissions from agricultural activities(Branca et al., 2011; Jat et al., 2014). Similarly, rainwaterharvesting, use of improved seeds, ICT based agro-advisories andcrop/livestock insurances can also help farmers to reduce the impact ofclimate change and variability (Altieri and Nicholls, 2013).

For all adaptation options, farmers need to make ex-ante decisions under climatic risk, while makingshort and long-run investments depending on the extent of current climate variability and expected climate change in the future (Callaway, 2004). The term climate-smart agriculture has developed to represent a set of strategies that can help to meet these challenges by increasing resilience to weather extremes, adapting to climate change and decreasing agriculture's greenhouse gas (GHG) emissions that contribute to global warming. CSA also aims to support sustainable and equitable transitions for agricultural systems and livelihoods across scales, ranging from smallholders to transnational coalitions. Forming a core part of the broader green development agenda for agriculture, CSA focuses on meeting the needs of people for food, fuel, timber and fiber through science-based actions; contributing to economic development, poverty reduction and food security; maintaining and enhancing the productivity and resilience of both natural and agricultural ecosystem functions, thus building natural capital; and reducing the trade-offs involved in meeting these goals. It invokes a continuous, iterative process for stakeholders, researchers and policymakers to meet the challenges presented by climate change and collectively transform agricultural and food systems towards sustainability goals. Increased awareness and adaptive management are essential components of the CSA strategy.

GHG emission mitigation by resource-poor farmers raises equity as an issue in developing countries because it may bring farmers little benefit unless it directly provides them with adaptive capacity.Developing appropriate and feasible climate-smart and climate-resilient agriculture practices is perceived to reduce hunger and improve food security and income (CCAFS, 2014). Transforming existing agriculture systems into climate-smart systems to negate the impacts of climate change, is necessary in order to address these emerging and unavoidable challenges (CCAFS, 2014). The important option is to build sustainable food systems, improve productivity and income of smallholder farmers. Agricultural intensification through improved technologies needs to consider farmers' response to new technologies and the extent to which these technologies had been adopted (Coulibaly et al., 2015). Therefore, an assessment of farmers' preferences and their willingness to adopt climate-smart interventions needs to align with government policies and institutional arrangements for large scale adoption ofclimate-smart agriculture.

Bangladesh is a South Asian developing country. It is the eighth-most populous country in the world, with a population exceeding 163 million people,in an area of according to Bangladesh Statistics Bureau (2020) 147,570 square kilometers (56,980 sq mi)making it one of the most densely populated countries in the world.According to a report by the United Nations Development Programme (UNDP), the population of Bangladesh would reach between 230-250 million in 2050. Presently, the country is adding 2.0 million people annually to the national population and for that it is losing 1 percent of agricultural land every year. There are roughly 8.774 million hectares of cultivable land available, out of which 88 percent is cultivated. So, there is a limited scope to expand the cultivated area. So this increasing population requires more food as a result dependence over agricultural sector is increasing day by day. Agriculture is the single largest producing sector of the economy and it contributes about 13.02 percent to the total Gross Domestic Product (GDP) of the country. This sector accommodates around 43.3 percent labor force (BBS, 2020). GDP growth rate of Bangladesh mainly depends on the performance of the agricultural sector.When it comes to the adoption of a new technology, farmers are faced with choices and trade-offs. Differences in adoption decisions are often due to the fact that farmers have different cultures, different resource endowments, different objectives, different preferences, and different socio-economic backgrounds.

It follows that some farmers adopt the new technology while others do not. Rogers (2003) defined the rate of adoption as “the relative speed with which an innovation is adopted by members of a social system”. In such a context, farmer’s decisions regarding the adoption of innovation can be explained using the theory of the maximization of expected utility. Following this theory, a farmer will adopt a given new technology if the expected utility obtained from the technology exceeds that of the old one.

Farmers do adopt a mix of technologies to deal with a multitude of agricultural production constraints. This implies that the adoption decision is inherently multivariate, and attempting univariate modeling would exclude useful economic information about interdependent and simultaneous adoption decisions. When farmers face multiple innovations, they consider the way these different technologies interact

and take these interdependencies into account in their adoption decisions. Ignoring these interdependencies can lead to inconsistent policy recommendations. Adoption of CSA technologies has become a major consideration to most farmers in Barishaldistrict. Adoption in this respect is defined as a process of implementing CSA techniques after being aware of the presence of the technologies.The favorable attitude of a person regarding about a strategy determines the success of a strategy. Therefore, the researcher becomes interested and undertakes the investigation entitled, "Farmers' Attitude towards Climate Smart Agriculture".

1.2 Statement of the Problem

CSA is crucial to achieving future food security and climate change goals.If farmers have unfavorable attitude towards climate smart agriculture like farmers who faced socio-cultural challenges in their farming activities have low chance of engaging in CSA. It causes decreasing resource efficiency which is essential both to increase and ensure food security on the long term and to contribute to mitigate climate change.Averring the existence of modern sophisticated technologies for the estimation of weather events to be limited or difficult to access, farmers depend on their personal experience through indigenous knowledge to predict weather events (Ogutu et al., 2014; FAO, 2010).The application of the concept still lacks clear understanding among most smallholder farmers and some organizations, especially regarding the payment of benefits or compensation for the occurrence of a predetermined risk (Fonta et al., 2015).In this era of climate change, weather events determine farmers' ability to cultivate and achieve the desired yields (Long et al., 2016). So farmers face various challenges and problems to overcome climate change risks.

Practicing of improved technologies for agricultural production is increasing in Bangladesh day by day. Climate-smart agriculture (CSA) is used as a mitigation and adaptation option to reduce the negative impacts of climate change and improve agricultural productivity. To achieve the desired objectives, CSA requires a complete package of practices that increase productivity and income, build resilience and reduce green gas emission. However, adoption is largely dependent on farmers' understanding, preferences and their capacity and willingness to practice.

In this context the present study has been undertaken to face following questions:

- What is the attitude of the farmers about climate smart agriculture?
- What are the selected characteristics of the farmers?
- Have any contribution of the farmers' selected characteristics on their attitude towardsclimate smart agriculture?

For getting clarification of the above questions the researcher selected the following objectives of the study.

1.3 Objectives of the Study

In view of the problem as stated above the following objectives were formulated for giving proper direction to the study:

i. To determine farmers' attitude towards climate smart agriculture;

ii. To describe the following selected characteristics of the farmers:

- Age
- Educational qualification
- Family size
- Farm size
- Annual family income
- Training exposure on climate change
- Farming experience
- Extension media contact
- Time spent in farming
- Organizational participation and
- Credit access ;

iii. To explore the contributing relationship between farmers 'attitude towards climate smart agriculture and selected characteristics of the farmers.

1.4 Scope of the study

Bangladesh is a global hot spot for climate change. The agricultural sector in Bangladesh has grown steadily in recent years, driven by an increase in productivity and efficiency achieved through investments in improved technology and

mechanization supported by conducive public policies which are known as climate smart strategies.

CSA initiatives sustainably increase productivity, enhance resilience, and reduce/remove greenhouse gases (GHGs), and require planning to address tradeoffs and synergies between these three pillars: productivity, adaptation, and mitigation. The lack of accessible and reliable climate information among farmers represents a considerable challenge to the scaling out of CSA practices. Strengthening climate information services and making them easily accessible to farmers would greatly improve their capacity to adapt farming practices. The main focus of the study is to determinants of the attitude of the farmers towards climate smart agriculture. The findings of the study will be specifically applicable to Barishal district.The findings of the study were expected to be helpful to the academicians and researchers. The findings might be supplementing to the field workers of different nation building departments and organizations to develop appropriate extension strategies for effective working with the rural people.

1.5 Justification of the Study

Agriculture is the dominant sector for the economic growth of Bangladesh. The agricultural system especially the coastal agriculture is heavily dependent on climatic factors such as the timing, intensity and distribution of the monsoon, natural hazards, soil salinity, the availability of freshwater for irrigation and so on. To achieve food security and sustainable agricultural development goals, adaptation to climate change and lower emission intensities per output will be necessary. So Climate smart agriculture is getting popularity among the farmers of Bangladesh by the introduction of new hybrid varieties coupled with growing market demand as well as food have opened a tremendous potentiality of rice, wheat, maize, etc. The government is also supporting this growth. Needless to say that research is necessary to determine pattern of diffusion of climate smart agriculture in order to formulate long-term strategy on crop production. Farmers often lack knowledge about potential options for adapting their production systems and have limited assets and risk-taking capacity to access and use technologies and financial services.Furthermore, the results of the study will

be used to provide reference for better understanding of the importance of practicing CSA by farmers. This will further help to inform policy makers and program designers on climate change response of agricultural systems in the National Government as well. Considering the above facts the researcher deemed it a timely necessity to undertake the present study entitled "Farmers`Attitude towards Climate Smart Agriculture".

1.6 Assumptions of the Study

An assumption is the supposition that an apparent fact or principle is true in the light of available evidence (Goode and Hatt, 1952). The researcher had considered the following assumptions while undertaking the study:

- The respondents, included in the sample are capable of furnishing proper responses to the questions included in the interview schedule.
- Views and opinions furnished by the respondents were the representative views and opinions of the whole population of the study.
- The responses furnished by the respondents are reliable. The researcher is well adjusted to the social environment of the study area. So, the respondents give their opinions without any hesitation.
- Data for the study are bias free, valid and reliable
- All the data concerning the independent and dependent variables are normally and independently distributed with their respective means and standard deviation.
- Findings of the study are expected to be useful for improving coastal agriculture.

1.7 Limitations of the Study

Considering the time, respondents, communication facilities and other necessary resources available to the researcher and to make study meaningful, it became necessary to impose certain limitations as mentioned bellow:

i. It is difficult to get exact information on effect of climate change on agriculture indicator from the farmers.

ii. The study was confined mainly to determinants of the adoption of climate smart agriculture.
iii. Characteristics of the farmers were many and varied, but only eleven characteristics were selected for the research study.
iv. There were embarrassing situations at the time of data collection. So, the researcher had to manage proper rapport with the respondents to collect maximum proper information.
v. Several methods, scales and statistical tests have been utilized in this study over a relatively short period of time.

1.8Definition of Related Terms

Attitude: Attitude may he thought of as a person's perspective toward a specific target and way of predisposition to act, perceive, think and feel in relation to something. It is learned and formed from the environment and social system. It is expressed as one's views regarding an object as positive or negative, favorable or unfavorable, like or dislike etc. with varying degrees.

CSA: CSA options integrate traditional and innovative practices, technologies and services that are relevant for particular location to adopt climate change and variability (CIAT, 2014).

