

**PERCEPTION OF CITY GARDENER TOWARDS ROOFTOP
GARDENS FOR CLIMATE REGENERATION**

MD. MAHIBUL ALAM SABUJ



**DEPARTMENT OF
AGRICULTURAL EXTENSION AND INFORMATION SYSTEM
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA -1207**

JUNE, 2020

**PERCEPTION OF CITY GARDENER TOWARDS ROOFTOP
GARDENS FOR CLIMATE REGENERATION**

MD. MAHIBUL ALAM SABUJ



**DEPARTMENT OF
AGRICULTURAL EXTENSION AND INFORMATION SYSTEM
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA -1207**

JUNE, 2020

**PERCEPTION OF CITY GARDENER TOWARDS ROOFTOP
GARDENS FOR CLIMATE REGENERATION**

BY

**MD. MAHIBUL ALAM SABUJ
REGISTRATION NO. : 12-05073**

A Thesis

Submitted to the Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University, Dhaka

In partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE (MS)

IN

AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

SEMESTER: JANUARY- JUNE, 2020

Approved by:

MD. ABUL BASHAR

Professor

Department of Agricultural Extension
and Information System

SAU, Dhaka

Supervisor

Dr. MD. MAHBUBUL ALAM

Professor

Department of Agricultural Extension
and Information System

SAU, Dhaka

Co-Supervisor

Dr. MUHAMMAD HUMAYUN KABIR

Chairman

Department of Agricultural Extension and Information system



Department of Agricultural Extension & Information
System

Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka- 1207

CERTIFICATE

This is to certify that the thesis entitled “PERCEPTION OF CITY GARDENER TOWARDS ROOFTOP GARDENS FOR CLIMATE REGENERATION” submitted to the Department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTERS OF SCIENCE (M.S.)** in Agricultural Extension and Information System, embodies the result of a piece of bonafide research work carried out by **MD. MAHIBUL ALAM SABUJ**, Registration No. : **12-05073** under 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.

June, 2020

Dhaka, Bangladesh

MD. ABUL BASHAR

Professor

Agricultural Extension and Information
System
SAU, Dhaka

**Dedicated to
My
Beloved Mother**

ACKNOWLEDGEMENTS

The author seems it a much privilege to express his enormous sense of gratitude to the Almighty Allah for there ever ending blessings for the successful completion of the research work.

*The author wishes to express his gratitude and best regards to his respected Supervisor, **Md. Abul Bashar**, Professor, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for his continuous direction, constructive criticism, encouragement and valuable suggestions in carrying out the research work and preparation of this thesis.*

*The author wishes to express his earnest respect, sincere appreciation and enormous indebtedness to his reverend Co-supervisor, **Dr. Md. Mahbubul Alam**, Professor, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for his scholastic supervision, helpful commentary and unvarying inspiration throughout the research work and preparation of the thesis.*

*The author feels to express his heartfelt thanks to the honorable Chairman, **Dr. Muhammad Humayun Kabir**, Department of Agricultural Extension and Information System along with all other teachers and staff members of the Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for their co-operation during the period of the study.*

The author feels proud to express his deepest and endless gratitude to all of his course mates and friends to cooperate and help him during taking data from the field and preparation of the thesis. The author wishes to extend his special thanks to his lab mates, class mates and friends for their keen help as well as heartiest co-operation and encouragement.

The author expresses his heartfelt thanks to his beloved parents, Elder Sister and Brother and all other family members for their prayers, encouragement, constant inspiration and moral support for his higher study. May Almighty bless and protect them all.

The Author

ABSTRACT

The main purpose of this study was to determine the perception of city gardener towards rooftop gardens for climate regeneration and to explore the relationship of the selected characteristics of the growers with their perception towards rooftop gardens for climate regeneration. The selected characteristics were age, education, family size, rooftop garden size, annual family income, training exposure, extension media contact, knowledge on rooftop gardening and problems on rooftop gardening. A list comprised a total of 713 respondents in the study area (27 and 28 No. Ward, Mohammadpur, Dhaka). These respondents constituted the population of this study. Fifteen percent (107 respondents) of the population were randomly selected as representative sample by using a Table of Random Numbers (Kerlinger, 1973). Thus, 107 farm family head constituted the sample of the study. Data were collected during the period of 1st December 2019 to 28 February, 2020. Pearson Product Moment Correlation test was used to explore the relationships among the concerned variables. Majority (61.68%) of the respondents had medium perception towards rooftop gardens for climate regeneration, 31.78 percent had high perception towards rooftop gardens for climate regeneration and only 6.54 percent had low perception towards rooftop gardens for climate regeneration. Out of nine selected characteristics of the respondents age, education, annual family income, training exposure, extension media contact and knowledge on rooftop gardening had positive significant relationship with their perception towards rooftop gardens for climate regeneration. And problems on rooftop gardening had negative significant relationship with their perception towards rooftop gardens for climate regeneration. No significant relationship was found with respondents family size and rooftop garden size.

LIST OF CONTENTS

Items	Page No.
ACKNOWLEDGEMENTS	i
ABSTRACT	ii
LIST OF CONTENTS	iii
LIST OF TABLES	ix
LIST OF APPENDICES	x
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS	xi

Chapter			
I	INTRODUCTION		
	SL. NO.	Items	Page No.
	1.1	General Background	1-3
	1.2	Statement of the Problems	4
	1.3	Objectives of the Study	5
	1.4	Justification of the Study	5-6
	1.5	Assumptions of the Study	6-7
	1.6	Limitations of the Study	7
	1.7	Definition of Terms	8-10

Chapter			
II	REVIEW OF LITERATURE		
	SL. No.	Items	Page No.
	2.1	Review of literature on the extent of	11-14

perception of different aspects

CONTENTS (Contd.)

SL. NO.	Items	Page No.
2.2	Relationships between respondents' characteristics and their perception of climate regeneration in rooftop garden	15
2.2.1	Age and respondents' perception	15-16
2.2.2	Education and respondents' perception	16-17
2.2.3	Family size and respondents' perception	18-19
2.2.4	Annual family income and respondents' perception	19-20
2.2.5	Rooftop garden size and respondents' perception	20-21
2.2.6	Training exposure and respondents' perception	21-22
2.2.7	Extension media contact and perception	23
2.2.8	Knowledge and respondents' perception	23-24
2.2.9	Problems and respondents' perception	24
2.3	Conceptual Framework of the Study	25

Chapter

III MATERIALS AND METHODS

SL. NO.	Items	Page No.
3.1	Locale of the Study	26
3.2.	Population and sampling design	28
3.3	Instruments for data collection	28-29
3.4	Measurement of Variables	29
3.5	Variables of the Study	29
3.5.1	Measurement of independent variables	29-30
3.5.1.1	Age	30
3.5.1.2	Education	30
3.5.1.3	Family size	30
3.5.1.4	Rooftop garden size	30-31
3.5.1.5	Annual family income	31
3.5.1.6	Training exposure	32
3.5.1.7	Contact with extension media	32
3.5.1.8	Knowledge on rooftop gardening	32-33
3.5.1.9	Problems of rooftop gardening	33
3.5.2	Measurement of dependent variable	33
3.6	Statement of Hypothesis	33-34
3.7	Collection of Data	34
3.8	Data Processing	34
3.9	Statistical Analysis	35

Chapter

IV RESULTS AND DISCUSSION

SL. NO.	Items	Page No.
4.1	Selected characteristics of the respondents	36-37
4.1.1.	Age	37-38
4.1.2.	Education	38-39
4.1.3.	Family size	39
4.1.5.	Rooftop garden size	40
4.1.6	Family income	40-41
4.1.6.	Training exposure	41-42
4.1.7.	Extension media contact	42-43
4.1.8	Knowledge on rooftop gardening	43-44
4.1.9	Problems on rooftop gardening faced by the respondents	44-45
4.2	Focus issue	45
4.2.1	Perception of city gardener climate regeneration	45-46
4.3	Relationship between the selected characteristics of the respondents and perception towards rooftop gardens for climate regeneration	46-48
4.3.1	Relationship between age of the respondents and their perception towards rooftop gardens for climate regeneration	48

Contents (Contd.)

SL. NO.	Items	Page No.
4.3.2	Relationship between education of the respondents and their perception towards rooftop gardens for climate regeneration	48-49
4.3.3	Relationship between family size of the respondents and their perception towards rooftop gardens for climate regeneration	49
4.3.4	Relationship between rooftop garden size of the respondents and their perception towards rooftop gardens for climate regeneration	50
4.3.5	Relationship between annual income of the respondents and their perception towards rooftop gardens for climate regeneration	50-51
4.3.6	Relationship between training exposure of the respondents and their perception towards rooftop gardens for climate regeneration	51
4.3.7	Relationship between extension media contact of the respondents and their perception towards rooftop gardens for climate regeneration	51-52
4.3.8	Relationship between knowledge on roof top gardening of the respondents and their perception towards rooftop gardens for climate regeneration	52
4.3.9	Relationship between Problems during Rooftop Gardening of the respondents and their perception towards rooftop gardens for climate regeneration	53

Chapter		Page No.
V	SUMMERY AND CONCLUSION	
	SL. NO.	
	Items	
	5.1	Summary of the findings 54
	5.1.1	Selected characteristics of the respondents 54-55
	5.1.2	Conclusion 56-57
	5.2	Recommendations 57
	5.2.1	Recommendations for policy implications 57-58
	5.2.2	Recommendations for the future study 58
	REFERENCES	59-66
	APPENDICES	67-73

LIST OF TABLES

Table No.	Title	Page No.
3.1	Distribution of population and sample of respondents in two selected areas at Mohammadpur, Dhaka	28
4.1	Major features of the selected characteristics of the respondents	37
4.2	Relationship between the selected characteristics of the respondents and perception towards rooftop gardens for climate regeneration	38
4.3	Distribution of the respondents according to their level of education	38
4.4	Distribution of the respondents according to their family size	39
4.5	Distribution of respondents according to their rooftop garden size	40
4.6	Distribution of respondents regarding annual family income	41
4.7	Distribution of the respondents according to their training exposure	42
4.8	Distribution of the respondents according to their extension media contact	43
4.9	Distribution of the respondents according to their knowledge on roof gardening	44
4.10	Distribution of the respondents according to their problems on roof gardening	45
4.11	Distribution of the respondents according to their perception of climate regeneration in rooftop garden	46
4.12	Computed Co-efficient of correlation between Independent and Dependent variables	47

LIST OF FIGURES

Fig. NO.	Items	Page no.
2.1	Conceptual Framework of the study	25
3.1	Map of Dhaka city showing the study area	27

LIST OF APPENDICES

Appendix No.	Title	Page No.
A	A questionnaire on interview schedule for a research study	67-72

ABBREVIATIONS AND ACRONYMS

BBS	=	Bangladesh Bureau of Statistics
CV %	=	Percent Coefficient of Variation
DAE	=	Department of Agriculture Extension
<i>et al.</i> ,	=	And others
e.g.	=	exempli gratia (L), for example
etc.	=	Etcetera
FAO	=	Food and Agricultural Organization
Fig	=	Figure
GO	=	Government Organization
i.e.	=	id est (L), that is
LSD	=	Least Significant Difference
M.S.	=	Master of Science
No.	=	Number
NGO	=	Non Government Organization
r	=	Correlation co-efficient
RTG	=	Rooftop Garden
SAU	=	Sher-e-Bangla Agricultural University
SD	=	Standard Deviation
SPSS	=	Statistical Package for Social Science
USA	=	United States of America
WHO	=	World Health Organization
%	=	Percentage

CHAPTER I

INTRODUCTION

1.1 General Background

Rooftop agriculture is the production of fresh vegetables, herbs, fruits, edible flowers and possibly some small animals on rooftops for local consumption. Productive green roofs combine food production with ecological benefits, such as reduced rainwater run-off, temperature benefits such as potential reduction of heating and cooling requirements (resulting in reduced emissions), biodiversity, improved aesthetic value and air quality.

