

**ROLE OF WOMEN IN ROOFTOP GARDEN MANAGEMENT: A
CASE STUDY OF MOHAMMADPUR THANA IN DHAKA CITY**

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CERTIFICATE

This is to certify that the thesis entitled 'ROLE OF WOMEN IN ROOFTOP GARDEN MANAGEMENT : A CASE STUDY OF MOHAMMADPUR THANA IN DHAKA CITY' submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University (SAU), Dhaka, in partial fulfillment of the requirements for the degree of Master of Science (MS) in Agroforestry and Environmental Science, embodies the result of a piece of bona fide research work carried out by Sumaiya Akter Registration number: 18-09181, under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

*Dated: December, 2020
Dhaka, Bangladesh*

*Dr. Md. Forhad Hossain
Professor
Supervisor*



*Dedicated to
My
Beloved Parents*



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ROLE OF WOMEN IN ROOFTOP GARDEN MANAGEMENT: A CASE STUDY OF MOHAMMADPUR THANA IN DHAKA CITY

ABSTRACT

Dhaka, the capital city of Bangladesh has experienced a higher rate of urban growth in recent decades and emerged as the world's fastest growing mega city. To improve the quality of healthy living and to create better opportunities for social and environmental benefits; rooftop gardening will be the solution and natural habitats to conserve some diversity in Dhaka city. The study was conducted within the 1 metropolitan area (Mohammadpur) of Dhaka city. The main purpose of this research was to examine the role of women in rooftop garden management and to explore the relationship between role of women in rooftop garden management in Dhaka City and the selected characteristics of garden owners. Data were collected from 80 randomly selected women by using an interview schedule during December 1 to December 30, 2020. The collected data were analyzed by using SPSS and MS Excel. The highest proportion (50%) of the respondents found in the middle-aged category. The highest proportion (37.5%) of the women belonged to the above secondary education category. The highest proportion (48.75%) of the women belonged to the medium families. Majority of the respondent (40%) belongs to medium income categories. The highest proportion of women (43.75%) were found to perform medium role whereas 40% had high and (16.25%) had low in rooftop garden management activities. Most of the respondents (40%) had medium rooftop area. Most of the respondents (52%) were tenant. 45.09% garden owners have the herbs type plants while 21.08% rooftop garden owners have the tree type of plants. 46.25% had medium knowledge about rooftop gardening. It was also found that costly management system positioned the 1st as per Problem Faced Index (PFI).

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CHAPTER I

INTRODUCTION

Bangladesh the 8th most populous country in the world. The capital city Dhaka is considered the largest in all of Bangladesh and the overall metropolitan area is the 9th largest city in the entire world. So, the city is facing remarkable problems associated with unplanned development, high level of poverty, social vulnerability, inadequate infrastructure, lack of social services, poor quality of physical and social environment, and inefficient urban management. In urbanization process, it is found that about 20 percent vegetation cover that was present in 1989 has gradually decreased to 15.5 percent and 7.3 percent in the year 2002 and 2010, respectively. Vegetation was found in the Dhaka metropolitan area is only 1.87 percent. The loss of plant diversity has been a common concern of mankind and a threat for our agriculture, environment, and forest also poses long term humanity problem. Diversity of life in all its forms and at all levels of organization has come under serious threat in many places in recent times.

Several of the global hotspots of biodiversity are at the same time areas where human population density has increased enormously, which has contributed to current global species extinction levels paralleling to previous mass 33 extinction events (Myers *et al.*, 2001). To clarify this severe problem, rooftop gardening will be the solution and natural habitats to conserve some diversity in Dhaka city (Kindt *et al.*, 2005).

Rooftop gardens are man-made green spaces on the uppermost levels of industrial, commercial, and residential structures. They may be planned to grow produce, provide play space, give shade and shelter, or simply be there as a living, green area. Plants are grown for a variety of utilitarian and non-utilitarian purposes (Sajjaduzzaman *et al.*, 2005). Rooftop garden can subsidize the diets of the community it feeds with fresh produce and provide a tangible benefits tie to food production. Plant species diversity is a resource, property and the characteristic of plant kingdom. We depend on it for our safety and health; it strongly affects our social relations and gives us freedom and choice. In this case, RTG can be an

impressive method to rich biodiversity which is important in maintaining the balance of nature (Hoggerbrugge and Fresco, 1993).

In Dhaka city most of the roofs are suitable for gardening and do not need major improvement work, sometimes only need a few modifications (Islam, 2004). Rooftop garden can be one of the best explanations against deforestation in the cities. City's gardeners and agriculturists, however, cite yet another reason why more house owners getting keens having a patch of greenery on their roofs, that means, they want vegetables and fruits fresh and free from poisonous chemicals. The temperature of roofs and the surrounding air can be reduced by Rooftop gardening. Urban heat island effect also reduced by Rooftop gardening. Carbon emissions and noise can also be absorbed by roof farming (Dubbeling, 2014 and Hui, 2011). This research serves to assess the contribution of rooftop garden to meet the needs of urban garden owners. As the roof top garden technique encompasses a wide variety of herb, shrub, climber and trees species, this research was attempt to find out the contribution in the conservation of precious natural resources. The finding of the research was directly advantageous to the garden owners as they get feedback from the research findings. The findings were also useful to all garden owners that fall in similar ecological zones to get idea for the adoption of new alternatives as roof top gardening or developing the existing practices.

Women can secure the production of pure and nutritious vegetables and fruits through their participation by small scale rooftop agriculture as they mostly reside in the house. The rooftop gardening can be a source of income. Roof garden has also economic value. From roof gardening people can earn money by selling the vegetables, fruits, and corns in the market. But in city areas, people use roof garden mainly for aesthetic purpose rather than economic purpose.

