

# **FACTORS INFLUENCING USE OF ROOF TOP GARDENING AT DHAKA CITY**

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**FACTORS INFLUENCING USE OF ROOF TOP GARDENING  
AT DHAKA CITY**

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**CERTIFICATE**

This is to certify that the thesis entitled “**FACTORS INFLUENCING USE OF ROOF TOP GARDENING AT 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**, embodies the result of a piece of bona fide research work carried out by **HUMAYON KABIR**, Registration No. **12-04832** 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 during the course of this investigation has duly been acknowledged.

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**DEDICATED TO  
MY  
BELOVED PARENTS**

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***The Author***

# **FACTORS INFLUENCING USE OF ROOF TOP GARDENING AT DHAKA CITY**

**HUMAYON KABIR**

## **ABSTRACT**

The objectives of the study are to determine and describe the characteristics of the house owners, determine the extent of house owners of Dhaka city practicing RTG and to identify the factors influencing house owners decision for gardening in their roof top. The study was conducted at Mohammadpur (ward no. 44) and Tejgaon (ward no. 40) thana of Dhaka North City Corporation (DNCC). Data were collected from randomly selected 106 house owners by using a personal pre-tested interview schedule in a time period of 21th January to 22th February, 2019. More than half of house owners (58.80%) did not use their roof top for gardening while 41.20% used for gardening. The binary logistic regression analysis showed that the influential variables viz; roof top area, media contact and knowledge were significant contributors on using roof top for gardening. It is recommended that the government and non-government organizations should take necessary steps to increase the use of roof top for gardening considering the above significant contributors.

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## LIST OF ABBREVIATIONS AND GLOSSARY

ABBREVIATIONS	ELABORATION
Ag. Ext. Ed.	Agricultural Extension Education
Ag. Ext. and Info. Sys.	Agricultural Extension and Information System
DNCC	Dhaka North City Corporation
RTG	Roof top gardening
URGS	Urban Roof Top Garden society
GO	Government Organization
NGO	Non- Government Organization
IPM	Integrated Pest Management
GIS	Geographical Information System
B.B.S	Bangladesh Bureau of Statistics

# CHAPTER I

## INTRODUCTION

### 1.1 GeneralBackground

The practice of gardening is an ancient, simple, inexpensive and profoundly satisfying tradition of human beings. However, rapid urbanization in most of the countries has enforced about 50% of the world's population to live in the cities where space is a limiting factor (WUP, 2018). The green cover of urban area 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 eat. People are now devoid of space for gardening. Without access to land for gardening, a roof garden is undoubtedly an attractive option. The continuous growth of the human population on earth is creating a lot of social, economic and ecological pressures on the environment. Roof gardens can be splendid substitutes for natural looking, landscaped areas at the ground level. With some imagination and fantasy, a flat roof can easily be turned into a green roof garden. Numerous rooftops of a city can be transformed from a barren landscape into a living network of gardens. A green roof is a contained ecological oasis for nature on top of human-made structure and it constitutes an environment that is very different from a garden rooted in a natural soil at ground level.

Dhaka is one of the world's most populated cities with current population of 20.628 million within a small area of 300 square kilometer (BBS, 2018). Population is increasing day by day. However, to maintain a pleasant living environment, the balance between green and concrete built-up areas cannot be overlooked. With the fundamental layout of cities unlikely to change for some years to come, city planners and decision makers face the challenge of finding other solution of increasing and enhancing the amount of greenery in cityareas.

One sustainable option for dense urban settings is the greening of buildings. It may also generate employment and economic facilities through its backward and forward linkages. With rapid and unplanned urbanization, incidence of urban poverty and food insecurity has been also increasing alarmingly in Dhaka (Choguill, 1995). Islam (2004) viewed that Urban agriculture (UA) contributes to food security by increasing the supply of food and by enhancing the quality of perishable foods reaching urban consumers. He also

suggested that strong political commitment and solid policy guidelines are the preconditions for creating supportive environment for RTG.

The rate at which our temperature is raising day by day, a garden on the roof of every house can help cool the air, by absorbing excessive carbon dioxide. Not just that, of birds and the rarest species of insects roof top gardens create biodiversity in nature, through the presence of different kinds. Besides the environmental advantages, a rooftop garden can help a family to a great extent by creating a number of opportunities. If we plant several types of vegetables and fruits, it can significantly reduce our daily food costs. It can also be interesting to explore the economic potential of cultivating food crops in these urban species. Roof gardens can easily be integrated of sustainable systems for green areas or food production within human settlements. They are small-scale alternatives to gardening, reforestation and landscaping or even modern industrial food productionsystems.

In big cities like Dhaka, opportunities for doing manual labor out of our routine work are very less. Roof top garden plays an important role in the mental well-being of the gardeners as well as in amelioration of the physical environment. One of the most important reasons to create roof gardens is the esthetic view of a green area in the city, which is contributing to the quality of life of the citizens. Green roofs absorb storm water, reducing runoff by at least 50% and filter polluted runoff water before it enters in drains, rivers and lakes. Pollution is sucked out of the air by plants in the garden, thus reducing air pollution and dust. Roof top gardens are one of the most innovative and cost-effective ways cities can use to improve the degrading urbanenvironment.

Roof top gardens have been proven to reduce the effects of the urban heat, the result of sunlight reflected off concrete and other reflective materials, which can make summer air in dense cities up to 10 degrees hotter than in rural areas. More energy has to be used to cool buildings and more air pollution is created in the form of smog. Roof top gardens keep buildings cooler in summer and warmer in winter. Air conditioning costs are cut down and roof gardens can cool the whole city by several degrees in summer.

A roof top garden can be the primary way of our urban agriculture to keep the environment calm and cool. It can be a great source of our local food system,

employment and daily engagement with nature. Even with a small space, one can start the garden of his/her dreams (Jahan, 2016). So, it is necessary to know which factors are influencing practicing of roof top gardening at Dhaka city. But a very limited research work has been done on this aspect. Therefore, the researcher felt necessity to conduct a research entitled “Factors Influencing Use of Roof Top Gardening at DhakaCity”.

## **1.2 Statement of theProblem**

In Dhaka, people are very anxious about the quality food and fruits bought from the market. To resist fruits from rotting and show them fresh and intact, formalin and other chemicals are indiscriminately used by sellers and suppliers. But rooftop gardeners are free from such worries, at least for the items they produce. Supply of fresh, chemical free vegetables and fruits from a safe source is a great relief for the practitioners and their family. Besides, working in the garden gives them immense pleasure. Sometimes vegetables and fruits are shared among the tenants which creates a social bonding. Besides, roof spaces are also utilized for a better purpose, other than as a stack yard. ( Seyfang et al.,2006)

However, it is necessary to ascertain that the factors which influence house owners in roof top gardening at Dhaka city having the following questions in mind:

1. What are the characteristics of the house owners at Dhaka city?
2. To what extent the house owners practice gardening in their rooftop?
3. What are the factors influence house owners decision for gardening in their rooftop?

## **1.3 Objectives of theStudy**

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

- i. To determine and describe the following selected characteristics of the house owners:
  - Age
  - Gender
  - Level ofeducation
  - Family size
  - Income from houserent
  - Roof toparea

- Organizational participation
  - Media contact
  - Training exposure
  - Knowledge on roof top gardening
- ii. To determine the extent of house owners practice gardening.
  - iii. To identify the factors influencing house owners decision to practice gardening in their rooftop.

#### **1.4 Scope of the Study**

The present study was designed to have an understanding on use of roof top gardening and to explore its contribution with their selected characteristics.

- i. The findings of the study will, in particular, be applicable to the study area at Mohammadpurthana (ward no. 44) and Tejgaonthana (ward no. 40) at Dhaka North City Corporation (DNCC). The findings may also be applicable to other locale of Bangladesh where socio-cultural, economic circumstance do not differ much than those of the study areas.
- ii. The findings of the study may also be subsidiary to the field worker of extension service to enhance their action strategies on rooftop gardening.
- iii. The findings of the study will be conducive to accelerate the improvement in agriculture, environment, information needs and the way of dissemination especially tuned to key role players in the society as well as use of rooftop gardening. The outcomes might also be helpful to the planners and policy makers, extension workers and beneficiaries of the agriculture.
- iv. To the academicians, it may help in the further conceptualization of the systems model for analyzing the rooftop gardening. The findings of this study may have other empirical evidence to all aspects of rooftop gardening strategies which may be used to explain of rooftop gardening.

#### **1.5 Justification of the Study**

The continuous growth of the human population on earth is creating a lot of social, economic and ecological pressures on the environment. Dhaka is one of the most popular city in the world. Nearly 20.628 million people live in Dhaka city. Present status shows

that Dhaka is the second air polluted city in the world. The reason of the pollution is the deficiency of sufficient trees. Due to lack of fresh air people have been suffering from different types of diseases like bronchitis, heart failure, cough etc. Practicing of roof top gardening may reduce these problems. The dwellers of Dhaka city do not get fresh fruits, vegetables. By practicing of roof top gardening they can easily get these. Implementing of roof top gardening can be a possible solution to reduce the food supply problems, make urban living more self-sufficient and make fresh vegetables more accessible to urban individuals. In summer season roof garden reduces the heat. By practicing large area of roof top gardening one can earn money by selling fruits and flowers. Green roofs can also address the loss and fragmentation of natural habitats due to urbanization. Although the benefit green roofs provide to rare animal taxa is not yet well documented, they are widely understood to support generalist species, especially invertebrates such as insects (Williams et al., 2014). In addition to their thermal and energy-saving benefits, green roofs also play a role in hydrology. One of the most beneficial hydrological characteristics of green roofs is their ability to retain rainwater and delay flow during heavy precipitation events. Rain water absorbed by the growth substrate is taken up by the vegetation, where it is either stored in plant tissues or returned to the atmosphere through evapotranspiration (Vijayaraghavan, 2016). Considering the above perspective the researcher interested to study “Factors Influencing Use of Roof Top Gardening at Dhaka City”.

### **1.6 Assumptions of the study**

The researcher had considered the following assumptions while undertaking the study:

- i. Answering the questions of the interview schedule is well equipped by the respondents.
- ii. No partiality was happened when collecting data.
- iii. Data collecting by the researcher were valid, acceptable and reliable.
- iv. Views and opinions of the study were same as the respondents' views & opinions.
- v. The researcher was well congenial to the atmosphere of the study area. Hence, the collected data from the respondents were free from favoritism.