Three primary types of food-producing green roofs can be distinguished (Gomez-Baggethun and Barton, 2013):

- Agricultural green roofs or direct-producing green roofs on which crops are directly grown in (shallow) beds in a soil-based growing medium that is possibly placed on top of a waterproof membrane or additional layers such as a root barrier, drainage layer and an irrigation system.
- Rooftop container gardens roofs that involve the growing of vegetables, herbs, fruits and flowers in pots, buckets, containers, bottles or raised beds which contain a soil-based growing medium.
- Rooftop hydroponic systems which involve growing plants using water-based nutrient solutions in place of soil. These require on-going fertilizer inputs. There are exposed hydroponic systems used in open-air settings, as well as hydroponic systems grown under cover (glass or plastic) to increase yields and extend growing seasons.

Extensive research on the perception of landscape was reported in academic writing. As time moving, landscape is evolving where the application is not only on the ground but also on the building's rooftop that known as a green roof. Green roof is defined as a roof covered with vegetation (Study on Green

Roof Application in Hong Kong, 2007; Yok and Sia, 2008; Niekerk et al., 2011; The GRO Green Roof Code, 2011). There are two types of green roof, which are extensive and intensive. Commonly, intensive green roof is recognised as a roof garden.

Rooftop gardens can be placed on individual homes, institutional and office buildings, and roofs of restaurants and serve either home consumption, use of fresh produce in restaurants or institutional kitchens or commercial production. Green roofs also offer an opportunity to promote inner-city biodiversity on under utilised, empty roofs and to address food security issues through the production of food. Cities are continuously in transition of urbanization process due to accommodate increasing number of population, industrialization, economic and social changes. Dhaka, the capital of Bangladesh and one of the fastest growing cities in the world is not an exception of this trend. Bangladeshi urban population has been growing at a yearly average rate of 6 percent since independence; As a result, urban population has grown six-fold, compared with a 70 percent increase in rural population (World Bank, 2007). As present UN data, approximately 25 percent of Bangladesh's population currently lives in urban areas. Of this urban population, more than half lives in the four largest cities: Dhaka, Chittagong, Khulna and Rajshahi, 58% of which live in Dhaka. With a population of almost 12 million, it is the 11th largest city in the world. At the same time, it is consistently ranked as one of the worlds least livable city. In the process of urbanization, Dhaka, with an area of 140 sq mi has caused significant decline of green spaces, agricultural lands, wet lands and water bodies due to discriminated land use transformation. Over last few decades, this trend is leading to loss of natural resources and habitat fragmentation (Hafiz, 2004). Due to this rapid development, green areas and soft surfaces of cities and communities are rapidly being grabbed by structures, roads, driveways, parking lots and other hard and impervious surfaces resulting from pressure of rapid and unplanned urbanization. However, due to destruction of green spaces, balance of thermal comfort and environmentalism

is being disturbed through high temperature, high humidity, air pollution, heat waves, rising sea level, water log off, floods, noise pollution, heat island effect etc (Hafiz, 2004).

There are various advantages reported in the previous study of green roof which beneficial towards the environment, economic and social. Among the environmental benefits is urban heat island mitigation (Oberndorfer et. al, 2007), decrease air pollution (Currie & Bass, 2008), increase the quality of air through carbon sequestration (Getter et. al, 2006), and improve the management and quality of storm water (Stovin, 2010). Meanwhile, the economic benefits are increasing property value through aesthetic element and enhance energy savings through effective thermal conductivity (Wong et al., 2003). In term of social benefits, green roof become a refugee oasis and gathering place for recreational activities for urban society (Dunnett and Kingsbury, 2004). Previous studies states that urban greening such as parks and gardens, urban agriculture and urban forestry has greater influence in ecological, social and economic.

In the process of rapid urbanization of Dhaka city, it is found that about 20 percent vegetation coverage that was present in 1989 has gradually decreased to 15.5 percent and 7.3 percent in the year 2002 and 2010, respectively (BBS, 2011). Vegetation was found in the Dhaka metropolitan area is only 1.87 percent (BBS, 2015). In this critical situation, Rooftop gardening can be one of the best solutions against this situation. However, green area in the city is getting lesser while the city with new building features is increased due to urban sprawling. Thus, create an option for the professional in the construction industry to plant vegetation on the exterior surface of the building that is the roof and wall facade. Both of these innovative greening options are green roof and green wall. Considering all of the benefits of green roof stated previously, it is undoubted that green roof can contribute for urban regeneration in the city, especially in a commercial area. However, the benefits could not be gained if the citizens are lack in terms of green roof awareness and knowledge.

1.2 Statement of the Problems

Clearly, different people will have a different perception. Perception allows people to criticize, interpret, differentiate and analyzed their surrounding environment based on their intrinsic values in order to adapt with the environment (Villagra Islas & Gastón Vergara, 2012). Perception is the process of awareness, alert and identification of the process that happens in the surrounding (Goodey, 1971). In view of the importance of roof top gardening in providing climate regeneration by city dwellers, the investigation of this survey was highlighted to keep major ecosystem services and benefits of roof top gardening in Dhaka city entitled ‘Perception of city dwellers towards rooftop gardens for climate regeneration’. This study attempted to find out the answer of the following research questions: An understanding about the same will be useful to the researchers, planners and extension workers in doing research, planning and execution of extension programs for enhancing rooftop gardening practice. In these respects, the answers to the following questions would be very much pertinent.

1. What is the perception of city gardener towards rooftop gardening ?
2. What are the characteristics of the city gardener (respondents) who is involved in practicing rooftop gardening?
3. What is the relationship between city gardener selected characteristics and the perception of climate regeneration by rooftop garden?

1.3 Objectives of the Study

The following objectives are framed out in order to give an appropriate track to the research work-

1. To assess the perception of rooftop gardening by the city dwellers
2. To determine some selected personal and socio-economic characteristics of the respondents, which are:
 - a) Age
 - b) Education
 - c) Family size
 - d) Rooftop garden size
 - e) Annual family income
 - f) Training exposure
 - g) Extension media contact
 - h) Knowledge on rooftop gardening
 - i) Problems on rooftop gardening
3. To explore the relationship between the selected characteristics of the city gardener to their perception on climate regeneration

1.4 Justification of the Study

There are many studies that have been conducted on rooftop gardening of various aspects of agriculture. However, within urban development research, little attention has been paid to the ecosystem services and climate regeneration provided by rooftop farming and very few research has been reported in home and abroad to determine the perception of city dwellers towards rooftop gardens for climate regeneration.

Rooftop gardening although being practiced in the cities in many forms for years in the past, there have been hardly any concerted effort on part of the government, community organization and as well the general citizens to integrate it to urban agriculture, which is beyond necessary to combat the present challenging environmental situation. Increasing knowledge in this

regard is required to design sustainable rooftop gardens and give tools to urban planners in order to implement such green infrastructures. Proper understanding of the problems and prospects associated with the adoption of this green saving practice will contribute, to a great extent, to build a sustainable, energy saving, comfortable and healthy environment in the city. The proposed study is an effort in this direction. The aim of this study was to perception of city dwellers towards rooftop gardens for climate regeneration for better understanding so that the existence of this landscape can be beneficial to the environment and contribute towards sustainable urban development in Dhaka city.

1.5 Assumptions of the Study

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

The respondents included in the sample were capable of furnishing proper responses to the questions set up in the interview schedule.

- The respondents included in the sample were capable of furnishing proper responses to the questions set up in the interview schedule.
- Views and opinions furnished by the respondents included in the sample were the representative views and opinions of the whole population of the study area.
- The responses furnished by the respondents were reliable. They expressed the truth about their convictions and awareness.
- The researcher acted as interviewer was very well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished their correct opinions without any kind of hesitation.
- The data collected by the researcher were free from bias and they were normally and independently distributed.

- The items included in the interview schedule to identify the usefulness in rooftop gardening to reflect the degree of use of rooftop gardening practices by the city dwellers of that locality.

1.6 Limitations of the Study

In order to conduct the research in a meaningful and manageable way, it becomes necessary to impose some limitations in certain aspects of the study. Considering the time, money, labor and other necessary resources to the researcher, the following limitations have been observed throughout the study:

- The study was conducted only one metropolitan areas under Dhaka city.
- Characteristics of the respondents were many and varied but only nine characteristics were selected for investigation in this study.
- The most limited factor was accessibility to the households with roof garden without any reference.
- The findings could be applicable for the study area and similar situations in physical, socio-economic cultural and geographic conditions only.
- Another drawback from the study is that it was only based on recordings between 8 am to 7 pm daily due to limitations related to the operating hours of the building.
- Finally, for collection of information, the researcher had to depend on the data furnished by the respondents during their interview with him. As none of the farmers (house owner) kept records of their farming activities, they furnished information to the different questions by recall.
- In some cases, the researcher faced unexpected interference from the over interested side talkers while collecting data from target respondents. However, the researcher tried to overcome the problems as far as possible with sufficient diplomacy and talent.

1.7 Definition of Terms

A idea is a conceptual observed thing, events or phenomenon or in other words, it is a short hand representation of assortment of facts (Wilkinson and Bhandarkar, 1977). A researcher needs to know the meaning and contents of every term that he uses. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study defined are interpreted as follows:

Age

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

Education

Education referred to the development of desirable knowledge, skill, attitudes, etc. of an individual through the experiences of reading, writing, observation and related matters.

Family size

Family size was defined as the numeral of individual in the family including family chief and other trustful members who lived and ate together.

Rooftop garden size

Rooftop garden size referred to the total area on which a respondent's family carries on rooftop gardening operations. The area being estimated in terms of full benefit or home consumption or aesthetic need to the owner's family.

Annual family income

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

Training exposure

It referred to the total number of days that a respondent had exposure training from DAE, NGOs or other organizations under different training program.

Extension media contact

It is referred to the respondent's becoming accessible to the influence of different information media through different extension teaching methods.

Knowledge on rooftop gardening

Literally knowledge means knowing or what one knows about a subject, fact, person etc. Knowledge on rooftop gardening referred to respondents' understanding of the facts, phenomena and methods in different aspects of rooftop gardening practices.

Rooftop gardening

Rooftop gardening is an agricultural practice which is the production of fresh vegetables, herbs, fruits, edible flowers and possibly some small animals on rooftops for local consumption.

Climate Regeneration

Climate regeneration is a comprehensive and integrated vision and action which seeks to resolve climatic problem and bring about a lasting improvement in the environmental condition of an area that has been subject to change or offers opportunities for improvement (Rajek, 2017).

Perception of city gardener towards rooftop gardens for climate regeneration

Perception refers to the ability to see, hear, or become aware of something through the senses (Khairul, 2018). Perception is the process of awareness, alert and identification of the process that happens in the surrounding (Goodey, 1971).

Assumption

An assumption is "the supposition that an obvious fact or principle is the true in glow of the accessible evidence" (Goode and Hatt, 1952).

Variable

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

CHAPTER II

REVIEW OF LITERATURE

The chapter deals with the past literature relevant to the objective of this study. The researcher made an elaborate search of available literature for this purpose. The researcher attempted to study the relationship of each of the variables. This Chapter is divided into three sections. The first section deals with the review of studies related to the extent of perception of different aspects; the second section deals with the relationships between respondents' characteristics and their perception on climate regeneration in rooftop garden and the third section deals with the conceptual framework of the study.