GHGs: Greenhouse gases are compound gases that trap heat or long wave radiation in the atmosphere. Their presence in the atmosphere makes the Earth’s surface warmer. Sunlight or shortwave radiation easily passes through these gases and the atmosphere. This radiation is absorbed by the surface of the earth and released as heat or long wave radiation. The accumulation of GHGs since the industrial revolution has accelerated this greenhouse effect, causing global warming and climate change.

Age: Age of a respondent was defined as the span of life and was operationally measured bythe number of years from his/her birth to the time of interviewing.

Education: Empirically it was defined to the development of desirable changes in knowledge, skill and attitudes in an individual through reading, writing, observation

and other selected activities. In this study it was measured on the basis of classes a farmer has passed from a formal educational institution.

Annual family income: The term annual family income referred to the total earning by the earning members of a farm family from agriculture, livestock, fisheries and other accessible sources (business, service, daily labor etc.) during a year. It was expressed in Thousand Bangladeshi Taka.

Training exposure: It was used to refer to the completion of an activity by the farmers which were offered by the government, semi-govt. or non-government organization (s) to improve the knowledge and skills of farmers for better performing an agricultural job. It was measured by the number of days of training received by the respondent.

Extension contact: It refers to an individual's (farmer) exposure to or contact with different communication media, source and personalities being used for dissemination of new technologies.

Credit access: Akudugu et al. (2009) emphasized that credit access is the situation where individuals have the rights to make decisions related to the allocation in the short term and repay according to schedule and interest rate committed. Credit access can be stated as the ability and the will of the person to get credit and also the ability to get and use financial services that can be used according to the need (Claeseens, 2006).

CHAPTER II

REVIEW OF LITERATURE

To find out the farmers' attitude towards climate smart agriculture and itscontributingrelationship with selected characteristics of the farmers were the main task of the study. This Chapter contains synthesis of selected literature those were related to the present study. The researcher made an elaborate search of available literature for this purpose. There was no literature directly related to the present study. Therefore, the present researcher searched relevant studies conducted by different scientist and authors on the attitude towards CSA. The finding of such studies related to the attitude towardsCSA and other partial studies have been reviewed and partially discussed in this Chapter. This Chapter is divided into three major sections:

Section1: The review of literature on attitude towards agricultural practices including Climate Smart Agriculture
Section 2: The contributing relationship between Farmers' characteristics and their attitude towardsagricultural practices including Climate Smart Agriculture and
Section 3: The conceptual framework of the study.

2.1 Review of Literature on Attitude towards Agricultural Practices including Climate Smart Agriculture

Attitude is predisposition to act in a certain way. By knowing attitude one may predict the behavior of the respondents.Attitude is the by-product of an individual's experience and have their bases in inner urges, acquired habits and environmental influences by which he is surrounded (Gnanamuthu, 2009)

Drever (1968) defined an attitude, which is more or less a stable set disposition of opinion interest, or purpose, involving expectancy of certain kind of experience and readiness with appropriate kind of response.

No direct research on farmers' attitude towards agricultural practices including Climate Smart Agriculture could be identified. However, findings of other researches related to farmers 'attitude have been described in the following:

Nurzzaman (2000) conducted a study on knowledge attitude and practice of FFS and non-FFS farmers in respect of IPM .He found that about half (48.3%) of the FFS farmers had highly favorable attitude compared to 40% had moderately favorable and only 11.67% had slightly favorable attitude while 56.67% of non-FFS farmers had slightly favorable attitude, 36.67% had medium favorable and only 6.67% had highly favorable attitude.

Paul (2001) carried out a research on attitude of farmers towards use of urea super granule (USG) in rice cultivation at AbhaynagarUpazilla under Jessore district. It revealed that the majority of the farmers (59.62%) had moderately favourable attitude while 25% had slightly favourable attitude and 15.38% had highly favourable attitude towards the use of USG.

Sarkar (2002) carried out a research on farmers' attitude towards organic homestead gardening program of World Vision at Kuptala, Ramnagar. Saihata and Bhelabari village under Sariakandiupazila of Bogra district, lie found that more than three-fifth (64%) of the World vision farmers were found to have moderately favorable attitude while 20% having slightly favorable attitude and only 16% farmers belonged to highly favorable attitude.

Ahaduzzaman (2003) conducted a research on farmers' attitude towards modern T. aman technologies at two villages of Haridevpur union under Sadar Thana of Rangpur district, lie found that about three-fifth (59 percent) of the respondents were found to have moderately favorable attitude while 14.6 percent having slightly favorable attitude and only 26 percent farmers belonged to highly favorable attitude.

Akanda (2001) found in his study that 66% of formers had moderately favorable attitude towards Rice-Fish program ofCARE. On the other hand, 22% of farmers had

slightly favorable attitude and 12% of them had highly favorable attitude towards Rice-Fish program of CARE.

Hossain (2002) also studied on the attitude of island farmers towards adoption of modern agricultural technologies at Musapur and Maitbhanga under Sandwipupazila of Chittagong district. His studied revealed that the highest portion (65%) of the farmers fell under the medium attitude category, while 30 percent showed high attitude and only 5 percent had low attitude towards modernagricultural technologies. Thus, an overwhelming majority of the farmers had medium to high attitude towards modern agricultural technologies.

Haque (2006) observed that two thirds of the farmers in organic farming group had highly favorable attitude towards organic farming, on the other hand, more than half (56%) of the conventional farmers had shown moderately favorable attitude towards organic farming.

2.2 Contributingrelationship between Farmers' characteristics and their attitude towards Agricultural Practices including CSA

Some studies showing contributing relationships between selected characteristics of the farmers and attitude of different aspects are cited here.

2.2.1 Age and farmers' attitude

Noor-E-Alam (2010) found in his study on farmers attitude towards modern jute cultivation that age had no significant relationship with attitude.

Bari (2001) conducted a research on attitude of farmers towards Hybrid Rice Alok 6201 in which he found no significant relationship between age of the farmers and their attitude towards Hybrid Rice Alok 6201.

Haque (2003) found that age of the farmers had no significant relationship with their attitude towards extension activities of Department of Agricultural Extension (DAE).

Mannnan (2001) found that age of the Proshika beneficiaries had positive relationship with their attitude towards organic farming. Singh (1982) also obtained similar findings.

Uddin (2004) conducted a study on attitude of sustainable agriculture. The findings presented that age of the respondents had negative significant relationship with their attitude of sustainable agriculture.

2.2.2 Educational Qualification and farmers' attitude

Paul (2001) carried out a research on attitude of farmers towards use of urea super granule (USG) in rice cultivation at AbhaynagarUpazilla under Jessore district. He also found that there was positive significant relationship between education of the farmers and their attitude towards use of USG in rice cultivation.

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

Parvez (2007) concluded from his study that there was positive significant relationship between education of the farmers and their attitude towards IPM for HYVs production

Islam (2007), Noor-E-Alam (2010) and Tarannum (2013) revealed that education of farmers' had no significant relationship with their attitude.

Singh (1982) observed that family education was positively related to their attitude towards agricultural technology and this relationship was statistically significant.

Nurzaman (2000) found in his study that education of the FFS and non-FFS farmers' were positively correlated with their attitude towards 1PM.

2.2.3 Farm size and farmers' attitude

Nurzaman (2000) conducted a study and he found that farm size of the FFS and non-FFS farmers had no significant relationship with their attitude towards 1PM.

Hossain (2002) revealed that there was no relationship between attitude and farm size in his study on attitude on Island farmers towards adoption of modern agricultural technologies.

Bhuiyan (2008) revealed in his study that farm size of the farmers had negative significant relationship with their attitude towards farmers' information need assessment.

Bari (2001) observed in his study that farm size of farmers had no relationship with their attitude towards hybrid rice AALOK 6201.

2.2.4 Annual family income and farmers' attitude

Bari (2001) found in the study attitude of farmers towards Hybrid Rice Alok 6201 that there was negative relationship between annual family income and attitude.

Paul (2001) revealed in his study attitude of farmers towards use of Urea Super Granule (USG) in rice cultivation that there was positive significant relationship between annual family income and attitude.

Khatri-Chhetri and Agarwal (2019) found in their study that all CSA interventions were evaluated based on their contribution to increase farm productivity and income.

Hanif (2000) found in his study that there was a negative insignificant relationship between annual income of the respondents and their awareness on environmental pollution.

2.2.5 Training exposure on climate changeand farmers' attitude

Uddin (2004) from his study concluded that farmers‟ training exposureon climate change had a significant positive relationship with their attitude of sustainable agriculture.

Sarker-(2002) found in the study farmers' attitude towards organic homestead gardening programme of World Vision that there was negative relationship between training received and attitude.

Haque (2003) found that training received of the respondent had positive significant relationship with their practices in farmers' attitude of adoption of modern maize cultivation technologies.

Paul (2000) found that there was a positive significant relationship between agricultural training experience of the farmers and their attitude towards the use of urea super granule.

2.2.6 Farming experienceand farmers' attitude

Alam (1996) in his study observed that there was no relationship between the farming experience of the farmers and their attitude regarding homestead deforestation.

Sarkar (1997) found that farming experience of potato growers had no significant relationship with their attitude of adoption of improved potato cultivation practices.

Chowdhury (1996) conducted a study in Nowabgonj, Dhaka on the factor affecting attitude towards adoption behavior of Boro rice growers. He reported that farming experience significantly influenced farmers in accepting production technology.

2.2.7 Extension media contact and farmers' attitude

Rahman (1995) conducted a research on farmers' attitude towards improved practices on potato cultivation by the farmers of Kajipur upazilla under Sirajganj district. The

study concluded a significant relationship between extension contact and attitude towards improved practices on potato cultivation.

Vidvashankar (1997) reported that the media participation had positive relationship with the attitude towards seed production program of seed growers.

Paul (1989) stated that there was positively significant relationship between the extension contact of the farmers and their opinion on the effectiveness of result demonstration. This means that the more the extension contact of the farmers, the more was the effectiveness for result demonstration.

2.2.8 Family size and farmers' attitude

Mannan (2001) found that in his study there was no significant relationship between family size of Proshikha farmers and their attitude towards the Ecological Agriculture Programme.

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

Noor (1995) revealed that there was no significant relationship between family size and farmers' attitude towards the cultivation of HYV of potato.

Habib (2000) observed in his study that there was no significant relationship between family size of the SAAOs and their attitude towards the use of agro-chemicals.
Nurzaman (2000) revealed that family size of the FFS and non-FFS farmers had no relationship with their attitude to IPM.

2.2.9 Time spent in farming and farmers' attitude

Arifullah (2008) found in his research study that there is no relationship between time spent for farm work of the elite rural people and their attitude towards extension activities of DAE performed by Upazilla Agricultural Extension Personnel

Uttam Kumar Roy (2014) observed in his study thattime spent in vegetable field had significant positive relationship with the attitude of the farmers towards IPM practices in vegetable cultivation and the research findings showed that 44 percent of the respondents were low tomedium time spender in their vegetable field.

