PROBLEMS OF ROOF TOP GARDENING AT MOHAMMADPUR THANA UNDER DHAKA CITY

Md. Shafiqur Rahman
Registration No. 07-02488
Semester: July-December, 2012

A thesis
Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science (M.S.)
In
AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

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

July-December 2014

PROBLEMS OF ROOT TOP GARDENING AT MOHAMMADPUR THANA UNDER DHAKA CITY

By

Md. Shafiqur Rahman

REGISTRATION NO.: 07-02488

A Thesis
Submitted to the Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University, Dhaka-1207,
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE (MS)
IN
AGRICULTURAL EXTENSION

SEMESTER: July-December, 2014

Approved by

Mohammad Zamshed Alam
Supervisor

Prof. Mohammad Hossain Bhuiyan
Co-supervisor

Dr. M. M. Shofi Ullah
Chairman
Examination Committee
Dept. of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University, Dhaka-1207

DEPARTMENT OF AGRICULTURAL EXTENSION AND INFORMATION SYSTEM
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

This is to certify that the thesis entitled "**PROBLEMS OF ROOF TOP GARDENING IN MOHAMMADPUR THANA UNDER DHAKA CITY**" submitted to the faculty of agriculture, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE in AGRICULTURAL EXTENSION & INFORMATION SYSTEM**, embodies the result of a piece of bona fide research work carried out by **Md. Shafiqur Rahman** , Registration No. **07-02488** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:
Dhaka, Bangladesh

Mohammad Zamshed Alam
Associate Professor & Supervisor
Dept. of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

DEDICATED TO MY BELOVED PARENTS

ACKNOWLEDGEMENTS

All praises to Almightly Allah, the Great, Gracious, Mercifull, Whose blessings enabled the author to complete this research work successfully. In particular, the author deems it a great pleasure to express his profound thankfulness to his respected parents, who entiled much hardship inspiring for prosecuting his studies, receiving proper education.

Guidance, help and co-operation have been received from several persons or authority during the tenure of the study; the author is immensely grateful to all of them. Although it is not possible to mention everyone by name, it will be an act of ungratefulness if some names are not mentioned here.

The author deems it a proud privilege to express his deep sense of gratitude, sincere appreciation and immense thanks to his supervisor ***Mohammad Zamshed ALam, Associate Professor,*** *Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for her continuous guidance, cooperation, constructive criticism and helpful suggestions in carrying out the research work and preparation of this thesis, without her intense co-operation this work would not have been possible.*

The author feels proud to express his deepest respect, sincere appreciation and immense indebtedness to his co-supervisor ***Professor Mohammad Hossain Bhuiyan,*** *Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for his scholastic and continuous guidance, constructive criticism and valuable suggestions during the entire period of course and research work and preparation of this thesis. The author also expresses his heartfelt thanks to all the teachers of the Department of Agricultural Extension and Information System, SAU, for their valuable teaching, suggestions and encouragement during the period of the study.*

Last but not the least, the author express his immense indebtness, deepest sense of gratitude and profound gratefulness to his friends who had been a constant source of bleesings, inspiration and encouragement for his higher study.

The Author

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

The purpose of the study was to find out the problems faced by the roof gardeners at Mohammadpur under the Dhaka city. Attempts were also made to describe some characteristics of the respondents of that area. The selected characteristics were: age, family size, education, family income, area covered by the roof garden, knowledge, use of information sources, attitude towards rooftop gardening, training exposure on roof top gardening. Sixty respondents were selected by using Yeomen's formula. Mohammadpur thana area under Dhaka city. Data were collected by using a pretested personal interview schedule during March to May, 2014. Pearson's Product moment Correlation "r" was used to determine the relationship between the selected characteristics of the respondents with their extent of problems in roof top gardening. The findings revealed that the majority (45%) of the respondent faced medium problem while 40% percent of the respondent faced low problem. Comparatively few respondents (15%) faced high problem in roof top gardening. Among nine selected characteristics of the respondents, 5 namely, Level of education, Knowledge on roof top gardening, Use of information sources, Attitude towards roof top gardening, and Training had significant negative relationship with their problems faced in roof top gardening and the rest 4 characteristics namely, age, Family Size, Family Annual Income and roof top space had no significant relationship with their problems of roof top gardening.

CHAPTER 1

INTRODUCTION

1.1Background :

Rooftop gardens' cultural significance stretches back for millennia starting with the Mesopotamians. They built the most famous ancient example of a rooftop garden: The Hanging Gardens of Babylon'. These early historical rooftop gardens were for kings and simulated nature. They were stand-alone buildings with multiple terraces containing the plants and trees. Rooftop gardens remained a luxury reserved for the wealthy throughout the early history. Roman leaders adopted rooftop gardens as a way to bring nature into their cities and stay connected to their agrarian roots. Examples can also be seen in medieval times, when churches were the only buildings structurally able to support the weight of a rooftop garden. Many large buildings from the Italian Renaissance placed gardens on rooftop piazzas to serve as an oasis and beautify their building.

The green cover of urban areas around the world is being replaced with concrete and brick. Urban dwellers no longer live and work intimately with the plant that provide the oxygen they breathe, the clothes they wear, the food supply they find so abundantly around them. Dhaka being an over populated city, meanwhile has exceeded her carrying capacity. Roof top gardening is fashionable activities mainly for the solvent people. If the city dwellers are well motivated in roof top gardening, it may potentially contribute in changing the highly polluted capital city into healthy one. In this regard, a sort of government and non-government support is required to train and motivate people with regards to technical aspects of roof top gardening including marketing. The study clarifies physical and cultural aspects of roof top gardening. It also clarifies that roof top gardening is financially viable in addition to amenity and recreational gain.

Agriculture, also called farming or husbandry, is the cultivation of animals, fish, plants, fungi, and other life forms for food, fiber, and bio-fuel, medicinal and other products used to sustain and enhance human life. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that nurtured the development of civilization. Naturally oriented agriculture

had been practiced from very early of the society formation and day by its became well structured, systematic or more productive. As the consequences urban people are also practicing different kind of agricultural practice to fulfill their nutrients and environmental requirements including beautification. Urban agriculture or urban farming is the practice of cultivating, processing, and distributing food in or around a village, town, or city. Urban agriculture can also involve animal husbandry, aquaculture, agro forestry, urban beekeeping, and horticulture. These activities occur in peri-urban areas as well.

Dhaka is the largest and fastest growing city of Bangladesh. Rapid population growth in Dhaka has created severe pressure on the land of the already overcrowded country. Due to emerge growth & colossal birth rate severe pressure created upon Dhaka city. Dhaka city is losing its maximum land because of residential system, shopping malls, flyovers, roads and many more urban creatures. A vast range of high riser buildings took place in every corner of the city. The building inhabitants can grow vegetables, fruits, and flowers or ornamental plants on the roof of their building. But unfortunately most of them do not practice any gardening on their roofs. Due to lack of adequate plants growth environment was being polluted since urbanization is being onward. Different diseases and deformation occurring through the citizens. Despite these there is a huge range of problems for roof top gardening. Presently the rooftops of the residential buildings are being used for various purposes: for drying (88%) and washing (45%) clothes, as playground for children (97%), for entertaining guests (20%), for cool air during the summer (64%), to sunbathe in the winter (33%). On most of the roofs, some form of pleasure garden exists (78%), sometimes there are fruit gardens (12%), and, less often, vegetable garden as well (8%). (Khandaker M. Shariful Islam, Dept. of Public Administration, The University of Dhaka, Bangladesh). The citizens are least aware and have least knowledge to practice roof top gardening. These facts indicate the need for conducting a survey on roof top gardening.

1.2 Statement of the problems:

In regards of importance of roof top gardening the investigators of this survey were highly interested to explore the Problems of roof top gardening in Dhaka city entitled "Problems of roof top gardening At Mohammadpur thana under Dhaka city".

This study attempted to find out the answer of the following research questions:

1. What are the respondents selected characteristics?
2. What are the problems of roof top gardening?
3. Are there any relationships between the selected characteristics of the respondents with their Problems of roof top gardening?

1.3 Justification of the study

This is almost the maiden attempt in doing such a research on Bangladesh perspective. Random studies have been conducted on problems of various aspects of agriculture but very few researches conducted at home and abroad to determine the Problems of roof top gardening of the respondents. However, it is very much important to find out Problems of roof top gardening in Dhaka city. It is about 1.7 crore people live in Dhaka metropolitan (BBS, 2015) and this number is increasing alarmingly in every single day. To create new physical structures the numbers of trees are decreasing drastically. The lack of finance is one of the critical factors that constraint the innovative projects in Roof Top Garden (RTG) in Dhaka. Lack of the provision for credit specially prevents the poor from leasing RTG and initiate food constraint the innovative projects in Roof Top Garden (RTG) in Dhaka. Lack of the provision for credit specially prevents the poor from leasing RTG and initiate food gardening. As has been expressed by the majority of the respondents burglary is the main concern. The possibility of theft is apprehended due to the ongoing food shortage in the city. Good quality of seeds is not available during the harvesting season because of huge demand. Many of the city of huge demand. Many of the city residents do not have training in agriculture. Starting gardening without proper training may lead to frustrating outcomes, which might result in reluctance of the people in initiating new projects. There is no authority to take care of gardens in the commercial and public office buildings especially at night. The guards and caretaker (often known as Mali) are sometimes part- time staff. There are several constraints due to the present conditions of buildings. For example, some buildings are old, especially in the old part of the city. Dhaka is situated in an active seismic zone. Many experts express their concerns about possibility of building collapse as a large number of 3-5 storied brick buildings are built with very little seismic resistance. Moreover, many of

these are founded on recent loose fills, with a possibility of ground failures during earthquake. Even some new buildings are not suitable for RTG. There have been several cases of buildings collapsing the city in recent years. These happened due to the noncompliance with the building construction regulation. In the city some buildings exceeded the limit of number of stories allowed to build on specified building foundation and structures. Shadow of taller buildings on smaller ones is one of the barriers for RTG although this is not unique to Dhaka. Although supply of water is not an issue for those who can afford it, there is a shortage of water particularly during the dry season from November to March. The limited access of urban poor to high valued land (in this case RT) in Dhaka is the most important constraint preventing the poor to involve and exploit their skills as urban farmers. The main insight resulting from the survey and discussion is that the people are not fully aware of the benefits that can be tapped from RTG. This is mainly due to the fact that there are no organized efforts on it from government, community and NGO side. There is a pool of agricultural skills among the recent migrants, which has not been utilized for UA. Through the use of RTG their potential can be tapped. For the earth, our next generation have to live in a worsen environment for scarcity of plants. They have to live in a polluted and unhealthy environment. To avoid this mesmerizing situation we have to decor our city with garden, in case of land scarcity we have to choose our roof top for gardening. But build up a garden on the roof is not an easy or conventional task, so it is important to undertake a program to isolate the problems and solutions of those problems of roof top gardening to rescue the program. However before giving suggestions to the dwellers we have to identify the Problems of roof top gardening of the respondents. On the above circumstances the researcher has undertaken the present study entitled "Problems of Roof top gardening at Mohammadpur thana Under Dhaka city".