2.1 Review of literature on the extent of perception of different aspects

There is an abundance of published research on perceptions towards the environment (Kaplan and Kaplan, 1989; Elmendorf *et al.*, 2005; Rosley *et al.*, 2013). The study area is focusing on several types of green environment such as park, rural and urban landscape. While, there are still few numbers of research on perceptions towards environment in details on green roof subject.

Yuen and Wong (2005) reported the residents of a high-rise building in Singapore consumed green roof are gaining demand as the sense of awareness is increasing. Study done by Taib and Abdullah (2012) on user expectations and perceptions of three different sky garden on a 21-storey office building in Penang, Malaysia indicate a similarities on the uses of the garden even the design and facilities provided are different. The findings elaborate that all the three sky gardens are a place to rest and relax.

Another study done by Fernandez-Canero *et al.* in 2013, investigate public attitudes and preferences of green roof in Southern Spain. The study revealed that respondents' preferences towards different green roof design are influenced by their background characteristics. While research in Malaysia done by Rahman *et al.*, (2012) and in the north eastern United States by Jeremy

et al., (2013) addressed the positive attitudes and aesthetic reactions toward rooftop gardening implementation.

In fact, many studies indicated that the way people perceived their environment was affected by their demographic factor (Erickson *et al.*, 2002; Kaltenborn & Bjerke, 2002; Gude *et al.*, 2006; Benjamin *et al.*, 2007; Bauer *et al.*, 2009). While according to Zube *et al.* (1975), perception in the landscape is also influenced by an individual's memory and experiences, background cultural, beliefs and preference. According to the "Biosphere" theory proposed by Bechtel (1987), human perception is influenced by social value and built environment.

In Bangladesh ornamental plant, fruit trees, flowering plants vegetables are mostly used. More or less all of the area in city people can establish roof garden on their roof. Green roofs can help in the absorption of carbon dioxide and help reduce air pollution area's aesthetics will be enhanced and property value could be increased. Economically there are no additional land costs. Temperatures around the building can be lowered in the summer. A can be further insulated from the cold in the winter. The roof life can be extended by protecting it from various weather conditions Heating and cooling bills will be reduced. The rooftop garden space can be used for food production. Kamrujjaman (2015), wrote a Book name "Green Banking" regarding the Rooftop Gardening. The book contains 7 chapters describing the thermal benefits of roof gardens and the overall techniques and farming procedures of vegetables, fruits, flowers/ornamental plants and multipurpose use of Roof garden.

Orsini *et al.* (2014) was carried out a study of addressing the quantification of the potential of rooftop vegetable production in the city of Bologna (Italy) as related to its citizen's needs. The potential benefits to urban biodiversity and ecosystem service provision were estimated. RTGs could provide more than 12,000 t year⁻¹ vegetables to Bologna, satisfying 77 % of the inhabitants' requirements.

Hodgon et al. (2011) reported that urban agriculture is much more than private gardens and community gardens, and many communities are beginning to see the promise of other forms of urban agriculture. This paper is to provide funders with an overview of urban agriculture and its various forms, dimensions, and benefits; its connections to the broader communitybased food system.

Tabassum and Sharmin (2010) observed that less green space creates urban heat island effect due to more reflection of solar radiation and outdoor temperature of denser built up area in Dhaka is 1°C-1.5°C higher than the immediate urban zones with less green coverage and also can be higher at a range of 0.5-1°C than the average meteorological record. This research also showed that indoor temperature of residential buildings in less green covered neighborhoods rise at a range of 1°C-2°C thus creates thermal discomfort among occupants.

Moustier (2007) provides an extensive summary of the importance of urban agriculture in 14 African and Asian cities. Among the results they found that 90 % of all vegetables consumed in Dar es Salaam (Jacobi et al. 2000) and 60 % of vegetables consumed in Dakar originate from urban agriculture.

Kamron (2006) has published an article named 'Adoption of roof gardening at Mirpur-10 area under Dhaka city'. She has reported that the selected characteristics of the respondents, family size, roof gardening experience, use of information sources, attitude towards roof gardening and knowledge of roof gardening had positive significance of relationship with their adoption of roof gardening. Other characteristics namely: age, family, education and family income did not show any significant relationship with the respondent's adoption of roof gardening.

Bennett (2003) reported that RTGs, while being aesthetically appealing, can contribute to biodiversity in the urban environment, achieve more sustainable conditions, including those necessary for the production of food and improve the overall quality of urban life.

Islam (2001) has published an article named “Roof gardening as a strategy of urban agriculture for food security’: the case of Dhaka city, Bangladesh.” He has reported that urban agriculture in the cities of developing countries are growing rapidly which also means the number of low-income consumers is increasing. Because of food insecurity in these cities is increasing. Urban agriculture (UA) contributes to food security by increasing the supply of food and by enhancing the quality of perishable foods reaching urban consumers.

2.2 Relationships between respondents’ characteristics and their perception of climate regeneration in rooftop garden

2.2.1 Age and respondents’ perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by the farmers in Ogbomoso, Nigeria and found that age had a significant influence on the farmers’ perception on environmental effects.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. Pal found that age had no significant relationship with farmer’s perception.

Roy (2009) stated that age had no significant relationship with farmer’s perception.

Majlish (2007) conducted a study regarding perception of participant women on social forestry program of BRAC. The study revealed that the relationship between age and perception of social forestry program was negatively significant.

Afique (2006) mentioned that there was no significant relationship between the age of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that age of the farmers had no significant relationship with their perception of causes and remedies of Monga in Kurigram district.

Sharmin (2005) stated that age of the rural women had no significant relationship with the perception of benefits of involvement in IGAs under a NGO.

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

Kabir (2002) studied perception of farmers on the effects of integrated area development project towards environmental upgradation. The study revealed that there was no significant relationship between age and perception of environmental upgradation. Similar finding was obtained by Fardous (2002) in his study.

Akhter (2003) found in his study that the age of the farmers had no significant relationship with their perception on agricultural activities.

Hossain (2003) reported that age of the farmers was not related to farmers' perception on modern Boro rice cultivation practices.

Sana (2003) found that age of the farmers was not related to their perception of shrimp culture.

2.2.2 Education and respondents' perception

Kabir and Rainis (2012) conducted a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They found that education had a significant influence on the farmers' perception.

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that education had a significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that education had a positive significant influence on the farmers' perception.

Roy (2009) stated that education had a negative significant relationship with farmer's perception.

Majlish (2007) found that the relationship between education of participant women and their perception of social forestry program of BRAC was positively significant.

Afique (2006) mentioned negatively significant relationship between personal education of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Snmity (SUS).

Sharmin (2005) found that personal education of the rural women had significant positive relationship with their perception of benefits of involvement of IGAs under a NGO.

Uddin(2004) concluded that the level education of the farmers had a significant positive relationship with their perception of sustainable agriculture.

Fardous (2002) found a significant positive relationship between education of the farmers' and their perception of the forestry development activities of Village and Farm Forestry Program (VFFP) towards sustainable forestry development.

Akhter (2003) found in his study that level of education of the farmers had a significant and positive relationship with their perception on agricultural activities.

Hossain (2003) found that with increased level of education of the farmers, there was a corresponding increase in the perception level of modern Boro rice farmers.

Sana (2003) showed that education of the respondents had positive relationship with their perception in shrimp cultivation.

2.2.3 Family size and respondents' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that family size had no significant relationship with farmer's perception.

Roy (2009) stated that family size had a positive significant relationship with farmer's perception.

Majlish (2007) found that the relationship between family size of the participant women and perception of social forestry program of BRAC was non-significant and followed a negative trend.

Afique (2006) found no significant relationship between family size of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that family size of the farmers had no significant relationship with their perception of both causes and remedies of Monga in Kurigram district.

Sharmin (2005) in a study found that family size of the rural women had no significant relationship with their perception of benefits involvement of IGAs under a NGO.

Uddin (2004) found that the family size of the farmers had no relationship with their perception of sustainable agriculture.

Rahman (2004) found in his study that family size of the farmers had no significant relationship with their perception on boro rice cultivation practices.

Sana (2003) revealed that family size of the farmers was not related to their perception of shrimp culture.

Hossain (2003) found that family size of the farmers was not significantly related to farmers' perception on modern Boro rice cultivation practices.

Kabir (2002) in his study found that family size of farmers had negative relationship with their perception on the effects of BIADP towards environmental upgradation. Similar finding was also obtained by Alom (2001) in his study.

2.2.4 Annual family income and respondents' perception

Chowdhury (2010) found that annual income had a significant positive relationship with perception on maize cultivation in five selected villages of Shibalaya Upazila under Manikgonj District.

Islam (2008) found that annual income had a positive and substantial significant relationship with perception on vegetables production activities by woman members in homestead area under world vision project.

Islam (2008) found that income from vegetable had a positive and substantial significant relationship with perception on vegetables production activities by woman members in homestead area under world vision project.

Roy (2009) stated that annual family income had a positive significant relationship with farmer's perception.

Majlish (2007) found that the relationship between family income of participant women and perception of social forestry program of BRAC was non-significant but followed a negative trend.

Afique (2006) found no significant relationship between annual family income of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Islam (2005) found that annual income of the farmers had positive significant relationship with their perception regarding causes and remedies of Monga in Kurigram district. Uddin (2004) concluded that annual family income of the farmers had significant and positive relationship with their perception of sustainable agriculture.

Sayeed (2003) found that annual family income of the farmers had a significant relationship with their perception of benefit from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Kabir (2002) found that there was non-significant relationship between annual family income of the farmers and their perception of the effects of BIADP towards environmental upgradation.

2.2.5 Rooftop garden size and respondents' perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that household size had a non-significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that rooftop garden size had no significant relationship with farmer's perception.

Roy (2009) stated that farm size had negatively significant relationship with farmer's perception.

Majlish (2007) revealed from her study that the relationship between farm size of participant women and perception of social forestry program of BRAC was non-significant and followed a positive trend.

Rahman (2006) examined in his study that farm size of the farmers had a significant relationship with perception on prawn culture.

Afiq (2006) stated that there was no significant relationship between family farm size of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Khan (2005) determined that farm size of the respondent had no significant relationship with their perception on maize cultivation.

Islam (2005) found that farm size of farmers had no significant relationship with their perception of both causes and remedies of Monga in Kurigram district.

Sharmin (2005) found in her study that farm size of the rural women had no significant relationship with their perception of benefits of involvement in IGAs under a NGO.

Uddin (2004) found that farm size of the farmers had significant and positive relationship with their perception of sustainable agriculture.

Sana (2003) reported that farm size of the shrimp cultivators had no relationship with their perception of shrimp culture.

2.2.6 Training exposure and respondents' perception

Kabir and Rainis (2012) conducted a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They found that training had a significant influence on the farmers' perception.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that training received had a positive significant influence on the farmers' perception.

Roy (2009) stated that training received had a positive significant relationship with farmer's perception.

Islam (2008) found that training on vegetable cultivation had a positive and substantial significant relationship with perception on vegetables production activities by woman members in homestead area under world vision project.

Majlish (2007) found from her study that the relationship between training experience of participant women and perception of social forestry program of BRAC was positively significant.

Afique (2006) mentioned that there was no significant relationship between training exposure of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Sharmin (2005) reported from her study that training exposure of the rural women had no significant relationship with their perception of benefits of involvement in Income Generating Activities (IGAs) under a NGO.

Uddin (2004) from his study concluded that farmers' training exposure had a significant positive relationship with their perception of sustainable agriculture.

Sana (2003) found that training received of the farmers had a positive significant relationship with their perception in shrimp culture.