2.2.10 Organizational participation and farmers' attitude

Noor (1995) found that organizational participation of the farmers had positive significant relationship with their attitude towards the cultivation of high yielding varieties of potato.

Patel et al., (2007) reported that there was no relationship between organizational participation of the farmers and their attitude towards IPM strategy.

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

2.2.11 Credit access andfarmers' attitude

Karim et al., (1987) revealed that commercialization, income and credit availability of the farmers had positive relationship with their attitude towards the use of urea.

Ellis (2000) mentioned that financial capital refers to savings, loans and credits whilst social capital take account of social relations and networks such as co-operatives and farmer associations. These resources or assets from the bases and means for attaining household food security.

Bari (2001) found in the study attitude of farmers towards Hybrid Rice Alok 6201 that there was negative relationship between training received and attitude.

FAO (1994) reported that the direct consequence of small farmers' lack of access to land and membership in rural organizations is their lack of access to credit. Rather

than no findings were observed on this aspect to the researcher at the time of reviewing literature.

2.3 The Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. "a dependent variable" and "an independent variable". A dependent variable is that factor which appears, disappears or varies as the research introduces, removes or varies the independent variable (Townsend, 1953). An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon.Related literature, discussion with the experts and research fellows in the relevant field and available resources at hand helped the researcher in selecting 11 variables to assess the adoption of climate smart agriculture by the farmers. In view of prime findings of review of literature, the researcher constructed a self-explanatory conceptual model of the study which is presented in Figure 2.

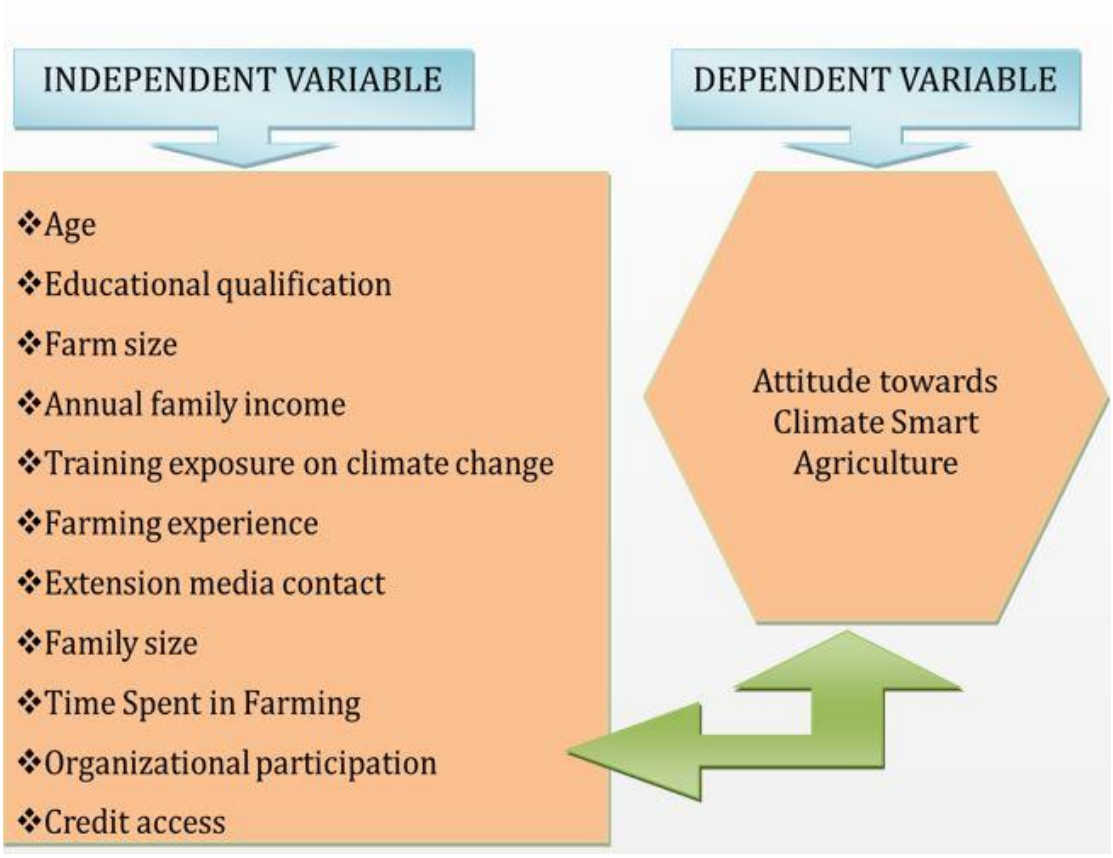

Fig 2.1: The Conceptual Framework of the Study

CHAPTER III

METHODOLOGY

Methodology should be a very careful consideration in conducting scientific research. It may be understood as a science of studying how research is done (Kothari, 1990).Importance of methodology in conducting any research cannot be undermined. Methodology enables the researcher to collect valid and reliable information and to analyze them properly to arrive at correct decisions. Mingers (2001) stated that research method is a structured set of guidelines or activities to generate valid and reliable research results. Keeping this point in view, the researcher took utmost care for using proper methods in all the aspects of this piece of research work. A sequential description of the methodologies followed in conducting this research work has been presented in this chapter.

3.1 The Locale of the Study

The study was conducted at Babuganj upazila of Barishal district. Out of 6 unions, two villages of one union was purposively selected. This was because of easy communication as well as easy contact with the farmers who practice CSA practices and technologies are used comparatively more in this area than other area. The village was Rakudia and Baherchor of Dehergati union. A map of Babuganj upazilla showing the study area presented below in figure 3.1 and figure 3.2.

3.2 Population and Sampling

Two villages were selected from one union. List of these villages were arranged and population of farmers in the study area was about 731. About 15 percent of the population was selected proportionally from the selected villages as the sample by following random sampling method. Thus, the total sample size stood at 110. Moreover, a reserved list of 11 farmers was prepared for use when the farmers under sample were not available during data collection. The distribution of the selected farmers with reserve (10%) list of the selected villages. The distribution of the

populations and the samples as well as a reserve list of the farmers is shown in Table 3.1.