Peoples live in Dhaka city which is increasing day by day. On the other hand, the numbers of plants of this city are decreasing quickly. However, before building awareness of the respondents for roof top garden it is necessary to gain clear-cut idea about the present status of women in roof top gardening activities. On the above circumstances the researcher has undertaken the present study entitled

“Role of Women in Rooftop Garden Management: A Case Study of Mohammadpur thana in Dhaka City”.

In view of the importance of roof top gardening in diversity measurement the investigators of this survey were highly interested to find out the role of women and problems of roof top gardening in Dhaka city entitled “Role of Women in Rooftop Garden Management: A Case Study of Mohammadpur thana in Dhaka City”.

This study attempted to focus on the following:

1. To assess the role of women in rooftop garden management in Dhaka city;
2. To assess some selected characteristics of the women who participate in rooftop garden management in Dhaka city; and
3. To explore the relation between the role of women in rooftop garden management in Dhaka city and the selected characteristics of garden owners.

CHAPTER II

REVIEW OF LITERATURE

The present study is concerned with the role of women in rooftop garden management in a selected area. This chapter deals with the review of past studies and findings related to the present study. The researcher, therefore, made full effort to review the previous research works directly or indirectly related to the present study by different researchers in rooftop and other. Literatures reviewed are presented below in six sections. In the first section concept of rooftop garden management, in the second section purpose of rooftop garden management, in the third section problems faced in rooftop garden management, in the fourth section attitude towards use of various technologies, in the fifth section adoption of rooftop garden management and in the sixth section conceptual framework of the study.

2.1 Concepts of roof top and rooftop garden management

Role of roof top garden systems in biodiversity conservation and urban household consumption in a private land of garden area is biologically and socially more worthy for either through vegetable trees, fruit trees cultivation. A common hypothesis is strongly implied to the roof top garden systems that integration of variety of tree species with herbaceous crops enlarge the biodiversity and the overall productivity consumed by households and supply products to relatives and neighbor. On this aspect there have been few trials. However, literature reveals sufficient vacuum as regards to systematic studies on the role of roof top garden in biodiversity conservation and consumption of roof top garden products in Dhaka by the people of urban.

BBS (2017) stated that average family size is 4.06 in our country.

Hossain (2009) stated that the vegetated space may be below, at or above grade; located on a podium deck, a 'sky garden' on an intermediate floor level, or at the very top level of the building; but overall, the plants are not planted in the ground.

A roof garden is generally utilized for recreation, entertaining, and as an additional outdoor living space for the building's resident(s). It may comprise planters, plants, dining and lounging furniture, outdoor structures such as pergolas and sheds, and automated irrigation and lighting systems. A green roof is usually established to cover a large area in the most economical and efficient means possible with an emphasis on improving the insulation and /or improve the overall energy efficiency within a building. In case of lack of green-open spaces, green roof concept can be most successful in urban areas.

Millat-e-Mustafa (1997) stated that about a hundred years ago the standard construction practices of roof greening in many countries have started. Until the mid-20th century, green roofs have been a feature of the vernacular architecture notably of Scandinavia and Kurdistan region. Traditional Scandinavian turf roof (combination of mud and grass on flat roof) maintained to lessen heat loss during the long, dark winters. Scandinavian immigrants to the United States and Canada took the idea with them, and grass roofs were used on settler cabins. Traditional Kurdish turf roofs distribute to keep heat in winter and keep out the burning sun in summer.

Hossain (2014) revealed that the roof top garden of Dhaka city shows high plant species diversity where Shannon-Weaver diversity index were 3.84.

In 2004, a brown field roof garden was constructed on the Botanical Roof Gardens of Augustenborg in Malmö, Sweden. The base of the 200 square meter garden forms a 150 mm layer of chalk. The roof design contains dry meadows, shallow water and plant nursery, and spontaneous colonization of plants is encouraged. The purpose is to get the combination of pioneer species, extreme strategists and threatened cultural plants that would flourish in brown field's conditions. The purpose of the experimental garden is to gain practical experience of brown field construction. On this roof top garden research on the dynamics of brown fields is conducted. As the two landscapes share similar conditions, roof conditions are excellent for brown field land construction containing harsh climatic conditions, wind exposure and rapidly fluctuating temperatures, as well as limited amounts of

biomass. Roof garden design can benefit from the brown field design concept, from this paper it shows that. Benefits of roof garden includes low maintenance and costs, beauty and species richness, brown field roofs can be valuable contributions to the urban environment.

Wood and Linne (1997) have suggested a research to increase the diversity available to owners and to enhance roof garden capacity to maintain this dynamically in any kinds of empty space.

Roof gardens are dynamic systems and are highly acknowledged for retaining higher diversity that represents microenvironments within larger farming system, many studies on roof garden in other parts of world have discussed this (Agelet *et al.*, (2000), Nair (2001), Clerck De and Negreros (2000), Gessler *et al.*, (1998), Hoggerbrugge and Fresco (1993), Padoch and De Jong (1991), Okafor and Fernandes (1987).

Krupka (1992) wrote a book that is “Roof Gardening: use of plants and vegetation on buildings”. There are 20 chapters consisting the history and importance of growing plants on buildings from the architectural and town planning aspects, in last decade development in technique of roof gardening, the ecological value of growing plants on buildings, habitat restriction of vegetation on buildings, planning factors, prevention of loss to buildings, preparation and protection of habitat and various forms of greening. The choice of plants for intensive and extensive greening of roofs, walls and noise reduction screens explained in chapter 10 to 15. The qualitative requirement of seeds, plants and vegetation and planting and vegetation stands in relation to decline criteria explained in chapter 16 to 17. In last 3 chapters forms of damage, care and maintenance and performance of roof and vegetation are explained. English translation shall be made so that the information will be made more accessible to a wider readership.