Kabir (2002) found that training experience of the farmers had a significant positive relationship with their perception of the effects of BIADP on environmental upgradation.

2.2.7 Extension media contact and perception

Islam (2002) conducted a study on adoption of modern agricultural technologies by the farmers of Sandwip. He found that extension media contact of the farmers had no significant relationship with their perception of modern agricultural technologies.

Aurangozeb (2002) conducted a study on adoption of integrated homestead farming technologies by the rural women in RDRS. He found that there was significant relationship between contact with extension media and perception of integrated homestead farming technologies.

Sarker (1997) found that extension contact of potato growers had a positive significant relationship with their perception of improved potato cultivation practices.

Hossain (1999) conducted a study to determine the farmer's perception of the effect of agro-chemicals on environment. He found that there was no relationship between the farmers media exposure with perception on agrochemicals.

2.2.8 Knowledge and respondents' perception

Kabir and Rainis (2012) conducted a study on Farmers' Perception on the Adverse Effects of Pesticides on Environment: The Case of Bangladesh. They found that experience of farmers had a significant influence on the farmers' perception.

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that farming knowledge had a significant influence on the farmers' perception.

Roy (2009) stated that knowledge on IPM practices had a positive significant relationship with farmer's perception.

Majlish (2007) conducted her study regarding perception of participant women on social forestry program of BRAC. She found from her study that the relationship between knowledge on tree plantation and perception of social forestry program of BRAC was positively significant.

2.2.9 Problems and respondents' perception

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that several constraints in using organic fertilizer had a significant influence on the farmers' perception.

Roy (2009) stated that majority (98.75 percent) of the respondent had high problem while only 1.25 percent had medium problem in using IPM.

2.3 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.* “Selected Characteristics” and “Focus issue”. Focus issue is that factor which appears, disappears or varies as the researcher introduces, removes or varies the selected characteristics (Townsend, 1953). The selected characteristics are that factor which is manipulated by the researcher in his attempt to ascertain its relationships to an observed phenomenon.

Conceptual Framework of the Study

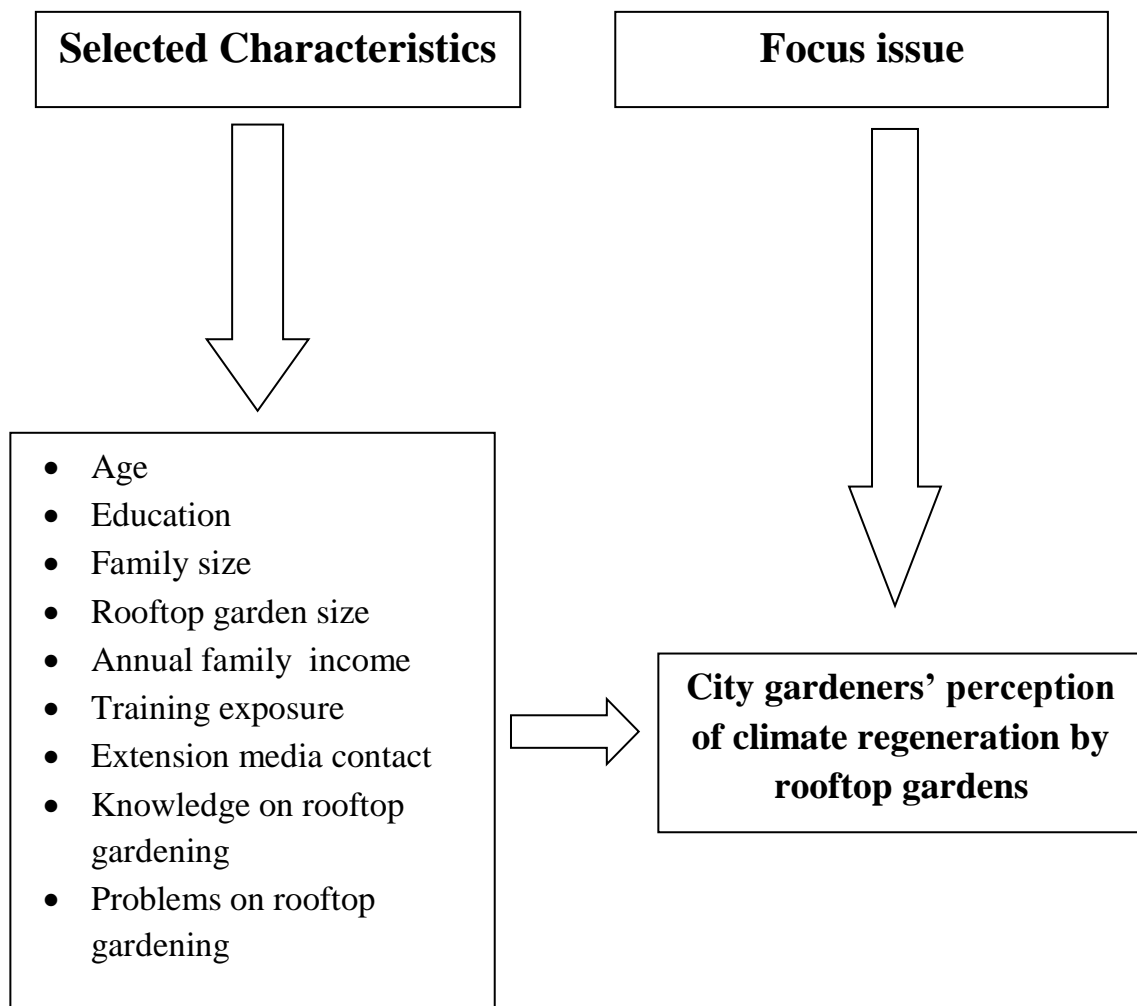


Fig. 2.1 Conceptual Framework of the study

CHAPTER 3

MATERIALS AND METHODS

In any scientific research, methodology plays an important role. Appropriate methodology helps the researcher to collect valid and reliable information and analyze the information properly in order to arrive at correct conclusions. The methods and procedures followed in conducting this study have been described in this chapter. Also statistical methods and their use have been mentioned in the later section of this Chapter. The bifurcation of research methodology adopted is given under following heads:

3.1 Locale of the Study

Two wards, Ward No. 27 and 28, of Mohammadpur thana under Dhaka district were purposively selected as the study area. The researcher himself with the cooperation of Centre for Urban Studies located at Lalmatia, Mohammadpur and Horticulture centre located at Asad gate, Dhaka near the study area collected a list of city dwellers having rooftop gardens. The total numbers of city dwellers who do rooftop gardens are 713 which constituted the population of the study. A map showing study area have been shown in figure 3.1.

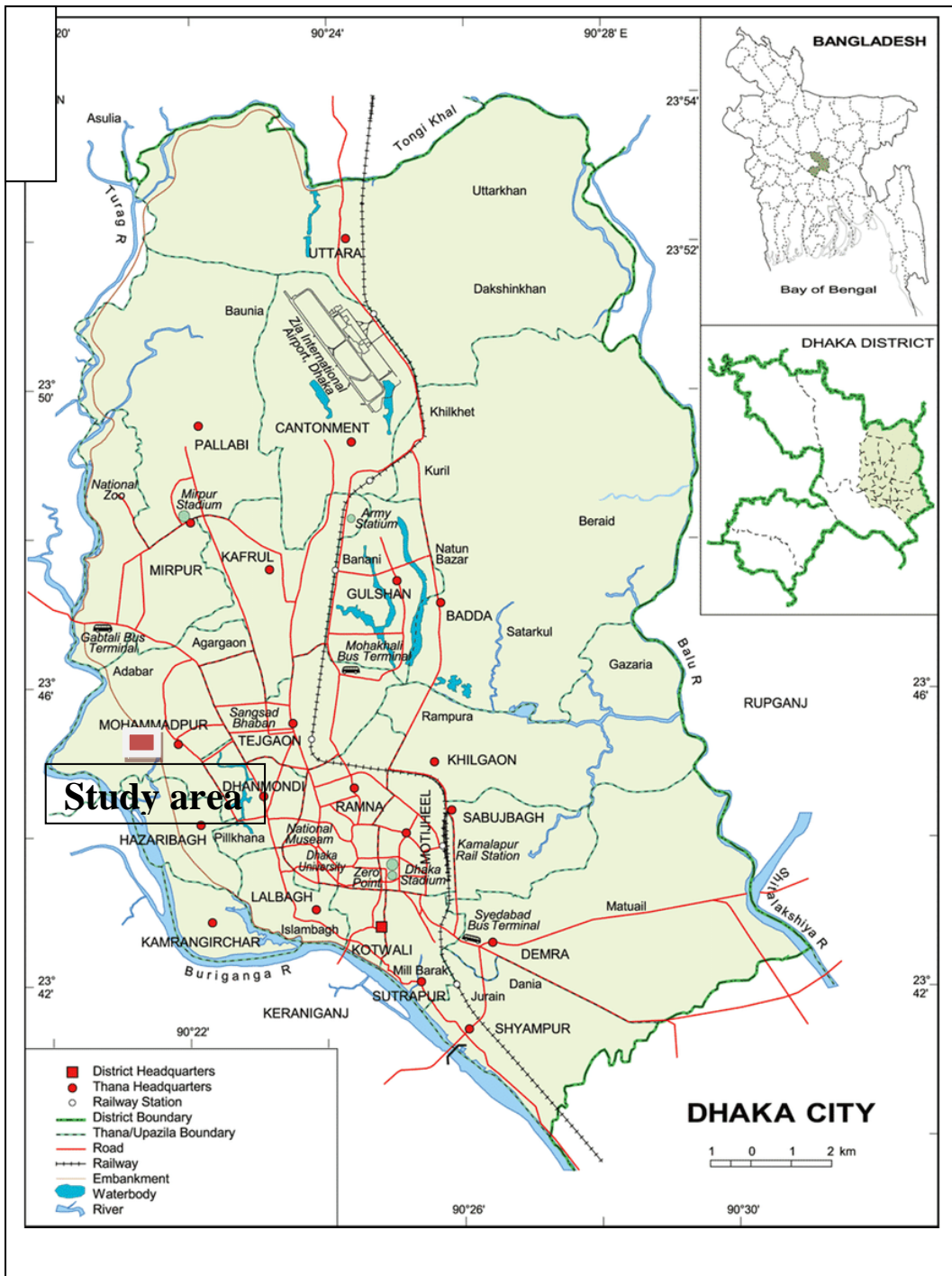


Figure 3.1 Map of Dhaka city showing the study area

3.2. Population and sampling design

An up to date list of all family heads of the selected city gardeners were prepared with the help of Centre for Urban Studies located at Lalmatia, Mohammadpur and Horticulture centre located at Asad gate near the study area. The list comprised a total of 713 respondents in the study area. These respondents constituted the population of this study. Fifteen percent of the families of these area were randomly selected as representative sample by using a Table of Random Numbers (Kerlinger, 1973). Thus, 107 farm family head constituted the sample of the study. Further eleven respondents (10 percent of the sample) were selected randomly from the population which were interviewed when the respondent in the original sample list were not available at the time of interview. A detailed structure of population and sample has been presented in the Table 3.1. The distribution of the respondents included in the population, sample and those in the reserve list appears in Table 3.1.