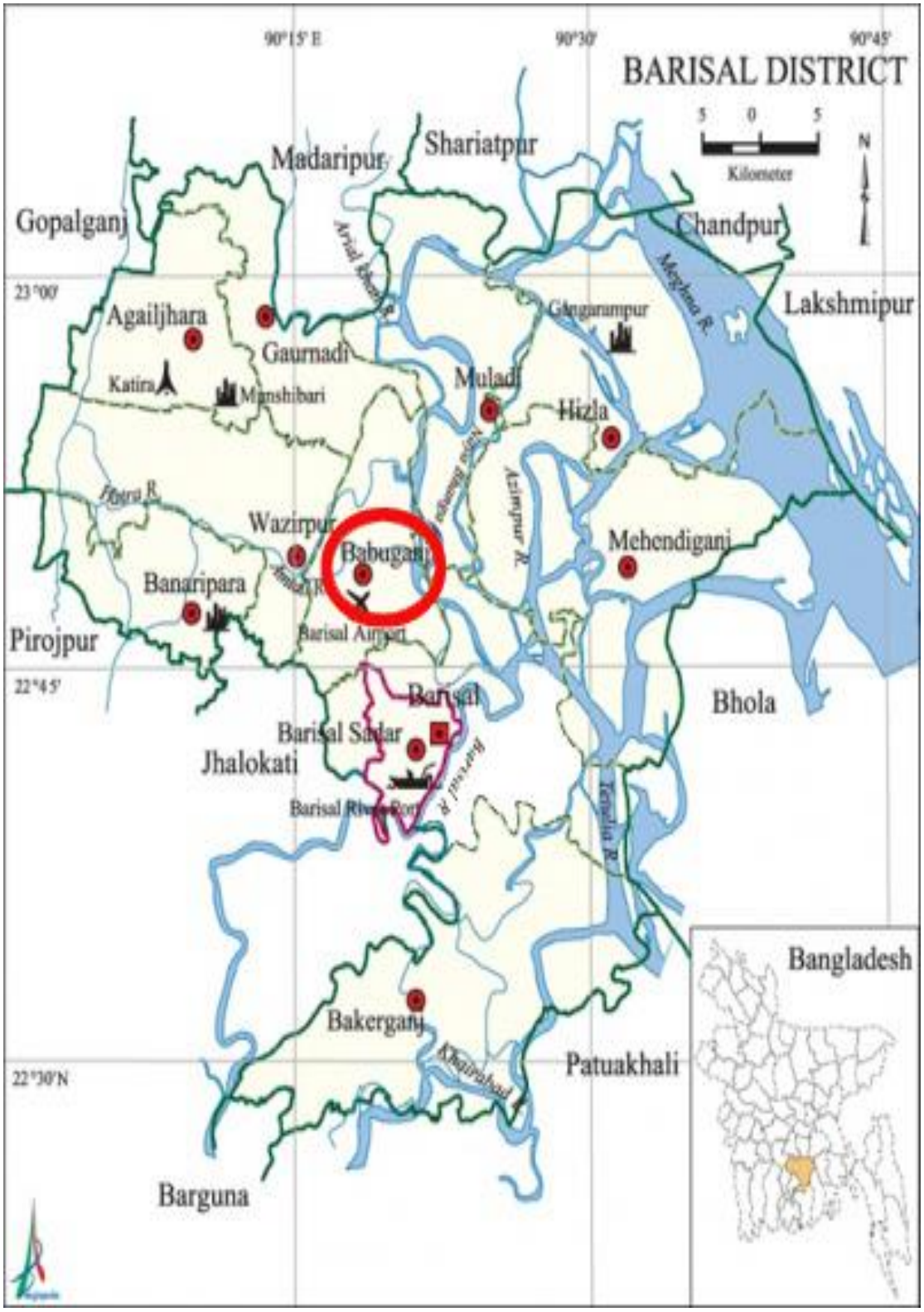

Figure 3.1 A map of Barishal district showing BabuganjUpazila

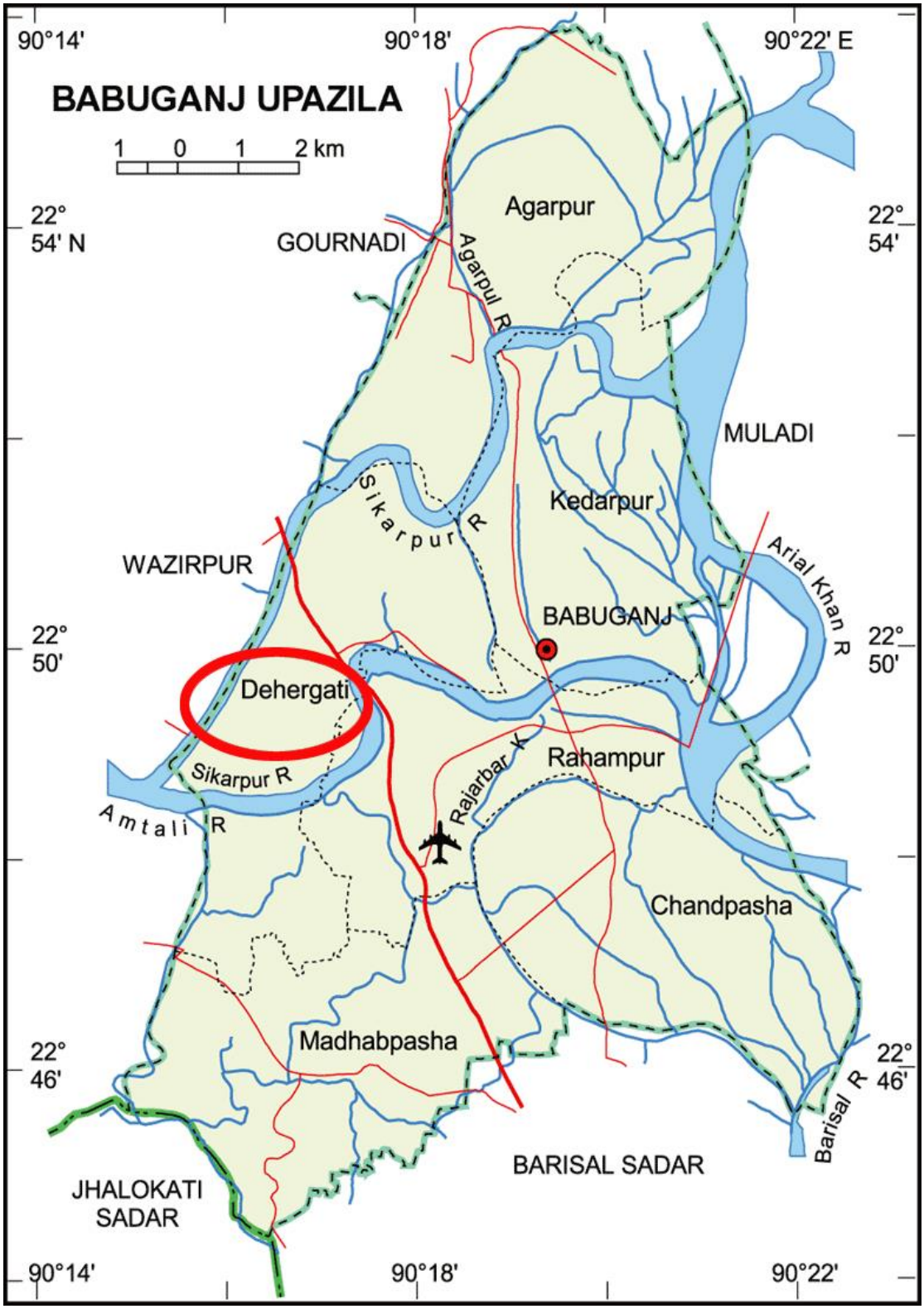

Figure 3.2 A Map of Babuganjupazila showing the study area

Table 3.1: Population and sample of farmers of Dehergati Union under Babuganj Upazila

Union	Village	Population of farmers	No. of farmers included in sample (15%)	No. of farmers included in reserve list (10%)
Dehergati	Rakudia	421	63	6
	Baherchor	310	47	5
Total		731	110	11

3.3 The Data Instrument

A well-structured interview schedule was developed based on the objectives of the study for collecting information with containing direct and simple questions in open form and close form keeping in view the dependent and independent variables. Appropriate scales were developed to measure both independent and dependent variables. The questionnaire had been pre-tested with ten farmers in actual situation before it was finalized for collecting data. Necessary corrections, additions, alternations, rearrangements and adjustments were made in the interview schedule based on pretest experience. The questionnaire was then multiplied by printing in its final form. A copy of the interview schedule is presented in Appendix I.

3.4 Collection of Data

Before data collection, the researcher met the Agriculture Extension Officer (AEO) and one of the Sub-Assistant Agriculture Officer (SAAO) of that block for necessary help and cooperation. Data were collected personally by the researcher herself through face to face interview. Interviews were usually conducted in respondents' house or field during their availability. While starting interview with any respondent, at first the researcher took all possible care to establish rapport so that he/she did not hesitate to furnish proper responses to the questions and statements included in the interview schedule. However, if any respondent felt difficulty in understanding any question, the researcher took utmost care to explain and clarify the question. Data were collected from 2 February to 28 March, 2020.

3.5 Selection of Variables

There are twelve variables in this study. Eleven of these are independent variables and one is dependent variable.

The independent variables are Age,educational qualification, Family size, farm size, Annual family income, Farming experience, Time spent in farming, Training exposureon climate change, Extension media contact, Organizational participation, Credit access and the dependent variable is “Attitude towards climate smart agriculture”.

3.6 Measurement of Variables

The variable is a characteristic, which can assume varying, or different values in successive individual cases. A research work usually contains at least two important variables, independent and dependent variables. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable (Townsend. 1953). In the scientific research, the selection and measurement of variable constitute a significant task.

3.6.1 Measurement of the independent variables

3.6.1.1 Age

Age of a respondent farmer was measured by the period of time from his/her birth to the time of interview and it was measured in terms of complete years on the basis of his/her response. A score of one (I) was assigned for each year of age.

3.6.1.2 Educational qualification

The educational qualification was measured on the basis of a farmers year of schooling in the educational institutions which was determined by his response to item No. 2 of the for example, if the respondent passed the final examination of class

"X", his/her educational score was given as 10. If the respondent did not know how to read and write, his/her education score was given as '0' (zero). A score of 0.5 was given to that respondent who could sign his/her name only. Interview schedule. A score of one (1) was given for each year of schooling completed.

3.6.1.3 Farm size

The farm size of a respondent measured as the total area of land on which his/her family carried out farming operations, the area being in terms of full benefit to his/her family. Data obtained from asking direct question. The farm size was measured in hectares by using the following formula:

Farm size = A + B + 1/2 (C+D) + E

Where, A = Homestead area including pond
B= Own land under own cultivation
C= Land given to others as borga
D= Land taken from others as borga
E= Land taken from others as lease

3.6.1.4 Annual family income

Annual family income of respondent was measured in Thousand Taka. It is the annual gross income of a respondent family from agricultural production, business, service and income from other family members during the last one year. A score of 1 was given for each Tk. 1,000 to compute the annual income scores of the respondents.
'The method of ascertaining income involved three phases; firstly, the yield of all crops in the preceding year was noted and converted into taka, secondly, income attained from domestic animal, poultry and fish resources. Thirdly. Nonagricultural sources of income included earning form service, business, day labor and other family members.

3.6.1.5 Training exposure on climate change

Training received on climate change and related with CSA was measured by the total number of days of training received by the respondent from any organization. A score

of one (1) was assigned for each day of training received. A zero (0) score was assigned for no training.

3.6.1.6 Farming experience

Farming experience of a respondent was determined on the basis of the length of time of a farmer spent directly in farming activities. The farming experience of a farmer was measured in terms of actual number of working experience of a farmer either his /her own land or others in terms of year**.**

3.6.1.7 Extension media contact

The extension media contact of a respondent was measured on the basis of the response of the media contact user farmers against the extent of his using of selected seven media by putting tick mark against any one of the four responses: regularly, occasionally, rarely, never. The responses were scored as 3, 2, 1 and 0 respectively. The use of extension media contact score of the respondents ranged from 0 to 30 where, 0 indicates no contact and 30 indicates high contact. Based on their extension media contact, the respondents were classified into three categories as low contact, medium contact, and high contact. This variable appears in item number 7 in the interview schedule as presented in Appendix-I.

3.6.1.8 Family size

The family size was measured by the total number of members in the family of a respondent. The family members included the respondent himself, his wife, sons and daughter and other dependents. The information was obtained by a respondent's response to item No. 8 of the interview schedule (Appendix A). The total number of family members was considered as the family size score of a respondent.

3.6.1.9 Time spent in farming

Time spent in farming activities was measured based on how much time a respondent spent in field or farming activities. It was expressed in hours/week.

3.6.1.10 Organizational participation

Agricultural organizational participation of the respondent was measured on the basis of the nature of his/her participation in selected seven organizations. Nature of participation score was computed in the following manner for each organization

Participation nature	Score
Not involved	0
Participation as ordinary member	1
Participation as executive member	2
Participation as president/secretary	3

Thus, the organizational participation scores of a respondent could range from 0 to 21, where „0" indicated no agricultural organizational participation and 21 indicated very high agricultural organizational participation.

3.6.1.11 Credit access

Credit access of a respondent was measured in terms of the amount of money received from different sources by him as loan. It was expressed by thousand taka only. This variable appears in question no.11 of the interview schedule as presented in Appendix-A.. During interview each respondent was asked to indicate whether he taken any credit for agricultural purpose during last year or not. A score of 1 was assigned for Tk. 1000.

3.6.2 Measurement of dependent variable

Farmers' attitude towards CSA was the dependent variable of this study. The procedure for measuring the dependent variable was as follows:

In this study, farmers' attitude towards CSA was measured on the basis of some attitude related issues or statements. Twelve statements were taken under consideration through literature review and pilot survey. In response to each statement, score 4, 3, 2, 1 and 0 was given for strongly agree, agree, no opinion, disagree and strongly disagree, respectively (AfruzZahan, 2008:Rajib Roy Shing, 2018). Each respondent was asked to indicate his extent of agreement or disagreement against each of the statements along a 5 point scale. Thus the attitude score varied

from 0 to 48 where 0 indicates very unfavorable attitude towards CSA and 48 indicates highly favorable attitude towards CSA practices.

3.7 Categorization

For describing the various independent and dependent variables, the respondents were classified into several categories in respect of each variable. These categories were developed by considering the nature of distribution of data and general understanding prevailing in the social system. The procedure for categorization of data in respect of different variables was elaborately discussed while describing those variables in Chapter 4.

3.8 Compilation of data

After completion of field survey all the interview schedule were compiled, tabulated and analyzed according to the objectives of the study. In this process all the responses in the interview schedule were given numerical coded values. The responses to the question in the interview schedule were transferred to a master sheet to facilitate tabulation. Tabulation was done on the basis of categories developed by the investigator himself.

3.9 Data Analysis

The data after collection were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures such as range, mean, percentage, standard deviation were used in categorizing and describing the dependent and the independent variables. SPSS computer program was used for analyzing the data. The categories and tables were used in describing data. The categories and tables were also used in presenting data for better understanding. For clarity of understanding, tables were used for presentation of data. Linear Regression was used to explore the contributing relationship between the independent variables and the dependent variables. Throughout the study at one percent and five percent (0.05) level of probability was used to reject any null hypothesis.