Islam (2001) reported that urban agriculture in the cities of developing countries is growing rapidly that means the number of low –income consumers is enhancing. Food securities in this city is enhancing. By enhancing the supply of food and the quality of perishable food reaching urban consumers, urban agriculture provides

food security. This study helps to identify the potential for and barriers to urban agriculture with reference to roof top gardening and to explore strategies to enhance food security in Dhaka.

Kamron (2006) reported that the selected characteristics of the respondents, family size, roof gardening experience, use of information sources, attitude towards roof gardening and knowledge of roof gardening had positive significance of relationship with their adoption of roof gardening. Other characteristics namely: age, family education and family income did not show any significant relationship with the respondent's adoption of roof gardening.

Orsini *et al.* (2014) and Gorgolewski *et al.* (2011) stated that increasing literature on rooftop gardens means to the importance of these spaces in the context of urban consumption. Urban gardens on rooftops means plots on public land assigned to individuals or families, community gardens in abandoned and/or vacant spaces and individual or common gardens in either yard, balconies and the rooftops of buildings.

Matsuo and Relf (1995), Orsini *et al.* (2013) stated that A range of studies has addressed the act played by urban vegetable gardens in enhancing human well-being through the provision of both ecosystem services and food supply to the city dwellers.

Wackernagel & Rees (1996) stated that by the reduction of pollution and noise, the absorption of CO_2 emissions and the control of the Urban Heat Island (UHI) effect by shading rooftop gardens may decrease a city's Ecological Footprint (EF).

Khandaker (2001) stated that rooftop gardening can also contribute to the biodiversity in the urban environment and achieve more reasonable conditions.

Matsuo and Relf (1995), Orsini *et al.* (2014) stated that day by day the rate of urbanization is increasing and that food production sites should be increasingly located near main consumption centers.

Wackernagel & Rees (1996) stated that the concept of ecological citizenship uses the metaphor of 'ecological footprint' where people are liable for pulling up a certain amount of ecological 'space' expressed as a personal footprint left on the Earth.

Franklin (2011) said that in the increasing of food, rooftop gardens for urban consumption are also sites for collaboration between artists and community.

Franklin (2011), Gorgolewski *et al.* (2011) stated that in some cases, the creative structural elements of the garden are outlined and built by local artists using recycled and reclaimed materials. The sharing of knowledge on how to grow food is seen to have an educational and community impact as a result of spaces that bring people together and train them about production systems.

Gehl (1987) stated that Rooftop gardens in institutional and office buildings are seen to design places where people engage in different ways in various activities enhancing placemaking.

Foss *et al.* (2011) said that to develop community engagement people from different socio-economic backgrounds work together in a social networking space growing food.

Lee *et al.* (2015) stated that the University of Melbourne, Australia found that viewing a roof with green grass for forty seconds could enrich mental concentration.

Lynch (1960) said that Urban design theories focus that imageability of a city is firstly cognitive and is based on peoples' perception, reasoning and rational thinking.

Bentley *et al.* (1985) stated that People's choices for seven different qualitative aspects of built environments could affect by responsive design of physical environments.

Hui (2011) stated that rooftop farming create economic sustainability; increase in local food production and sale, increase in food security, roof durability improvement, reduction in building cooling load and energy costs etc.

Environmental sustainability can be attained through reduction in carbon emission food transportation, reduction of wastes by generating less packaging, recycling of organic wastes by composting, mitigation of urban heat island, increase in biodiversity, improvement of air quality etc.

For the surrounding communities, staff members, clients and visitors to these buildings and environments these rooftop gardens are crucially essential.

2.2 Purpose of rooftop gardening

Islam (2004) stated that urban agriculture provides food security by enhancing the supply of food and by increasing the quality of perishable foods reaching urban consumers.

Kamal *et al.* (2013) searched an article ‘Present Status of Rooftop Gardening in Sylhet City Corporation of Bangladesh: An Assessment Based on Ecological and Economic Perspectives’ that every gardener was keened in rising of rooftop garden because they think that home gardens could assist them to income and secure money (29.8%), 54.9% respondents were interested in environmental amelioration, 95.3% in mental satisfaction, 82.5% in aesthetic value and 87.8% in leisure time activity.

Towle (1996) was found in approval of mental satisfaction (10%), aesthetic value (12.5%) and leisure time activity (5%) in the role of ecological restoration in biodiversity conservation: basic issues and guidelines.

Matsuo and Relf (1995) revealed that working with plants and in the outdoors, prosperity are the mental health, mental outlook, and personal wellness of individuals in having roof top gardening.

Hynes (1996); Patel (1996); Hanna (1999); Saldivar-Tanaka (2002) were found that gardeners consider rooftop gardening for sharing food with friends, families, neighbors, and/or needy members of their community in need. Various researchers in the world supported this.

2.3 Problems faced in rooftop garden management

Morshed (2015) stated that Dhaka city has 14% of open space whereas 25% of open spaces are needed for fresh air and habitable living. It was also reported that water bodies covered 13% of Dhaka city. Green spaces of Dhaka city were found in preserved natural vegetation or in parks or gardens. In another sense, urban green means in Dhaka city referred to all urban and peri-urban greenery. In Dhaka metropolitan area vegetation was only 1.87%.

Rahman (2014) stated that the majority (45%) of the respondent faced medium problem while 40% and 15% faced low problem and high problem in roof top gardening respectively. He also found that level of education, knowledge on roof top gardening, use of information sources, attitude towards roof top gardening, and training had significant negative relationship with their problems faced in roof top gardening whereas age, family size, family annual income and roof top space had no significant relationship with their problems of roof top gardening.