Table 3.1 Distribution of population and sample of respondents in two selected areas at Mohammadpur, Dhaka:

Sl. No.	Name of Area	Total number of respondents (Groweres)	Sample size	Number of respondents in the reserve list
1	Mohammadpur, Word No. 27	370	56	6
2	Mohammadpur, Word No. 28	343	51	5
Total		713	107	11

3.3 Instruments for data collection

Data were collected using a previously selected interview schedule. Both open and closed forms of questions were included in the schedule. Before finalization, the interview schedule was pre-tested with 10 respondents of the study area which were excluded from the sample. On the basis of the pre-test experiences necessary corrections, modifications and alterations were made before finalizing the interview schedule for final data collection. During

modification of the schedule, valuable suggestions were received from the research supervisor and relevant experts. A copy of interview schedule in English version is placed in Appendix.

3.4 Measurement of Variables

A variable is any characteristic, which can be assumed varying different values in successive individual cases (Ezekiel and Fox, 1959). A well organized piece of research usually contains at least two important variables, *viz.* selected characteristics and focus issue. A selected characteristics are that factor which is maintained by the researcher in his/her attempt to ascertain its relationship to an observed phenomenon. A focus issue is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable (Townsend, 1953).

3.5 Variables of the Study

In the present study, selected characteristics of the respondents, *viz.* age, education, family size, rooftop garden size, annual family income, training exposure, extension media contact, knowledge on rooftop gardening and problems on rooftop gardening are selected characteristics and their perception of climate regeneration in rooftop garden constituted focus issue.

3.5.1 Measurement of independent variables

Cultivation of various crops in rooftop garden and various characteristics of city gardeners might have affect on their perception of climate regeneration in rooftop garden. The selected characteristics of this study were nine (9) selected characteristics of the respondents. These were: age, education, family size, rooftop garden size, annual family income, training exposure, extension media contact, knowledge on rooftop gardening and problems on rooftop gardening. The procedures followed in measuring the independent variables are briefly discussed below:

3.5.1.1 Age

Actual age of a respondent was measured by counting the actual years from his/her birth to the time of collecting data with an interview schedule. It was expressed in terms of complete years. This variable appears in item number one (1) in the interview schedule as presented in Appendix-A.

3.5.1.2 Education

Education of a respondent was measured by the number of years of schooling completed in an educational institution. A score of one (1) was given for each year of schooling completed. If a respondent completes primary level of education his/her score was considered as 5 as well as 10 for secondary level of education and above 10 means higher education. This variable appears in item number two (2) in the interview schedule as presented in Appendix-A.

3.5.1.3 Family size

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent members like husband/wife, brother and sister, parents, children etc. who lived and ate together. The total number of family members was considered as his family size score. If a respondent had five members in his/her family, his/her family size score was given as five (5). This variable appears in item number three (3) in the interview schedule as presented in Appendix-A.

3.5.1.4 Rooftop garden size (RGS)

Rooftop garden size of a respondent is referred to the total roof area under gardening on which his/her family carried out farming operations, own roof under own gardening, roof given to others on share roof taken from others on share and roof taken from others on lease. This variable appears in item number four (4) in the interview schedule as presented in Appendix-A.

3.5.1.5 Annual family income

The income of a respondent is an important indicator that shows how much he can invest in his rooftop gardens. Annual income of a respondent was measured in taka on the basis of total yearly earnings from crop production and other sources in which the respondent as well as his family members were involved. The method of determining income from farming involved different aspects. In calculating the annual income of the respondents, the total yield from all the sources making in the preceding year were converted into cash income according to the prevailing market price and added together to obtain total income of a respondent. However unit score of 1 was taken for every Tk. 1000/- of annual income. This variable appears in item number five (5) in the interview schedule as presented in Appendix-A.

3.5.1.6 Training exposure

Training exposure of a respondent was identified on the basis of number of days of agriculture based training programme received from different sources in the last 15 years. Training exposure score of a respondent was measured in terms of number of days for receiving training. For example, if a respondent received no training his/her score was zero (0) and score one was assigned for receiving one day training. This variable appears in item number six (6) in the interview schedule as presented in Appendix-A.

3.5.1.7 Contact with extension media

It was defined as one's extent of exposure to different communication media related to farming activities. Contact with extension media of a respondent was measured by computing extension media contact score on the basis of their nature of contact with fourteen extension media. Each respondent was asked to indicate his nature of contact with four alternative responses, like frequently, occasionally, rarely and not at all basis to each of the 14 media and score of three, two, one and zero were assigned for those alternative responses,

respectively (Hasan, 2006). These four options for each medium were defined specially to each medium considering the situation, rationality and result of pre-test.

Extension media contact of the respondent was measured by adding the scores of 14 selected extension media. Thus extension media contact score of a respondent could range from 0 to 42, where zero indicated no extension media contact and 42 indicated highest level of extension media contact. This variable appears in item number seven (7) in the interview schedule as presented in Appendix-A.

3.5.1.8 Knowledge on rooftop gardening

After thorough consultation with relevant experts and reviewing of related literature, 10 questions regarding rooftop gardening were selected and those were asked to the respondent to determine their knowledge on rooftop gardening. Scores two (2) was assigned according to question type for each correct answer and zero (0) for wrong or no answer. Partial score was also assigned for partially correct answer. Thus, possible scores for the knowledge on rooftop gardening of the respondents could range from 0 to 20, where 0 indicating no knowledge and 20 indicate very high knowledge on rooftop gardening. This variable appears in item number eight (8) in the interview schedule as presented in Appendix-A.

3.5.1.9 Problems on rooftop gardening

Problems faced by the respondents during rooftop gardening were measured on the basis of 9 possible common problems which the respondents faced during rooftop gardening. On the basis of the main aspect, the researcher selected problems by visiting the study area. Each respondent indicated the extent of problems caused by each of the problems by checking any one of the following four responses. These were high, medium, low and not at all. The scores for responses against all the 9 problems were added together to obtain one's

problem score. Therefore, problem score of the respondents could range from 0 to 27 where '0' indicated no constraint facing and '27' indicated highest problem facing.

3.5.2 Measurement of focus issue

Perception of city gardener towards climate regeneration in rooftop garden used by the respondents was measured on the basis of 4 selected asked to him and comments from them were scored as 4 categories like strongly agreed, agreed, disagreed, and strongly disagreed and which were given score as 4,3,2 and 1 respectively. Thus 28 and 7 were the possible highest score and possible lowest score, respectively. According to score it was classified into favorable perception, unfavorable perception and neutral.

3.6 Statement of Hypothesis

As defined by Goode and Hatt (1952) 'A hypothesis is a proposition, which can be put to a test to determine its validity'. It may prove valid or invalid of a proposition. In any event, however, it leads to a practical test. In studying contribution among variables, research hypotheses are formulated which state anticipated contribution among variables.

However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship among the concerned variables. If a null hypothesis is rejected on the basis of a statistical test, it is assumed that there is a relationship among the concerned variables.

The following null hypotheses were formulated for this study:

"There was no relationship between the respondents selected characteristics and their perception of climate regeneration in rooftop garden".

The characteristics were: age, education, family size, rooftop garden size, annual family income, training exposure, extension media contact, knowledge on rooftop gardening and problems on rooftop gardening.

3.7 Collection of Data

Data were collected personally by the researcher himself through face to face interview. To familiarize with the study area and for getting local support, the researcher took help from the local leaders. The researcher made all possible efforts to explain the purpose of the study to the respondents. Rapport was established with the respondents prior to interview and the objectives were clearly explained by using local language as far as possible. Data were collected during the period from 1st December 2019 to 28 February, 2020.

3.8 Data Processing

After completion of field survey, all the data were coded, compiled and tabulated according to the objectives of the study. Local units were converted into standard units. All the individual responses to questions of the interview schedule were transferred in to a master sheet to facilitate tabulation, categorization and organization. In case of qualitative data, appropriate scoring technique was followed to convert the data into quantitative form.

3.9 Statistical Analysis

The collected data were assembled, tabulated, coded and analyzed in accordance with the objectives of the study. Qualitative data were quantified by mean of suitable scoring techniques. The statistical measures such as number and percentage distribution were used for describing the variables of the study. In order to explore the relationship between the perception of climate regeneration in rooftop garden and the selected characteristics of the respondents, Pearson Product Moment Correlation Coefficient (r) was computed at five percent (0.05) level of significance was on the basis of rejecting any null hypothesis.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter arrangement with the result and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. However, for convenience of the discussions, the findings are systematically presented according to the objectives of the study.

4.1 Selected characteristics of the respondents

Selected characteristics of the respondents were discussed in this section with their classification. In this section the findings on the respondent's selected nine characteristics have been discussed. The selected characteristics are (i) age, (ii) education, (iii) family size, (iv) rooftop garden size, (v) annual family income, (vi) training exposure, (vii) extension media contact, (viii) knowledge on rooftop garden and (ix) problems on rooftop gardening. Range, mean and standard deviations of these characteristics of the respondents are described in this section. A summary profile of the respondent's characteristics has been given in Table 4.1.

Table 4.1 Major features of the selected characteristics of the respondents

Sl. No.	Characteristics (with measuring unit)	Range		Mean	Standard deviation
		Possible	Observed		
1.	Age (years)	--	30-70	47.43	11.94
2.	Education (schooling years)	--	5-18	11.49	4.15
3.	Family size (number of members)	--	3-9	6.36	1.76
4.	Rooftop garden size (decimal)	--	2-7	3.66	1.14
5.	Annual family income ('000'Taka)	--	300-4000	2328.32	944.44
6.	Training exposure	--	0-15	6.82	4.55

	(number of days)				
7.	Extension media contact (obtained score)	0-42	11-30	20.63	6.16
8.	Knowledge on rooftop gardening	0-20	5-18	11.74	4.02
9.	Problems of rooftop gardening	9-27	5-22	13.03	4.93

4.1.1. Age

Age of the respondents varied from 30-70 years, the average being 47.43 years with the standard deviation of 11.94 (Table 4.1). According to their age, the respondents were classified into three categories as “young aged” (up to 35 years), “middle aged” (36- 50 years) and “old aged” (above 50 years). The distribution of the respondents according to their age is shown in Table 4.2.

4.1.1 Age

Table 4.2 Distribution of the respondents according to their age

Categories	Years	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Young age	< 35	23	21.49	47.43	11.94
Middle	36 to 50	41	38.32		
Old age	> 50	43	40.19		
Total		107	100		

Table 4.2 showed that the highest percentage of the respondents (40.19%) was in old aged followed by middle and younger respectively. An overall majority of the respondents (78.51%) were middle to old aged. This result indicates that about 78.51 percent of the respondents were middle aged to old aged as compared to 21.49 percent being young. The mean is 47.43 and standard deviation is 11.94 (Table 4.2).

This seems logical because heads of the families were selected as respondent. With the increase in age they find few alternatives for livelihood. This might be

lead to promote them to be motivated for rooftop gardening regarding climate regeneration.

4.1.2. Education

Education level of the respondents ranged from 5-18 in accordance with year of schooling. The average education score of the respondents was 11.49 with a standard deviation of 4.15 (Table 4.1). On the basis of their level of education, the respondents were classified into five categories as shown in Table 4.3.

Table 4.3 Distribution of the respondents according to their level of education

Categories	Basis of Categorization (schooling years)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Primary	1-5	8	7.47	11.49	4.15
Secondary	6-10	41	38.32		
Above	> 10	58	54.21		
Total	107	100	38.32		

Table 4.3 showed that 54.21 percent respondents had above secondary level of education compared to 38.32 and 7.47 percent having secondary level and primary level of education, respectively. It was revealed that higher level of education of an individual is likely to be more amenable to the modern facts and ideas. They have much mental strength in deciding on a matter related to problem solving. The mean is 11.49 and standard deviation is 4.15 (Table 4.3).

Education helps the respondents to gain knowledge on different improved technologies which is applicable easily in rooftop garden by studying books, leaflets, bulletins and other printed materials. Thus, respondents in the study area may be well considered as a suitable ground for climate regeneration through rooftop gardening.