- vi. Data were normally and independently distributed with their means and standard deviation.
- vii. The finding is also adaptable to the other area of Bangladesh.

### **1.7 Limitations of the study**

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

- i. There are 46 thana in Dhaka city, but the study was confined only to Mohammadpur and Tejgaon thana which may fail to represent the actual scenario of the whole situation as people develop their strategies according to the concrete situation they face.
- ii. Sometimes the researcher could not find the house owners at proper time.
- iii. There were many characteristics of the house owners in the study area but only ten of them were selected for investigation.
- iv. Some respondents do not want to give their accurate information.
- v. The study was a new dimension in Bangladesh. The researcher could not equip sufficient evidence in equipping his/her study report with relevant literature reviews.

### **1.8 Definition of Important Terms**

**Roof top Garden:** Rooftop gardens are man-made green spaces on the topmost levels of industrial, commercial, and residential structures. They may be designed to grow produce, provide play space, give shade and shelter, or simply be there as a living, green area. The practice of cultivating vegetables, flowers and fruits on the rooftop of buildings is sometimes referred to as rooftop farming.

**Variable:** Variable is any characteristics, number, or quantity that can be measured or counted.

**Independent variable:** An independent variable is exactly what it sounds like. It is a variable that stands alone and isn't changed by the other variables.

**Dependent variable:** A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable.

**Gender:** Gender is a socially constructed definition of women and men.

**Age:** Age of a farmer has been defined as the period of time in years from his birth to the time of interview.

**Education:** Education referred to the ability of the respondents to read and write or having formal education received up to a certain level from educational institute at the time of interview. Education was measured on the basis of completed years of schooling.

**Family size:** Family size generally refers to the total number of individuals in a family.

**Annual income from house rent:** Annual income from house rent refers to the total financial return from house to let in one year.

**Media contact:** It defines ones extent of exposure to different communication media related to roof top gardening.

**Training exposure:** Training exposure refers to the total number of days when respondents attended in different training programs in his life.

**Hypothesis:** A hypothesis is a proposed explanation for a phenomenon.

**Population:** All the inhabitants of a particular place.

**Sampling:** Statistical method of obtaining representative data or observations from a group (lot, batch, population, or universe).

**Data:** Facts and statistics collected together for reference or analysis.

**Variance:** The fact or quality of being different, divergent or inconsistent.

**Analysis:** A detailed examination of anything complex in order to understand its nature or to determine its essential features: a thorough study.

## CHAPTER II

### REVIEW OF LITERATURE

A literature review is a descriptive, analytic summary of the existing material relating to a particular topic or area of study. This study was mainly concerned with influencing factors of roof top gardening. The researcher searched in Bangladesh Agriculture Research Council (BARC), Sher-e-Bangla Agricultural University Library and Regional, HORTEX foundation, Green Dhaka Projects office journals, Nagar Krishi Organisation and from Internet browsing. There was very few literature works with respect to research studies on this aspect. Therefore, the findings of such studies related to roof top gardening by the house owners and other partial studies have been reviewed in this Chapter. This Chapter is divided into three sections: the first section deals with general findings of influential factors practicing of roof top gardening, the second section involves with past findings to the relationships of influential factors with the house owners selected characteristics and the third section deals with the conceptual framework of the study.

#### 2.1 General Findings on Practicing RTG

Jaher Wasim and AKM Hasan Julker Nine (2016) found that Dhaka city corporations have taken a number of projects to bring their open spaces under greenery coverage through massive plantations as the capital is gradually getting denuded of its greeneries due to unplanned development works. Though a livable city should have 25 percent greeneries of its total area, the capital has barely five percent greeneries for lack of regular plantation and maintenance of the existing ones, and unplanned urbanization.

Dhaka is one of the world's most populated cities with current population of 20.628 million within a small area of 300 square kilometers. Population is increasing day by day. However, to maintain a pleasant living environment, the balance between green and concrete built-up areas cannot be overlooked. With the fundamental layout of cities unlikely to change for some years to come, city planners and decision makers face the challenge of finding other solution of increasing and enhancing the amount of greenery in city areas. This research has shown that the installation of rooftop garden in a four story industrial building at Bangladesh could result in a saving of 1/100th to 1/10th amount of total annual energy consumption, 1/10th to 1/3rd of space cooling load and

1/5th to 1/2nd amount of in the peak space load. The study also shows that an optimum reduction of 8 to 40% on roof thermal value, 25 to 55% on peak RTTV with different soil thickness of 200-600mm.

Islam (2001) found that urban agriculture in the cities of developing countries are growing rapidly which also means the number of low-income consumers is increasing because of food insecurity in these cities is increasing. Urban agriculture (UA) contributes to food security by increasing the supply of food and by enhancing the quality of perishable foods reaching urban consumers.

Nira (2006) found that majority (62%) of the respondents possessed no adoption compared to 15% and 23% had 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 gardening.

A research on “Thermal Performance of Green Roofs through Field Evaluation” published by the National Research Council of Canada shows that an extensive green roof reduces the daily energy demand for air conditioning in the summer by over 75 percent (Liu and Baskaran, 2003).

Mithon (2016) found that attitude of the house owners towards rooftop gardening at Dhaka city”, the findings revealed that maximum (62.1 %) of the roof top gardeners had moderately favorable attitude towards roof top gardening.”

Tanvir Morshed (2015) found that Dhaka city has 14% of open space whereas 25% of open spaces 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 refers to all urban and pier-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. Before a meaningful analysis of the effectiveness of green roofs can be made, the urbanization effects that green roofs seek to mitigate must first be identified. Urbanization is

occurring at an increasingly rapid rate and goes hand in hand with the rising global population. Just 13% of the global population lived in cities in 1800, when the global population was around 1 billion (Seto et al., 2014). This increased from 13% to 29% in 1950, and reached 52% in 2011 (Seto et al., 2014). Today well over half of the total global population lives in urban areas and urbanization levels are projected to increase to at least 80% within the next 14 years at which point the world urban population will continue to increase by one billion every 13 years (Karteris et al., 2016; Seto et al., 2014). More than 90% of the global economy is generated within these urban areas, which consume at least 65% of the world's energy and produce over 70% of total greenhouse gas emissions across the globe (Solecki et al., 2013). This concentration of population and built environments have profound effects both within cities as well as their surrounding areas, making cities simultaneously causes of and solutions to anthropogenic changes to the natural environment (Mills, 2007).

Urbanized areas have high concentrations of anthropogenic activity, they are serious contributors to global climate change. Atmospheric concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) have steadily increased since 1750, exceeding pre-industrial levels by 40%, 150%, and 20%, respectively (IPCC, 2013). Over 70% of total global greenhouse gas (GHG) emissions are produced by urban-based activities and residents, which account for more than 66% of global energy consumption (Fragkias et al., 2013). Energy consumption and CO<sub>2</sub> production in a city depend primarily on population size, spatial organization and structure, but climate, technology, density, and wealth are also factors (Fragkias et al., 2013). GHG emissions increase proportionally with urban population size, meaning larger cities emit more than smaller ones (Fragkias et al., 2013). Since GHG emissions are a major driving force of climate change, cities also have extraordinary mitigation potential. One of the overriding characteristics of urbanized areas is a high concentration of impermeable surfaces, which has been identified as an indicator of environmental quality (Yuan, 2008). Impermeable surfaces are surfaces through which water and other substances can not penetrate to recharge ground water or perform other natural hydrologic functions. From roads, sidewalks and parking lots to rooftops, a majority of urban areas have been modified through development to be impermeable. Of these impermeable surfaces, rooftops account for 40-50% of the total area (Stovin, 2009). Parks and other green areas are the exception within cities, with parkland occupying a median of 8.2% of adjusted cityarea

(Harnik et al., 2015). This pervasive type of land cover change has many implications for both the built and natural environments. One such impact is a reduction in groundwater recharge, as precipitation that falls on these impermeable surfaces is funneled into storm drains rather than penetrating the earth to replenish underground aquifers (Choi et al., 2012). A 30% increase in urban development can result in as much as a 30-40% decrease in natural direct groundwater recharge (Choi et al., 2012). One city block can generate 500% the quantity of runoff of a woodlot of the same size (Van Woert et al., 2005). This runoff is also highly polluted, as water picks up pollutants from the rooftops and roads upon which it falls, resulting in degradation of water quality in rivers and other water bodies downstream from storm drain outlets (Carter and Rasmussen, 2006). During extreme storm events, runoff can overwhelm storm drains, carrying sewage with it into downstream water bodies with devastating effects (Van Woert et al., 2005).

Another more obvious effect of urbanization is widespread habitat loss and fragmentation. With approximately 50% of the Earth's land area altered or controlled by human activity, the current species extinction rate significantly outpaces expectations (Sushinsky et al., 2013). As areas are developed and land cover changes, species of all types are driven out of their natural habitats. While some may be able to relocate to other areas nearby, even the best scenarios involve a dramatic reduction in the total area available for such organisms. Even parks and other green areas within urban centers do not provide adequate habitat for the naturally occurring species in the area. In addition to habitat lost due to changes in land cover, the introduction of roads and railways leads to habitat fragmentation ((Liu et al., 2015). This reduction in biodiversity has many cascading deleterious effects, including impacts on net primary productivity and biogeochemical cycles (Wu, 2008). In addition to the fragmentation and loss of suitable habitat for native species, urbanization often introduces invasive and exotic species that bring further imbalance to the ecosystem (W.u, 2008). This threatens the ecosystem services that provide essential benefits for rural and urban areas alike (Revi et al., 2014).