Sajjaduzzaman *et al.* (2004) found that approximated number of housing plots in DCC was about 186,000 out of which 80% plots (i.e., about 148,800 plots) are already used for housing. From these more than 85% are residential buildings and 15% are institutional buildings. The residential buildings are mainly in private possession and few residential buildings are government official staff quarters. From 500 households, about 12% of the houses are bestowed with gardens either in roofs or in balconies; majority found in expensive residential areas (e.g in .Gulshan area 25% houses with garden). Greater portion of the roof gardener belongs to middle class category having their own houses (75%). Lower class is less interested in RTG practitioners highly prefer to use the seedlings (65%) for roof top gardening followed by propagated materials (25%) and direct seed sowing (10%). Major purpose of roof top gardening is passing leisure time (100%), creating aesthetic values (100%), giving in environmental melioration (45%) and financial gain being a very minor cover (4% only).

2.4 Attitude towards use of various technologies

Mithon (2016) said that majority of the respondents (62.1%) had a moderately favorable attitude towards rooftop gardening while 22.0% and 15.9% had poorly and highly favorable attitude towards rooftop gardening at Dhaka city respectively.

Tarannum (2013) conducted a study and found that majority of the respondents (50.08%) had favorable attitude while 41.7% had neutral attitude and only 7.5% had unfavorable attitude regarding improved agricultural implements in Jamalpur District.

Noor (2010) revealed that almost half (48.57%) of the respondents had moderately favorable attitude while 43.81% had highly favorable attitude and only 7.62% had low favorable attitude towards “one house bone farm” program.

Zahan (2008) said that 38.1% of the women had more positive attitude whereas 36.2% and 25.7% had most positive attitude and positive attitude towards livestock rearing respectively.

Bhuiyan (2008a) stated that majority (64%) of the respondents had moderate level attitude while 20% and 16% had lowest level attitude and higher-level attitude towards farmers information need assessment respectively.

Bhuiyan (2008b) said that majority (62%) of the respondents had slightly favorable attitude while 23% and 15% had slightly unfavorable attitude and moderately favorable attitude towards organic cultivation of rice respectively.

Islam (2007) conducted in a study that majority (39%) of the respondents had highly favorable attitude while 37% and 24% had favorable attitude and less favorable attitude towards modern jute cultivation respectively.

Shehrawat *et al.* (2002) said that the cropping pattern was cereal based managed by rice and wheat crops and less than half of the farmers had favorable attitude concerning diversification in farming system.

Sadat (2002) revealed that majority (72%) of the Proshika beneficiaries showed highly favorable attitude towards Proshika where 20% showed moderately

favorable attitude and only a few showed unfavorable attitude towards Proshika. For non-beneficiaries, majority of the respondents (32%) showed a moderately favorable attitude while 21.33 showed highly favorable, 6.67% showed neutral, 26.67% showed moderately favorable and 13.33% were detected extremely unfavorable attitude towards Proshika.

Sarker (2002) revealed that majority (62%) of the rice growers had moderately unfavorable attitude whereas 27% and 11% had favorable attitude and highly favorable attitude to the use of DAP in rice field.

Ahmed (2002) said that majority (74%) of the farmers had slightly favorable attitude towards BRRI dhan 29 whereas 10% respondents had favorable and 16% had highly favorable attitude towards the variety.

Mannan (2001) revealed that most of the Proshika farmers (57.3 percent) had moderately favorable attitude towards the EAP whereas 12.7 percent had slightly and 30 percent had highly favorable attitude towards EAP.

2.5 Adoption of roof gardening

Nira (2016) revealed that about 62% of the respondents shows no adoption whereas 15% had low and 23% had medium adoption of roof gardening at Mirpur-10 areas under Dhaka city.

2.6 The Conceptual Framework of the study

In scientific research, selection and measurement of variables make up an important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. a dependent variable and an independent variable. A dependent variable is that factor which appears, disappears or varies as the research establishes, removes or varies the independent variable (Townsend, 1953). An independent variable is that factor which is manipulated by the researcher in her effort to ascertain its relationship to an observed phenomenon. In view of prime findings of review of literature, the researcher constructed a self-explanatory conceptual model of the study which is presented in Figure 1.