1.4 Specific Objectives:

The following specific objectives were formulated for giving the proper direction to the study:

i) To determine nine selected characteristics of the building inhabitants of Mohammadpur thana, Dhaka city. The characteristics were as: age, family size, education, family annual income, use of information source, attitude towards roof top gardening, training exposure and knowledge on roof top gardening.

ii) To identify and assess the extent of Problems of roof top gardening faced by the gardeners.

iii) To explore the relationship between the problems and characteristics of roof gardeners in Dhaka City.

iv) To identify the categories of plants in the roof top gardening.

1.5 Limitations

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 available to the researcher, the following limitations have been observed throughout the study:

1. The study was confined to a small area namely Mohammadpur thana under Dhaka city.
1. There were many respondents in the study area, but only the respondents who were building inhabitants were considered for this study.
2. Characteristics of the respondents were many and varied but only nine characteristics were selected for investigation in this study.
3. For collection of information the researcher had to depend on the data furnished by the respondents during their interview.
4. The present study highlights a new dimension of research in the fields of agricultural extension in Bangladesh and so the researcher could not provide sufficient evidence in equipping his/her study report with relevant literature reviews.
5. Major information, facts and figures supplied by the respondents were applicable to the situation prevailing in the locality during the year 2014-2015.

1.6 Assumptions

An assumption has been defined as "the supposition that an apparent fact or principle is true in light of the available evidence" (Goode, 1945). An assumption is taken as a fact or belief to be true without proof. So the following assumptions were in mind of the researcher while carrying out this study:

i. The respondents included in the sample were capable of furnishing proper responses to the questions in the interview schedule.
ii. Views and opinions furnished by the respondents were the representative views & opinions of the study.
iii. The responses furnished by the respondents were reliable.
iv. The researcher himself as the interviewer was well aware of the social and cultural environment of the study area. Hence, the data collected by the researcher were free from bias and the respondents furnished their opinions without hesitations.
v. The respondents had almost similar background and seemed to be homogenous to a great extent.
vi. The information sought by the researcher revealed the real situation to satisfy the objectives of the study.
vii. The findings were useful in choosing the clients as well as for planning execution and evaluation the extension program.

1.7 Definition of Terms

Certain terms used throughout the study are defined and interpreted below for clarity of understanding.

Age

Age of a respondent refers to the period from his to the time of interviewing.

Family Size

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

Education

Academic qualification refers to the development of desirable change in knowledge, skills and attitude in an individual through reading, writing and other related activities. It was measured in terms of years of schooling completed by the respondent's family members at the time of interview.

Family annual income

Family annual income of respondents refers- to the total amount of money(taka) earned by him/his and other members of his family from services, business, agriculture source and other source in a year for maintaining his family.

Training Exposure

It refers the total days that respondents participated on training for roof top gardening. Generally training means action of teaching a person a particular skill.

Use of Information Sources

Use of information sources of an individual refers to his association in various sources within a specified period of time with a view to serve the roof garden towards development.

Attitude to Roof top gardening

Attitude is the mental predisposition of an individual to act in a particular way. In other words, it refers to one's favorable or unfavorable feelings, beliefs and actions towards an objects and concept.

Knowledge on Roof top gardening

Literally knowledge means knowing or what one knows about a subject, fact, person etc. Knowledge, however, refers to the amount of facts or information about an idea, object or person which a person knows.

Regarding technological aspect knowledge occurs when an individual is exposed to a technologies existence and gains some understanding of how it functions (Rogers, 1983).

Problems

According to sociologists problem is A perceived gap between the existing state and a desired state, or a deviation from a norm, standard, or status quo. Although many problems turn out to have several solutions (the means to close the gap or correct the deviation), difficulties arise where such means are either not obvious or are not immediately available. In this study problem was defined as the phenomenon of constraints or hinders into roof top gardening practices by the respondents.

Roof Garden

The garden that is situated on the building roof is called roof garden and the activity is called roof top gardening.

Chapter 2

REVIEW OF RELATED LITERATURE

2.1 Review of the previous Research findings

Review was searched in Bangladesh Agriculture Research Council (BRAC), Sher-E-Bangla Agricultural University Library, and Regional office of BAN Bhaban at Mohakhali, HORTEX foundation, Green Dhaka Projects office and from internet browsing. But there was no previous work on this exact title. Only a few work references was found from visiting those office and some articles of BD scientists and abroad works were found by internet browsing.

These are described below:

MD. Sajjaduzzaman, Masaokoike and Nur Muhammad (23 nov, 2004) wrote an article named "Study on Cultural and Financial Aspects of Roof top gardening in Dhaka Metropolitan City of Bangladesh". In this article they gave a clear cut idea on roof top gardening status on DCC. They studied- Estimated number of housing plots in DCC is about 186,000 (plot size 4.5-7.5 decimals) out of which 80% plots (i.e., about 148,800 plots) are already used for housing (DCC, 2004). Among the houses, more than 85% are residential buildings and 15% are institutional buildings (private and public).The residential buildings are mostly in private possession and few residential buildings are government official staff quarters. The survey shows that out of 500 households, on an average only 12% of the houses are bestowed with gardens either in roofs or in balconies; majority found in expensive residential areas (e.g. in Gulshan area 25% houses with garden). It is found that a large portion of the roof gardener belongs to middle class category having their own houses (75%). Lower class is less interested in RTGpractitioners mostly prefer to use the seedlings (65%) for roof top gardening followed by propagated materials (25%) and direct seed sowing (10%). Major purpose of roof top gardening are passing leisure time (100%), creating aesthetic values (100%), contributing in environmental melioration (45%) and financial gain being a very minor concern (4% only). Roof gardens present possibilities for carrying the notions of nature and open space further in tall building development (Yuen and Wong, 2005). A study at the National Research Council of Canada showed the differences between

roofs with gardens and roofs without gardens against temperature. The study shows temperature effects on different layers of each roof at different times of the day. Roof gardens are obviously very beneficial in reducing the effects of temperature against roofs without Gardens. If widely adopted, rooftop gardens could reduce the urban heat island, which would decrease smog episodes, problems associated with heat stress and further lower energy consumption (Liu, 2009). Plants have the ability to reduce the overall heat absorption of the building which then reduces the Urban Heat Island (UHI). If the sky gardens are used properly, they can play an important role in urban cities such as Kuala Lumpur to improve the quality of the urban environment (Wan, 2009). Sky garden adds to the quality of urban built environment. The parks and green spaces in and around the towns and cities, improve the health, wellbeing and quality of life of individuals. Their place is at the heart of communities, helping to make them stronger and safer and ensuring that the places in which they live and work are more sustainable and attractive (Hodson 2009). Sky gardens also serve as important links in the green-space network of a city. Well maintained sky gardens help to relieve mental fatigue and encourage leisure participation of the community of high-rise buildings in congested neighborhoods and stressful urban environment, (Tian and Jim, 2012). Recreational space at the roof level will reduce social problems that are normally encountered at public green spaces such as vandalism, assault and other problems. Contact with nature will results in improvement for the community to know more about environmental education (Castletona, etl. 2010). High-rise buildings can apply sky garden as green space provision in order to create a healthy living and environment (Wan, 2009).

Tanvir Morshed (30 jan,2015) wrote an article on "Mitigating Climate Change Impacts on Urban Ecosystems - Prospects of rooftop gardens in existing buildings of Dhaka city, considering the make and pattern of such buildings" He wrote that Dhaka city has 14% of open space whereas 25% of open space are required for fresh air and habitable living. One study in the year 2000 reported that 13% of Dhaka city is covered by water bodies. Most, if not all green spaces of Dhaka city are in the form of preserved natural vegetation or in the form of parks or gardens. In a broader sense, urban green resources in Dhaka city refer to all urban and peri-urban greenery. A study by satellite imaging shows a grim picture of decreasing greenery in Dhaka city. In the study, it is found that about 20% vegetation cover that was present in 1989 has gradually decreased to 15.5 and 7.3% in the year 2002

and 2010, respectively. They also found vegetation in the Dhaka metropolitan area is only 1.87%. Most of these areas are in the form of parks and roadsides greeneries. Plantation especially application of roof gardens can mitigate the effect of both direct and diffuse solar radiation to a large extent and can clean the heavily polluted urban centers. One study shows that roof gardens can reduce the indoor air temperature 6.8°C from outdoor during the hottest summer period when the outdoor temperature is recorded 39.72°C. Therefore, roof gardens can actually save electricity and impact of climate change by reducing the cooling demand for comfort.

Islam (2001) has published an article named "Roof top gardening as a strategy of urban agriculture for food security: the case study of Dhaka city, Bangladesh". He has reported that urban agriculture in the cities of developing countries is 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. The exploration of local socio-economic and institutional conditions that might promote and hinder urban agriculture is needed to implement policies that effectively integrate agriculture into the urban environment. This study aims to identify the barriers to UA with reference to roof top gardening (RTG) and to explore strategies to promote food security in Dhaka.

S. Brenneisen (2001) provided some important information on the topics "Green roofs-How nature returns to the city" in the International Conference on Urban Agriculture. He has reported that following a promotional campaign in 1996, green roofs have become an important factor in urban planning in the city of Basil, Switzerland. An investigation based on an urban ecological assessment proved the significance of green roofs for modern town-planning strategies. It showed that the extent of the area with a high environmental load could be reduced from 19% to 2% of the total. Furthermore, bio-ecological surveys underlined the need for the development of green roofs and the variety of designs available.