4.1.3 Family size

The number of family size of the respondents ranged from 3 to 9 with an average of 6.36 and standard deviation of 1.76 (Table 4.1). Based on the family size, the respondents were classified into three categories as small, medium and large family as shown in Table 4.4.

Table 4.4 Distribution of the respondents according to their family size

Categories	Basis of categorization (No. of family member)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Small family	Up to 3	3	2.8	6.36	1.76
Medium	4-6	52	48.51		
Large family	> 6	52	48.51		
Total		107	100		

Table 4.4 represented that the highest proportion (48.51%) of the respondents had medium family size consisting of 4 to 6 members, while the same respondents belongs to large family members (48.51%) compared to 2.8% of them having small family size. The mean is 6.36 and standard deviation is 1.76 (Table 4.4).

4.1.4 Rooftop garden size

Rooftop garden size of the respondents ranged from 2 decimal to 7 decimal with the mean of 3.66 decimal and standard deviation of 1.14 (Table 4.1). On the basis of their rooftop garden size, the respondents were classified into three categories as shown in Table 4.5.

Table 4.5 Distribution of respondents according to their rooftop garden size

Categories	Basis of categorization (decimal)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Small	Up to 3	49	45.79	3.66	1.14
Medium	4-6	57	53.27		
Large	> 6	1	0.94		
Total		107	100		

Data presented in the Table 4.5 demonstrated that highest proportion (53.27%) of the respondents had medium rooftop garden compared to 45.79% and 0.94% having small and large rooftop size, respectively. The findings indicated that overwhelming majority (53.27%) of the respondents had medium roof size. The mean is 3.66 and standard deviation is 1.14 (Table 4.5).

Table 4.5 also shows that overwhelming majority (46.73%) of the total respondent as well as rooftop garden owner had small to large size of rooftop garden.

4.1.5 Annual Family income

The annual family income of the respondents was varied from 300 to 4000 thousand taka with a mean of 2328.32 thousand taka and standard deviation of 944.44 (Table 4.1). On the basis of annual family income, the respondents were categorized into three classes namely low, medium and high income categories shown in Table 4.6.

Table 4.6 Distribution of respondents regarding annual family income

Categories	Basis of categorization ('000' taka)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	Up to 2000	42	39.25	2328.12	944.44
Medium	2001 to 3000	34	31.78		
High	> 3000	31	28.97		
Total		107	100		

Results on annual family income shown in Table 4.6 presented that the highest proportion of the respondents (39.25%) had low annual family income while 31.78% and 28.97% of them had medium and high annual family income, respectively. Findings reveal that the most (71.03%) of the respondents had low to medium annual family income in the selected study area. The mean is 2328.12 and standard deviation is 944.44 (Table 4.6).

This might be due to the fact that the respondents of the study area were not engaged in agriculture only, they earned from other sources such as service, business etc. Respondents with low income generally invest less in their roof garden and most of them are interested to high return with low input. It is therefore, likely that in most of the rooftop garden practice might be hampered with high synthetic inputs for better returns.

4.1.6 Training exposure

The score of training exposure on rooftop gardening, the respondents were ranged from 0 to 15 days. The mean was 6.82 days and standard deviation was 4.55 (Table 4.1). On the basis of training exposure, the respondents were categorized into three groups as shown in Table 4.7.

Table 4.7 Distribution of the respondents according to their training exposure

Categories	Basis of categorization (Days)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	0-5	45	42.06	6.82	4.55
Medium	6-10	35	32.71		
High	>10	27	25.23		
Total		107	100		

Data presented in the Table 4.7 showed that 42.06% of the total respondents had low training on rooftop gardening while 32.71% of the respondents had medium training exposure and only 25.23 percent had high training exposure. It means that an overwhelming majority (42.06 percent) of the respondents had low training exposure. The mean is 6.82 and standard deviation is 4.55 (Table 4.7).

Training makes the respondents skilled and helps them to acquire deep knowledge about the respected aspects. Trained respondents can face any kind of problems about the adverse situation in their cultivation. So, they show favorable attitude toward rooftop gardening for modern cultivation.

4.1.7 Extension media contact

The score of extension contact on rooftop gardening practice regarding perception of climate regeneration ranged from 11-30 with possible score range of 0-42. The mean was 20.63 and standard deviation was 6.16 (Table 4.1). On the basis of extension media contact, the respondents were categorized into three groups as shown in Table 4.5.

Table 4.8 Distribution of the respondents according to their extension media contact

Categories	Basis of categorization (score)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	Up - 14	28	26.17	20.63	6.16
Medium	15 - 28	67	62.62		
High	> 28	12	11.21		
Total		107	100		

Data presented in Table 4.8 indicate that 62.62% of the respondents had medium extension contact while 26.17% had low and 11.21% respondents had high extension contact. The mean is 20.63 and standard deviation is 6.16 (Table 4.8).

It is generally known that extension contact may be a good source of different information. Extension contact helps the respondents for better understanding and to get recent information regarding rooftop gardening. In order to increase rooftop gardening practice, contact with different media of the respondents should be increased. The findings of the study indicate that most of the respondents had medium extension contact with various information sources for getting necessary agricultural information.

4.1.8 Knowledge on rooftop gardening

Knowledge on rooftop gardening score of the respondents ranged from 5-18 against the possible range of 0 – 20 having an average of 11.74 and standard deviation of 4.02 (Table 4.1). On the basis of knowledge scores, the respondents were classified into three categories namely, ‘low knowledge’,

‘medium knowledge’ and ‘high knowledge’. The distribution of the respondents according to their perception of climate regeneration in rooftop garden is given in Table 4.9.

Table 4.9 Distribution of the respondents according to their knowledge on roof gardening

Categories	Basis of categorization (score)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	0-7	21	19.63	11.74	4.02
Medium	8-14	50	46.73		
High	>14	36	33.64		
Total		107	100		

Table 4.9 showed that 46.73 percent of the respondents felt in medium knowledge category followed by 33.64 percent in high knowledge category and only 19.63 percent respondents were in low knowledge category. The mean is 11.74 and standard deviation is 4.02 (Table 4.9).

Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding rooftop gardening. It is clear perception of reality that the knowledge helps an individual to reach a desired goal. It makes individuals to become rational and conscious about related field. To perform optimum production and processing of food, respondents should have adequate knowledge on different aspects of production technology.

4.1.9 Problems on rooftop gardening faced by the respondents

Problems on rooftop gardening score faced by the respondents ranged from 5-22 against the possible range of 9 – 27 having an average of 13.03 and standard deviation of 4.93 (Table 4.1). On the basis of problem scores, the respondents were classified into three categories namely, ‘low’, ‘medium’ and ‘high’. The distribution of the respondents according to problemse on rooftop gardening is given in Table 4.10.

Table 4.10 Distribution of the respondents according to their problems on roof gardening

Categories	Basis of categorization (score)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	9-15	31	28.97	13.03	4.93
Medium	16-22	59	55.14		
High	>22	17	15.89		
Total		107	100		

Table 4.10 showed that 55.14 percent of the respondents felt in medium problem category followed by 28.97 percent in low problem category and only 15.89 percent respondent was in low knowledge. The mean is 13.03 and standard deviation is 4.93 (Table 4.10).

Problems are the most important issue against any work which might be successfully done. Results showed that most of the respondents (84.11%) of the respondents were medium to low problems.

To perform optimum production and processing of food in the rooftop garden regarding perception of climate regeneration, respondents should have to remove problems using proper knowledge and skills on different aspects of rooftop gardening.

4.2 Focus issue

4.2.1 Perception of city gardener towards climate regeneration

Perception of city gardener towards climate regeneration score ranged from 10 to 27 against the possible range of 7 - 28 having an average of 17.53 and standard deviation of 5.33 (Table 4.11). On the basis of perception of climate regeneration in rooftop garden scores, the respondents were classified into three categories namely, 'low', 'medium and 'high'. The distribution of the respondents according to their perception of climate regeneration in rooftop garden is given in Table 4.11.

Table 4.11 Distribution of the respondents according to their perception of climate regeneration in rooftop garden

Categories	Basis of categorization (score)	Respondents		Mean	Standard Deviation
		Numbers	Percent		
Low	7-13	7	6.54	17.53	5.33
Medium	14-20	66	61.68		
High	>20	34	31.78		
Total		107	100		

Data on Table 4.11 showed that 61.68 percent of the respondents felt in medium perception of climate regeneration in rooftop garden category followed by 31.78 percent in high category and 6.54 percent respondents were in low perception of climate regeneration in rooftop garden category. To achieve best performance from rooftop garden, respondents need higher perception of climate regeneration in rooftop garden and to receive proper technologies regarding rooftop crop production.

4.3. Relationship between the selected characteristics of the respondents and perception towards rooftop gardens for climate regeneration

Co-efficient of correlation was computed in order to explore the relationship between the selected characteristics of the respondents and their perception towards rooftop gardens for climate regeneration. Pierson's Product Moment Co-efficient of Correlation (r) has been used to test the hypothesis concerning the relationship between two variables. Five percent and one percent level of probability were used as the basis of acceptance or rejection of a hypothesis. The Table value of 'r' was calculated at (107) = 105 degrees of freedom. The summary of the results of the co-efficient of correlation indicating the relationships between the selected characteristics of the respondents and their perception towards rooftop gardens for climate regeneration is shown in Table 4.12.

Table 4.12 Computed Co-efficient of correlation between Independent and Dependent variables (N=107)

Dependent variable	Independent variable (Respondents Characteristics)	Correlation of co- efficient (r) with Respondents perception
Perception of city dwellers towards rooftop gardens for climate regeneration	Age	0.855**
	Education	0.921 **
	Family size	0.011 ^{NS}
	Rooftop Garden size	-0.138 ^{NS}
	Annual family income	0.895**
	Training exposure	0.855 **
	Extension media contact	0.871**
	Knowledge on Rooftop Gardening	0.821**
	Problems on Rooftop Gardening	-0.868 **

^{NS} = Not significant

** Correlation is significant at 0.01 level of probability.

* Correlation is significant at 0.05 level of probability.

Tabulated value of 0.01 level = 0.254

Tabulated value of 0.05 level = 0.195

A hypothesis was rejected when the observed 'r' value was greater than the tabulated value of 'r' at 0.01 level of probability. As mentioned earlier, the selected nine characteristics of the respondents were the independent variables of the study. The variables were age, education, family size, rooftop garden size, annual family income, training exposure, extension media contact, knowledge on rooftop gardening and problems on rooftop gardening. The dependent variables was perception of city gardenres towards rooftop gardens for climate regeneration.

4.3.1. Relationship between age of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.855 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.
- The computed value of 'r' (0.855) was found to be greater than the Table value of 'r' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The finding implies that the age of the respondents had significant positive relationship with their perception towards rooftop gardens for climate regeneration. The finding is quite balanced because aged people generally eager to adopt roof gardening through their experience and well understanding of roof gardening.

4.3.2 Relationship between education of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.922 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.
- The computed value of 'r' (0.922) was found to be greater than the tabulated value of 'r' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The finding implies that the education of the respondents had significant positive relationship with their perception towards rooftop gardens for climate regeneration. The finding is quite balanced because educated people have well perception on climate regeneration.

4.3.3 Relationship between family size of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.011 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.
- The computed value of ' r ' (0.011) was found to be smaller than the tabulated value of ' r ' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variable was not significant at 1% level of probability.

The researcher concluded that the family size of the respondents had no significant relationship with their perception towards rooftop gardens for climate regeneration.