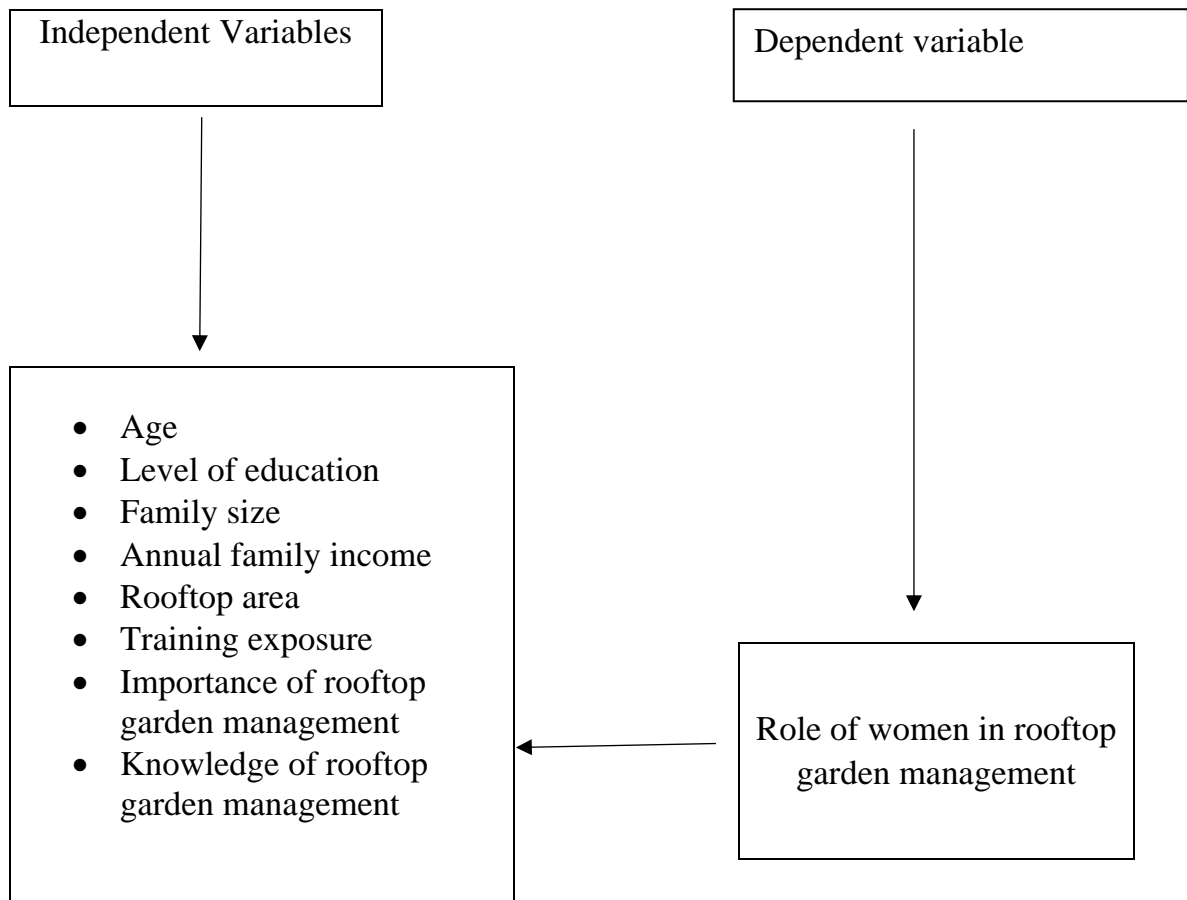


Figure 1. A Conceptual Framework for the study

CHAPTER III

METHODOLOGY

The method and procedure used in the study are presented in this chapter. The principal method used in this study was field survey using structured interview schedule. In any scientific research methodology plays an important role. To perform a research work systematically, careful consideration of appropriate methodology is a must. It should be such that it would enable the researcher to collect valid and reliable information to arrive at correct decisions. The methods and procedures followed in conducting this study have been described in this Chapter in the following sections.

3.1 Description of Study Area

3.1.1 Location of the study

The locale of the study was Mohammadpur thana of Dhaka District. Mohammadpur thana is at 23.7542°N 90.3625°E. It has 57,551 units of households and area 11.65 km². This area was selected as the locales of the city of Dhaka. Purposive sampling of the study area was done as because it is closed to researchers living area. A map of Dhaka district showing Mohammadpur thana has been presented in figure 2.

3.1.2 Demography of roof top gardening in Dhaka city

Roof top gardening becomes growingly popular in the Dhaka city as the land for gardening shrinks every day with construction of more and more new buildings. City's gardeners and agriculturists, however, cite yet another reason why more house owners getting keen on having a patch of greenery on their roofs, which is, they want vegetables and fruits fresh and free from poisonous chemicals. The Department of Agricultural Extension reported that around 6,000 roof top gardens are in the Dhaka city. The DAE has divided the Dhaka north city in three areas supervised by its three offices called Metropolitan Tejgaon, Metropolitan Gulshan and Metropolitan Mohammadpur.



Figure 2. A map of Dhaka city showing the study area -Mohammadpur

It has found 3082 roof top gardens in the neighborhoods overseen by its Gulshan office, 2000 have been spotted in areas under its Tejgaon office and 600 in the Mohammadpur neighborhoods. Vegetables, fruits and flowers on their roofs grown in these gardens include tomato, bottle gourd, ash gourd, beans, pumpkin, mango,

sweet tamarind, litchi, banana, lemon, orange, guava, olive, strawberry, varieties of seasonal flowers, cacti and orchids.

3.1.3 Population and Sampling Procedure

The survey was conducted within 1 metropolitan area of Dhaka north city. There are five metropolitan areas in Dhaka city. The metropolitan areas are Uttora, Kamrangichor, Mirpur, Mohammadpur and Gulshan. Out of 5 metropolitan area of Dhaka one (1) metropolitan area as Mohammadpur was selected purposively as the locale of the study. The sub area of Mohammadpur metro area Mohammadpur housing society, Mohammadpur housing limited and Shekhertek area were selected. Sample size of the study was 80 rooftop buildings. Responses to open questions were collected on a variety of demographic and socioeconomic indicators: roof garden species, rooftop area, role of women, knowledge on rooftop gardening, importance and so forth. The respondents were free to express their views on each topic. Finalization of the questionnaire was made after pre-testing in adjacent roof gardener of the research site. Direct observation of roof garden was also carried out simultaneously. For quality control, the surveyed questionnaires were passed through edition, revision in different tiers first by enumerator herself, then peer review and editing among enumerators and final editing by the researcher on the same date.

Table 3.1: Distribution of population and sample size in selected Metropolitan areas

Metropolitan areas	Sub areas under metro	No. of total roof gardeners	No. of roof gardeners finally selected for data collection
Mohammadpur	Mohammadpur housing society	140	50
	Mohammadpur housing limited	100	20
	Shekhertek	40	10
	Total	280	80

3.2 Data collection

Reconnaissance survey was carried out before conducting the detailed data collection. After getting the general information about the study area, primary data were collected by using following methods:

3.2.1 Direct observation of roof top garden with garden owners

80 roof top gardens were visited with the help of Sub Assistant Agricultural Officer of metropolitan area and garden owners for obtaining the accurate information about the garden plants.