3.10. Research hypothesis

Based on review of literature and development of conceptual framework, the following research hypothesis was formulated:

“Each of the eleven selected characteristics (age, educational qualification, annual family income, farm size,training exposure on climate change, farming experience, extension media contact, family size, time spent in farming, organizational participation and credit access)of the farmers has significant relationship with their attitude towards climate smart agriculture.”

3.10.1. Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was formulated to explore the contributing relationship of the selected characteristics with theirattitude towards climate smart agriculture. Hence, in order to conduct tests, the earlier research hypothesis was enlivened into null form as follows:

"There is no relationship of the selected characteristics (age, educational qualification, annual family income, farm size, training exposure on climate change, farming experience, extension media contact, family size, time spent in farming, organizational participation and credit access) of the farmers with theirattitude towards climate smart agriculture.

CHAPTER IV

RESULTS AND DISCUSSION

The recorded observations in accordance with the objective of the study were presented and probable discussion was made of the findings with probable justifiable and relevant interpretation under this chapter. Procedures of using these data for the measurement needed some discussion for clear understanding. Necessary explanation has also been made showing possible and logical basis of the findings whenever necessary.

The chapter content in three (3) sections. In first section the chapter deals with the selected characteristics of the farmers. Second sectiondeals with the farmers 'attitude towards climate smart agriculture and third section deals with the contribution between individual characteristics of the farmers and their attitude towards climate smart agriculture.

4.1 Characteristics of the farmers

Salientfeatures of 11 selected characteristics the farmers such as age, level of education, farm size, annual family income, organizational participation, farming experience, training exposureon climate change, extension media contact, family size, time spent in farming, credit access that might influence the farmers attitude towards CSA are presented in table 4.1. Moreover, for ready reference, separate tables are provided while presenting categorizations, discussing and /or interpreting results concerning each of the characteristics in this chapter.

Table 4.1The salient features of the selected characteristics of the farmers

Categories	Measuring Unit	Range		Mean	SD
		Possible	Observed		
Age	Actual year	-	29-70	50.34	9.632
Educational qualification	Year of schooling	-	0.5-12	6.973	2.577
Farm Size	Hectare	-	0.12-1.40	0.426	0.26
Annual Family income	'000' taka	-	46-223	89.75	36.727
Training exposure on climate change	No. of days	-	0-9	1.61	2.168
Farming experience	Years of farming	-	7-47	22.96	9.514
Extension media contact	Score	0-30	11-22	15.21	2.630
Family Size	No. of members	-	2-11	5.66	1.878
Time spent in farming	Hours/week	-	2-10	6.82	1.671
Organizational participation	Score	0-21	0-10	2.54	2.084
Credit access	'000' taka	-	0-100	9.91	19.096

4.1.1 Age

The age of the respondents' farmers ranged from 29 to 70 with a mean and standard deviation of 50.34 and 9.632 respectively. Farmers were classified into three categories namely 'young', 'middle' and 'old' aged based on their observed age. The distribution of the respondents in accordance with their age under the present study "farmers' attitude towards CSA" are presented in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Respondents		Mean	Standard Deviation
	Number	Percent		
Young aged (< 35 years)	9	8.18	50.34	9.632
Middle aged (35-55 years)	61	55.45		
Old aged (above 55 years)	40	36.37		
Total	110	100		

Table 4.2 indicates that the middle aged farmers comprise the highest proportion (55.45%) followed by the old aged category (36.37%) and the lowest proportion is made by young aged category (8.18%). Data also indicates that a total 91.82 percent respondent belongs to the group of old and middle aged group. The young and middle aged farmers were generally tended to involve in different new innovations than the younger. Probably middle and old aged persons were more dynamic and basically they were more involved in searching new innovations and also used to gather knowledge on different issues and practices those innovations within their daily activities for their socio-economic development.

4.1.2Educational qualification

The educational qualification scores of the respondent farmers' under the present study "farmers' attitude towards Climate Smart Agriculture" ranged from 0.5 to 12 with a mean and standard deviation of 6.973 and 2.577 respectively. Based on the educational scores, the farmers were classified into four categories such as 'can sign only' (0.5), 'primary education' (1 to 5), 'secondary education' (6 to 10) and above Secondary level (>10). The distributions of the farmers according to their educational qualification are presented in Table 4.3.

Table 4.3 Distribution of the farmers according to their educational qualification

Categories	Respondents		Mean	Standard deviation
	Number	Percent		
Can sign only (0.5)	4	3.63	6.973	2.577
Primary education (1 to 5)	44	40		
Secondary education (6 to 10)	49	44.55		
Above Secondary level (> Cass 10)	13	11.82		
Total	110	100		

Table 4.3 shows that farmers under 'secondary education category constitute the highest proportion (44.55%) compared to 40% percent primary level category, 11.82% above Secondary level and 3.63 percent can sign only category.

Education broadens the horizon of outlook of farmers and expands their capability to analyze any situation related to different innovations. It was found that appreciable proportions (84.55 percent) of the farmers were primary to secondary level educated. The people of the locality have more interest in education which is reflected in their literacy level because it is higher than the national literacy rate.

4.1.3 Farm size

The farm size of the respondent farmers' family ranged from 0.12 hectare to 1.40 hectare with a mean and standard deviation of 0.426 and 0.26, respectively. Based on their farm size, the respondents were classified into three categories following the categorization of DAE (1995). These categories were marginal farm holder (Up to 0.020 - 0.20 ha), Small farm holder (0.21 ha – 1.0 ha) and Medium farm holder (above 1.0 ha). The distributionof the farmers according to their farm size categories has been presented inTable 4.4.

Table 4.4 Distribution of the farmers according to their farm size

Categories	Respondents		Mean	Standard Deviation
	Number	Percent		
Marginal farm holder (Up to 0.020 - 0.20 ha)	21	19.09	.426	.26
Small farm holder (0.21 ha – 1.0 ha)	84	76.36		
Medium farm holder (above 1.0 ha)	5	4.55		
Total	110	100		

Table 4.4 indicates that the small farm holder constitute the highest proportion 76.36 percent followed by 19.09 percent as marginal farm holder and 4.55 percent as medium farm holder. The findings of the study revealed that majority of the farmers were small sized farm holder.

4.1.4 Annual family income

Annual family income scores of the respondents ranged from 46 to 223 with the average of 89.75 and the standard deviation was 36.727. From the observed range, on the basis of the annual family income, the respondents were classified into three categories namely “low income”, “medium income” and “high income” as shown on Table 4.5.

Table 4.5 Distribution of the farmers according to their annual family income

Categories(‘000’ Taka)	Respondents		Mean	Standard Deviation
	Number	Percent		
Low income (up to 60)	21	19.1	89.75	36.727
Medium income (60-90)	48	43.6		
High income (above 90)	41	37.3		
Total	110	100		

The data included in table 4.5 indicate that the majority (43.6 percent) of the farmers had medium income compared to 37.3 percent had high family income and19.1

percent had low family income. Income of an individual allows him to involve in adoption of new technologies.

4.1.5 Training exposureon climate change

Training exposure on climate changevarious agricultural knowledge like modern cultivation or on climate ranged from 0 to 7with a mean of 1.61, standard deviation of 2.168. Based on the training received scores, the farmers were categorized into three categories according to Amin, 2011 such as- “no training received” (0), “low training received” (1-2) and “high training received” (>2). The distribution of the farmers according to their training experience is presented in Table 4.6.

Table 4.6 Distribution of the farmers according to their training exposureon climate change

Categories (No. of days)	Respondents		Mean	Standard deviation
	Number	Percent		
No training received(0)	63	57.28	1.61	2.168
Low training received (1-2)	18	16.36		
High training received (>2)	29	26.36		
Total	110	100		

Data in the table 4.6 reveals that 57.28 percent of the respondents had no training compared to 26.36 percent who receive high training while the rest 16.36 percent of them received low training exposureon climate change. Training increases knowledge and skills of the farmers in a specific subject matter area. Individuals who gain high training experiences are likely to be more competent in performing in different improved farm activities. But the fact that overwhelming majority of the farmers did not receive any training, this may be due to inadequate applied training facilities, unwillingness of the farmers.

4.1.6 Farming experience

The farming experience score of the farmers ranged from 7 to 47 with a mean of 22.96 and standard deviation of 9.514. Based on the farming experience scores, the

farmers were classified into three categories: “low experience” (up to14 years), “medium experience” (15-30 years) and “high experience” (above 30 years). The distribution of the farmers according to their farming experience is presented in Table 4.7.

Table 4.7 Distribution of the farmers according to their farming experience

Categories (year)	**Respondents**		**Mean**	**Standard Deviation**
	Number	**Percent**		
Low experience(up to 14 years)	21	19.09	22.96	9.514
Medium experience (15-30 years)	59	53.64		
High experience (above 30 years)	30	27.27		
Total	110	100		

About 53.64 percent of the farmers had medium experience on farming activities while the rest 27.27 and 19.09 percent of them had high and low experience on farming. Data shown in Table 4.7 indicates that 80.91 percent of the respondents had medium to high experience on farming activities. High experienced farmers easily can realize the convenient aspects of accepting CSA practices.

4.1.7 Extension Media contact

An extension contact score was computed for each respondent on his extent of contact with 7 selected media. Each respondent was asked to mention the frequency of his contact with each of the 10 selected media. Extension media contact scores of the farmers ranged from 11 to 22 with an average of 15.21and standard deviation of 2.630.

It was measured as one's extent of exposure with different information sources. On the basis of their extension media contact, the respondents were classified into three categories (Mean±SD) namely, low contact, medium contact and high contact. The scale used for computing the extension contact score of a respondent is given table 4.8.

Table 4.8 Distribution of the farmers according to theirextension media contact

Categories	Respondents		Mean	Standard deviation
	Number	Percent		
Low contact (Up to 13)	29	26.36	15.21	2.630
Medium contact (14-17)	57	51.82		
High contact (>17)	24	21.81		
Total	110	100		

Table 4.8 showed that majority proportion (51.82 percent) of the farmers had medium extension contact compared to 26.36 percent of them had low media contact and 21.81 percent of them had high media contact. So, majority (78.18 percent) of the farmer had low to medium extension contact. This may be due to socio-economic conditions of the farmers. It was found that low income farmers had low extension media contact in the study area. Their involvement in day labor, small vendors, reluctance to extension media contact, etc. may be some reasons behind small to medium extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies. So extension contact should be increased for agricultural development.

4.1.8 Family size

The family size of the farmers ranged from 2 to 11 with mean 5.66, the standard deviation was 1.878**.** According to family planning ministry, family size of the farmers were classified into three categories: Small family (up to 4), Medium family (5-7) and Large family (above 7) considering their no. of members.The distribution of the farmers according to their family size is shown in Table 4.9.