4.3.4 Relationship between rooftop garden size of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be -0.138 presented in Table 4.12 which led to the following observations:

- The relationship showed a negative direction.
- The computed value of ' r ' (-0.138) was found to be smaller than the tabulated value of ' r ' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variable was not significant at 1% level of probability.

The researcher concluded that the rooftop garden size of the respondents had no significant relationship with their perception towards rooftop gardens for climate regeneration.

4.3.5 Relationship between annual family income of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.895 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.
- The computed value of ' r ' (0.895) was found to be greater than the tabulated value of ' r ' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The researcher concluded that the annual income of the respondents had significant positive relationship with their perception towards rooftop gardens for climate regeneration.

4.3.6 Relationship between training exposure of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was worked out and found to be 0.855 presented in Table 4.12 which directed to the following observations:

- The relationship showed a positive indication.
- The computed value of ' r ' (0.855) was higher than the tabulated value of ' r ' (0.254) with 105 degrees of freedom at 1% level of probability.
- Hence, the concerned null hypothesis was rejected.

- The correlation co-efficient between the training exposure of the respondents and their perception towards rooftop gardens for climate regeneration was significant.

The finding implies that the training exposure of the farmers had significant relationship with their perception towards rooftop gardens for climate regeneration.

4.3.7 Relationship between extension media contact of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.871 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.
- The computed value of ' r ' (0.871) was found to be greater than the tabulated value of ' r ' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The finding implies that the extension contact of the respondents had significant positive relationship with their perception towards rooftop gardens for climate regeneration.

4.3.8 Relationship between knowledge on roof top gardening of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be 0.821 presented in Table 4.12 which led to the following observations:

- The relationship showed a positive direction.

- The computed value of 'r' (0.821) was found to be greater than the tabulated value of 'r' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The finding implies that the knowledge on rooftop gardening of the respondents had significant positive relationship with their perception towards rooftop gardens for climate regeneration. Moreover, it can be said that the farmers who has more knowledge on rooftop gardening have higher attitude for perception towards rooftop gardens for climate regeneration.

4.3.9 Relationship between Problems on Rooftop Gardening of the respondents and their perception towards rooftop gardens for climate regeneration

The co-efficient of correlation (r) between the concerned variables was computed and found to be -0.868 presented in Table 4.12 which led to the following observations:

- The relationship showed a negative direction.
- The computed value of 'r' (-0.868) was found to be greater than the tabulated value of 'r' (0.254) with 105 degrees of freedom at 1% level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variable was significant at 1% level of probability.

The finding implies that the knowledge on rooftop gardening of the respondents had significant negative relationship with their perception towards rooftop gardens for climate regeneration. Moreover, it can be said that the respondents who are in more problems, rooftop gardening have higher attitude for perception towards rooftop gardens for climate regeneration.

CHAPTER V

SUMMARY AND CONCLUSION

5.1 Summary of the findings

5.1.1 Selected characteristics of the respondents

Age

The middle-aged and old aged respondents comprised the highest proportion (78.5%) and the lowest proportion were young aged category (21.49%).

Education

Respondents under above secondary education category constitute the highest proportion which was 54.21%. On the other hand, the lowest 7.47% in primary category whereas 38.32% respondents had secondary level of education.

Family size

The highest proportion (48.51%) of the respondents had medium & large family size, while 2.8% belonged to the small family size.

Rooftop garden size

The highest proportion (53.27%) were medium size respondents whereas only 0.94% were large rooftop garden holder and 45.79% had small size rooftop garden.

Annual family income

The highest portion of respondents (39.25%) had small annual income and (31.78%) had medium annual income while the lowest proportion (28.97%) was in high annual family income.

Training exposure

Highest portion of the respondents (42.06%) had low training compared to 25.23% and 32.71% having high and medium training, respectively. It means overwhelming majority (74.77%) of the respondents had medium to low training on rooftop gardening.

Extension media contact

Most of the respondents 62.62% had medium extension media contact compared to 26.17% and 11.21% having low and high extension contact, respectively. It means more than 88.79% of the respondents had medium to low extension contact.

Knowledge on rooftop gardening

The highest proportion (46.73%) of the respondents had medium knowledge on rooftop gardening while 33.64% had high knowledge and 19.63% had low knowledge on rooftop gardening.

Problems on roof gardening

Highest portion of the respondents (55.14%) had medium problems followed by 28.97% and 15.89% had low and high problems on rooftop gardening, respectively.

Perception of city dwellers towards rooftop gardens for climate regeneration

The highest proportion (61.68%) of the respondents were under medium levels of perception towards rooftop gardens by 31.78% in high category and 6.54% was in low category.

5.1.2 Conclusion

the following conclusions is drawn from the findings of the study and the reasonable understanding of their meaning in the light of other related facts incited the researcher:

1. Finding shows that majority of the respondents (40.19%) were old aged. Age had a significant contribution with perception towards rooftop gardens for climate regeneration. Therefore, it can be concluded that higher aged respondents have higher perception towards rooftop gardens for climate regeneration.
2. Finding revealed that the education of the respondents had significant positive relationship with their perception towards rooftop gardens for

climate regeneration. Respondents under above secondary education category constitute the highest proportion which was 54.21%. The finding is quite balanced because educated people have well perception on climate regeneration.

3. Finding revealed that The highest portion of respondents (39.25%) had small annual income and (31.78%) had medium annual income while the lowest proportion (28.97%) was in high annual family income. Therefore, it could be concluded that, the annual income of the respondents had significant relationship with perception towards rooftop gardens for climate regeneration positively.
4. Finding shows that highest portion of the respondents (42.06%) had low training compared to 25.23% and 32.71% having high and medium training, respectively. Based on the findings , it may be concluded that GOs and NGOs should review their training programme so that the city dwellers understand the necessity of RTG and increase their perception level on climate regeneration.
5. The researcher observed that the highest proportion (46.73%) of the respondents had medium knowledge on rooftop gardening while 33.64% had high knowledge and 19.63% had low knowledge on rooftop gardening. Therefore, it can be concluded that perception towards rooftop gardens for climate regeneration belongs to moderate satisfactory level and needs more improvement.
6. The results indicate that Extension media contact had a positive and significant contribution with their perception towards rooftop gardens for climate regeneration. Most of the respondents (62.62%) had medium extension contact compared to 26.17% and 11.21% having low and high extension contact, respectively. Therefore, it can be concluded that more the Extension media contact by the respondent, perception towards rooftop gardens for climate regeneration increased positively.

7. The results indicate that about 50% of the respondents had medium problems which also showed negative contribution. The results might not be a good scenario to increase perception towards rooftop gardens for climate regeneration. However, still there is a need to take initiative to solve the problems faced by the respondents.
8. The findings of the study revealed that that majority (61.68%) of the respondents had medium levels perception towards rooftop gardens for climate regeneration. Besides 6.54% respondents had low perception towards rooftop gardens for climate regeneration. Therefore, it can be concluded that perception towards rooftop gardens for climate regeneration belongs to moderate satisfactory level and needs more improvement.

5.2 Recommendations

5.2.1 Recommendations for policy implications

On the basis of findings and conclusions following recommendations were drawn:

1. Bangladesh government through Bureau of Non-formal Education (BNFE) and NGOs can take necessary steps to increase awareness towards rooftop gardens for climate regeneration through non-formal education (adult education) and regular training, workshop, rally needs to be organized to broaden their perception.
2. Extension media contact had a very strong impact to increase perception towards rooftop gardens for climate regeneration. Steps should be taken by DAE to encourage respondents to have more media contact. More result demonstration, method demonstration, farm and home visit etc. program should be conducted to increase perception towards rooftop gardens for climate regeneration.
3. Attention should be paid more to the respondents having less income and less media contact to increase perception towards rooftop gardens

for climate regeneration. In this case to select respondents for training, rally and workshop, emphasize should be given to above mentioned respondents.

5.2.2 Recommendations for the future study

1. Findings of the study need to be varied by undertaking similar research in other areas of the country.
2. The study was conducted Mohammadpur in Dhaka District. Similar studies might be carried out in other area of Dhaka.
3. This study investigated the relationship and contributions of 10 characteristics of the respondent's perception towards rooftop gardens for climate regeneration; further research is needed to explore the effects of other characteristics of the respondents.
4. Similar research should be conducted at different aspects.

REFERENCES

- Adeola, R. G. 2012. Perceptions of Environmental Effects of Pesticides Use in Vegetable Production by Farmers in Ogbomoso, Nigeria. *Global Journal of Science Frontier Research Agriculture & Biology*. Volume 12 Issue 4 Version 1.0 April 2012.
- Afique, A. A. 2006. Rural Women's Perception of Benefit from Agricultural Model Farm Project of SUS. MS. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Alom, M. Z. 2001. Farmers' Perception of Binamoog-5 as a Summer Crop. M.S. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- BBS (Bangladesh Bureau of Statistics), (2011). Population and Housing Census. Bangladesh Bureau of Statistics, Ministry of Planning, GOB. Dhaka, Bangladesh, p: 21.
- BBS. (2015). Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the people's Republic of Bangladesh, Dhaka, Bangladesh.
- Bechtel, R. B., Marans, R. W., Michelson, W., Taylor, J. G., Zube, E. H., & Sell, J. L. (1987). Landscape Assessment and Perception Research Methods. In R. Bechtel, R. Marans, & W. Michelson (Eds.), *Methods in Environmental and Behavioral Research* (pp. 361–393). Van Nostrand Reinhold Co.
- Benjamin, K., Bouchard, A., & Domon, G. (2007). Abandoned Farmlands as Components of Rural Landscapes: An Analysis of Perceptions and Representations. *Landscape and Urban Planning*, 83(4), 228–244.
- Bennett, (2003). Linkages in the landscape: The role of corridors and connectivity in wildlife conservation. Gland: International Union for Conservation of Nature and Natural Resources

- Chowdhury, S.S. 2010. Farmers' Knowledge on Maize Cultivation in Five Selected Villages of Shibalaya Upazila under Manikgonj District. M.S. (AEIS). Thesis, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka.
- Dunnett, N. & Kingsbury, N. (2004). *Planting Green Roofs and Living Walls*. Timber Press, Portland.
- Gedge, D. (2002). 'Roofspace – a place for brownfield biodiversity. *ECOS*, 22 (3/4), 69 – 74.
- Elmendorf, W. F., Willits, F. K., & Sasidharan, V. (2005). Urban park and forest participation and landscape preference: A review of the relevant literature. *Journal of Arboriculture*, 31, 311–317.
- Erickson, D. L., Ryan, R. L., & De Young, R. (2002). Woodlots in the Rural Landscape: Landowner Motivations and Management Attitudes in a Michigan (USA) Case Study. *Landscape and Urban Planning*, 58(2-4), 101–112.
- Ezekiel, M. and K. A. Fox. 1959. *Method of Correlation and Regression Analysis*. 3rd ed. New York: John Wiley and Sons, Inc.
- Fardous, M. T. 2002. Farmers' Perception of Village and Farm Forestry Program Towards Sustainable Forestry Development. M.S. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Fernandez-Cañero, R., Emilsson, T., Fernandez-Barba, C., & Herrera Machuca, M. Á. (2013). Green roof systems: a study of public attitudes and preferences in southern Spain. *Journal of Environmental Management*, 128, 106–115.
- Gómez-Baggethun E., & Barton, D.N. (2013). Classifying and Valuing Ecosystem Services for Urban Planning. *Ecological Economics*, 86, 235- 245.
- Goode, W.J. and P.K. Hatt 1952. *Methods of Social Research*. New York: McGraw-Hill Book Company, Inc.