Another familiar urbanization impact is pollution, particularly a reduction in air quality. Local air quality in urban centers is affected by transportation, industry, commercial and residential sources (Revi et al., 2014). With urbanization and industrialization comes an increased demand for energy and transportation, resulting in the combustion of more fossil fuels, producing waste heat, CO<sub>2</sub> and other airborne particulates (Hao and

Wang, 2005). Aside from CO<sub>2</sub>, the most common airborne pollutants are oxides of nitrogen (NO<sub>x</sub>), oxides of sulfur (SO<sub>x</sub>), ozone (O<sub>3</sub>), carbon monoxide (CO) and particulate matter (PM) (Schell and Denham, 2003). Anyone who has visited a major urban center like Los Angeles or Beijing is familiar with the concept of air pollution, which is the result of concentrated emissions combined with a lack of vegetation to naturally process CO<sub>2</sub> and other pollutants (Hao and Wang 2005; Rowe 2011). In the United States, over 3,700 premature deaths occur each year due to increased O<sub>3</sub> levels (Yang et al, 2008). Globally, more than 1 million premature deaths have been linked to urban air pollution in developing countries each year (Yang et al, 2008). Apart from mortality, air pollution reduces pulmonary function in those who suffer from asthma (Schell and Denham, 2003). Long-term exposure to low levels of air pollution also has adverse health effects on healthy individuals, reducing life expectancy by one to two years (Schell and Denham, 2003).

Brenneisen (2004), 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 Basel, 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 roof concepts at the scale of the town. The wide range of vegetation found on green roofs and the variety of designs available.

Krupka (1992) wrote a book named "Roof gardening: use of plants and vegetation on buildings." This book consists of 20 chapters covering the history and importance of growing plants on buildings from the architectural and town planning aspects, developments in techniques of roof gardening in the last decade, the ecological value of growing plants on buildings, habitat restrictions of vegetation on buildings, planning factors, prevention of damage to buildings, preparation and protection of the habitat and different forms of greening. Chapters 10 to 15 cover the choice of plants for intensive and extensive greening of roofs, walls and noise reduction screens. Chapter 16 to 17 deal with the qualitative requirements of seeds, plants and insulating vegetation, and planting

and vegetation stands in relation to decline criteria. Forms of damage, care and maintenance, and performance of roof and vegetation are covered in the last 3 chapters. The comprehensive coverage of the theoretical and practical aspects of growing vegetation on buildings, the clear diagrams and the extensive list of suitable plants make this book a valuable source of information. It is to be hoped that an English translation will be made so that the information will be made so that the information will be more accessible to a wider readership.

## **2.2 Relationship between House Owners Selective Characteristics and Use ofRTG**

### **2.2.1 Age and Use ofRTG**

Mithon (2016) found that the old-aged rooftop gardeners comprised of the highest proportion (76.8 percent) and the middle-aged category constituted by 23.2 percent respondents.

Rahaman (2014) found that there is no relationship between age of the respondents and roof top gardening.

Nira (2006) found that there is no relationship between age of the respondents and their adoption of roof gardening.

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

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

Sutradhar (2002) found that the age of the respondents had no relationship with their awareness on environmental degradation.

Uddin (2001) reported that age of the BSS had no significant relationship with their opinion on environmental hazards and associated problems due to continuous and intensive rice farming.



Hanif (2000) found on his study on that there was a positive significant relationship between age of the respondents and their awareness on environmental pollution in case of farmer field school (FFS) farmers. Also, it was found that there was a negative insignificant relationship between age of the farmers and their awareness on environmental pollution.

Hossain (2000) found that age of the farmers had no significant relationship with their knowledge on Binadhan-6 technology.

Hamid (1997) made a survey to determine the awareness of farmers on environment. He found that age of the farmers had negative relationship with their awareness on environmental pollution.

Chowdhury (1997) observed that the age of the farmers had no significant relationship with their adoption of selected BINA technologies.

Mutaleb (1995) found that age of the farmers had no relationship with overall adoption of potatotechnologies.

Parveen (1995) revealed that the age of the farm women was not related with their knowledge on the use of fertilizers, pesticides, and irrigation water.

### **2.2.2 Level of education and Use of RTG**

Mithon (2016) examined that there was negative significant relationship between Education of the respondents and their Problems of roof topgardening.

Rahaman (2014) found that there was negative significant relationship between Education of the respondents and their Problems of roof topgardening.

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

Nira (2006) found that there is no relationship between family education of the respondents and their adoption of roof gardening.

Rahman (2006) observed in his study that education level of the farmers had significant and positive relationship with their knowledge on prawn culture.

Islam (2005) found that education level of the farmers had significant positive relationship with their knowledge on IPM in crop production.

Hossain (2004) concluded that education of the farmers had a significant and positive relationship with their adoption of modern Boro rice cultivation practices

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

Farhad (2003) found that the education of the rural women farmer had significant and positive relationship with their knowledge in using IPM in vegetable cultivation.

Sana (2003) showed that education of the respondents had positive relationship with their knowledge in shrimpcultivation.

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

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

Kashem (2001) found that the farmers had a significant positive relationship with the environmental awareness on the environmental pollutions.

Uddin (2001) reported that education of the BSS had significant relationship with their opinion on environmental hazards and associated problems due to continuous and intensive rice farming

Hanif (2000) found in his study that there was a positive significant relationship between education of the respondents and their awareness on environmental pollution.

Hossain (2000) found that education of the respondents had significant positive relationship with their knowledge on Binadhan-6.

Sarkar (1999) revealed that the level of education of the farmer had significant positive relationship with their perception on environmental degradation.

Hamid (1997) found that education of the farmers had positive relationship with the awareness on environmental pollution in both cases of the progressive and less progressive village.

Parveen (1995) found that the level of education of the farm women had a significant positive relationship with their knowledge on the use of fertilizer, pesticides and irrigationwater.

### **2.2.3 Family size and Use ofRTG**

Mithon (2016) examined that the medium size family constitute the highest proportion (67.1 percent) followed by the small size family (24.4 percent).

Rahaman (2014) examined that the finding indicated that the family size of the respondents had no significant relationships with their Problems of roof top gardening.

Hossain (2009) observed in a study that family size of the farmers had no significant relationship with their use of IPM practices.

Nira (2006) found that family size of the respondents had a positive significant relationship with their adoption of roof gardening.

Hossain (2006) found that family size of the farmers had no significant relationship with their use of IPM practices.

Mia (2005) found that family size of the vegetable growers' had positive significant relationship with their adoption of IPM practices.

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

Farhad (2003) found that family size of rural women farmer had no significant relationship with their knowledge in using IPM in vegetable cultivation.

Sana (2003) revealed that family size of the farmers was not related to their knowledge of shrimpculture.

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

Sutradhar (2002) found that family size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Rafiqul (2002) observed that family size of the woman had no significant relationship with their poultry rearing.

Rahman (2001) in his study found that family size of the farmers had no significant relationship with their adoption of Aalok 62 hybrid.

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

Hossain (2000) found on his study that farmers' knowledge and perception of Binadhan-6" that family size of the farmers had significant positive relationship with their knowledge on Binadhan-6.

Chowdhury (1997) observed that family size of the farmers had positive and significant with the adoption of selected BINA Technologies. Similar findings were observed by

Barkatullah (1985), Okoro and Obibuaka (1992), Pathak and Sasmal (1992) and Sarkar (1997).

Alam (1997) found that family size of the farmers had positive and significant relationship with their use of farm practices in rice cultivation.

Islam (1996) observed the family of the farmers had significantly negative relationship with their extent of use of ITK.

Ullah (1995) observed that family size had positive significant relationship with adoption of livestock and green revolution technologies.

#### **2.2.4 Income from House rent and Use ofRTG**

Mithon (2016) found that from house rent : Medium annual income constituted the highest proportion (67.1%), while the lowest proportion in low annual income from house rent (13.4 percent)category.

Rahaman (2014) concluded from the finding that there was no significant relationship between family annual income of the respondents and their problems of roof top gardening.

Nira (2006) found that there is no relationship between family annual income of the respondents and their adoption of roof gardening.

#### **2.2.5 Roof top area and Use ofRTG**

Mithon (2016) examined that most of the respondents (40.2 percent) had medium rooftop area while 23.2 and 36.6 percent of them had low and high rooftop area respectively.

Rahaman (2014) examined that the finding implied that roof top space of the respondents had no significant relationship with their Problems of roof top gardening.

Hossain (2009) showed a study on use of integrated pest management practices by the farmers of Brahmanbaria district. He found that farm size of the farmers had positive significant relationship with their use of IPM practices.

Nira (2006) found that there is no relationship between roof top area of the respondents and their adoption of roof gardening.

Rahman (2006) found that farm size of the farmers had a significant relationship with knowledge on prawn culture.

Mia (2005) found that vegetable growers' had a positive significant relationship with their adoption of IPM practices.

Islam (2005) explored in his study that farm size of the farmers' had a significant positive relationship with their knowledge on IPM in crop production.

Farhad (2003) found that farm size of rural women farmer had a positive significant relationship with their knowledge in using IPM in vegetable cultivation.

Hossain (2003) reported that the farm size of the respondents had a positive and significant relationship with their knowledge on modern Boro rice at 0.05 level of probability.

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

Sutradhar (2002) found that farm size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Sardar (2002) conducted a study on adoption of IPM practices by the farmers under PETRRA project of RDRS. He found that farm size of the farmers had a positive significant relationship with their adoption of IPM practices.

Islam (2002) observed that farm size of the farmers had a positive significant relationship with their adoption of modern agricultural technologies.

Kashem (2001) found in his study that farm size of the farmers had no relationship with the awareness on the environmental pollutions.

Hussen (2001) observed that there was a significant positive relationship between farm size of the farmers and their adoption of modern sugarcane cultivation practices.

Rahman (2001) found that there was a significant positive relationship between farm size of the farmers and their adoption of Aalok-62 hybrid rice.

Hossain (2000) found that farm size of the farmers had no relationship with their knowledge on Binadhan-6.

Hanif (2000) found that there was a negative insignificant relationship between farm size of the respondents and their awareness on environmental pollution.

Hossain (2000) found that farm size of the farmers had no relationship with their knowledge on Binadhan-6.

Chowdhury (1997) found that farm size of the farmers had a strongly positive significant relationship with their adoption of selected BINA technologies. Rahman (1986), Khan (1993), Hoque (1993) and Sarkar (1997) observed similar results in their respective studies.

Hamid (1997) found that area under cultivation of farmers had no relationship with the awareness on environmental pollution.

Alam (1997) found that the farm size had a significant relationship with their use of improved farm practices in rice cultivation.

Islam (1996) found that the farm size of the respondents had a significant negative relationship with their extent of use of indigenous technical knowledge (ITK).

Parveen (1995) revealed that the homestead of the farm women had a positive significant relationship with their knowledge on use fertilizers, pesticides and irrigation water.