Table 4.9 Distribution of the farmers according to their family size

Categories	Respondents		Mean	Standard deviation
	Number	Percent		
Small family (up to 4)	30	27.27	5.66	1.878
Medium family (5-7)	59	53.64		
Large family (above 7)	21	19.09		
Total	110	100		

It was found that 27.27 percent of the farmers were small family, 53.64 percent were medium family and the rest 19.09 percent were large family. Here data revealed that most of the farmers in the study area were small to medium family.

4.1.9Time Spent in Farming

Time spent in farming activities varied from 2 to 10 hrs/week with an average of6.82 hrs/week and standard deviation of 1.671. Based on their time spent in farming activities, the farmers were classified into three categories as shown in Table 4.10.

Table 4.10 Distribution of the farmers according to theirtime Spent in farming

Categories	**Respondents**		**Mean**	**Standard deviation**
	Number	**Percent**		
Short time spent (<5hrs/week)	10	9.1	6.82	1.671
Moderate time spent (5-7hrs/week)	49	44.6		
Long time spent (>7hrs/week)	51	46.3		
Total	**110**	**100**		

Data in Table 4.10indicate that majority (46.3%) of the respondents spent long time infarming activities. More than 44.6 percent spent moderate time and only 9.1 percent spent short time in farming activities. The findings of the study reveal that 90.9 percent of the farmers spent moderate to long time in farming.

4.1.10 Organizational participation

Organizational participation score of the respondent farmers ranged from 0 to 10 with a mean and standard deviation of 2.54 and 2.084, respectively. According to organizational participation the respondents were classified into three categories viz. 'No participation, 'low level participation and high level participation. On the basis of their observed scores the distribution has been presented in Table 4.11.

Table 4.11 Distribution of the farmers according to theirOrganizational participation

Categories	Respondents		Mean	Standard deviation
	Number	Percent		
No participation (0)	27	24.5	2.54	2.084
Low level participation (1-4)	66	60		
high level participation (>4)	17	15.5		
Total	110	100		

Family Data in Table 4.11 indicates that the low level organizational participation constitutes the highest proportion (60 percent) followed by no participation (24.5 percent) and high level participation (15.5 percent)). Results revealed that the maximum percentage of respondents was in the category of low level organizational participation. However it is expected that more organizational participation could create opportunity for changing attitude towards climate smart agriculture.

4.1.11 Credit access

The observed credit access scores of the farmers engaged in farming activities ranged from 0 to 100 thousand taka. The mean and standard deviation were 9.19 and 3.96 respectively. According to this score, the farmers were classified into three categories is presented in Table 4.12

Table 4.12Distribution of the farmers according to theircredit access

Categories	Respondents		Mean	Standard deviation
	Number	Percent		
No credit(0)	80	72.72	9.19	19.096
Medium credit (10-30)	15	13.64		
High credit (>30)	15	13.64		
Total	110	100		

Data presented in table 4.12 showed that majority proportion (72.72 percent) of the farmers had no credit available compared to 13.64 percent of them had medium credit

access, 13.64 percent had high credit access. It may be concluded that financial institutions provided credit on agricultural activities thus could be helped the farmers to change their attitude and practice towards CSA.

4.2 Attitude towards Climate Smart Agriculture

Score of attitude towards climate smart agriculture of farmers ranged from 22-38 against the possible range of 0 to 48 with the mean and standard deviation of 29.46 and 3.76, respectively. Attitude towards CSA of farmers was measured 12 statements towards CSA. Attitude scores of a respondent was determined by adding the score obtained from all the statements. Based on score of attitude towards CSAof the respondents were classified into two categories as shown in Table 4.13.

Table 4.13 Distribution of the farmers according to their attitude towards climate smart agriculture

Categories	**Respondents**		**Mean**	**Standard deviation**
	Number	**Percent**		
Unfavorable (<24)	21	19.1	29.46	3.76
Favorable (> 24)	89	80.9		
Total	**110**	**100**		

Among the respondents, the highest proportion (80.9 percent) of the farmers belong to the group of favorable attitude towards CSA practices followed by 19.1 percent in unfavorable attitude group.However, still 19.1% farmers possess unfavorable attitude towards climate smart agriculture which need to change or improve their attitude through taking various steps.

4.3 The Contribution of the selected characteristics of the respondents to their Attitude towards CSA

In order to estimate the farmers' attitude towards climate smart agriculture, the multiple regression analysis was used which is shown in the Table 4.14

Table 4.14Multiple regression co-efficient of the contributing variables related to the farmers' attitude climate smart agriculture

Dependent Variable	Independent variable	β	P	R^2	Adj. R^2	F
Farmers' Attitude towards climate smart agriculture	Age	.396	.001**	.667	.630	17.840
	Educational qualification	.146	.044*			
	Farm Size	.296	.002**			
	Annual family income	.018	.768			
	Family size	.033	.589			
	Training exposure on climate change	.000	.996			
	Farming experience	.094	.141			
	Time spent in farming	.027	.663			
	Extension media contact	.025	.701			
	Organizational participation	.087	.163			
	Credit access	.155	0.048*			

- ** Significant at ρ <0.01;
- *Significant at ρ <0.05

Table 4.14 shows that age, educational qualification, farm size and credit access were the main contributory factors for the attitude towards CSA of the respondents. Among these age and farm size were the most important contributing factors (significant at the 1% level of significant), educational qualification and credit access were also (significant at 5% level of significant) while coefficients of other selected variables don't have any contribution on farmers attitude towards climate smart agriculture.

The value of R^2 is a measure of how of the variability in the dependent variable is considered by the independent variables. So, the value of R^2= 0.667 means that independent variables accounts for 67% of the variation in farmers' attitude towards climate smart agriculture. The F ratio is 17.840 which is highly significant (p<0).

However, each predictor may explain some of the variance in respondents' attitude towards climate smart agriculture simply by chance. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but values 0.630 is still show that variance is farmers'attitude towards climate smart agriculture can be attributed to the predictor variables rather than by chanced the suitable model (Table 4.14). In summary, the models suggest that the respective authority should be considers the farmers' age,educational qualification, farm size, credit access and farmers' attitude towards climate smart agriculture and in this connection some predictive importance has been discussed below:

4.3.1 Significant contribution of age to the farmers' attitude towards climate smart agriculture

From the multiple regression, it was concluded that the contribution of age to the farmers' attitude towards climate smart agriculture was measured by the testing the following null hypothesis;

"There is no contributing relationship between age and the farmers' attitude towards climate smart agriculture".

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a) The contribution of age was significant at 1% level (ρ=0.001).
b) So, the null hypothesis could be rejected.
c) The β-value of age is (.396). So, it can be stated that as age increased by one unit, farmers' attitude towards climate smart agriculture increased by 0.396 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that farmers' age increased attitude towards climate smart agriculture. So, age has high significantly contributed to the farmers' attitude towards climate smart agriculture.

4.3.2 Significant contribution of farm size to the farmers' attitude towards climate smart agriculture

The contribution of farm size to farmers' attitude towards climate smart agriculture was measured by the testing the following null hypothesis;
"There is no contributing relationship between farm size and the farmers' attitude towards climate smart agriculture".

The following observations were made on the basis of the value of the concerned variable of the study under consideration:
a. The contribution of the farm size was at 1% significance level (ρ=0.00).
b. So, the null hypothesis could be rejected.
c. The β-value of level farm size was (0.296). So, it can be stated that as farm size increased by one unit, farmers' attitude towards climate smart agriculture increased by 0.296 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that farmers have more farm size increased the farmers' attitude towards climate smart agriculture. This implies that with the increase of farm size of the farmers will increase their attitude towards climate smart agriculture.

4.3.3 Significant contribution of educational qualification to the farmers' attitude towards climate smart agriculture

The contribution ofeducational qualificationto the farmers' attitude towards climate smart agriculture was measured by the testing the following null hypothesis;
"There is no contributing relationship between educational qualification and the farmers' attitude towards climate smart agriculture".

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of the educational qualification was at 5% significance level (ρ=.044).

b. So, the null hypothesis could be rejected.

c. The β-value of level educational qualification is (0.146). So, it can be stated that as educational qualification increased by one unit, farmers' attitude towards climate smart agriculture increased by 0.146 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that farmers' educational qualification increased the farmers attitude towards climate smart agriculture will increase. So, educational qualification has significantly contributed to the farmers' attitude towards climate smart agriculture.

4.3.4 Significant contribution of credit access to the farmers' attitude towards climate smart agriculture

From the multiple regression, it was concluded that the contribution of credit access to the farmers' attitude towards climate smart agriculture was measured by the testing the following null hypothesis;

"There is no contributing relationship between credit access and the farmers' attitude towards climate smart agriculture".

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of the credit access was significant at 5% level (ρ=0.048)

b. So, the null hypothesis could be rejected.

c. The β-value of credit access to was (0.155). So, it can be stated that as credit access to decreased by one unit, farmers'attitude towards climate smart agriculture decreased by 0.155 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that farmers had more credit access increased the farmers' attitude towards climate smart agriculture. So, credit access hashigh significantly contributed to the farmers' attitude towards climate smart agriculture.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study was conducted in Babuganj upazila under Barisal district. From Babuganj upazila Rakudia and Baherchor villages were purposively selected as the locale of the study area. The populations were randomly selected as the sample of the study by using random sampling method. Thus. 110 farmers constituted the sample of the study. A well-structured interview schedule was developed based on the objectives of the study for collecting information. The researcher herself collected data through personal contact. The independent variables were age, educational qualification, farm size, annual family income, training exposure on climate change, organizational participation, farming experience, extension media contact, family size, time spent in farming and credit access. Data collection was started in 2 February, 2020 and completed in 28 March, 2020. Various statistical measures such as frequency counts, percentage distribution, average, and standard deviation were used in describing data. Regression test was used to explore the contributing relationship between the concerned variables. The major findings of the study are summarized below:

5.1 Major findings

5.1.1 Characteristics of the farmers

Age

The age of the respondents' farmers ranged from 29 to 70 with a mean and standard deviation of 50.34 and 9.632 respectively. The middle aged farmers comprise the highest proportion (55.45%) followed by the old aged category (36.37%) and the lowest proportion is made by young aged category (8.18%).

Educational qualification

Farmers'educational qualificationranged from 0.5 to 12 with a mean and standard deviation of 6.973 and 2.577 respectively. Secondary education category constitutethe highest proportion (44.55%) compared to 40% percent primary level category, 11.82% above Secondary level and 3.63 percent can sign only category.

Farm size

The farm size ranged from 0.12 hectare to 1.40 hectare with a mean and standard deviation of 0.426 and 0.26, respectively. The small farm holder constitute the highest proportion 76.36 percent followed by 19.09 percent as marginal farm holder and 4.55 percent as medium farm holder.

Annual family income

Annual family income scores of the respondents ranged from 46 to 223 with the average of 89.75 and the standard deviation was 36.727. The majority (43.6 percent) of the farmers had medium income compared to 37.3 percent had high family income and 19.1 percent had low family income.