Theodore Osmundson In his book *Roof Gardens: History, Design, and Construction*, Theodore Osmundson defines a rooftop garden as, "A roof garden is any planted open space, intended to provide human enjoyment or

environmental enhancement that is separated from the earth by a building or other structure. It may be below, level with, or above the ground."1 For this study of rooftop gardens it is assumed that "rooftop garden" refers to above ground structures only. Rooftop gardens are gardens meant for people to directly enjoy and interact with. They are often modeled after the traditional on-the-ground garden but on a roof. I emphasize the use of rooftop gardens for food production, but they can be used for any type of gardening. Green roofs are another name for vegetated rooftop space, but there are two types of green roofs. An extensive green roof utilizes the increasingly popular thin rooftop cover of grasses, succulents, and other small plants. These are mainly used to reduce heat radiated by the roof, absorb rainwater, and insulate the building. They require little maintenance and are usually used solely as roof cover. Intensive green roofs are the same as rooftop gardens; they are meant to function like traditional gardens. Intensive green roofs have a deeper growing media and are meant to grow larger plants. They can be used to grow vegetables, small shrubs, or even small trees. Unless specifically refers to extensive green roofs, the use of the term green roof in this report refers to intensive green roofs and is synonymous with rooftop garden.

Pen state center for Green roof research has developed a green roof field experiment in Central Pennsylvania which consists of 6 separate experimental buildings. 3 buildings were developed with green roofs and the other 3 were constructed with control dark roofs. The temperature, Meteorological conditions and water retention and runoff were monitored on those roofs. The hourly averages of temperature data was taken every five minutes. These data demonstrate the cooling potential of green roof surfaces compared to dark impervious roof surface. The peak temperature of 30°C or lower can be measured on the roof tops (Gaffin et al., 2005).

Results showed that the maximum difference air temperature of the roo munderneath between the bare concrete roof and the ivy covered roof was around 15 degree C. A research to investigate the effects of rooftop garden on energy consumption of a five-storey commercial building has been conducted in Singapore. The study was conducted on three different types of roof which are exposed roof, typical flat roof, and rooftop garden with different level of vegetation (low vegetation, medium vegetation and high vegetation). The study revealed that the installation of

rooftop garden on five storey commercial building can result in a saving of 1 to 15% of annual energy consumption, 17-79% in space cooling load and 17-79% in the peak space load and shrubs were found to be the most effective energy consumption in building (Wong et.al., 2003b).Other researchers from India discovered that the com roof top garden with different level of vegetation (low vegetation, medium vegetation and high vegetation). The study revealed that the installation of rooftop garden on five storey commercial building can result in a saving of 1 to 15% of annual energy consumption, 17-79% in space cooling load and 17-79% in the peak space load and shrubs were found to be the most effective energy consumption in building (Wong et.al., 2003b).Other researchers from India discovered that the combination of green roof and solar thermal shading lead to the reduction of average indoor air temperature by 5.bination of green roof and solar thermal shading lead to the reduction of average indoor air temperature by 5.

Rumana Rashid, Khan & Mohd. Hamdan Bin Ahmed accomplished a thesis work on "Green roof and its Impact on Urban Environmental sustainability: The Case in Bangladesh". They Find that green application can reduce the indoor air temperature 6.8°C from outdoor during the hottest summer period when outdoor is recorded 39.72°C. comfort zone analysis for Bangladesh according to Sharma, Ali and Mallick (1995) during the summer season, the comfort temperature range is between 24 °C to 32 °C while relative humidity range is fixed in 50% (lower limit) to 90% (upper limit). According to the graph profile the indoor temperature of the residence shows that maximum hour of the day is stay within comfort temperature range. It is a desirable condition for the resident.

Kamrun Nahar Nira (2006) accomplished a thesis work on "Adoption of Roof Gardening at Mirpur-10 Area under Dhaka City. She found that majority (62%) of the respondents possessed no adoption compared to 15% and 23% have low and medium adoption of roof gardening respectively. The main problem was lack of time for roof gardening. Most of the respondents were interested to flower plant for their roof garden.

2.2 Conceptual Framework

The conceptual framework of the study of Rosenbarg and Hovland (1960) was kept in mind while framing the structural arrangement for the dependent and independent variables. Problems of roof top gardening of the respondents as dependent variable which is supposed to be influenced and through interacting forces of many characteristics in his/her surroundings. It is therefore, necessary to limit the characteristics which include age, family, size, Education, family annual income, use of information sources, and attitude towards roof top gardening, Training Exposure and knowledge on roof top gardening. Based on this discussion and the review of literature the conceptual framework of this study has been formulated as shown below-

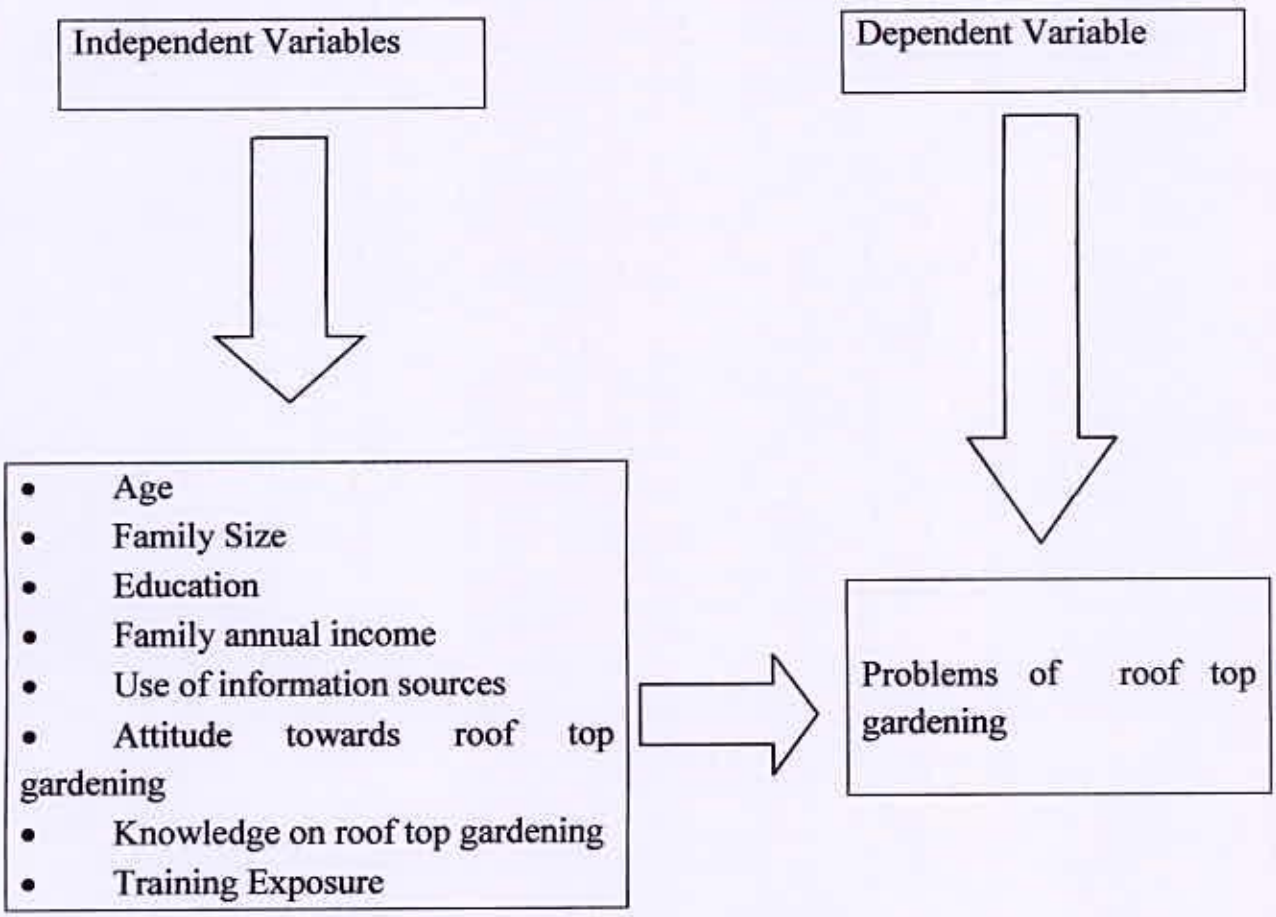

Fig. 1 A conceptual framework for the study

CHAPTER 3

METHODOLOGY

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.

3.1 Location of the study

The locale of the study was Mohammadpur thana which is one of the Thana among 28 of Dhaka District. Mohammadpur thana is at 23.7542°N 90.3625°E. It has 57551 units of households and area 11.65 km².This area was selected as the locales of the city of Dhaka. Purposive sampling of the study area was done as because it is closed to researchers living area. A map of Dhaka district showing Mohammadpur thana has been presented in figure 3.1.

3.2 Population and sampling procedures

About 3,000 families lived in buildings in Mohammadpur thana area. The family heads of buildings inhabitants were the population of the study. A list of total inhabitants was collected from the ward commissioner's office. To minimize the sample size, the inhabitants were randomly selected. By using yeoman equation (1967) sample size was determined. The equation was

$$n = \frac{N \cdot Z^2 \cdot p \cdot (1-p)}{(N-1) \cdot e^2 + Z^2 \cdot p \cdot (1-p)}$$

Where,

n = sample size

N = population size

e = level of precision

Z = confidence level

P= the degree of variability

By using yeoman equation (1967) sample size was determined which consisted of 60 inhabitants. A reserve list of nine inhabitants was also prepared so that the inhabitants of list could be used if any selected respondent was not available during the interview.