Okoro and Obibuaka (1992) studied adoption of recommended management practices among small holders in IMO state, Nigeria. The findings of the study indicated a positive relationship between the farm size and adoption of recommended management practices.

### **2.2.6 Organizational participation and Use ofRTG**

Habib (2000) observed in his study that organizational participation of the block supervisors had no significant relationship with their attitude towards agrochemicals.

Rafiqul (2002) observed that organizational participation of the woman had no significant relationship with their poultryproduction.

Noor (1995) found that there was positive and significant relationship between the farmers and their attitude towards the cultivation of HYV potato.

Ali(1987) also found that organizational participation of the farmers had significant positive relationship with their poultry rearing.

### **2.2.7 Media contact and Use ofRTG**

Mithon (2016) found that the highest proportion (42.7 percent) of the respondents had medium use of information sources as compared to 30.5 percent of them having low use of information sources.

Rahaman (2014) examined that there is no relationship between use of information sources of the respondents and their Problems of roof top gardening.

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

Nira (2006) found that there is no relationship between use of information sources of the respondents and their adoption of roof gardening.



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

Sadat (2002) found that extension media contact had a significant positive relationship with both PROSHIKA-beneficiaries and non-beneficiaries towards PROSHIKA.

Kashem (2001) found in his study that extension contact of the farmers had positive significant relationship with the awareness on the environmental pollutions.

Hanif (2000) obtained in his study that there was a positive significant relationship between extension contact of the respondents and their awareness on environmental pollution.

Vidyashanker (1987) revealed that the contact with extension agencies and contribute favorably to the attitude of the farmers.

Yasmin (1987) concluded that the extension contact of the farmers had no relationship with their poultry production.

### **2.2.8 Training exposure and Use of RTG**

Mithon (2016) found that the highest proportion (48.8 percent) of the roof top gardeners had medium training exposure compared to 28.0 percent in low training exposure.

Rahaman (2014) examined that 65 percent of the respondents' had no training exposure; while 20 percent of the respondents' very low training exposure and 15 percent had low training exposure.

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

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

Islam (200) found that training on vegetable cultivation had a positive and substantial significant relationship with knowledge on vegetable production activities by woman members in homestead area under world vision project.

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

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

Hossain et al. (2000) observed in his study that there was positive significant relationship between training on pest management and their awareness on the environmental pollution caused by the use of pesticides.

### **2.2.9 Knowledge on roof top gardening and Use of RTG**

Mithon (2016) concluded that 63.4 percent of the respondents had medium rooftop gardening knowledge, 19.5 percent had low knowledge and 17.1 percent had high knowledge on rooftop gardening.

Rahaman (2014) examined that half of the respondents possessed medium knowledge on roof top gardening.

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

Nira (2006) found that there is no relationship between roof gardening experience of the respondents and their adoption of roof gardening.

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

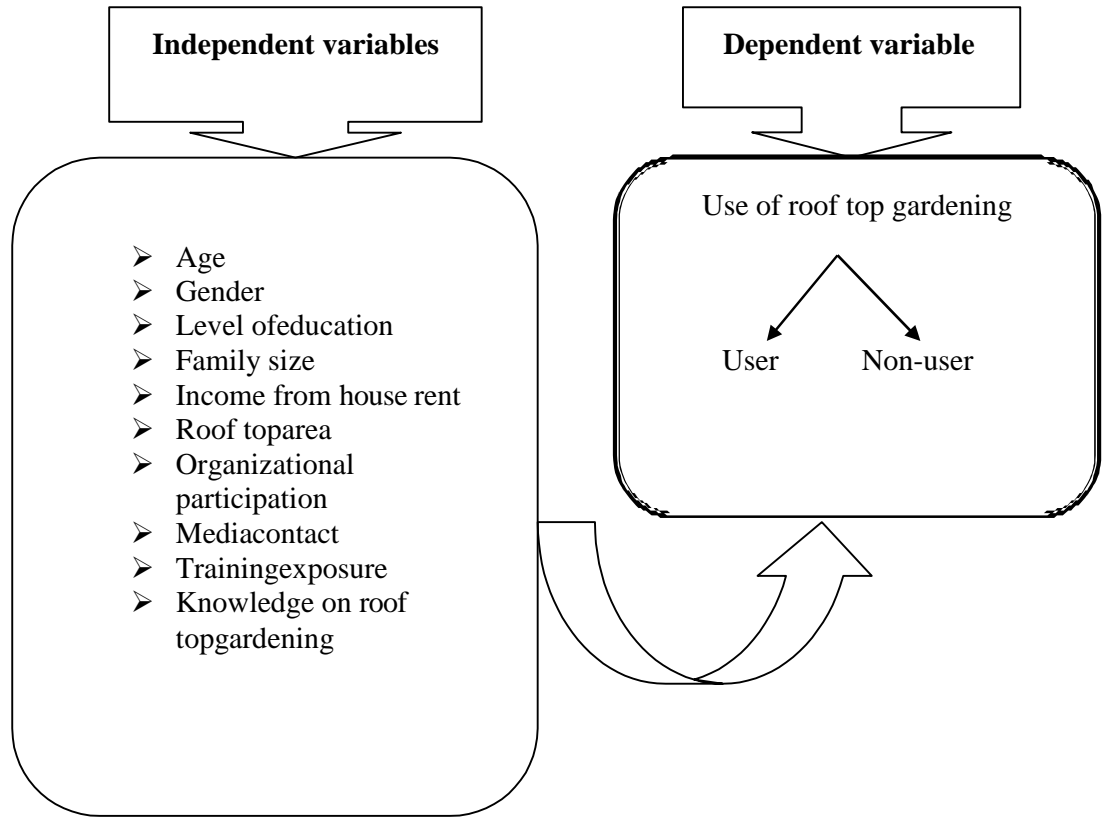
Hoque (2001) found that there was positive significant relationship between knowledge on IPM and their awareness on the environmental pollution caused by the use of pesticides.

Yasmin (1987) found that the farmers had significant positive relationship with their poultry knowledge on poultry production.

### **2.3 Conceptual Framework of the Study**

According to Rogers and Havens (1960), the conceptual framework is kept in mind while framing the structural arrangement for the dependent and independent variables. A dependent variable is that which appears, disappears or varies as the researcher introduces, remove or varies the independent variables (Townsend, 1953).

This study is concerned with the “Factors Influencing Use of Roof Top Gardening at Dhaka City”. Here use of roof top gardening is dependent variable. The researcher can select a lots of independent variables if he/she wants. But it is quit impossible to deal with the independent variable in single thesis. So, the researcher choose 10 selective independent variables. The independent variables are age, gender, level of education, family size, income from house rent, roof top area, organizational participation, media contact, training exposure and knowledge on roof top gardening. Depend on these above discussion a conceptual frame work has been developed and given in figure 2.1.



**Figure 2.1 The conceptual framework of the study**

## **CHAPTER III**

### **MATERIALS AND METHODS**

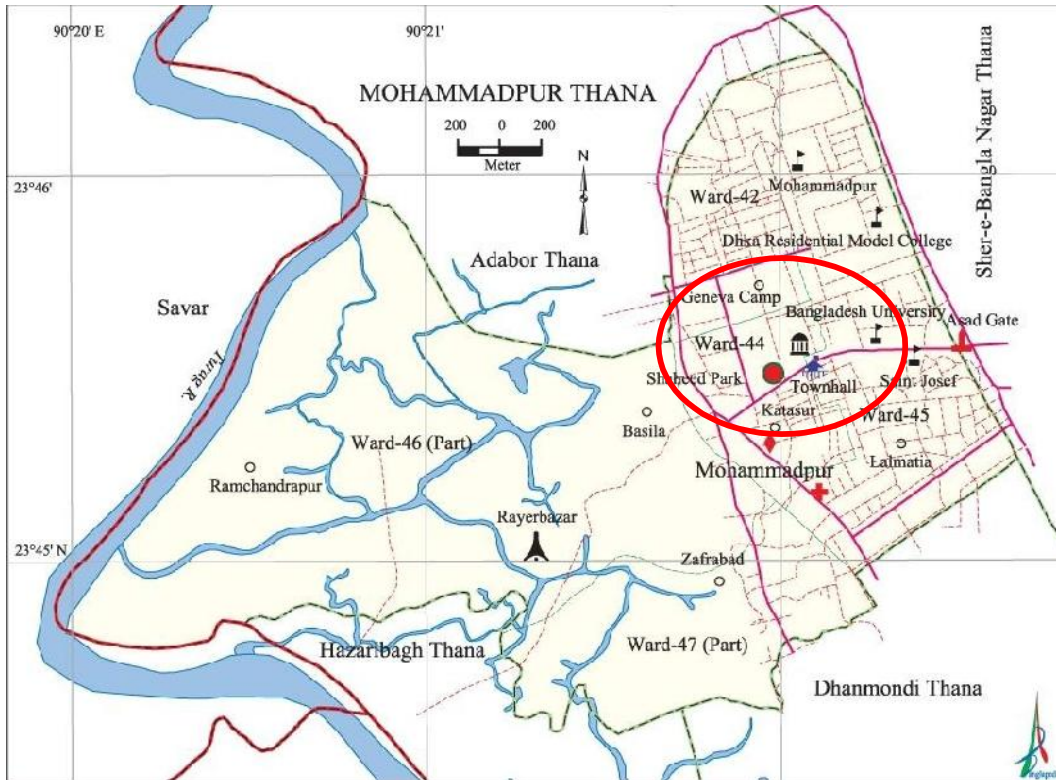
In conducting a research study, methodological issue is one of the prime considerations for yielding of valid and reliable findings. Appropriate methodology enables the researcher to collect valid and reliable information and to analyze the information properly in order to arrive at correct conclusions. However, the methods and operational procedures followed in conducting this study has been described in the subsequent sections of this chapter.

#### **3.1 Locale of the Study**

The study was conducted in the ward no. 44 of Mohammadpurthana and ward no. 40 of Tejgaonthana under Dhaka metropolitan area. Although initially Mohammadpur had grown as a residential area, commercial places also subsequently developed. Mohammadpur is situated at 23.7542°N and 90.3625°E. It has 57551 units of households and area of 11.65 km<sup>2</sup>. On the other hands, Tejgaon is situated at 23°49 41 N and 90°25 11 E. Tejgaonthana has a total area of 15.88 square kilometres. According to the 2011 Bangladesh census, Tejgaonthana had 31,141 households and a population of 130,053. The literacy rate (age 7 and over) was 73.8%, compared to the national average of 51.8%. A map of Mohammadpurthana and Tejgaonthana showing the study area have been shown in Fig 3.2 and 3.3 respectively.