Training exposure on climate change

Training exposure on climate change ranged from 0 to 9 with a mean of 1.61, standard deviation of 2.168.

Majority 57.28 percent of the respondents had no training compared to 26.36 percent who receive high training while the rest 16.36 percent of them received low training exposure on climate change.

Extension Media contact

Extension media contact scores of the farmers ranged from 11 to 22 with an average of 15.21 and standard deviation of 2.630. Majority proportion (51.82 percent) of the farmers had medium extension contact compared to 26.36 percent of them had low media contact and 21.81 percent of them had high media contact.

Farming experience

Farming experience score of the farmers ranged from 7 to 47 with a mean of 22.96 and standard deviation of 9.514. Majority53.64 percent of the farmers had medium experience on farming activities followed by 27.27 and 19.09 percent of them had high and low experience.

Family size

The family size of the farmers ranged from 2 to 11 with mean 5.66, the standard deviation was 1.878. 27.27 percent of the farmers were small family, 53.64 percent were medium family and the rest 19.09 percent were large family.

Time Spent in farming

Time spent in farming activities varied from 2 to 10 hrs/week with an average of 6.82 hrs/week and standard deviation of 1.671. Majority (46.3%) of the respondents spent long time in farming activities followed by 44.6 percent spent moderate time and only 9.1 percent spent short time in farming activities.

Organizational participation

Organizational participation scores of the farmers ranged from 0 to 10.The average score being 2.54 with the standard deviation 2.084. The low level organizational participation constitutes the highest proportion (60 percent) followed by no participation (24.5 percent) and high level participation (15.5 percent).

Credit access

Credit access scores of the farmers engaged in farming activities ranged from 0 to 100 with the mean and standard deviation were 9.19 and 19.096 respectively. Majority proportion (72.72 percent) of the farmers had no credit available compared to 13.64 percent of them had medium credit access, 13.64 percent had high credit access.

5.1.2 Farmers' attitude towards climate smart agriculture

Attitude towards CSA of farmers was measured 12 statements towards CSA. Score of attitude towards climate smart agriculture of farmers ranged from 22-38 against the possible range of 0 to 48 with the mean and standard deviation of 29.46 and 3.76, respectively. Among the farmers, the highest proportion (80.9 percent) of the farmers belong to the group of favorable attitude towards CSA practices followed by 19.1 percent in unfavorable group.

5.1.3 Contribution of the selected characteristics of the farmers' attitude towards CSA

There is a significant contribution of age and farm size and both of these were the most important contributing factors (significant at the 1% level of significance). Educational qualification and credit access were also the important contributing factors (significant at the 5% level of significance).

5.2 Conclusions

The findings and relevant facts of research work prompted the researcher to draw following conclusions.

i. The findings revealed thatoverwhelming majority(80.9%) of the respondents had favorable attitude towards climate smart agriculture and the rest 19.1% farmers had unfavorable attitudeat the study area. Still there is a scope to improve farmers' attitude through more involving with organization, more education and increasing knowledge.
ii. Age had highest contribution to the farmers' attitude towards climate smart agriculture. It also showed that majority of the respondents were old aged farmers. The result concluded that higher the age more favorable attitude towards climate smart agriculture.
iii. Farm size had significant contribution to the farmers' attitude towards climate smart agriculture. The majority (76.36%) of the farmers were small farm holder. It is therefore concluded that large farm holders had favorable attitude towards climate smart agriculture.

iv. Educational qualification is the 3rd highest contribution to the farmers' attitude towards climate smart agriculture. The majority (44.55%) farmers were in secondary education category. It is therefore concluded that if the education level is increase, then the farmers will have favorable attitude towards climate smart agriculture.

v. Credit access is the 4th highest contributor to the farmers' attitude towards climate smart agriculture. The majority (72.72%) farmers had no credit available. It is therefore concluded that if the credit access is increased, the farmers will have favorable attitude towards climate smart agriculture.

5.3 Recommendations

5.3.1 Recommendation for policy implications

On the basis of the observation and conclusions drawn from the findings of the study following recommendation is made:

i. Age had the highest contribution to the farmers' attitude towards harmful effects of climate change on agriculture. Therefore, it was recommended that steps should be taken by the different government and non-government organizations like DAE and others to maximize individual involvement with young aged farmers.

ii. Higher the farm size more the favorable attitude towards the CSA. Therefore SAAO should contact more with the farmers who has smaller farm to motivate towards forming favorable attitude on CSA practices.

iii. Higher the educational qualification more the climate smart agriculture. SAAO and NGOs can take necessary steps to increase farmers' primary level of education through non-formal education (adult education) and regular farmers' training, workshop to broaden their knowledge of climate smart agricultural technology.

iv. Higher the Credit access more the favorable attitude towards CSA. Therefore policies should be taken to engage farmers with diversified credit access to practice CSA strategies. NGOs can play a vital role in this regard.

5.3.2 Recommendations for further research

1. The study was conducted on the farmers of selected area of Babuganj upazilla of Barishal district. Findings of this study need verification by similar research in other parts of the country.
2. Relationships of eleven characteristics of the farmers and their knowledge, attitude and practice have been investigated in this study. Further research should be conducted to explore the contributing relationships of other characteristics of the farmers with their knowledge, attitude and practice.
3. Educational qualification, farm size, age and credit access had significant and positive relationship with their attitude towards climate smart agriculture.So, further investigation may be undertaken to verify the result.

REFERENCE

IPCC. 2014. Climate change 2014: Synthesis report (Contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change). Geneva: Intergovernmental Panel on Climate Change.

Lobell, D. & Burke. 2012. Food security and adaptation to climate change: What we know? In D. Lobell & M. Burke (Eds.), Climate change and food security: Adapting agriculture to a warmer climate (pp. 133–154). Dordrecht: Springer.

Aggarwal, P.K., A.K. Singh, J.S. Samra, G. Singh, A.K. Gogoi, G.G.S.N. Rao and Y.S. Ramakrishna. 2009. Introduction. In: Aggarwal, P.K. (Ed.), Global Climate Change and Indian Agriculture.

Prasanna, V.2014. Impact of monsoon rainfall on the total food grain yield over India. J. Earth Syst. Sci. 123 (5), 1129–1145.

Brida, A.B.,T.Owiyo. 2013. Loss and damage from the double blow of flood and drought in Mozambique. International Journal of Global Warming 5 (4), 514–531.

Singh, G., D.Mishra, K.Singh and R. Parmar. 2013. Effect of rainwater harvesting on plant growth, soil water dynamics and herbaceous biomass during rehabilitation of degraded hills in Rajasthan, India. For. Ecol. Manag. 310, 612–622.

Gwambene, B. 2011. Climate Change and Variability Adaptation Strategies: Implication of adaptation strategies on land resources in Range District, Tanzania. LAP Lambert Academic Publishing, Saarbrucken Deutschland.

Coulibaly, Y. J., G. Kundhlande, N. Amosi, H.Kaur and J.Hansen. 2015. What climate services do farmers and pastoralists need in Tanzania? CCAFS

Working Paper no. 110. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

FAO.2010. Climate Smart Agriculture: Policies, Practices and Financing For Food Security, Adaptation and Mitigation.

Vermeulen, S.J., B.M.Campbell and J.S.I. Ingram. 2012. Climate change and food systems.Annu. Rev. Environ. Resour. 37, 195–222.

Lipper, L.,P. Thornton,B. M. Campbell,T. Baedeker, A.Braimoh, M. Bwalya and E. F. Torquebiau. 2014. Climate-smart agriculture for food security. Nature Climate Change, 4, 1068–1072. Doi: 10.1038/nclimate2437

Branca, G.,N. McCarthy, Lipper and M.C.Jolejole. 2011. Climate-smart agriculture: a synthesis of empirical evidence of food security and mitigation benefits from improved cropland management. Mitigation of Climate Change in Agriculture Series 3.

Altieri, M.A. and C.I. Nicholls. 2013. The adaptation andmitigation potential of traditional agriculture in a changing climate.

Callaway, J.M. 2004. Adaptation benefits and costs: are they important in the global policy picture and how can we estimate them? Glob. Environ. Chang. 14, 271–282.

Climate Change, Agriculture and Food Security (CCAFS). 2014. Which climate-smart agriculture technologies are farmers willing to put their money on? http://tinyurl.com/njsd9s9

Coulibaly, Y. J., G. Kundhlande, N. Amosi, A.Tall, H. Kaur and J.Hansen. 2015. What climate services do farmers and pastoralists need in Tanzania? CCAFS Working Paper no. 110. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

BBS. 2020. Household income and expenditure survey. Bangladesh Bureau of Statistics Ministry of Planning, Government of the People‟s Republic of Bangladesh, Dhaka.

UNDP.2020. BANGLADESH CLIMATE FISCAL FRAMEWORK.

Rogers. 2003. Diffusion of innovations. 5th Edition.New York:The Free Press

Aggarwal, P.K., Arun Khatri-Chhetri, P.K. Joshi and S. Vyas. 2017. Farmers' prioritization of climate-smart agriculture (CSA) technologies. Agricultural Systems 151 (184–191).

Ogutu, S. O., J. J.Okello, &D. J.Otieno. 2014. Impact of information and communication technology based market information services on smallholder farm input use and productivity: The case of Kenya. World Development, 64, 311-321.

Food and Agriculture Organisation. 2010. The state of food insecurity in the world 2010. Retrieved from www.fao.org/docrep

Fonta, W. M., B. I.Sanfo&B. Barry. 2015. Farmers' awareness, perception of climate hazards and their willingness to participate in crop insurance schemes in Southwestern Burkina Faso. Procedia Environmental Sciences, 29, 7-8.

Long, T. B., V. Blok &I.Coninx. 2016. Barriers to the adoption and diffusion of technological innovations for climate-smart agriculture in Europe: Evidence from the Netherlands, France, Switzerland and Italy. Journal of Cleaner Production, 112, 9-21.

Food and Agriculture Organisation. 2014. the state of food and agriculture (SOFA) 2014.

Goode, W. J. and P. K. hatt. (1952). Methods of Social Research. New York: McGraw Hill Book Company, Inc.

Akudugu, A., M. Egyir& B.A. Mensah. 2009. Women farmers's access to credit from rural banks in Ghana. Agricultural Finance Review, 69(3), 84-99.

Claeseens, S. 2006. Access to financial services: A review of the issues and public policy objectives. The world Bank Research Observer, 2(2), 207-240.

Gnanamuthu, J. Samuel and R. Krishnakumar. 2009. A Tool to Measure the B.ED Teachers Trainees' Attitude towards ICT. I-manager's Journal on School Educational Technology, Vol. 5

Drever, J. 1968. Dictionary of Psychology. Great Britain: English LanguageBook Society and Penguin Book Ltd.