3.2.2 Questionnaire survey with schedule

The pertinent information on the subject was collected from various primary sources. The questionnaires were pre-tested in some roof garden during the preliminary survey and were finalized by incorporating the feedbacks from garden owners. The pertinent information on the subject was collected from various primary sources. The feasibility of Rooftop Gardening was explored through a questionnaire survey of selected public and commercial buildings. The detail of the questionnaire is given in Appendix-1. After modifying questionnaire, out of 280 garden owners, 80 garden owners (28 percent) were selected as a sample, which represent male female respondents. Head of family and elderly individuals were interviewed. Moreover, a focus group discussion was also organized where stakeholders were invited to discuss the prospects and problems of rooftop gardening in the city. Data were collected by face-to-face interviewing of the respondents during period from December 01, 2020 to December 30, 2020.

3.3 Measurement of Independent Variables

In this study selected personal, economic, social and psychological characteristics of the garden owners were considered as independent variables. These characteristics are as follows:

3.3.1 Age:

Age of a respondent was measured in terms of years from birth to the time of interview which will found on the basis of response. It was located in the Q no. 1 of interview schedule.

3.3.2 Education:

Education was measured in terms of one's year of schooling. One score was for passing each level in an educational institution. For example, if a respondent passed the SSC examination, educational score will be given as 10. If a respondent did not know how to read and write, his educational score will be given as '0'. It was located in the Q no. 2 of interview schedule.

3.3.3 Family size:

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent members like husband/wife, children, etc. who live and eat together. It was located in the Q no.3 of interview schedule.

3.3.4 Family annual income:

Family annual income of the respondents was measured in terms of lack taka. Income from all sources by all the earning family members were added together to obtain family annual income. It was located in the Q no. 4 of interview schedule.

3.3.5 Total area of roof garden:

The surface area of roof (sq. ft.) garden refers to the total area of roof on which her family carried out roof garden operation, the area being in terms of full benefit to the family. It was located in the Q no. 5 of interview schedule.

3.3.6 Duration for gardening (year):

Spending time for gardening (years) of a respondent was measured in terms of 1 yr, 2 yr and above 2 yr options of interview which was found on the basis of response. It was located in the Q no. 6 of interview schedule.

3.3.6 Training for gardening (days):

Training received was measured by the total number of days a respondent received training in her entire life under different roof garden technologies. It was indicated by the total number of days of receiving training on different technologies of roof gardening. It was located in the Q no. 8 of interview schedule.

3.3.7 No. of plant species type found in the Rooftop Garden:

Plant species was counted in numbers and grouped them into herb, shrub and tree.

3.3.8 Importance of Rooftop Garden:

Importance of rooftop garden conservation in the study area was evaluated by three categories which were not important, less important and very important according to the selected women's response.

3.3.9 Knowledge on rooftop gardening:

Rooftop gardening knowledge of a respondent was measured by asking her 9 questions related to different components of rooftop gardening e.g. What is optimum time for planting tomato? Name two major insects of okra? Name two organic fertilizers used in vegetables cultivation? It was measured assigning weightage two (2) for each question. So, the total assigned scores for all the questions became eighteen. 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 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 eighteen (18), where zero indicates very poor knowledge and eighteen indicates highest knowledge. This variable appears in item number eleven (11) in the interview schedule as presented in Appendix-I. Based on the information cited by respondents, they were classified into three categories namely low, medium, high knowledge on rooftop gardening.

3.3.11 Measurement of Problem Faced Index (PFI) in practicing RTG

Women of the study area might have faced various types of problems in participating roof top garden management activities. But the investigator gained an experience through personal contact regarding common problems faced by the respondents at the time of data collection. Besides, the researcher gained knowledge through consultation with experts, pre-testing experience and reviewing previous research findings. Finally, a list of ten possible problems in this regard have been prepared by the researcher. A scale was prepared to indicate the extent to which each of the ten problems was applicable in the case of a respondent. The respondents were asked to indicate the degree of severity of the problems in a 5-point scale as 'very high problem', 'high problem', 'moderate problem', 'little problem', and 'no problem at all'. Weights were assigned to those responses as '4', '3', '2', '1' and '0' respectively. It was located in the Q no. 12 of interview schedule.

The Problem Faced Index (PFI) for each problem was computed by using the following formula:

$$\mathbf{PFI = (P_{vh} \times 4) + (P_h \times 3) + (P_m \times 2) + (P_l \times 1) + (P_n \times 0)}$$

Where,

P_{vh} =Percentage of women who faced very high problem

P_h = Percentage of women who faced high problem

P_m =Percentage of women who faced moderate problem

P_l =Percentage of women who faced little problem

P_n =Percentage of women who faced no problem at all.

To determine comparative importance of those ten problems, PFI was computed for each of the ten problems by summing up the scores of all the respondents.

3.4. Measurement of dependent variable

3.4.1 Role of women in Rooftop Garden Management

Role of rooftop garden management in the study area was evaluated by three categories which are low, medium and high according to the selected women's response. 15 different activities were observed done by women in rooftop garden management. 1 score was given for every 1 activity.

3.5 Statement of Hypothesis

As defined by Goode and Hatt (1952), "A hypothesis, which can be put to a test to examine its validity. It may see contrary to, or in accord with common sense. It may be proved to be correct or incorrect. In any event, however, it leads to an empirical test". In studying the relationship between variables, research hypothesis is formulated which state the anticipated relationship between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between the variables. On the basis of a statistical test, if a null hypothesis is rejected, it is assumed that there is a relationship between the concerned variables. For this study the null hypothesis can be assumed as – "there was no relationship between the role of women in rooftop garden management and the selected characteristics of garden owners". The 10 selected characteristics were: age, education, family size, annual family income, area of roof garden, duration for gardening (year), training for gardening (days), no. of plant species, role of women for gardening and problem faced by the garden owners.

3.6 Compilation of Data

After completion of field survey all the data of the interview schedule were compiled. Local units were converted into standard unit. Appropriate coding and scoring technique were followed to convert the qualitative data into quantitative forms. The responses of the individual garden owner contained in the interview schedules were transferred to a master sheet for entering the data in the computer.