**Figure 3.1 A Map of Bangladesh showing Dhaka District**



**Figure 3.2 A Map of Mohammadpurthana showing the study area (ward no.44)**

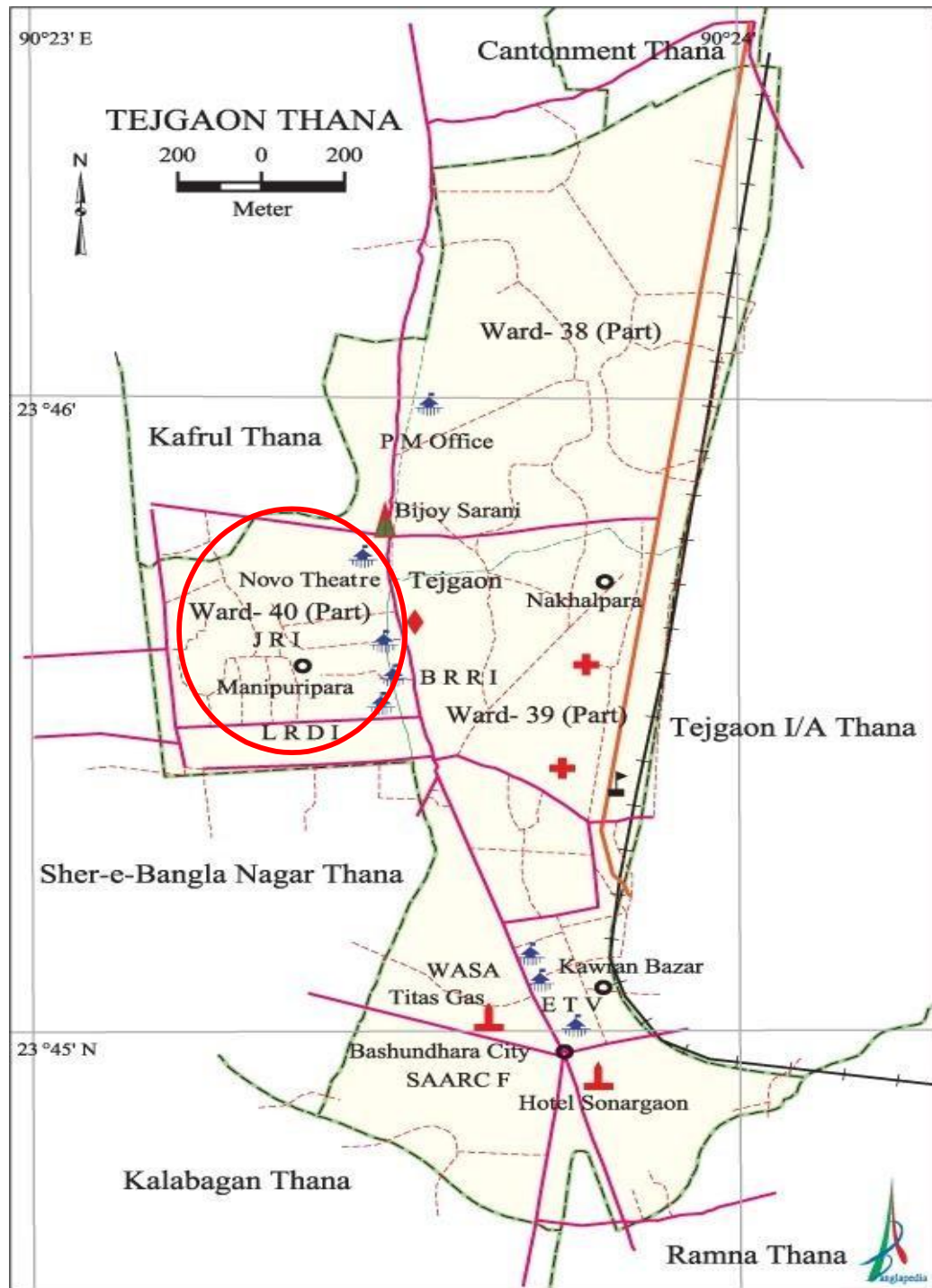


Figure 3.3 A Map of Tejgaonthana showing the study area (ward no.40)



### 3.2 Population and sample size

The total house owners of the two selected areas namely ward no. 44 (Mohammadpurthana) and ward no. 40 (Tejgaonthana) was the population of the study. A list of house owners of two wards was collected from ward commissioner's office. Out of 311 house owners of ward no. 44, 62 house owners (20% of house owners) were selected randomly. Similarly out of 221 house owners of ward no. 40, 44 house owners (20% of house owners) were selected randomly. Thus, a total of 106 house owners constituted the sample of the study. A reserve list of 10 house owners was prepared if the house owners included in the sample was not available during the collection of data.

**Table 3.1 Population of the study area**

Thana	Ward no.	No. of House Owners	Sample size	Reserve list
Mohammadpur	44	311	62	6
Tejgaon	40	221	44	4
Total		532	106	10

### 3.3 Data Collection Methods and Instrument

#### 3.3.1 Data collection methods

The survey method was used to collect quantitative and qualitative data that allow to answer the research questions framed and to gain an understanding of the study.

Individual interviews were used in the survey and were conducted in a face-to-face situation by the researcher. This method is useful to get unanticipated answers and to allow respondents to describe the world as they really see it rather than as the researcher does (Bryman, 2001).

#### 3.3.2 Data collection instrument

Structured and different semi-structured interview schedules were prepared to reach the objectives of the study. A structured interview schedule was prepared containing open and closed form questions. The open questions allowed for the respondents to give answers using their own language and categories (Casley and Kumar, 1998). Most of the questions were simple and direct. The data collection took 31 days from 21th January to 22th February, 2019. The initially prepared interview schedule was pre-tested by 15 respondents of the study area. The pretest was helpful to find out gaps and to locate

faulty questions and statements. Alterations and adjustments were made in the schedule on the basis of experience of the pretest. The questionnaires were also checked for validity by supervisor and educational experts at Sher-e-Bangla Agricultural University (SAU). Finally, based on background information, an expert appraisal and the pre-test, the interview schedule was finalized. English version of the interview schedule is shown in Appendix A.

### **3.4 Variables of the Study and their Measurement Techniques**

In social research, the selection and measurement of variables constitute an important task. In this connection, the researcher looked into the literature to widen his understanding about the nature and scope of the variables involved in research studies. Ezkiel and Fox (1959) defined a variable as any measurable characteristics which can assume varying or different values in successive individual cases. The hypothesis of a research, while constructed properly, contains at least two important elements, an independent variable and a dependent variable. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationships to an observed phenomenon (Townsend, 1953). A dependent variable is that factor which appears, disappears or varies as the experimenter introduces, removes or varies in the independent variables. The dependent variable is often called the criterion or predicted variable, where as the independent variable is called the treatment, treatment experimental and antecedent variable (Dalen, 1977).

#### **3.4.1 Measurement of independent variables**

It was pertinent to follow a methodological procedure for measuring the selected variables in order to conduct the study in accordance with the objectives already formulated. The procedures for measuring the independent variables are described below:

##### **3.4.1.1 Age**

Age of a respondent was measured in terms of years from birth to the time of interview which was found on the basis of response (Azad, 2003). A score of one (1) was assigned for each year of age. Question regarding this variable appears in item no. 1 in the interview schedule (Appendix A).

### **3.4.1.2 Gender**

Gender is a socially constructed role of women and men. Gender is determined by the conception of tasks, functions and roles attributed to women and men in society and in public and private life. A unit score 1 and 2 was assigned for male and female respectively. Question regarding this variable appears in the item no.2 in the interview schedule (Appendix-A).

### **3.4.1.3 Level of education**

Education was measured in terms of one's year of schooling. One score was given for passing each year in an educational institution (Amin, 2004). For example, if the respondent passed the S.S.C. examination, his/her education score was given 10, if passed the final examination of class Seven (VII), his/her education scores was given 7. If the respondent did not know how to read and write, his education score was given as '0'(zero). A score of 0.5 (half) was given to that respondent who could sign his/her name only. Question regarding this variable appears in the item no.3 in the interview schedule Appendix A.

### **3.4.1.4 Family size**

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent members like husband/wife, children, etc. who lived and ate together. A unit score 1 was assigned for each member of the family. If a respondent had five members in his/her family, his/her family size score was given as 5 (Khan, 2004). Question regarding this variable appears in the item no. 4 in the interview schedule Appendix A.

### **3.4.1.5 Income from house rent**

Income from house rent of the respondents was measured in lacs taka on the basis of total annual income from the rent of house. This variable appears in item no.5 in the interview schedule as presented in Appendix A.

### **3.4.1.6 Roof top area**

The area under roof top garden was measured as the total area on which his/her family carried out the gardening operation, the area being in terms of full benefit to the family through rooftop gardening (Mithon, 2016). It was expressed in square feet variable appears in item no.6 in the interview schedule as presented in Appendix A.

### **3.4.1.7 Organizational participation**

Organizational participation means respondent's participation in any organization like : government, non-government, krishi club etc. For measuring participation in any

organization, the respondents were asked to choose one answer among four nature namely not involved, ordinary member, executive member and president. This variable appears in item no.7 in the interview schedule as presented in Appendix A. Scores were assigned for all extension media in the following manner:

**Table 3.2 Nature of participation of the respondents in different organization**

<b>Name of the organizational participation</b>	<b>Assigned score</b>
Not involved	0
Ordinary member	1
Executive member	2
President	3

#### **3.4.1.8 Media contact**

Media contact of a house owner was measured by computing contact score on the basis of his/her extent of use of the eleven selected media. Each house owner was asked to indicate his/her nature of contact with five alternative responses, like regularly, frequently, sometimes, rarely and not at all basis to each of the eleven media and score of four, three, two, one and zero were assigned for those alternative responses, respectively. Logical frequencies of contacts were assigned to those alternative responses. Respondent's extension media contact score was obtained adding the weights for his/her responses to all sources listed in the interview schedule. Thus, media contact score of a house owner could range from 0 to 44, where zero indicated no media contact and forty four indicated highest level of media contact. This variable appears in item no. 8 in the interview schedule as presented in AppendixA.