Figure 3.1(a): A map of Dhaka district showing the study area

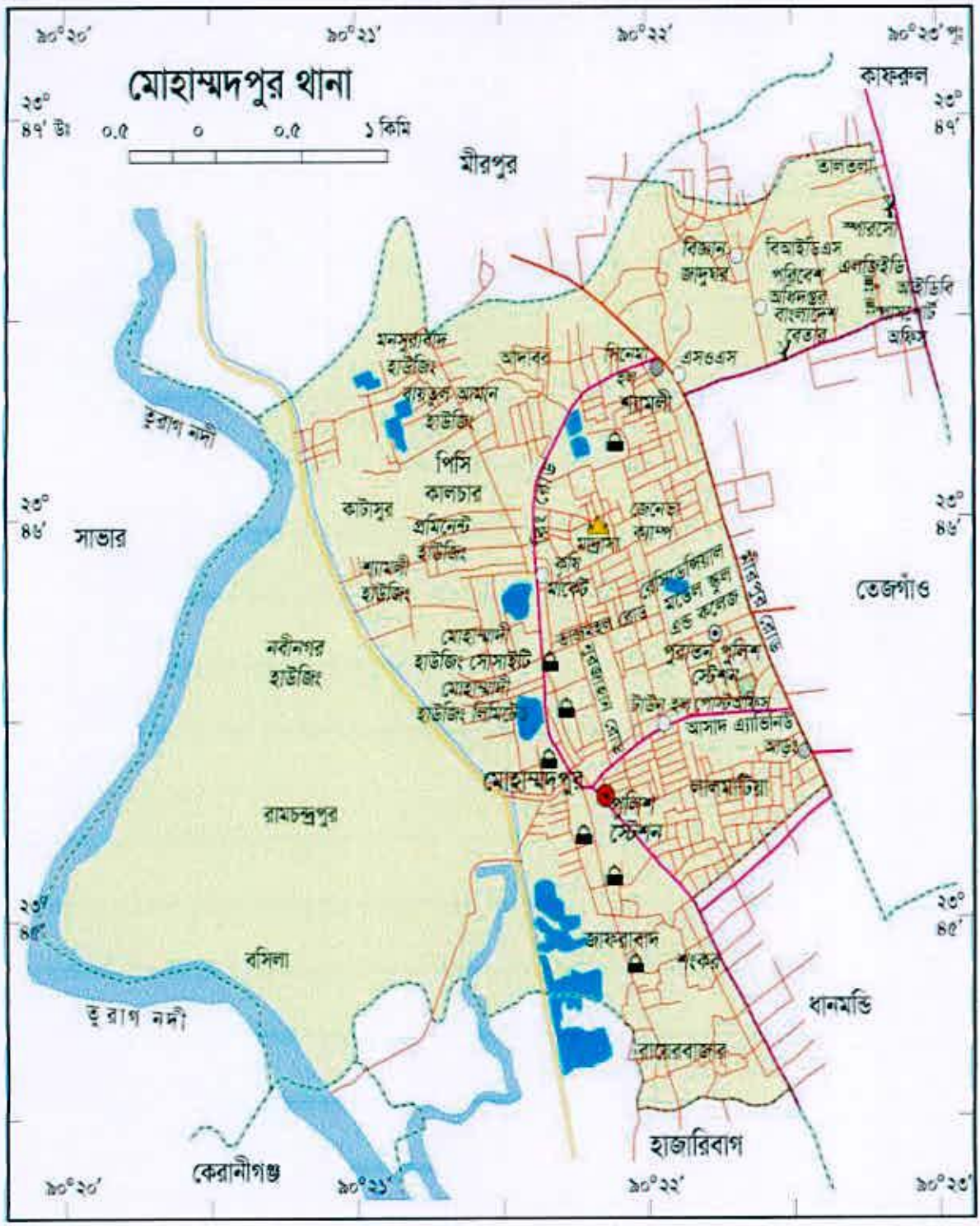

Figure 3.1(b): A map of showing Mohammadpur Thana under Dhaka district showing the locale of the study area.

3.3 The Research instrument

For the purpose of data collection an interview schedule was prepared keeping the objectives of the research in view. The schedule contained both open and closed questions. Most of the questions were simple and direct, while some scales were included in the schedule to collect data regarding the attitude towards roof top gardening, knowledge on roof top gardening and Problems of roof top gardening. The draft schedule was pre-tested before using it for collection of data. Based on the pre-test experience, necessary corrections, additions, alterations and rearrangements were made in the schedule. Thus the schedule was prepared in the English version, because all the inhabitants are educated and they were capable of understanding the questions. The interview schedule has been presented at Appendix-1.

3.4 Data collection

The researcher himself collected data for this study personally through interviewing the respondents by using the interview schedule prepared earlier. Appropriate rapport was established with the respondents before collecting relevant information. However, if any respondent failed to understand any question, the researcher took necessary care to explain the matter. Data collection was started on 24 march, 2014 and completed on 11 may, 2014.

3.5 Variables and their Measurement

3.5.1 Measurement of independent variables

An independent variable is that factor manipulated by the experimenter in his attempt to ascertain its relationship to an observed phenomenon (Townsent, 1953). Nine characteristics of inhabitants were selected as independent variables

of this study. Procedures followed in measuring the selected characteristics are described in the subsequent sections.

3.5.1.1 Age

Age of an individual was defined as the period of time from the birth to the time of interview and was operationally measured in terms of years. It was located in the serials no. 1 of the interview schedule.

3.5.1.2 Family Size

The term family size refers to the number of members of the respondent's family. This variable appears in the serial no.2 of the interview schedule.

3.5.1.3 Education

Education of a respondent was measured by the highest grade of formal schooling completed by him or her in any educational institute. If an individual was found illiterate, he/she was given a score of '0'. A score of 1 was assigned for each class one formally completed or passed. Education refers to the total score of education of all the member of the family. The question for this variable appears in the serial no. 3 of the interview schedule.

3.5.1.4 Annual Income

Family annual income of a respondent was determined by his family's total income from business, service, agriculture and other sources during a year. Family Annual income score of a respondent was expressed in thousand taka.

3.5.1.5 Roof top garden area

Area under roof top gardening of a respondent was measured in terms of area covered by roof top garden by the respondent. It was expressed in square feet.

3.5.1.6 Roof top gardening Training Exposure

Roof top gardening training exposure of a respondent was measured by counting the number of day a respondent trained in roof top gardening. For each training day the respondent was assigned by a score of 1 and so on. It was located in the item number 10 of the interview schedule.

3.5.1.7 Use of Information sources

For measuring use of information sources, the respondents were asked to choose one answer among five nature of contact for each media, namely regularly, frequently, Often, Seldom and not at all. These five options for each media considering the situation, rationality and result of pre-test. Scores were assigned for all extension media in the following manner:

Extent of contact	Weighting system
Regularly	4
Frequently	3
Often	2
Seldom	1
Never Use	0

The use of information sources of a respondent was determined by adding the total responses against the 13 selected media. Thus the total score could range from 0 to 52, where 0 indicating no use of information sources.

3.5.1.8 Attitude towards roof top gardening

Twelve statements expressing possible and negative feelings towards roof top gardening. A statement was considered positive if it indicated a favorable attitude towards roof top gardening. If the case was reverse, it was considered as a negative. Scoring was done by assigning 4,3,2,1 and 0 scores to the five alternative responses a " Strongly agree", "agree", "No decision", "Disagree", "Strongly disagree" respectively in case of positive statement. However, attitude

toward roof top gardening score for a respondent was obtained by summing up his scores for all the statements in item no 9 in the interview schedule. Attitude score thus obtained for a respondent could range from to 48, where 0(zero0 indicated very unfavorable attitude and 48 indicated highest level of favorable attitude towards roof top gardening.

3.5.1.9 Knowledge on roof top gardening

This refers to ones knowledge about roof top gardening. It was measured by asking the inhabitant ten questions on different aspects of roof top gardening. The total marks for all the question was 15. An inhabitant answering a question correctly obtained the full marks; this variable appears in the serial no. 7 of the interview schedule.

3.6 Measurement of dependent variable

3.6.2.1 Problem's on roof gardening

A dependent variable is that factor which appears, disappears or varies as the experimenter introduces, removes, or varies the independent variables (Townsent,1953) It is often called predictable variable. Problems of roof gardening was the main dependent variable of this research. For measuring problem confrontation in roof gardening if problem were selected after consultation with the relevant experts, researchers and from other available sources. The nature of responses of the respondents to each of the 15 problems was very much problems, much problems, some problems, little problems, and very little problem 'and scores were assigned as 5, 4, 3, 2 and 1 respectively. Finally problem faced in roof gardening score of the owners was measured by adding up all the scores of all the responses to all the 15 problems of that respondent. Thus, the possible score of the problem confrontation in nursery management of a respondent could range from 1 to 75 while 1 indicating very

little problem and 75 indicating very much problems faced in nursery management.

Extent Of constraints	Score assigned
Very much problems	5
Medium much problems	4
Some problems	3
Low little problems	2
Very little problem	1
Not at all	0

3.6.2.2 Comparative Problem Confrontation

Fifteen problems which might be faced by the respondents were identified. In respect of each problem, each respondent indicated to what extent that problem was faced by him. His response was noted by putting a tick mark in any of the five columns and was quantified by: very much (5), much (4), some (3), little (2), and very little (1).

The roof gardening problem index (RGPI) of a particular practice was measured by using following formula.

$RGPI=5\times f5+ 4\times f4+ 3\times f3+ 2\times f2+ 1\times f1$

Where, RGPI= Roof Gardening Problem Index

f5 = number of respondents who faced very much problems

f4= number of respondents who faced much problems

f3 = number of respondents who faced some problems

f2 = number of respondents who faced little problems

f1 = number of respondents who faced very little problem.

While, 1 indication very little problem and 5 indication very much problem.

3.7 Hypothesis

A null hypothesis states that there is no relationship between the concerned variables. If a null hypothesis is rejected on the basis of statistical test, it is concluded that there is a relationship between the concerned variables. However, following null hypothesis were formulated for the present study:

1. There was no significant relationship between the selected characteristics of the family heads building inhabitants of Mohammadpur thana area under Dhaka and their Problems of roof top gardening.

The selected characteristics were: age, family size, Education, family annual income, useful information sources, attitude towards roof top gardening, Training exposure and knowledge on roof top gardening.

3.8 Compilation of data

After completion of field survey data from all the interview schedules were compiled, tabulated and analyzed according to the objectives the study. In this process, all the responses in the interview schedule were given numerical coded values. Local units were converted into standard units. The responses to the questions in the interview schedules were transferred to a master sheet to facilitate tabulation. Tabulations and cross tabulations were done on the basis of categories developed by the investigator himself.

3.9 Data processing and analysis

The analysis was performed issuing SPSS (Statistical Package for Social Science) Computer package. Descriptive analysis such as range, frequency count, number and percentage, mean and standard deviation were used wherever possible. Pearson's product moment co-efficient of correlation (r) was used in order to explore the relationship between the concerned variables. Throughout the study, five percent 0.05 level of profitability with an accompanying 95 percent confidence level was used as a basis of rejecting null hypothesis.