As soon as the data entered into the computer, it was then analyzed in accordance with the objectives of the study.

3.7 Data Analysis

The data were coded, categorized and fed in computer and analyzed using computer software packages MS Excel and SPSS (Statistical Package for Social Science) 20 versions. Quantitative data were analyzed by simple statistical tools such as frequency, mean, percentage and standard deviation and qualitative data were analyzed by ordering, ranking with descriptive manner. The impacts of various socio-economic factors such as education status, family size, annual income, area of roof garden, duration for gardening (year), training for gardening (days), problem faced by the garden owners, knowledge of rooftop gardening and the role of women in Rooftop Garden management with comparison of percent of plants present in roof garden and diversification present in roof top garden were analyzed by using SPSS. The results are presented through text, Tables and Figures with interpretation accordingly. Pearson's Product Moment Co-efficient Correlation (r) has been used to test the null hypotheses concerning the relationship between the variables. At least 0.05 level of probability with an accompanying 95 percent confidence level was used as the basis for rejection of a null hypotheses.



Plate 1. Photograph showing Data collection.

CHAPTER IV

RESULTS AND DISCUSSION

The recorded observations in accordance with the objective of the study were presented and probable discussion was made of the findings with probable justifiable and relevant interpretation under this chapter. The findings of the study and their interpretation have been presented in this chapter.

4.1 Characteristics of the respondents

There were various characteristics of the respondents that might have consequence to rooftop gardening. In this study, ten characteristics of them were selected as independent variables, which included their age, level of education, family size, annual family income, house ownership, effective rooftop area, duration of rooftop gardening, training exposure, rooftop gardening management practice and knowledge on rooftop gardening that might be greatly influenced the role of women in rooftop gardening and problem faced index are presented below:

4.1.1 Age

The age of the respondents has been varied from 18 to 60 years with a mean and standard deviation of 36.99 and 9.57 respectively.

Table 4.1 Distribution of the respondents according to their age

Category	Range (years)		Respondents		Mean	SD
	Year	Observed	Number	Percent		
Young aged	≤ 35	18-60	31	38.75	36.99	9.574
Middle aged	36-50		40	50		
Old aged	> 50		9	11.25		
Total			80	100		

Considering the recorded age, the respondents were classified into three categories namely young, middle and old age. From Table 4.1 it was revealed that the middle-aged respondents comprised the highest proportion (50 percent) followed by young aged category (38.8 percent). Nira (2006) and Rahman (2014) also found the similar findings in their studies related to rooftop gardening in Dhaka city.

4.1.2 Level of education

The level of educational scores of the respondents ranged from 1 to 17 with a mean and standard deviation of 9.28 and 4.006 respectively. Based on the educational scores, the respondents were classified into five categories. Table 4.2 shows that respondents under above secondary education category constitute the highest proportion (37.5 %) followed by secondary education (35 %) category. On the other hand, the lowest 27.5% in primary education category. Education broadens the horizon of outlook of respondents and expands their capability to analyze any situation related to adopt the rooftop gardening. Most of the respondents (37.5 %) had higher education because most of them live in Dhaka city, comparatively get more opportunity to receive education facilities. Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

Table 4.2 Distribution of the respondents according to their level of education

Category	Range (years)		Respondents		Mean	SD
	Score	Observed	Number	Percent		
Can't read and sign	0	1-17	0	0	9.28	4.006
Can sign only	0.5		0	0		
Primary education	1-5		22	27.5		
Secondary education	6-10		28	35		
Above secondary	>10		30	37.5		
Total			80	100		

4.1.3 Family size

Family size of the respondents ranged from 2 to 7 with the mean and standard deviation of 5.06 and 1.27 respectively. According to family size the respondents were classified into three categories namely ‘small’, ‘medium’ and ‘large’ family.

Table 4.3 Distribution of the respondents according to their family size

Category	Range (No.)		Respondents		Mean	SD
	Score	Observed	Number	Percent		
Small family	Up to 3	2-7	11	13.75	5.06	1.276
Medium family	4-5		39	48.75		
Large family	> 5		30	37.5		
Total			80	100		

Results in Table 4.3 indicate that the medium size family constitute the highest proportion (48.75 percent) followed by the large size family (37.5 percent). Only 13.75 percent respondents had small family size. Such finding is quite normal as per the situation of Bangladesh. The average family size of the study area was more than the national average which is 4.06 (BBS, 2017). Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

4.1.4 Annual family income

The score of annual income of the rooftop gardeners ranged from 12 to 60 lac (BDT) with a mean and standard deviation of 27.52 and 8.7 respectively. On the basis of annual income, the rooftop gardeners were classified into three categories namely ‘low’, ‘medium’ and ‘high’ annual family income. Data reveals that the rooftop gardeners having medium annual family income constitute the highest proportion (40 percent), while the lowest proportion in low family income (26.25

percent). The high family income category constituted with 33.75 percent respondents.

Table 4.4 Distribution of the respondents according to their annual family income

Category	Range ('lac' BDT)		Respondents		Mean (lac)	SD
	Score	Observed	Number	Percent		
Low income	≤ 21	12-60	21	26.25	27.52	8.709
Medium income	22-29		32	40		
High income	> 29		27	33.75		
Total			80	100		

Most of the respondents had large business farm along with the house rent constituted the above scenario which reflected the handsome annual family income. Their average annual family income was higher than national average annual family income because they had more than one income sources namely business, income from house rent etc. Nira (2006), Rahman (2014) and Mithon (2016) also found the similar findings in their studies related to rooftop gardening in Dhaka city.