#### **3.4.1.9 Training exposure**

Training exposure of a respondent was determined by the total number of days when he/she attended in different training programs in his/her life regarding rooftop gardening. A score of one (1) was assigned for each day of training attended (Mithon, 2016). This variable appears in item no.9 in the interview schedule as presented in Appendix A.

#### **3.4.1.10 Knowledge on roof topgardening**

Rooftop gardening knowledge of a respondents was measured by asking him/her 13 questions related to different components of rooftop gardening. It was measured

assigning different marks for each question. The total assigned scores for all the questions became thirty five. The score was given according to response at the time of interview. Answering a question correctly an individual could obtain full score while for wrong answer or no answer he/she obtained zero (0) score. Partial score was assigned for partially correct answer. Thus, the rooftop gardening knowledge score of a respondent could range from zero (0) to thirty nine (35), where 0 indicates poor knowledge and 35 indicates sound knowledge. This variable appears in item no.10 in the interview schedule as presented in AppendixA.

### 3.5 Measurement of dependentvariable

Use of roof top for gardening was the dependent variable of the study. It is assume that all house owner do not use their roof top for gardening. Some of them use while other don't use roof top for gardening. Therefore, this was measured on the basis of whether the user or non-user of roof top gardening. The scoring method for both group is mentionedbelow:

Type of house owner	Assigned score
User of RTG	1
Non-user of RTG	0

The user of RTG was given a score of 1 and the non-user of RTG was given a score of 0.

### 3.6 Hypothesis of theStudy

As defined by Goode and Hatt (1952) a hypothesis is “A proposition which can be put to test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test.” In broad sense hypotheses are divided into two categories: (a) Research hypothesis and (b) Null hypothesis.

#### 3.6.1 Researchhypothesis

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

“Each of the 10 selected characteristics (age, gender, level of education, family size, income from house rent, roof top area, organizational participation, mediacontact,

training exposure and knowledge on roof top gardening) of the respondents had significant contribution on use of roof top gardening”.

### 3.6.2 Null hypothesis

A null hypothesis states that there is no contribution among the variables. If a null hypothesis is rejected on the basis of a statistical test, it is assumed that there is a contribution among the concerned variables (age, gender, level of education, family size, income from house rent, roof top area, organizational participation, media contact, training exposure and knowledge on roof top gardening).

Throughout the study the 0.01 and 0.05 levels of significance was used as the basis of rejection or accepting a null hypothesis.

### 3.7 Data Processing and Analysis

The collected raw data were examined thoroughly to detect errors and omissions. Having consulted with the research supervisor, the investigator prepared a detailed coding plan. Data were then coded into a coding sheet. In case of qualitative data, putting proper weight against each of the traits to transfer the data into quantitative forms followed suitable scoring techniques. Collected data for the study were compiled, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures such as number and percentage distribution, range, mean, standard deviation and rank order were used in describing the variables of the study. Tables and figures were used in presenting data for clarity of understanding.

To find out the contribution of the individual characteristics of the respondents on their use of roof top gardening were ascertained by binary logistic regression model.

The model for this study is given below:  $\text{Log} [P/1-P] =$

$$\theta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + e$$

Where,

$P$  = Probability of outcome

$\theta_0$  = Intercept

$e$  = random error

$\beta_1 - \beta_{10}$  = Regression co-efficient of respective variables

$X_1$ =Age

$X_2$ = Gender

$X_3$ = Level of education

$X_4$ = Family size

$X_5$ = Income from house rent

$X_6$ = Roof top area

$X_7$ = Organizational participation

$X_8$ = Media contact

$X_9$ = Training exposure and

$X_{10}$ = Knowledge on roof top gardening

## **CHAPTER IV**

### **RESULTS AND DISCUSSION**

Results and discussion is a mirror of a research work. A consequential and detailed discussion on the findings of the scientific research study has been presented in this Chapter. Data obtained from house owners through interview were measured, analyzed, tabulated and statistically treated according to the objectives of the study. This Chapter includes three sections. In the first section, independent variables i.e. characteristics of the respondents have been discussed. The second section deals with dependent variable i.e., use of RTG and finally, the third section deals with contribution of the house owners' selected characteristics to the use of RTG.

#### **4.1 Selected Characteristics of the HouseOwners**

Behavior of an individual is determined to a large extent by one's personal characteristics. The ten selected characteristics of the house owners were age, gender, level of education, family size, income from house rent, roof top area, organizational participation, media contact, training exposure and knowledge on RTG which have been discussed. Range, mean and standard deviations of these characteristics of the house owners have been described in the following sub-sections:



**Table 4.1 The salient features of the selected characteristics of the house owners**

Categories	Measuring unit	Range		Mean	S.D
		possible	observed		
Age	Year	-	27-85	50.95	13.05
Gender	Score	1 or 2	1-2	-	-
Level of Education	Year of schooling	-	4-17	14.08	3.52
Family size	Number	-	2-7	4.32	1.10
Income from house rent	'00000'	-	1.5-9	4.25	1.64
Roof top area	(00) Sq.ft	-	1500-4200	2918.49	603.37
Organizational participation	Score	-	0-8	1.59	1.53
Media contact	Score	0-44	21-39	23.95	7.32
Training exposure	Days	-	0-5	1.39	1.29
Knowledge on roof top gardening	Score	0-35	9-32	23.21	5.85

**4.1.1 Age**

The age of the house owners ranged from 27 to 85 years with an average of 50.95 and standard deviation of 13.05. According to their age, the house owners were classified into three categories as “young aged” (up to 35 years), “middle aged” (36- 50 years) and “old aged” (above 50 years). The distribution of house owners according to their age is shown in Table 4.2.

**Table 4.2 Distribution of the house owners according to their age**

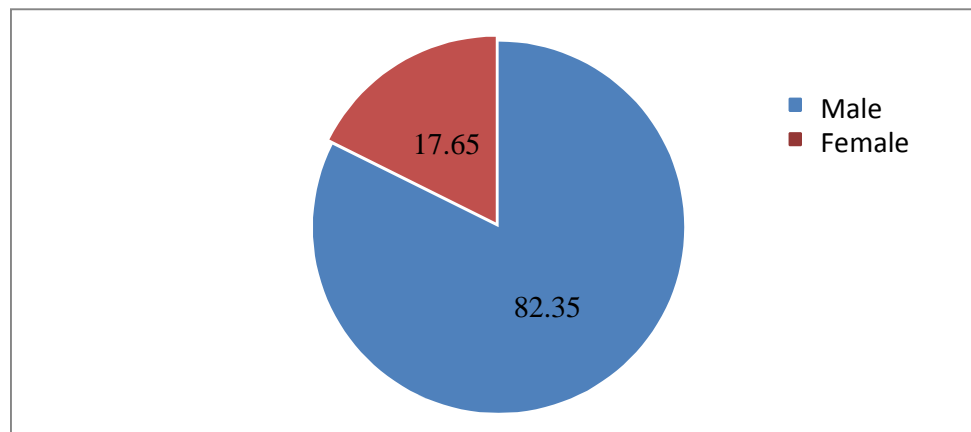
Category	Basis of categorization (Year)	Observed range	House owners	
			Number	Percent
Young aged	35	27-85	15	14.15
Middle aged	36-50		32	30.19
Old aged	> 50		59	55.66
Total			106	100.00

From the Table 4.2 it was indicated that the highest proportion (55.66 %) of the houseowners were old aged where young aged were 14.15% and middle aged were

30.19%. It was indicated that old aged house owners were more accessible to practice roof top gardening because they had lots of time leisure time. Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

#### 4.1.2 Gender

On the basis of gender, the house owners of this study were classified into two groups viz. male and female. Among the house owners some of them were male while others were female. The number of male and female house owners was presented below in Figure 4.1 (pie chart).



**Figure 4.1 Distribution of the house owners on the basis of gender**

It was observed from the Figure 4.1 that majority of the house owners (82.35%) were male and remaining (17.65 %) were female. Less than one fifth of the total house owners were female. The Figure 4.11 is consistent with general observation. In the context of Bangladesh, usually the society is more male dominated therefore most house owners are found male.. Moreover, the number of service holder and businessman are also higher among the male. This might have influence to earn more as well as be owner of a flat. These are the probably reasons of getting more male house owner than the female.

#### 4.1.3 Level of education

Education level of the house owners ranged from 4-17 in accordance with year of schooling. The average education score of the house owners was 14.08 with a standard deviation of 3.52. On the basis of their level of education, the house owners were classified into five categories as shown in Table 4.3.

**Table 4.3 Distribution of the house owners according to their level of education**

Category	Basis of categorization (Score)	Observed Range	House owners	
			Number	Percent
Can't read and sign	0	4-17	0	0
Can sign only	0.5		0	0
Primary education	1-5		4	3.78
Secondary education	6-10		22	20.75
Above secondary	>10		88	75.47
Total			106	100.00

Table 4.3 indicate that about 75.47% house owners were higher educated where 20.75% had secondary level education and 3.78% of house owners had primary level of education. In Dhaka city most of the people are rich so that they get more opportunity to obtain higher education. Education increases one's knowledge and experience.

#### 4.1.4 Family size

The number of family members of the house owners ranged from 2 to 7 with an average of 4.32 and standard deviation of 1.10. Based on the family size the house owners were classified into three categories as small, medium and large family as shown in Table 4.4.

**Table 4.4 Distribution of the house owners according to their family size**

Category	Basis of categorization (Score)	Observed Range	House owners	
			Number	Percent
Small family	3	2-7	21	19.81
Medium family	4-5		72	67.93
Large family	>5		13	12.26
Total			106	100.00

Data shown in the Table 4.4 reveals that 67.93 percent of the house owners had medium family size followed by 19.81 percent had small family size while 12.26 percent had large family size. The findings indicate that average family size of the study area was smaller than the national average which is 4.85 (BBS,2014).

#### 4.1.5 Income from house rent

Annual income from house rent of the house owners ranged from 1.5 to 9 lac (BDT) with a mean and standard deviation of 4.25 and 1.64, respectively. On the basis of

annual income from house rent, the house owners were classified into three categories viz. low, medium and high. The distribution of house owners according to their annual income from house rent is presented in Table 4.5.