CHAPTER 4

FINDINGS AND DISCUSSION

The findings of the study field survey and related interpretations have been presented in three separate sections of this chapter. The first section deals with selected individual characteristics of the respondents while the second section deals with the problem faced in roof top gardening, the third section deals with the relationship between the selected characteristics of the respondents and their problem faced in roof top gardening. The fourth section deals with the comparative severity among the problems faced by the respondents in roof top gardening.

4.1 Individual Characteristics of the respondents

In this section the findings of the respondent's individual characteristics have been discussed. Descriptive statistics of nine selected characteristics of the respondents have been presented 4.1.

Table 4.1 Descriptive statistics of the inhabitants selected characteristics

Characteristics	Measuring Unit	Range		Mean	Standard Deviation
		Possible	Observed		
Age	Years	Unknown	28-62	43.42	7.96
Education	Score	Unknown	5-17	13.38	3.24
Family Size	Number	Unknown	2-13	6.30	2.15
Family Annual Income	'000' Taka	Unknown	400-5000	1436.16	859.70
Roof top space	Sq.ft	Unknown	30-3000	380.25	570.27
Knowledge on roof top gardening	Score	0-15	4-13	8.43	2.42
Use of information sources	Score	0-52	4-13	8.66	2.73
Attitude	Score	0-60	10-45	20.81	7.89

towards roof top gardening					
Training Exposure	Years	"	0-7	1.26	2.13

4.1.1 Age

Observed age score of the respondent ranged from 28-62 with the average of 43.42 and standard deviation of 7.96. Based on their age score, the categories and distribution of the respondents have been presented in Table 4.2

Table 4.2 Distribution of the respondents according to their age

Categories	**Number**	**Percentage**	**Mean**	**Standard deviation**
Young (up to 35 years)	13	21.70	43.42	7.96
Middle-aged (36-50 years)	32	53.30		
Old (>50 years)	15	25.00		
Total	60	100		

From the table 4.2 it was indicated that the highest proportion (53.30 %) of the inhabitants were middle aged. But, the proportions of old aged were 25 % and young aged respondents were 21.70. Above two-fifth of respondents were middle to old aged. This is relevant because most of the roof gardens are being practiced to pass an enjoyable leisure time and comparatively elders get more time for leisure.

4.1.2 Family size

The family size of the respondent ranged from 2-13 with an average of 6.30 and standard deviation of 2.15.

Table 4.3 Distribution of respondents according to their family size:

Categories	Number	Percentage	Mean	Standard deviation
Small (up to 4)	13	21.70	6.30	2.15
Medium (5 to 6)	22	36.60		
Large (above 6)	25	41.70		
Total	60	100		

On the basis of their family size, the respondents were classified into three categories as shown in table 4.3. The highest proportion (41.70 percent) of respondents felt under the large category compared to 36.60 percent medium family and remaining 21.70 percent with small family. The average family size (6.30percent) in the study area was higher than that of the national average which is 4.8 (BBS, 2002) because most of the respondents were house owner, aged person and live with their children.

4.1.3 Education

Education of a respondent's family was measured by the level of his formal education i.e. highest grade (class) passed by all member of his family. The observed education score of the respondents ranged from 5 to 17 with the average of 13.38 and standard deviation of 3.24. Based on their Education, the categories and distribution of the respondents have been presented in table 4.4

Table 4.4 Distribution of respondents according to their education:

Categories	Number	Percentage	Mean	Standard deviation
Primary level (1 to 5)	1	1.70	13.38	3.24
Secondary level (6 to 10)	12	20.00		
Higher level (above 10)	47	78.30		
Total	60	100		

Table 4.4 indicate that about 78.30% respondents were higher educated where 20% had Secondary level education and 1.70% of respondents had primary level education. Overwhelming respondents (78.30) had higher education because most of them live in Dhaka city, comparatively rich and they get more opportunity to education.

4.1.4 Family Annual Income

Family annual income of a respondent was determined by his family's total income from business, service, agriculture and other sources during a year. Family Annual income score of a respondent was expressed in thousand taka. The observed range of family annual income score was 400 to 5000 with an average of 1436.16 and standard deviation of 859.70. On the basis of their family annual income, the respondents were classified into three categories as shown in Table 4.5.

Table 4.5 Distribution of respondents according to their family annual income.

Categories (000 Tk)	Number	Percentage	Mean	Standard deviation
Low income (below1006.31)	22	36.70	1436.16	859.70
Medium income (1006.31 to 1866.01)	28	46.60		
High income (above 1866.01)	10	16.70		
Total	60	100		

Total 4.5 indicate that majority (46.6 %) of the respondents had medium family annual income compared to 36.70 % and 16.70 % had low and high family income respectively. Their average income higher than national average income because they have more than one income sources e.g income from house rent.

4.1.5 Use of Information sources

Observed scores of use of information sources of the respondents ranged from 4 to 13 against the possible range of 0 to 52. The average and standard deviation were 8.43 and 2.73. Based on their use of information sources, the respondents were classified into two categories. This has been presented in table 4.7.

Table 4.6 Distribution of respondents according to their use of information sources:

Categories	Number	Percentage	Mean	Standard deviation
Low use (up to 7)	32	53.30	8.43	2.73
Medium (above 7)	28	46.70		
Total	60	100		

Table 4.6 indicates that the highest proportion (53.30 %) of the respondents had low use of information sources while only 46.70 % had medium use of information sources. Nobody of the respondents was found having high rate of use information sources about roof top gardening. Above half of the respondents had low use of information sources because information of roof top gardening was not available.

4.1.6Attitudes towards roof top gardening

Attitude towards roof top gardening score of all the respondents ranged from 10-45 against the possible range of 0 to 48. The average and standard deviation were 20.81 and 7.89 respectively based on the attitude towards roof top

gardening, the respondents were classified into three categories which have been presented in table 4.7

Table 4.7 Distribution of respondents according to their attitude towards roof top gardening.

Categories (score)	Number	Percentage	Mean	Standard deviation
Low favorable attitude (below 24)	43	71.70	20.81	7.89
No decision(24)	0	0		
High favorable attitude (above 24)	17	28.30		
Total	60	100		

Table 4.7 Showed that most (71.70 %) of the respondents low favorable attitude towards roof top gardening. Respondents no decisionwere only 18.30 %. The rest (28.30 %) of the respondents had high favorable attitude towards roof top gardening. Nearly three-fourth of the respondents had low favorable attitude towards roof top gardening because roof top gardening concept is one of the new and incommodious task to them.

4.1.7 Training exposure

The score of training exposure of the respondents ranged from 0 to7 days, the mean being 1.26 and standard deviation of 2.13. Based on training exposure, the respondents were classified into three categories as shown in Table 4.8.

Table 4.8 Distribution of the respondents according to Training exposure

Categories (days)	Roof top Gardeners		Mean	Standard deviation
	Number	Percent		
No training (0)	39	65.00	1.26	2.13
Very low training (up to 3)	12	20.00		
Low training (4-7)	9	15.00		
Total	60	100		

Data contained in Table 4.8 indicates that 65 percent of the respondents had no training exposure; while 20 percent of the respondent's very low training exposure and 15 percent had low training exposure. This 15 percent were trained through very personal effort through few expertises in Dhaka.

4.1.8 Roof Top Garden area

Roof garden area of the respondents varied from 30 to 3000 Sq. The average Roof garden area was 380.25 Sq. with the standard deviation of 570.27. Based on Roof garden area, the respondents are classified into three categories as shown in Table 4.9.

Table 4.9 Distribution of the respondents according to their roof garden area

Categories (Sq.ft)	Roof top Gardeners		Mean	Standard deviation
	Number	Percent		
Small (up to 210)	37	61.70	380.25	570.27
Medium (211 to 580)	14	23.30		
Large (above 580)	9	15.00		
Total	60	100		

Data contained in Table 4.9 indicates that the largest proportion (61.70 percent) of respondents had small roof garden area compared to 23.30 percent having medium and 15percent had large roof garden area. Nearly two-third of the respondents had small roof garden area because space is not available for roof garden.

4.1.9 Knowledge on roof top gardening

The knowledge on roof top gardening score of the respondents could range from 0-25, while that observed score ranged from 4 to 13. The mean was 8.43 and the standard deviation was 2.42. Based on their knowledge on roof top gardening

scores, the respondents were classified into three categories, which have been presented in table 4.10

Table 4.10 Distribution of respondent according to their knowledge of roof top gardening

Categories (score)	Number	Percentage	Mean	Standard deviation
Low knowledge (up to 6)	17	28.30	8.43	2.42
Medium knowledge (7 to 10)	30	50.00		
High knowledge (above 10)	13	21.70		
Total	60	100		

Table 4.10 revealed that half of the respondent's possessed medium knowledge on roof top gardening. Compared to 28.30 % and 21.70 % had low and high knowledge on roof top gardening. Above three-fourth of respondents (78.30%) had low to medium knowledge on roof top gardening because training facilities, information sources were not available.

DEPENDENT VARIABLE

4.2 Problem's of roof top gardening

The respondent's Problem's of roof top gardening in study area ranged from 20 to 60 against the possible range of 1 to 75. The average Problems score was 36.80 and the standard deviation was 10.96. Based on the Problems score the respondents were classified into three categories as shown in table 4.11.

Table 4.11 Distribution of the farmers according to problems faced roof top gardening

Categories (score)	Roof top Gardeners		Mean	Standard deviation
	Number	Percent		
Low (up to 33)	24	40.00	36.80	9.79
Medium 33 to 47)	27	45.00		
High (>47)	9	15.00		
Total	60	100		

Data presented in the table shows that the majority (45%) of the respondent faced medium problem while 40% percent of the respondent faced low problem. Comparatively few respondents (15%) faced high problem in roof top gardening. Nearly two-third of respondents (60%) had medium to high problem on roof top gardening because training facilities, information sources were not available.

4.3 Relationship between the selected characteristics of the respondents with problems faced during roof top gardening

This section deals with the relationship between the respondents constituted the independent variables while the dependent variable was the respondents Problems of roof top gardening. Pearson's Product Moment co-efficient of co-relation ('r') has been used to test the null hypotheses concerning the relationships between the variables. At least 0.05 level of significance was used as the basis for rejection of a null hypothesis.