- Goodey, B. (1971). Perception of the Environment. University of Birmingham. Centre for Urban and Regional Studies. Birmingham, R.R Ltd.
- Gude, P. H., Hansen, A. J., Rasker, R., & Maxwell, B. (2006). Rates and Drivers of Rural Residential Development in the Greater Yellowstone. *Landscape and Urban Planning*, 77(1-2), 131–151.
- Hafiz, R., (2004). Comfort and Quality of Indoor and Outdoor Spaces in Dhaka: An Analysis of Urban Planning and Design, GBER, Vol. 4 No. 2 pp 61 – 70.
- Hasan, M. K. 2006. Participation in Farming Activities by Conventional and Organic Farmers. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Hodgon, K., Campbell, M. C., and Bailkey, M. (2011). Investing in Healthy, Sustainable Places through Urban Agriculture. Funders' Network for Smart Growth and Livable Communities, 1-15.
- Hossain, M.M. 2003. Farmers' Knowledge and Adoption of Boro Rice Cultivation Practices M.S. (Ag. Ext. Ed). Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Hossain, M.N. 1999. Farmers Perception of the Effects of Agro-chemicals on Environment. M.S. (Ag. Ext. Ed.) Thesis. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Islam, M. N. 2005. Perception of the Farmers about Causes and Remedies of Monga in Kurigram District. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Islam, M.N. 2008. Knowledge on Vegetables Production Activities by Woman Members In Homestead Area Under World Vision Project. M.S. (AEIS). Thesis, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka.

- Islam, M.S. 2002. Adoption of Modern Agricultural Technologies by the Farmers of Sandwip. M.S. (Ag. Ext. Ed.) Thesis. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Islam, N. M. (2001). Homegarden Agroforestry in Bangladesh: A case study in Rangpur district. M.Sc. thesis, Agricultural University of Norway, Oslo, Norway
- Kabir, M. H. and R. Rainis. 2012. Farmers' Perception on the Adverse Effects of Pesticides on Environment: The Case of Bangladesh. *International Journal of Sustainable Agriculture* 4 (2): 25-32, 2012.
- Kabir, M. T. N. 2002. Perception of Farmers on the Effects of Barind Integrated Area Development Project Towards Environmental Upgradation. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Kaltenborn, B. P., & Bjerke, T. (2002). Associations between Environmental Value Orientations and Landscape Preferences. *Landscape and Urban Planning*, 59, 1–11.
- Kamron, N.N. (2006). Adoption of roof gardening at Mirpur-10 area under Dhaka city.
- Kamrujjaman, R. (2015). Vertical Farming: Social Work and Sustainable Urban Agriculture in an Age of Global Food Crises. *Australian Social Work* 66 (2): 187– 203.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, MA: Cambridge University Press.
- Khan, M. S. I. 2005. Farmers' Knowledge of Maize Cultivation in Tilli Union. M. S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Majlish, S. A. K. 2007. Perception of Participant Women on Social Forestry Program of BRAC. M.S. (Ag.Ext.Ed.) Thesis, Department of

- Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Moustier, P. (2007). Urban horticulture in Africa and Asia, an efficient corner food supplier. *ISHS Acta Horticulturae*, 762: 145–158.
- Niekerk, M. Van, Greenstone, C., & Hickman, M. (2011). *Guideline for Designing Green Roof Habitats* (p. 52).
- Oberndorfer, E., Lundholm, J., Bass, B., Connelly, M., Coffman, R., Doshi, H., et. al (2007). Green roofs as urban ecosystems: Ecological structures, functions and services. *BioScience*, 57 (10), 823-833.
- Orsini, F., Gasperi, D., Marchetti, L., Piovene, C., Draghetti, S., Ramazzotti, S., and Gianquinto, G. (2014). Exploring the production capacity of rooftop gardens (RTGs) in urban agriculture: the potential impact on food and nutrition security, biodiversity and other ecosystem services in the city of Bologna. *Food Security*, 6(6): 781-792.
- Pal, B. K. 2009. *The Perception of Organic Farmers Regarding Introduction of ICT in Organic Farming*. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Rahman, M. S. 2004. *Extent and Level of Knowledge of Farmers' on HYV Boro Rice Cultivation Practices*. M. S. (Ag. Ext. Ed). Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Rashid and Ahmed MHB. (2009). The passive cooling effect of green roof in high-rise residential building in Malaysia. *Sustainable Architecture and Urban Development*, CSAAR, 3-6 November.
- Rajek, r. (2017). *Urban Regeneration*. (Second Edi., p. 18).
- Rosley, M. S. F., Rahman, S. R., and Lamit, H. (2013). Perceiving the Aesthetic Value of Rural Landscape through Valid Indicators. *Social and Behavioral Sciences*, 85, 318 – 331.

- Roy, B. H. 2009. Farmers' Perception of the Effect of IPM for Sustainable Crop Production. M.S. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Sana, M.C. 2003. Farmers' Knowledge of Shrimp Cultivation in Assouni Upazila Under Satkhira District. An M.Sc. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Sarker, D.C. 1997. Correlates of Selected Characteristics of Potato Growers with Their Adoption of Improved Potato Cultivation Practices in Five Villages of Comilla District. M.S. (Ag. Ext. Ed.) Thesis. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Sharmin, H. 2005. Rural Women's Perception of Benefits of Involvement in Income Generating Activities under a Non-Government Organization. M.S. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Tabassum, T. and Sharman, S., (2010). The Impact of Green Space Declination in Dhaka's Local Thermal Environment, Conference proceeding, urbanization, traffic jam and Bangladesh environment, ISBN: 978-984-33-5373-3.
- Taib, N., & Abdullah, A. (2012). Study of Landscape Gardens: Expectations and Users' Perceptions of a High-Rise Office Building. *Procedia - Social and Behavioral Sciences*, 50(July), 633–642.
- Townsend, J. C. 1953. *Introduction to Experimental Methods*. New York: McGraw Hill Book Company Inc.
- Uddin, M. N. 2004. Farmers' Perception of Sustainable Agriculture: A Comparative Study between CARE Beneficiaries and Non-beneficiaries. M.S. (*Ag.Ext.Ed.*) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

- Villagra Islas, P., & Gastón Vergara, D. (2012). Perceived Visual Landscape Changes in a Fire Prone Environment: A MultiMethod Approach. *Journal of Environmental Psychology*, 32(2), 144–157.
- Wilkinson, T. S. and Bhandarka, P. L. (1977). *Methodology and Techniques of social Research*, Bombay: Himalaya Publishing House. p 79.
- Wong, N. H., Cheong, D. K. W., Yan, H., Soh, J., Ong, C. L., & Sia, A. (2003). The effects of rooftop garden on energy consumption of a commercial building in Singapore. *Energy and Buildings*, 35, 353–364.
- World Bank. (2007). *Development and the Next Generation*.
- Yok, T. P., & Sia, A. (2008). A Selection of Plants for Green Roofs in Singapore. (A. Tan Puay Yok and Sia, Ed.) (Second Edi., p. 122). Singapore: National Parks Board 2008.
- Yuen, B., & Nyuk Hien, W. (2005). Resident perceptions and expectations of rooftop gardens in Singapore. *Landscape and Urban Planning*, 73(4), 263–276.

APPENDICES

Appendix- A

A questionnaire on interview schedule for a research study

Perception of city gardeners towards rooftop gardens for climate regeneration

Serial No. :

Name of the respondent :
Address :
:

Please answer the following questions. Information given by you will be kept secret and only be used for research work

1. Age: How old are you?

..... years

2. Education (Please mention your educational attainment by putting (√) mark against the appropriate answer)

- a) Do not know reading and writing
- b) Can sign only
- c) I have studied up to class

3. Family size

Please mention the number of your family members engaged in farming activities:

- a) Male member.....person
- b) Female member.....person
- c) Total member.....person

4. Rooftop garden size

Please mention the area of your land possession:

Sl. No.	Types of land ownership	Land area	
		Local unit	Decimal
1.	Own rooftop size		
Total			

5. Annual family income (Tk.)

Please mention your family income from different sectors in the last year

Sl. No.	Source of income	Amount of production	Price per unit(TK)	Total (Tk.)
A.	Farming			
B.	Business			
C.	Service			
D.	Others			

Total annual income =A+B+C+D =

6. Training exposure

Do you attend any training on rooftop gardening? Yes /no. If yes,

Then please mention the training courses you have attended so far.

Subject	Place	Duration (day)	Organization

7. Contact with extension media

Please mention the extension contact you have attended so far

Type of media	Name of information media	Extent of contact			
		Frequently 3	Occasionally 2	Rarely 1	Not at all 0
Personal Contact	Friends/relatives				
	Extension agents (SAAO)				
	Extension officials (AEO/AAO/UAO)				
	BADC officials				
	NGO personnel				
Group Contact	Demonstrations				
	Group meetings				
Mass Contact	Radio				
	Television				
	Newspaper				
	Leaf lets or booklet				
	Reading agricultural books				
	Agricultural fair				
	Audio-visual aids				

8. Knowledge on rooftop gardening

Kindly answer the following question:

Sl. No.	Questions	Marks	Obtained mark
1.	What do you mean by rooftop gardening?	2	
2.	Can you mention soil preparation practice for rooftop garden?	2	
3.	Can you mention soil management practices that conserve soil moisture?	2	
4.	Can you mention pot preparation or structures practices that that are enable for rooftop garden?	2	
5.	Do you know what kind of crops (vegetables/fruits) are more profitable for rooftop garden?	2	
6.	Name two mechanical control of weed management practices.	2	
7.	Name two pesticide controls of insect or disease management practices.	2	
8.	Have you any idea on organic manuring? Please mention.	2	
9.	Mention two organic sources of nutrient for plants.	2	
10.	Do you know what is IPM?	2	
Total		20	

9. Problems faced by the farmers on rooftop gardening

Please mention the problems that you faced so far

Sl. No.	Problems	Extent of problems			
		High	Medium	Low	Not at all
		3	2	1	0
1.	Lack of knowledge on appropriate cultivation technique for climate regeneration				
2.	Lack of knowledge on climate regeneration				
3.	Lack of knowledge on adverse climatic effect				
4.	Lack of knowledge on climate change adaptation				
5.	Unavailability of technological resources in desired amount				
6.	Lack of training facility for adoption of technologies				
7.	Lack of initiatives and motivation from Extension agencies				
8.	Lack of interest on adoption of new technologies				
9.	Lack of knowledge on application of different technologies				

10. Perception of city gardener towards climate regeneration in rooftop garden

Please give your opinion for the following statements:

Sl. No.	Statements	Extent of responses			
		Strongly agreed	Agreed	Disagreed	Strongly disagreed
		4	3	2	1
1.	Rooftop agriculture is the production of fresh vegetables, herbs, fruits, edible flowers and possibly some small animals on rooftops for local consumption.				
2.	Productive green roofs combine food production with ecological benefits,				

	such as reduced rainwater run-off, temperature benefits such as potential reduction of heating and cooling requirements (resulting in reduced emissions).				
3.	Productive green roofs combine food production may create biodiversity, improved aesthetic value and air quality.				
4.	Ecological advantage may be enhanced during roof gardening through obtaining by products such as leaves, flowers, fruits, seeds etc. which helps to create organic manure, animal feed etc.				
5.	Eco-friendly management is possible in rooftop gardening by increasing organic manure instead of synthetic chemicals.				
6.	Roof top gardening can be considered as commercial production unit of fruit, vegetables etc.				
7.	Roof top gardening may hamper quality of roofs in case of miss management which also may be responsible for disease incidence.				
Total					

Thank you for your kind cooperation.

Date:.....

.....
Signature of Interviewer