**Table 4.5 Distribution of the house owners according to their house rent**

Category	Basis of categorization ('000000' T.k)	Observed Range	House owners	
			Number	Percent
Low income	3	1.5-9	41	38.67
Medium income	4-6		52	49.06
High income	>6		13	12.27
Total			106	100.00

The Table 4.5 reveals that rooftop gardeners having medium annual income from house rent constitute the highest proportion (49.06 percent), while the lowest proportion in low annual income from house rent (38.67 percent). The high annual income from house rent category constituted with 12.27 percent respondents. These results expressed that house rent of Dhaka city is higher than any other cities in Bangladesh.

#### 4.1.6 Roof top area

Roof top area of the respondents varied from 1500 to 4200 Sq.ft. The average roof garden area was 2918.49 Sq. with the standard deviation of 603.37. Based on roof garden area, the respondents are classified into three categories as shown in Table 4.6.

**Table 4.6 Distribution of the house owners according to their rooftop area**

Category	Basis of categorization ('00' sq.ft)	Observed Range	House owners	
			Number	Percent
Small area	24	15-42	24	22.65
Medium area	25-32		54	50.94
Large area	>32		28	26.41
Total			106	100.00

The observed data shows that most of the house owners (50.94 percent) had medium rooftop area while 22.65 and 26.41 percent of them had low and high rooftop area respectively. Overwhelming majority (77.35 percent) of the house owners have medium

to high rooftop area for gardening. The house owners who have more space on roof can produce more vegetables, fruits and flowers.

#### 4.1.7 Organizational participation

Organizational participation scores of the house owners ranged from 0 to 8. The average score was 1.59 with a standard deviation of 1.52. The house owners were classified into the following three categories namely; low participation (below 1 or equal to 1), medium participation (2 to 3) and high participation (above 3). The distribution of the house owners according to their organizational participation is presented in Table 4.7

**Table 4.7 Distribution of the house owners according to their organizational participation.**

Category	Basis of categorization (Score)	Observed Range	House owners	
			Number	Percent
Low participation	1	0-8	60	56.61
Medium participation	2-3		33	31.13
High participation	>3		13	12.26
Total			106	100.00

Data presented in Table 4.7 indicate that majority (56.61percent) of the house owners had low participation while (31.13 percent) of their had medium participation and (12.26 percent) had high participation in various organizations. The most of the dwellers of Dhaka city were busy in different activities. For this, most of them were passing their off day in rest or with family members rather than organizational participation on roof top gardening.

#### 4.1.8 Media contact

The extension contact scores of the house owners ranged from 21 to 39 against the possible range from 0 to 44. The mean was 23.95 and standard deviation was 7.32. The house owners were classified into three categories which are shown in Table 4.8.

**Table 4.8 Distribution of the house owners according to their media contact**

Category	Basis of categorization (Score)	Observed Range	House owners	
			Number	Percent
Low contact	24	21-39	34	32.07
Medium contact	25-32		48	45.29
High contact	>32		24	22.64
Total			106	100.00

Data furnished in Table 4.8 indicate that the largest proportion (45.29%) of the house owners fell in the medium media contact category, while 32.07 percent of them were in the low media contact category and about 22.64 percent constituted the high media contact category. Media contact is important for gathering information from many sources. High media contact is essential for creating awareness about new idea, practice and issues among the house owners.

#### 4.1.9 Training exposure

The score of training exposure on use of roof top gardening ranged from 0-5 days. The mean was 1.39 and standard deviation was 1.29. On the basis of training exposure on use of roof top gardening , the house owners were categorized into four groups as shown in Table 4.9.

**Table 4.9 Distribution of the house owners according to their training exposure**

Category	Basis of categorization (Days)	Observed Range	House owners	
			Number	Percent
No training	0	0-5	31	29.25
Low training	1-2		53	50
Medium training	3		14	13.21
High training	>3		8	7.54
Total			106	100.00

Data presented in the Table 4.9 showed that (50%) of the house owners had low training exposure; while 29.25% of the house owners had no training exposure and 13.21% percent had medium exposure while 7.54% had high training. It means that an overwhelming majority (79.25%) of the house owners had no or low training exposure. It

is logical that there is always a relationship between training exposure and knowledge on use of roof top gardening. Because training develops the house owners knowledge and skill.

#### 4.1.10 Knowledge on roof top gardening

Knowledge on roof top gardening of the house owners ranged from 9 to 32 against the possible range of 0-35 having an average of 23.21 and standard deviation of 5.84. On the basis of knowledge scores, the house owners were classified into three categories viz; namely, 'poor knowledge', 'moderate knowledge' and 'sound knowledge'. The distribution of the house owners according to their knowledge on use of roof top gardening is given in Table 4.10.

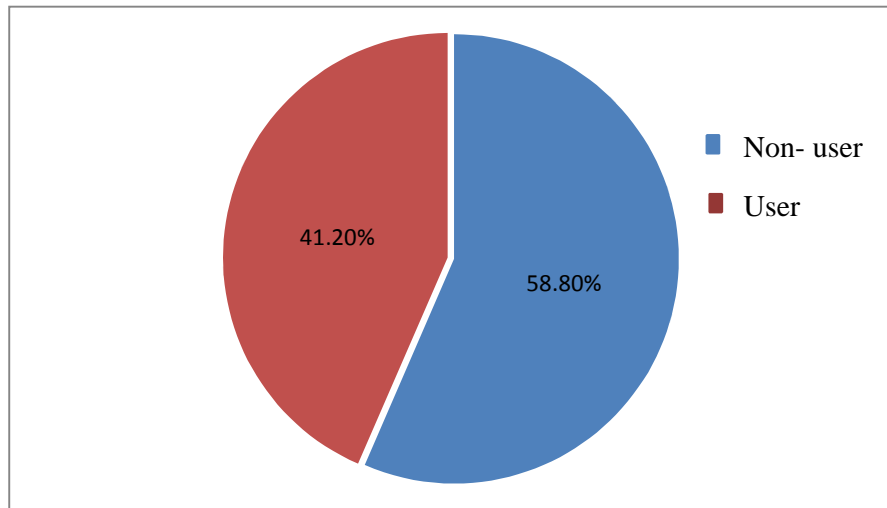
**Table 4.10 Distribution of the house owners according to their knowledge on use of roof top gardening**

Category	Basis of categorization (Score)	Observed Range	House owners	
			Number	Percent
Poor knowledge	0-20	9-32	32	30.19
Moderate knowledge	21-28		52	49.06
Sound knowledge	>28		22	20.75
Total			106	100.00

Data of Table 4.10 show that 49.06 percent of the house owners felt in moderate knowledge category followed by 20.75 percent in sound knowledge category and 30.19 percent in poor knowledge category. Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding roof top gardening. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he/she may have to face in future. It makes individuals to become rational and conscious about related field.

#### 4.2 Use of roof top gardening

Based on the scenario regarding use of roof top gardening by the house owners, they were classified into two categories as roof top garden/ user and non-user. The distribution of the house owners according to their use of roof top gardening has been presented in Figure 4.2 (pie chart).



**Figure 4.2 Distribution of the house owners according to their use of roof top gardening**

It was observed from the Figure 4.2 that more than half of the house owner (58.80 percent) did not use their roof top for gardening, while the rest other (41.20 percent) house owners used their building roof for gardening. This may be due to the several reasons like business of the house owners, negative attitude of the house owners towards roof top gardening, problem to manage equipment and material for making roof top gardening etc.

#### **4.3 Determinants of use of RTG**

In order to estimate the influential factors on use of RTG by the house owners to develop environment binary logistic regression analysis was used which is shown in Table 4.11.



**Table 4.11 Binary logistic regression coefficients of contributing factors related to the use of roof top gardening to develop environment**

Dependent variable	Independent variable	B	S.E.	Wald	Sig.	Exp(B)
Use of roof top gardening	Age	0.012	0.021	0.326	0.568	1.012
	Gender	-0.348	0.551	0.398	0.528	0.706
	Level of education	-0.011	0.086	0.015	0.901	0.989
	Family size	-0.091	0.247	0.137	0.711	0.913
	Income from house rent	-0.111	0.156	0.508	0.476	0.895
	Roof top area	0.001	0.000	3.945	0.047*	1.001
	Organisational participation	-0.156	0.204	0.583	0.445	0.856
	Media contact	0.136	0.062	4.807	0.028*	1.145
	Training exposure	-0.238	0.227	1.106	0.293	0.788
	Knowledge on roof top gardening	0.222	0.082	7.242	0.007*	1.249

Overall percentage of correct prediction = 74.5

Omnibus test of model coefficient = 39.872\*\*

Cox and Snell  $R^2 = 0.314$

Nagelkerke  $R^2 = 0.420$

Table 4.11 shows roof top area, media contact and knowledge on RTG were the important contributing factors (significant at the 5% level of significance). The data in Table 4.11 test the final null hypothesis: There is no relationship between the selected characteristics (age, gender, level of education, family size, income from house rent, roof top area, organizational participation, training exposure, knowledge on RTG ) and use of roof top gardening. The analysis suggests that the respective authority should consider the house owners roof top area, media contact and knowledge for increasing the use Of RTG to develop environment.

The Cox and Snell  $R^2 = 0.314$  of the variation in the house owners changed the probability of use of roof top gardening can be attributed 31% to house owners roof top area, media contact and knowledge on RTG. However, each predictor may explain some of the variance in house owners use of roof top gardening simply by chance. Besides, the overall percentage of correct prediction is 74.5% and the omnibus test of model coefficient

is 39.872 which is significant at 1% level (Table 4.11) These findings indicate that, the model is valid.

#### **4.3.1 Roof top area and use of RTG**

The contribution of roof top area on the probability of use of roof top gardening by house owners to develop environment by testing the following null hypothesis; “There is no contribution of roof top area in the probability of use of roof top gardening by the house owners”.

Based on p value and the direction of coefficient value of the concerned variable of the study under consideration the following observations were made.

- a. The contribution of roof top area was significant at 5% level. So, the null hypothesis could be rejected.
- b. The direction between occupation and the use of roof top gardening is positive.

Based on the direction of co-efficient value it can be said that a building with more roof top area increased the probability of using roof top gardening. Moreover, the odd ratio value (1.001) indicates a house owner with high area has 1.001 times higher probability of use of roof top gardening.