The results of correlation test have been presented in table 4.14. However, a correlation matrix for all independent and dependent variables has been included in Appendix-2.

Table 4.12 Co-efficient of Correlation (r) showing relationship between the respondents' selected characteristics and the problems faced in seedling production

Dependent variable	Independent variable	Computed value "r"	Tabulated value of "r" with 58 df at	
			0.05 level	0.01 level
Problems of Roof Top Gardening in Dhaka City	Age	-0.103 NS	0.254	0.332
	Level of education	-0.567**		
	Family Size	0.112 NS		
	Family Annual Income	-0.134 NS		
	Roof top space	-0.178 NS		
	Knowledge on roof top gardening	-0.798**		
	Use of information sources	-0.547**		
	Attitude towards roof top gardening	-0.627**		
	Training	-0.541**		

NS Not significant
*Correlation is significant at the 0.05 level
**Correlation is significant at the 0.01 level

The relationship between age of the respondents with their Problems of roof top gardening was measured by testing the following null hypothesis: "There is no relationship between age of the respondents and their Problems of roof top gardening." The computed value of 'r' (-0.103) was smaller than that of the tabulated value (0.254) with 58 degrees of freedom at 0.05 level of probability. Hence, the concerned null hypothesis was accepted. It could be concluded from the finding that there was no significant relationship between age of respondents and their Problems of roof top gardening.

4.3.1 Age and Problems of roof top gardening

The relationship between age of the respondents and Problems of roof top gardening was measured by testing the following null hypothesis: there is no relationship between age of the respondents and their Problems of roof top gardening." The computed value of 'r' was (-0.103) was smaller than that of the tabulated value (0.254) with 58 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was accepted. It could be concluded from the finding that there was no significant relationship between age of the respondents and their Problems of roof top gardening.

4.3.2 Education and Problems of roof top gardening

The relationship between Education of the respondents and Problems of roof top gardening was measured by testing the following null hypothesis: there is no relationship between Education of the respondents and their Problems of roof top gardening." The computed value of 'r' was (-0.567) was greater than that of the tabulated value (0.332) with 58 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. It could be concluded from the finding that there was negative significant relationship between Education of the respondents and their Problems of roof top gardening.

4.3.3 Family size and Problems of roof top gardening

The relationship between family size of the respondents and their Problems of roof top gardening was measured by testing the following null hypothesis: "there is no relationship between family size of the respondents and their Problems of roof top gardening'. The compound value of 'r' (0.112) was smaller than that of the tabulated value (0.254) with 58 degrees of freedom at 0.05 level of profitability. Hence the concerned null hypothesis was accepted. The finding indicated that the family size of the respondents had a no significant relationships with their Problems of roof top gardening.

4.3.4 Family annual income and Problems of roof top gardening

The relationship between family annual income of the respondents and their Problems of roof top gardening was measured by testing the following null hypothesis: "There is no relationship between family annual income of the respondents and their Problems of roof top gardening. "The computed value of 'r' (0.134) was smaller than that of the tabulated value (0.254) with 58 degrees of freedom at 0.05 level of probability. Hence, the concerned null hypothesis was accepted. It could be concluded from the finding that there was no significant relationship between family annual income of the respondents and their Problems of roof top gardening.

4.3.5 Roof top space and Problems of roof top gardening

The relationship between roof top space of the respondents and their Problems of roof top gardening was measured by testing the following null hypothesis: "There is no relationship between roof top space of the respondents and their Problems roof top gardening." The computed value of 'r' (-0.178) was smaller than that of the tabulated value of 'r' (0.254) with 58 degrees of freedom at 0.05 level of probability. Hence, the concerned null hypothesis was accepted. The finding implied that roof top space of the respondents had a no significant relationship with their Problems of roof top gardening.

4.3.6 Use of Information sources and Problems of roof top gardening

The relationship between Use of Information sources of the respondents and their Problems of roof top gardening was measured by testing the following null hypothesis: "There is no relationship between use of information sources of the respondents and their Problems roof top gardening." The computed value of 'r' (-0.547) was greater than that of the tabulated value of 'r' (0.332) with 58 degrees of freedom at 0.01 level of probability. This means that the concerned null hypothesis was rejected. Thus the use of information sources of the

respondents had a negative significance relationship with their Problems of roof top gardening. The findings is quite logical because the more use of information, the less was the Problems of the respondents.

4.3.7 Attitudes towards roof top gardening and Problems of roof top gardening

The relationship between attitude towards roof top gardening of the respondents and their Problems of roof top gardening was examined by testing the following null hypothesis: "There is no relationship between roof attitude of the respondents and their Problems of roof top gardening." The computed value of 'r' (-0.627) was greater than that of the tabulated value of 'r' ((0.332) with58 degrees of freedom at 0.01 level of probability. This means that the concerned null hypothesis was rejected. Thus the attitude towards roof top gardening of the respondents had a negative significance relationship with their Problems of roof top gardening. The finding is logical, because the more attitudes towards roof top gardening, the less was the Problems of roof top gardening of the respondents.

4.1.8 Knowledge on roof top gardening and Problems of roof top gardening

The relationship between knowledge on roof top gardening of the respondents and their Problems of roof top gardening was examined by testing the following null hypothesis: "There is no relationship between knowledge of the respondents and their Problems of top gardening." The computed value of 'r' (-0.798) was greater than that of the tabulated value of 'r' (0.332) with 58 degrees of freedom at 0.01 level of probability. This means that the concerned null hypothesis was rejected. Thus the knowledge on roof top gardening of the respondents had a negative significance relationship with their Problems of roof top gardening.

4.3.9 Training towards roof gardening and Problems of roof gardening

The relationship between Training towards roof gardening of the respondents and their Problems of roof gardening was examined by testing the following null hypothesis: "There is no relationship between Training of the respondents and their Problems roof gardening." The computed value of 'r' -0.541) was greater than that of the tabulated value of 'r' (0.332) with58 degrees of freedom at 0.01 level of probability. This means that the concerned null hypothesis was rejected. Thus the attitude towards roof gardening of the respondents had a negative significance relationship with their Problems of roof gardening. The finding is logical, because the more attitudes towards roof gardening, the less was the Problems of roof gardening of the respondents.

4.4 Rank order of the problems Faced by the respondents

Ten problems which might be faced by the respondents were identified. In respect of each problem, each respondent indicated to what extent that problem was faced by him. His response was noted by putting a tick mark in any of the five columns and was quantified by: very much (5), much (4), some (3), little (2), and very little (1).

The roof top gardening problem index (RGPI) of a particular practice was measured by using following formula.

$RGPI=5\times f^5+4\times f^4+3\times f^3+2\times f^2+1\times f^1$

Where, RGPI=Roof top gardening Problem Index

F^5= number of respondents who faced very much problems

f^4= number of respondents who faced much problems

f^3= number of respondents who faced some problems

f^2= number of respondents who faced little problems

f^1= number of respondents who faced very little problem at all.

While,1 indication very little problem and 5 indication very much problem. By this formula, the most important problem of the respondents' was identified as "Roof leakage". Other problems were followed by "Lack of proper water drainage system on the roof, Chance of building damages, Lack of enough time for taking care of garden, Lack of quality seed, seedlings, saplings, Input, Lack of knowledge, Costly Management System, Lack of technological information and advice, Lack of training, Insect Infestation, Scarcity of Source of water, Lack of proper planning, Lack of skilled labor and Security problems.

Table 4.13 Rank order of the problems faced during roof top gardening

SL. No	Problem items	RGPI	Rank order
1	Roof leakage	240	1
2	Lack of proper water drainage system on the roof	210	2
3	Chance of building damages	198	3
4	Lack of enough time for taking care of garden	178	4
5	Lack of quality seed, seedlings, saplings, Input.	165	5
6	Lack of knowledge	160	6
7	Costly Management System	155	7
8	Lack of technological information and advice	153	8
9	Lack of training	148	9
10	Lack of motivational work	144	10
11	Insect Infestation	138	11
12	Scarcity of Source of water	115	12
13	Lack of proper planning	84	13
14	Lack of skilled labor	65	14
15	Security problems	55	15

4.5 Categories of plants in the roof garden:

Most of the roof gardener of the research area planted flower and ornamental plants. The next important plants were fruits, vegetables and medicinal plants. The rich people of the research were chose bonsai for their roof garden and indoor decoration because of its price. The most common flowers were rose and marigolds. Besides these the most common fruits were mango and guava. The respondents like to plat chill as vegetables as the need of their family.

Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 SUMMARY

5.1.1 INTRODUCTION

The title of the thesis is "Problems of roof top gardening at Mohammadpur thana area under Dhaka city." There is a great demand for vegetables, fruits and flowers or ornamental plants at Mohammadpur thana area under Dhaka city. The building inhabitants of Dhaka city can grow vegetables, fruits and flowers or ornamental plants on their building's roofs. It is very important for conserving the environment of the city and production of vegetables, fruits and flowers or ornamental plants. By gardening the gardener can make his and his family member's health better. These facts indicate the need for conducting the study to determine the Problems of roof top gardening with the following objectives:

i. To determine nine selected characteristics of the building inhabitants of Mohammadpur thana, Dhaka city, such as, Age, family size, Education, family annual income, use of information sources, attitude towards roof top gardening and knowledge on roof top gardening.

ii. To determine and describe the extent of Problems of roof top gardening by the building inhabitants.

iii. To explore the relationships between the selected characteristics of the respondents' with their Problems of roof top gardening.

iv. To identify the problem faced by the respondents.

v. To identify the categories of plants in the roof top gardening.

5.1.2 METHODOLOGY

Mohammadpur thana under Dhaka city was the locale of this research. Family heads of building inhabitants of this area were the population of this research.

Sixty (60) family heads of building inhabitants of Dhaka city of the selected area were the sample of the research. An interview schedule was made earlier and this interview schedule was the instrument for collection of data from building family heads of inhabitants of Mohammadpur thana of Dhaka city.

Problems of roof top gardening was the only dependent variable of this study. Nine selected characteristics such as age, family size, Education, family annual income, use of information sources, attitude towards roof top gardening and knowledge on roof top gardening were considered as independent variable for the study.

Statistical measures such as number, frequency distribution, percent, possible range, observed range, mean, standard deviation etc. were used in describing the selected dependent and independent variables. Simple correlation was used for determining the between the dependent and independent variable.