Nurzaman, M. 2000. Knowledge, Attitude and Practices of FF5 and Non-FFSFarmers in Respect of 1PM. M.S. (Ag. Ext. Ed) Thesis, Department ofAgricultural Extension Education, Bangladesh Agricultural University,Mymensingh.

Paul, S. K. 2000. Attitude of Farmers towards the Use of urea Super Granule onRice Cultivation. M.S. (Ag. Ext. Ed.) Thesis, Department of AgriculturalExtension Education, Bangladesh Agricultural University, Mymensingh.

Sarker, M. A., A. Halim and Zulfikar Rahman. (2002). Farmers' Attitude towardsorganic Homestead gardening program of World Vision. Bangladesh J.Ext. Edit., 14(1&2): 4145.

Ahaduzzaman, S. M.,M. R. Islam and G. M. Faruk. 2003. Farmers'Attitude towards Modern T. Aman Technologies. J. Agrit Mu. And Tech.6(1&2): 17-20.

Akanda, M. M. H. 2001. Farmers' Attitude towards Rice Fish Program ofCARE in MuktagachaUpazilla of Mymensingh District. M.S. (Ag. Ext.Ed.) Thesis, Department of Agricultural Extension Education, BangladeshAgricultural University, Mymensingh.

Hossain, M. A., M. S. Islam and M. A. M. Miah. (2002). Attitude of Island Farmers' towards Adoption of Modem Agricultural Technologies. Bangladesh .1 Eu. Edit, 14(1&2): 47-5 I.

Haque, A. T. M. S. 2006. Comparison of Attitude towards Organic Fanning between Organic and Conventional Farmers. M.S. (Ag. Ext. Ed.) Thesis. Department of Agricultural Extension Education, Bangladesh AgriculturalUniversity, Mymensingh.

Neogi M. G. and Dr. William Erskine. 2017. Climate-Smart Agriculture in CoastalBangladesh Daily Sun.

FAO. 2013. Climate-Smart Agriculture Sourcebook. Module 17: Capacity development for climate-smart agriculture

Chandra Alvin, Karen E. McNamara & Paul Dargusch. 2018. Climate-smart agriculture: perspectives and framings, Climate Policy, vol. 18:4, page: 526-541, DOI: 10.1080/14693062.2017.1316968

Azad, M. J. 2013. Farmers' knowledge on postharvest practice of vegetable. M.S.Thesis, Department of Agricultural Extension and Information System, Sher-E-Bangla Agricultural University, Dhaka.

Aurangozeb, M.K. 2002. Adoption of Integrated Homestead Farming Technologies by the Rural Women in RDRS, M.S. (Ag. Ext. Ed.) Thesis. Bangladesh Agricultural University, Mymensingh.

FAO. 2018. Climate-Smart Agriculture Case studies Successful approaches from different regions.

Bari, M.A. 2000. Attitude of farmers towards hybrid rice Alok 6201. M.S. Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Bari, M.A., M.A. Kashem and M.J. Rahman. 2001. Attitude of farmers towardshybrid rice Alok 6201 in Noagoan district. Bangladesh Journal of Extension Education. Vol. 13(1&24):1-7.

Bhuiyan, M. H. 2012. Generation and diffusion of agricultural innovation. GurpukurResearch Institute, Dhaka, Bangladesh

Reddy, P.R., M.M. Reddy, and D.R. Reddy. 1987. "Impact of National Demonstration on Knowledge level Attitude and Adoption Behaviour of Farmers in Ranaga Reddy District of Andhra Pradesh state." Journal of Research APAU, 15 (1): 35-38

Mannan, M.A. 2001. Attitude of Proshika Farmers towards the Ecological Agricultural Programme in SaturiaUpazilaUnderManikganj District. M.S. (Ag. Ext. Ed.) thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Sarker, P. P. 1990. Farmers' attitude towards Organic Farming. M.S. (Ag. Ext.Ed.) Thesis. Department of Agricultural Extension Education, BangladeshAgricultural University, Mymensingh.

Vidyashanker, P.N. 1987. A Study of Different Characteristics of Seed Growers and Non-Seed Growers of Bangalore District. Thesis Abstract, 11(4): 256. Directorate of Publication, Haryana Agricultural University, Hissar, India.

Bhuiyan, M.R.K. 2008. Attitude of farmers towards organic cultivation of HYV ofRice. M.S. Thesis, Department of Agricultural Extension and InformationSystem, Sher-E-Bangla Agricultural University, Dhaka.

Rahman, M.H. 2003. Adoption of Year round Homestead Fruit Cultivation Practices in Selected Area of Meherpur District. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Rahman, M.M. 1999. Adoption of Balanced Fertilizer by the boro Rice Farmers of Ishwarganj Thana. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education. Bangladesh Agricultural University, Mymensingh, Bangladesh.

Rogers, E.M. 1995. Diffusion of innovations, 4th Edn. New York: The Free Press.

Tripathy, S. L. and L. R. Pande 1967. Comparative Effectiveness of theExtension Teaching Methods in a C. D. Block. Indian I Er:.Edu.16(l&2): 47-49.

Noor, M. S. 1995. Farmers' Attitude Towards The Cultivation of High Yielding Varieties of Potato. M.S. (Ag. Ext. Ed) Thesis, Department of Agricultural Extension Education, ISPA, Gazipur.

World Bank. 2017. Climate-Smart Agriculture in Bangladesh. CSA Country Profiles for Asia Series. International Center for Tropical Agriculture (CIAT); World Bank. Washington, D.C. 28 p.

Zahan Afruz. 2008.Attitude of Rural Women towards Livestock Rearing.M.S. Thesis, Department of Agricultural Extension and Information System, Sher-E-Bangla Agricultural University, Dhaka.

Shing Rajib Roy. 2018. Knowledge and Attitude of the Farmers towards Maize Cultivation in Selected Area of Gaibandha District. M.S. Thesis, Department of Agricultural Extension and Information System, Sher-E-Bangla Agricultural University, Dhaka.

Townsend, J.C. 1953. Introduction of Experiment Methods. International Student Edition, New York: McGraw Hill Book Company Inc.

APPENDIX-A

(English version of the interview schedule)

Department of Agricultural Extension and Information system

Sher-E-Bangla Agricultural University, Dhaka-1207

An interview schedule for a research study entitled -

FARMERS' ATTITUDE TOWARDS CLIMATE SMART AGRICULTURE.

Respondent No. ……

Name of the respondent:

Village: Upazila:

Union: District:

Mobile No.

(Please answer following questions. Your information will be kept confidential and will be used for research purpose only)

1. Age

What is your present age? ……. Years

2. Educational qualification

What is the level of your t?

a) Can't read and write: ……

b) Can sign only: ……..

c) I read up to class: …….

d) Others (specify) ……..……

3. Farm size

Please furnish information about your farm size:

Sl. No.	Land type	Area	
		Local unit (Decimal)	Hectare
1.	Homestead area including pond (A)		
2.	Own land under own cultivation (B)		
3.	Land given to others as borga (C)		
4.	Land taken from others as borga (D)		
5.	Land taken from others as lease (E)		
Total= A+B+1/2(C+D)+E			

4. Annual family income

Please state the income from following specific sources during the last year

Sl. No.	**Sources of income**	**Income (Tk.)**
A. Income from Agricultural Crop		
1.	Field crops	
2.	Rice	
3.	Maize	
4.	Pulse crop	
5.	Oil crop	
6.	Spice crop	
7.	Fruits	
8.	Vegetables	
B.Income from domestic animals and fish resources		
1.	Livestock	
2.	Fisheries	
3.	Poultry	
C. Income from off farm sources		
1.	Business	
2.	Services	

3.	Day labor	
F 4.	Others (if any)	
Total (A+B+C)		

5. Training exposure on climate change

Did you get any training on the last year? a) Yes b) No

If yes, then please give the following information:

Sl. No.	**Name of the training course**	**Concerned organization**	**Duration of training (Days)**
1.			
2.			
3.			
Total			

6. Farming experience

How long have you been practicing farming activities? ..... Years

7. Extension media contact

Please indicate the nature of your contact with the following communication media

Sl. No.	**Communication media**	**Extent of participation**			
		Regularly (3)	**occasionally(2)**	**Rarely (1)**	**Never (0)**
A) Personal Contact					
1	Meet with Agriculture Extension Officer (per year)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
2	Meet with SAAO (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )

3	Meet with ideal farmers (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
4	Meet with NGO or development worker (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
5	Meet with agricultural input dealer (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
B) Mass Media Contact					
1	Listening agricultural program on Radio	Daily ( )	Weekly ( )	Monthly ( )	No time/year ( )
2	Watching agricultural program on Television	Daily ( )	Weekly ( )	Monthly ( )	No time/year ( )
3	Reading agricultural Publications like newspaper, poster, leaflet etc.	Daily ( )	Weekly ( )	Monthly ( )	No time/year ( )
C) Group Contact					
1	Participation in farmers field day (per year)	3 ( )	2 ( )	1 ( )	0 ( )
2	Participation in Focused Group Discussion (FGD) program (per year)	3 ( )	2 ( )	1 ( )	0 ( )
Total (A+B+C)					

8. Family size

How many members do you have in your family? …….. Nos.

9. Time Spent in Farming

How many hours do you spent in farming? .....hours/week.

10. Organizational participation

Please mention the nature of your participation with the following organization. Tick in right place.

Sl. No.	Name of the Organizations	Nature of participation			
		Not involved (0)	Ordinary Member (1)	Executive Member (2)	President/ Secretary (3)
1	Farmers' co-operative association				
2	BRAC				
3	SDF				
4	PROSHIKHA				
5	IPM club				
6	FFS				
7	ASA				

11. Credit access

Did you get any credit on the last year?

a) Yes b) No

If yes, then how much? ……taka.

12. Attitude towards climate smart agriculture

Please mention your degree of agreement with the following statements

Sl. No.	Statements	Extent of agreement/disagreement				
		SA(4)	A(3)	NO(2)	D(1)	SD(0)
1.	CSA is built for strengthening resilience to climate change risk & variabity.					
2.	CSA helps to attain food security.					
3.	CSA practices helps to maintain optimum irrigation.					
4.	CSA practices influence to reduce labor price.					
5.	CSA promotes higher yield and household income.					
6.	CSA ensure sustainable agriculture.					
7.	CSA reduces crop production cost.					
8.	CSA helps to protect soil erosion.					
9.	CSA positively influence the quality of agricultural products.					
10.	Proper land use management and pest control management are improved due to CSA.					
11.	CSA provides a fresh opportunity to improve market facility.					
12.	CSA helps to minimize production cost of vegetables yield.					

N.B: SA= Strongly Agreed; A= Agreed; NO= No Opinion; D= Disagreed; SD= Strongly Disagreed

Thank you for your kind co-operation.

…….

Signature of the interviewer

Date: ……