Among the house owners who has more roof top area have utilize more than one function including roof top gardening. This might be influenced the house owner with higher roof top size to enhances the abilities to use roof top gardening.

#### **4.3.2 Media contact and use of RTG**

The contribution of media contact on the probability of use of RTG by house owners to develop environment by testing null hypothesis; “There is no contribution of media contact on the probability of use of RTG by the house owners”.

The p value of the concerned variables was found 0.028. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of media contact was significant at 5% level. So, the null hypothesis could be rejected.
- b. The direction between media contact and the use of roof top gardening is positive.

- c. Based on the direction of coefficient value it can be said that a house owner with more on media contact increased the probability of using roof top gardening to develop environment. Moreover, the odd ratio value (1.145) indicates a house owner with high media contact has 1.145 times higher probability of using RTG who have less on mediacontact.

The house owner who have more media contact about roof top gardening his/her skill is more than other house owners. Thus, media contact enhances the abilities of the house owners to use roof top gardening.

#### **4.3.3 Knowledge and use ofRTG**

The contribution of knowledge on the probability of use of roof top gardening by house owners use testing the following null hypothesis; “There is no contribution of knowledge in the probability of use of roof top gardening by the houseowners”.

The p value of the concerned variables was found 0.007. The following observations were made on the basis of the value and coefficient of the concerned variable of the study underconsideration.

- a. The contribution of knowledge was significant at 5% level. So, the null hypothesis could berejected.
- b. The direction between knowledge and the probability of use of roof top gardening ispositive.

Knowledge was the highest contributory factor on use of use of roof top gardening by the house owners. Moreover, the odd ratio value (1.249) indicates a house owner with high knowledge has 1.249 times higher probability of using roof top gardening. The house owner who has more knowledge enhances the probability the use of roof top gardening.

## CHAPTER V

### SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Summary of Findings

The major findings of the study are summarized below:

##### 5.1.1 Selected characteristics of the homeowners

**Age:** The highest proportion (55.66%) of the house owners belonged to old aged category, while 30.19 percent belonged to middle aged category and only 14.15 percent to the young aged category.

**Gender:** The highest proportion (82.35%) of the house owners were male while 17.65% were female.

**Level of education:** Above secondary education constituted the highest proportion (75.47percent) while 3.78 percent and 20.75 percent were primary and secondary education category.

**Family size:** The highest proportion (67.93 percent) of the house owners had medium family size, while 19.81 percent and 12.26 percent belonged to the small family size and large family size respectively.

**Income from house rent:** Medium annual income constituted the highest proportion (49.06%), while the lowest proportion in low annual income from house rent (12.27 percent) category.

**Roof top area:** The largest proportion (50.94 percent) of the house owners had medium roof garden area compared to 26.41 percent having high and 22.65 percent had small roof gardenarea.

**Organizational participation:** Majority of house owners (56.61%) had low participation while 31.13% and 12.26% were medium and high participation respectively.

**Media contact:** The highest proportion (45.29 percent) of the house owners had medium media contact as compared to 32.07 percent of them having low use of media contact.

**Training exposure:** Most (50 percent) of the house owners had low training exposure compared to 29.25 percent and 13.21 percent having no training and medium training respectively. It means, overwhelming majority 63.21 percent of the house owners had low to medium training on roof topgardening.

**Knowledge on roof top gardening:** 49.06 percent of the house owners had moderaterooftop gardening knowledge, 30.19 percent had poor knowledge and 20.75 percent had sound knowledge on rooftop gardening.

### **5.1.2 Use of RTG by the houseowners**

The highest proportion 58.80 percent of the house owners are the non-user of roof top gardening and 41.20 percent are the user of roof top for gardening.

### **5.1.3 Factors related to the useRTG**

Roof top area, media contact and knowledge had significant positive contribution to their use of roof top gardening by the house owners. Characteristics of the house owners like age, gender, education, family size, income from house rent organizational participation, media contact, and training exposure had no contribution to their use of roof top gardening.

## **5.2 Conclusion**

Findings of the present study and the logical interpretation of other relevant facts prompted the researcher to draw the following conclusions:

1. The findings revealed that more than half (58.80%) of the house owners did not use their roof top for gardening. However, to develop environment ,there is need to increase practicing of roof top gardening. So, steps should be taken to increase the number of roof topgardener.
2. Knowledge on RTG had a significant contribution to use of roof top gardening. Through gaining knowledge house owners had opportunity to learn more about different aspect of roof top gardening which may influence house owners to use ofRTG.
3. Maximum (50.94%) house owners had medium roof top area and the binary logistic regression analysis revealed that roof top area was a contributing factor on practicing of rooftop gardening. Therefore, it may be concluded that roof top area makes the house owners with enhancing use ofRTG.
4. The analysis revealed that media contact was a contributing factor on the use of roof top gardening. Therefore, it may be concluded that media contact encourages the house owners to enhance use ofRTG.

### **5.3 Recommendations**

On the basis of practical consideration and conclusions drawn from the findings of the study following recommendations are made:

1. The concerned authorities like Department of Agricultural Extension (DAE), Non-Government Organizations (NGOs) should motivate more the house owners having relatively smaller roof top size to increase the use of roof topgardening with a view to improvingenvironment.
2. It should be selected on priority basis for launching some innovative knowledge gaining program by Department of Agricultural Extension (DAE) and Non-Government Organizations (NGOs) for gaining sustainable roof top gardening.
3. DAE should engage SAAO more on motivating and practicing roof top gardening and at the same time NGOs should focus more on thisaspect.

#### **5.3.1 Recommendations for furtherstudy**

A small proper understanding of piece of study as has been conducted cannot provide all information for the house owners towards RTG . Therefore, the following recommendations were made for further study:

1. The present study was conducted in Mohammadpur and Tejgaonthana. It is recommended that similar studies should be conducted in other areas of Dhaka city.
2. The present study was undertaken to explore contribution of 10 selected characteristics of the house owners with the influential factors of practicing roof top gardening. Therefore, it could be recommended that further studies should be designed considering other agricultural and non-agricultural activities and including other characteristics of house owners with practicing of roof topgardening.
3. The present study was concerned only with the extent of practicing of roof top gardening. It is suggested, future studies should be included with knowledge onRTG.

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**APPENDIX A**

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University

Dhaka-1207

An interview schedule on

**Factors Influencing Use of Roof Top Gardening at Dhaka City**

Respondent's Name: ..... Serial No:.....

HouseNo:..... RoadNo:.....

Section:..... Thana:.....

District:.....

(Please provide the following information. Your information will be kept confidential and will be used for research purpose)

**1. Age:**

How old are you? \_\_\_\_\_ years.

**2. Gender:**

Please give tick mark on anyone of the following:

a) Male

b) Female

**3. Level of education:**

Please mention your level of education.

a) I can't read and write.

b) I can sign only.

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

**4. Family size:**

How many numbers do you have in your family?

a) Male..... b) Female..... Total.....

**5. Income from house rent:**

How much money do you get from house rent? ..... Tk./Month



**6. Roof Top Area:**

What is the size of your rooftop? ..... sq.ft

**7. Organizational participation:**

Please mention the nature of your participation:

Sl. No.	Name of the organization	Nature of the participation			
		Not involved (0)	Ordinary Member (1)	Executive Member (2)	President (3)
1.	Green Dhaka				
2.	Nagar Krishi				
3.	Facebook group				
4.	Chad Bagan				

\*GO =Government organization

\* NGO =Non- government organization

**8. Mediacontact**

Mention the extent of contact with the sources of information for roof top gardening.

Sl. No.	Name of the information sources	Extent of contact				
		Regularly (4)	Frequently (3)	Sometimes (2)	Rarely (1)	Not at all (0)
1.	Internet/ Month	>20 times/M	12-20 times/M	5-11times/M	1-4 times/M	0 times
2.	Agricultural Magazine/ Year	> 8 times/Y	6-8 times/ Y	4-5 times/ Y	1-3 times/ Y	0 times
3.	Friends, Relatives/ Month	10 times/M	6 -9 times/ M	4-5 times/ M	1-3 times/M	0 times
4.	Neighbors/ Month	10 times/M	7 -9 times/ M	4-6 times/ M	1-3 times/ M	0 times
5.	Television/ Month	10 times/M	7 -9 times/ M	4-6 times/ M	1-3 times/ M	0 times
6.	Radio/ Month	8 times/ M	5 -7 times/ M	4-6 times/ M	1-3 times/ M	0 times
7.	News paper/ Month	12 times/M	9 -11 times/ M	4-8 times/ M	1-3 times/ M	0 times
8.	Private Nursery / Year	8 times/Y	6-7 times/Y	3-5 times/Y	1-2 times/Y	0 times
9.	Visit to Upazila Agriculture Office/ Year	7 times/Y	5-6 times/ Y	3-4 times/ Y	1-2 times/Y	0 times
10.	Tree fair/ Year	7 times /Y	5-6 times/ Y	3-4 times/ Y	1-2 times/Y	0 times
11.	Hand books/ Month	8 times/M	6-7 times/M	4-5 times/M	1-2 times/M	0 times

\*Y= Year \*M= Month

## 9. Training Exposure

Have you participated in any training programs regarding roof top gardening?

A) No  B) Yes

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

Sl. No.	Name of the training course	Organization	Days
01.			
02.			
03.			

## 10. Knowledge on rooftop gardening

Please answer the following questions:

Sl. No.	Question	Full marks	Marks obtained
1.	What type of vegetables/flowers are suitable for roof top gardening? Why?	4	
2.	Name two ornamentals plants that are grown in roof	2	
3.	How could you make soil for roof top garden?	4	
4.	How could you maintain plant nutrition in RTG?	3	
5.	When do you do training and pruning?	3	
6.	What type of fertilizers do you can use and at what rate?	2	
7.	How many times do you apply fertilizer in a year?	2	
8.	Is it possible to make roof top gardening or business purpose? How?	3	
9.	Name two diseases of each of your planted flowers and vegetables	3	
10.	Name two major Insects of roof top practice	2	
11.	What do you do when the climate is draught or in chilling temperature?	3	
12.	Name two propagating materials of gladiators	2	
13.	Why de-potting is necessary?	2	
	Total	35	

**11. Use of Roof Top Gardening**

Do you practice roof topgardening?

A)Yes  B) No

Thanks for your co-operation.

Dated:.....

.....  
Signature of theinterviewer