5.1.3 MAJOR FINDINGS

Selected characteristics of the respondents

Age: Data was indicated that the highest proportion (53.30 %) of the inhabitants were middle aged. But, the proportions of old aged were 25 % and young aged respondents were 21.70.

Family size: The highest proportion (41.70 percent) of respondents felt under the large category compared to 36.60 percent medium family and remaining 21.70 percent with small family.

Education: about 78.30% respondents were higher educated where 20% had Secondary level education and 1.70% of respondents had primary level education

Family Annual Income: majority (46.6 %) of the respondents had medium family annual income compared to 36.70 % and 16.70 % had low and high family income respectively.

Use of Information sources: the highest proportion (53.30 %) of the respondents had low use of information sources while only 46.70 % had medium use of information sources.

Attitudes towards roof top gardening: most (71.70 %) of the respondents low favorable attitude towards roof top gardening. Respondents no decision were only 18.30 %. The rest (28.30 %) of the respondents had high favorable attitude towards roof top gardening.

Training exposure: 65 percent of the respondents had no training exposure; while 20 percent of the respondent's very low training exposure and 15 percent had low training exposure.

Top roof garden area: the largest proportion (61.70 percent) of respondents had small roof garden area compared to 23.30 percent having medium and 15percent had large roof garden area.

Knowledge on roof top gardening: half of the respondent's possessed medium knowledge on roof top gardening. Compared to 28.30 % and 21.70 % had low and high knowledge on roof top gardening.

Problems of roof top gardening: the majority (45%) of the respondent faced medium problem while 40% percent of the respondent faced low problem. Comparatively few respondents (15%) faced high problem in roof top gardening.

5.1.3 Relationship between selected characteristics of the respondents and their problems faced in roof top gardening

Among nine selected characteristics of the respondents, 5 namely, Level of education, Knowledge on roof top gardening, Use of information sources, Attitude towards roof top gardening, and Training had significant negative relationship with their problems faced in roof top gardening and the rest 4 characteristics namely, age, Family Size, Family Annual Income and Roof top space had no significant relationship with their problems faced in roof top gardening.

Problems of roof top gardening:

Ten problems were identified for roof top gardening. Lack of time was the most important problem. It was quite logical as because the inhabitants of Mohammadpur thana area under Dhaka city are very much busy with their work. The next important problem was "Roof top gardening was Laborious" and 3rd important problem was lack of knowledge. The 4th to 10th problems were difficult to supply plant essential nutrient elements, difficult to make roof garden for a tenant, seedling damage, and theft of seedling-flowers-fruits etc., no benefit in roof top gardening, lack of irrigation facilities and lack of sun shine due to side building.

Some major constraints that have been found from the interview, survey and relevant literature search include:

The lack of finance is one of the critical factors that constraint the innovative projects in RTG in Dhaka. Lack of the provision for credit specially prevents the poor from leasing RTG and initiate food gardening. As has been expressed by the majority of the respondents burglary is the main concern. The possibility of theft is apprehended due to the ongoing food shortage in the city. Good

quality of seeds is not available during the harvesting season because of huge demand. Many of the city residents do not have training in agriculture. Starting gardening without proper training may lead to frustrating outcomes, which might result in reluctance of the people in initiating new projects. There is no authority to take care of gardens in the commercial and public office buildings especially at night. The guards and caretaker (often known as Mali) are sometimes part-time staff. There are several constraints due to the present conditions of buildings. For example, some buildings are old, especially in the old part of the city. Dhaka is situated in an active seismic zone. Many experts express their concerns about possibility of building collapse as a large number of 3-5 storied brick buildings are built with very little seismic resistance. Moreover, many of these are founded on recent loose fills, with a possibility of ground failures during earthquake. Even some new buildings are not suitable for RTG. There have been several cases of buildings collapsing the city in recent years. These happened due to the noncompliance with the building construction regulation. In the city some buildings exceeded the limit of number of stories allowed to build on specified building foundation and structures. Shadow of taller buildings on smaller ones is one of the barriers for RTG although this is not unique to Dhaka. Although supply of water is not an issue for those who can afford it, there is a shortage 246 of water particularly during the dry season from November to March. The limited access of urban poor to high valued land (in this case RT) in Dhaka is the most important constraint preventing the poor to involve and exploit their skills as urban farmers. The main insight resulting from the survey and discussion is that the people are not fully aware of the benefits that can be tapped from RTG. This is mainly due to the fact that there are no organized efforts on it from government, community and NGO side. There is a pool of agricultural skills among the recent migrants, which has not been utilized for UA. Through the use of RTG their potential can be tapped.

Categories of plants in the roof garden:

The roof gardeners of Mohammadpur thana area under Dhaka city grow flowers, fruits, vegetables, medicine plants and ornamental plants on their building roof garden. Most of the roof gardener of these research area planted flower and ornamental plants like herbs and shrubs. Cactus as ornamental plant was most favorable of the respondents. Fruits like guava (kazi Peara), Mango (amrupali), Lemon (kagojilebo) were the most favorable plants for roof top gardening. Medicine plants like Aloe vera (gritto kumara), Mehedi, Tulsi etc were the most favorable plants. The rich people of the research area had chosen Bonsai for their roof garden and indoor decoration, because of it's high price. Fruits and vegetables were in 2nd and 3rdposition respectively.

5.1.3 CONCLUSION

The researcher on the basis of the findings has drawn following conclusions finally.

1. Level of education, Knowledge on roof top gardening, Use of information sources, Attitude towards roof top gardening, and Training had significant negative relationship with their problems faced in roof top gardening. the majority (45%) of the respondent faced medium problem while 40% percent of the respondent faced low problem. Comparatively few respondents (15%) faced high problem in roof top gardening.
2. The majority portion of the respondents receives necessary information about roof top gardening from nursery owner. Friends and relatives were the next highest important sources of information. Neighbors', Television, agricultural books, tree fair, newspaper were other source of information about roof top gardening.

3. Most of the roof gardener of Mohammadpur thana area under Dhaka city planted flower and ornamental plants like herbs and shrubs. Fruits and vegetables were in 2nd and 3rd position respectively.

5.1.4 RECOMMENDATIONS

Based on the findings of the study and practical consideration the following recommendations were made:

a. Sher-E-Bangla Agricultural University situated in the middle of Dhaka city. So this university or other research organizations can organize training courses on "Roof top gardening" and supply essential materials to the respondents. Then they will be able to make garden on their roof.

b. Necessary policy measures on roof top gardening by relevant government and non-government organizations may facilitate its institutional development

c. Many of the city residents do not have training in agriculture. Starting gardening without proper training may lead to frustrating outcomes, which might result in reluctance of the people in initiating new projects. Therefore proper steps should be taken by the concerned authority like DAE, DCC or SBAU or NGO's to provide necessary training on roof top gardening.

d. There is no authority to take care of gardens in the commercial and public office buildings especially at night. The guards and caretaker (often known as *Mali*) are sometimes part-time staff.

e. People are not fully aware of the benefits that can be tapped from RTG. This is mainly due to that there are no organized efforts on it from government, community and NGO side. So, motivational and awareness creating program should be taken b govt. and responsible authority.

5.1.5 RECOMMENDATION FOR FURTHER STUDY

On the basis of scope and limitations of the present study and observation made by the research work the following recommendations are made for further study:

1. The present study was conducted in only Mohammadpur thana area of Dhaka district. Such studies are required to conduct in other areas of the Dhaka city and districts as well.
2. The research had only included the roof top garden but not the garden in "Balcony" was counted here. But at the time of data collection there was found that a large number of respondents had garden in balconies.
3. The present study was conducted in only problems of roof top gardening. It therefore suggested that future study should include adoption, innovation, improvement, awareness etc.
4. Based on this information about roof top gardening a research work would be done on the topics of urban agriculture of Dhaka city.

REFERENCES

Alamgir, M. 1978., Bangladesh. A Case of Below Poverty Level Equilibrium Trap, Dhaka: The Bangladesh Institute of Development Studies.

Ali, Shawkat A.M.M. 1989. Agricultural Development in the Long Term: Policy Issues and Implementation Problems. Planning Commission Government of Bangladesh, Food Strategies in Bangladesh: Medium and Long Term Perspectives, University Press Limited: Dhaka.

Asaduzzaman, M. 1994. Impact of Climate Change on Urbanization and Urban Society in Bangladesh, Report of the Technical Urban Climates, 28 March-2 April, 1993 Dhaka, Bangladesh, World Meteorological Organization, Geneva, Switzerland.

Asaduzzaman, M. 1989. Feeding Our Future Towns: An Overview of Urbanisation and Associated Food Policy Issues, Planning Commission Government of Bangladesh, Food Strategies in Bangladesh: Medium and Long Term Perspectives, University Press Limited: Dhaka.

Balbo, M., Visser, C., and Argenti, O. 2000. Food supply and distribution into urban planning and management: A guide for Urban Planners and Managers in developing countries,(draft version), University Institute of Architecture, Venice and FAO, AGSM, Rome.

Choguill, C.L.1995. Urban Agriculture and Cities in the Developing World, Habitat International, Vol. 19, No. 2 pp. 149-235. Helen Keller International and Institute of Public Health Nutrition. 1985. Bangladesh Nutritional Blindness Study 1982-83, Dhaka.

Mayeed, M. and Choudhury, N.Y. 1996. Agriculture in Dhaka City, Urban Studies Program, Department of Geography, University of Dhaka, Dhaka.

Remenyi, J. 2000. Poverty Reduction and Urban Renewal Through Urban Agriculture and Microfinance: A Case Study of Dhaka, Bangladesh, School of Australian and International Studies, Deakin University, Australia.

Remenyi, J. 1999.The poverty of urban agriculture: a neglected domain of smallholder agriculture, Development Bulletin, No.49, July, pp. 95-97.

Talukder, A., Pee, de Saskia, Taher, A, Hal, A. 2000. Improving food and nutrition security through homestead gardening in rural, urban and peri-urban areas in Bangladesh.

World Bank 1981. World Bank Urban Sector Memorandum 1981.

Islam, Md. Shahidul, Md. Rejaur Rahman, A.K.M. Shahabuddin, and Rakib Ahmed, 2010. "Changes in Wetlands in Dhaka City: Trends and Physico-Environmental Consequences." *Journal of Life and Earth Science* 5: 37–42.

Krupka, B.1992. Roof top gardening: Use of Plants and Vegetation on Buildings. Genman p.508.

Press, E.M. 1983. Diffusion of Innovation. 3rd ed. New York: The FreeNabi, A S M Mahbubun, Md Kamruzzaman, Wahida Khalil, and Fahmida Khandokar. 2004. "Apartment Housing in High Class Re Sidential Areas of Dhaka City: A Case Study of Dhanmondi, Gulshan and Baridhara."*Jahangirnagar Planning Review* 2 (June 2004): 33–42.

Nishat, A, M Reazuddin, R Amin, and AR Khan. 2000. "The 1998 Flood: Impact on Environment of Dhaka City." *Department of Environment and IUCN Bangladesh, Dhaka, Bangladesh.*

Rahman, A. Atiq, Mozaharul Alam, Bangladesh. Paribesa Adhidaptara, United Nations Environment Programme. Regional Resource Centre for Asia and the Pacific, and Bangladesh Centre for Advanced Studies. 2003. *Dhaka City, State of Environment, 2005.* Dhaka: Published by the United Nations Environment Programme.

Rahman, Dr Atiq, and DL Mallick. 2008. "Climate Change Impacts on Cities of Developing Countries: A Case Study on Dhaka." In. Japan.

Kamrun Nahar, M.S. 2006. Adoption of Roof top gardening At Mirpur-10 Under Dhaka City. Thesis, Department of Agricultural Extension and Information System, Sher-E-Bangla Agricultural University,Dhaka.

Rahman, Mahbubur. 2005. "Role of the NGOs in Urban Housing for the Poor in Dhaka, Bangladesh." *GBER* 5 (1): 16–29.

Rahman, S, S. M. R. Hasan, M. A. Islam, and M.K. Maitra. 2011. "Temporal Change Detection of Vegetation Coverage of Dhaka Using Remote Sensing."*International Journal of Geomatics and Geosciences* 2 (2).

Takeuchi, Wataru, Kawin Worakanchana, Yoshifumi Yasuoka, and VivaradPhonekeo. 2007. "Comparative Analysis and Monitoring of Urban Heat Island Intensity in Asian Mega Cities by MODIS." In . Dhaka.

Theodore Osmundson, Roof gardens : history, design, and construction(New York: W.W. Norton, 1999).

Rumana Rashid, Khan and M. H. Ahmed, 2009. "Green roof and its Impact on Urban Environmental sustainability: The Case in Bangladesh"

APPENDICES

APPENDIX-A

AN ENGLISH VERSION OF THE INTERVIEW SCHEDULE

Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University/(Dhaka, Bangladesh)

An interview schedule for a research study entitled

"Problems of Roof Top Gardening At Mohammadpur Thana Under Dhaka City"

ADDRESS OF THE RESPONDENT

Name of the respondent----------
Husband's name----------
Occupation ----------
Area----------
House & Road No. ----------
Thana ----------
District ----------

(Provided information will be kept strictly confidential and will be used for Research Purpose Only)

1. Age.....years

2. Education
Please mention your educational level:

a) Can't read and write.....

b) Can sign only .....

c) Up to or equivalent to class .....

3. Please mention number of your family members?

Male..... Female.....

---------- Total

4. Would you please inform us about your family annual Income?

Sl. No.	Sources of Income	Amount of annual income(TK.)
1.	Jobs/Services	
2.	Business	
3.	Agriculture	
4.	Others	

5. Information about your Roof top Garden:

5. a Number of Pots/Drums/Plants

.....

5. b Please mention how have you allotted roof top space for your roof garden

Sl no.	Planting preferences	Allocated area (Sq.ft.)		
		No of Plants	No. of pots/drums	Space
1	Aesthetic plants/Ornamental Plant			
2	Fruits			
3	Vegetables			
4	Flowers			
5	Medicinal			
6	Bonsai			
7	Shrubs/Herbs			

6. Knowledge on roof top gardening

Please answer the following questions:

Sl. No	Questions	Full marks	Marks obtained
1.	What are the principles of Roof top gardening?	1	
2.	How do you follow the principles?	1	
3.	Do you think roof top is feasible for gardening?	1	
4.	What plants/vegetables/fruits/flowers are suitable for roof top gardening? Why?	1	
5.	How do you make soil for your roof top garden?	1	
6.	How do you maintain plant nutrition of your RTG?	1	
7.	When de-potting is necessary?	1	
8.	What type of fertilizers do you use and at what rate?	1	
9.	How many times do you apply fertilizer in a year?	1	
10.	How do you understand need of irrigation in your RTG?	1	
11.	Do you have insect & disease problem? If yes name two insects & name two diseases of your RTG.	1	
12.	Do you think roof top gardening could be an earning source? How?	1	
13.	Name one disease of each of your planted flowers & Vegetables.	1	
14.	Name one major Insects of each of your planted flowers & Vegetables	1	
15.	Name the Propagating materials of Rose.	1	

7. Extent of use of sources of information for roof top gardening:

Sl No	Informant of Information	Regularly 4	Frequently 3	Often 2	Seldom 1	Never Use 0
1.	Facebook	More than 15 times/Month	11-15 times/Moth	6-10 times/ Month	1-5 times/ Month	0 times/ Month
2.	Internet	16-20 times/Month	11-15 times/Mont h	6-10 times/Mont h	1-5 times/Mont h	0 times/M onth
3.	Agricultural Magazine	More than 6times/Year	5-6 times/Year	3-4 times/Year	1-2 times/Year	0 times/ Year
4.	Friends/Relat ives	10 or more/Month	6 -9/Month	4-5/Month	1-3/Month	0 times/ Month
5.	Neighbors	10 or more/Month	7 -9/Month	4-6/Month	1-3/Month	0 times/ Month
6.	Local Govt. Nursery	10 or more/Year	7-9/Year	4-6/Year	1-3/Year	0 times/ Year
7.	Television	10 or more/Month	7-9/Month	4-6/ Month	1-9/ Month	0 times/ Month
8.	Radio	10 or more/Month	7-9/Month	4-6/ Month	1-9/ Month	0 times/ Month
9.	Newspaper	10 or more/month	7-9/month	4-6/month	1-5/month	0 times/ Month
10.	Private Nursery Owner	7 or more/Year	5-6/Year	3-4/Year	1-2/Year	0 times/ Year
11.	Hand Books	7 or more/Year	5-6/Year	3-4/Year	1-2/Year	0 times/ Year
12.	Tree fair	6 or more time/year	5-6 time/ 2 year	3-4 times/ 3 year	1-2/year	0 times/ Month
13.	Agri Fair	6 or more time/year	5-6 time/ 2 year	3-4 times/ 3 year	1-2/year	0 times/ Month

8. Attitude towards roof top gardening:

Please indicate your agreement regarding the following statements:

Sl No	Statements	Extent of agreement				
		Strongly Agree (4)	Agree (3)	No Decision (2)	Dis Agree (1)	Strongly Disagree (0)
1. +	Roof gardens keep flat roofs cool in Summer – and also help insulate in winter. So I am Interested to build a roof garden.					
2. -	Water Stagnant may cause moist & dampness of the roof.					
3. +	Roof gardens have improved the environment. So I am Interested to build a roof garden					
4. -	Roof top gardening needs close observation & good nursing. So its practice is troublesome.					
5. +	Roof top gardening is a source of beautification of the residence. So I am Interested to build a roof garden.					
6. -	Roof top gardening plants require watering almost every day. It is difficult to manage time.					
7. +	• I enjoy my leisure time with RTG & also I have the privileges to distribute vegetables, fruits, flowers among the neighbors'. • So I am Interested to					

	build a roof garden.					
8. -	• Since soil is a relatively heavy substance, most roofs require reinforcements before gardening.					
9. +	RTG not only give the pleasure but also is a source of fresh vegetables, fruits and flowers. So I am Interested to build a roof garden.					
10. -	Roofs regularly may affect with strong winds which may lose significant numbers of plants and seedlings.					
11. +	• The plants on green roofs can absorb airborne pollutants and atmospheric deposition. So I am Interested to build a roof garden.					
12. -	Roof gardens require intricate and costly drainage systems to ensure no water seeps into the building.					

9. Training Exposure

9/A. Have you participated in training programs of RTG?

A) No B) Yes

If yes please mention the name of organizations and duration of training

Name of the Organization arranged training	**Duration (Days)**
1.	
2.	
3.	
Total	

10. Mention the problems faced during roof top gardening (Mention rank order)

Sl No	Problems	Degree of Severity(In a point scale of Max. 5)				
		5	4	3	2	1
1.	Roof leakage					
2.	Scarcity of Source of water					
3.	Lack of quality seed, seedlings, saplings, Input.					
4.	Insect Infestation					
5.	Lack of knowledge					
6.	Lack of proper planning					
7.	Lack of proper water drainage system on the roof					
8.	Lack of motivational work					
9.	Costly Management System					
10.	Lack of skilled labor					
11.	Chance of building damages					
12.	Security problems					
13.	Lack of enough time for taking care of garden					
14.	Lack of technological information and advice.					
15.	Lack of training					

Signature of the Interviewer

Date:

Mobile No:

APPENDIX-II

Correlation co-efficient matrix of the dependent and independent variables (N = 60)

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	Y
X_1	1										
X_2	-.600**	1									
X_3	.809**	-.503**	1								
X_4	.656**	-.346**	.557**	1							
X_5	.372**	-.273*	.196	.713**	.210	1					
X_6	-.198	.672**	-.220	.046	-.056	.262*	1				
X_7	-.483**	.780**	-.319*	-.337**	-.242	-.245	.669**	1			
X_8	-.141	.451**	-.150	.000	-.057	.255*	.834**	.571**	1		
X_9	-.172	.332**	-.205	-.018	.103	.220	.621**	.366**	.726**	1	
Y	.103	-.567**	.112	-.134	-.164	-.178	-.798**	-.547**	-.627**	-.541**	1

Note: *Significant at 0.05 level
** Significant at 0.01 level

Legend:

X_1 = Age

X_2 = Level of Education

X_3 = Roof top garden Area

X_4 = Annual family income

X_5 = Area covered by Roof top Garden

X_6 = Knowledge on Roof top gardening

X_7 = Use of Information Source

X_8 = Attitude towards Roof top Gardening

X_9 = Training Exposure

Y = Problems of roof top gardens