4.1.5 Rooftop area

Rooftop area of the respondents ranged from 1200 to 4200 square feet. The average and standard deviation were 29.11 and 7.35 respectively. Based on rooftop area, the respondents were categorized into three classes namely low, medium and high rooftop area. The observed data shows that most of the respondents (40 percent) had medium rooftop area while 25 and 35 percent of them had low and high rooftop area respectively (Table 4.5). Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

Table 4.5 Distribution of the respondents according to their rooftop area

Category	Range ('00' sq. ft.)		Respondents		Mean ('00' sq.ft.)	SD
	Score	Observed	Number	Percent		
Low area	≤ 24	12-42	20	25	29.11	7.354
Medium area	25-32		32	40		
High area	> 32		28	35		
Total			80	100		

4.1.6 House ownership

Based on the house ownership among the respondent's house owner tenant and govt. quarters was the criteria to look for. 65 percent of the respondents were tenant as the ownership of the rooftop garden. Whereas, 35 percent were the house owner and use their own rooftop space for gardening.

Table 4.6 Distribution of the respondents according to their house ownership

Category	Range		Respondents		Mean	SD
	Score	Observed	Number	Percent		
House owner	1	1-2	28	35	1.65	0.480
Tenant	2		52	65		
Govt. quarters	3		0	0		
Total			80	100		

4.1.7 Duration of rooftop gardening

The duration of rooftop gardening of the respondents has been varied from 1 to 15 years with a mean and standard deviation of 3.88 years and 2.98 respectively. Considering the recorded duration of rooftop gardening, the respondents were classified into three categories namely short, medium and long duration. From Table 4.7 it is revealed that the short-duration respondents comprised the highest proportion (56.25 percent) followed by long duration category (25 percent). Nira (2006) also found the similar findings in her studies related to rooftop gardening in Dhaka city.

Table 4.7 Distribution of the respondents according to their duration of Rooftop gardening

Category	Range (No.)		Respondents		Mean (years)	SD
	Years	Observed	Number	Percent		
Short duration	Up to 3	1-15	45	56.25	3.88	2.983
Medium duration	4-5		15	18.75		
Long duration	> 5		20	25		
Total			80	100		

4.1.8 Training exposure

Training exposure score of the rooftop gardeners ranged from 0 to 7 with a mean and standard deviation of 3.29 and 2.18 respectively. Based on the training exposure score, the rooftop gardeners were classified into four categories namely ‘no training’, ‘low’, ‘medium’ and ‘high’ training exposure. The distribution of the rooftop gardeners according to their training exposure is presented in Table 4.8. Table 4.8 indicates that the highest proportion (46.25 percent) of the rooftop

gardeners had medium training exposure compared to 18.75 percent in short training exposure and 6.25 percent in no training exposure category, respectively. 18.75 percent of the respondents had high training exposure category. Training makes the rooftop gardeners skilled and helped them to acquire deep knowledge about the respected aspects. Trained rooftop gardeners could face any kind of challenges about the adverse situation in their cultivation. Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

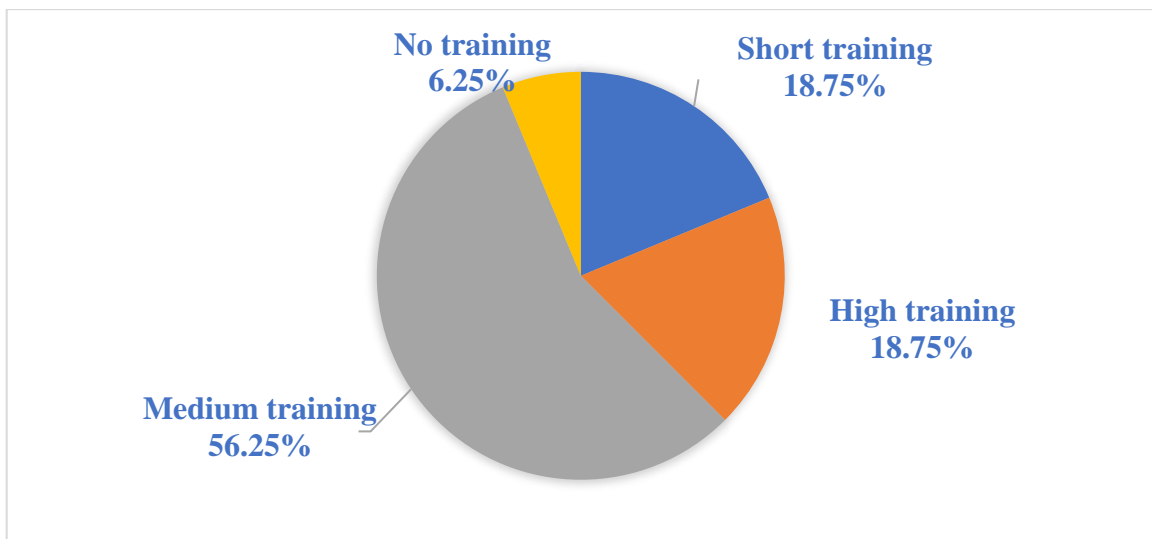


Figure 3: Distribution of women based on their training

Table 4.8 Distribution of the respondents according to their training exposure

Category	Range (No.)		Respondents		Mean	SD
	Score	Observed	Number	Percent		
No training	0	0-7	5	6.25	3.29	2.189
Short training	1		15	18.75		
Medium training	2-5		45	56.25		
High training	5+		15	18.75		
Total			80	100		

4.1.9 Number of plant species type found in the rooftop garden

Different types of plants were present in the roof top garden. Gardeners were chosen many indigenous and foreign species for gardening which were showing in Table 4.9 The result revealed that 45.09 percent garden owners have the herbs type plants, 33.82% have shrub type of plants while 21.08 percent rooftop garden owners have the tree type of plants (920 plants in total) from the area under the following study.

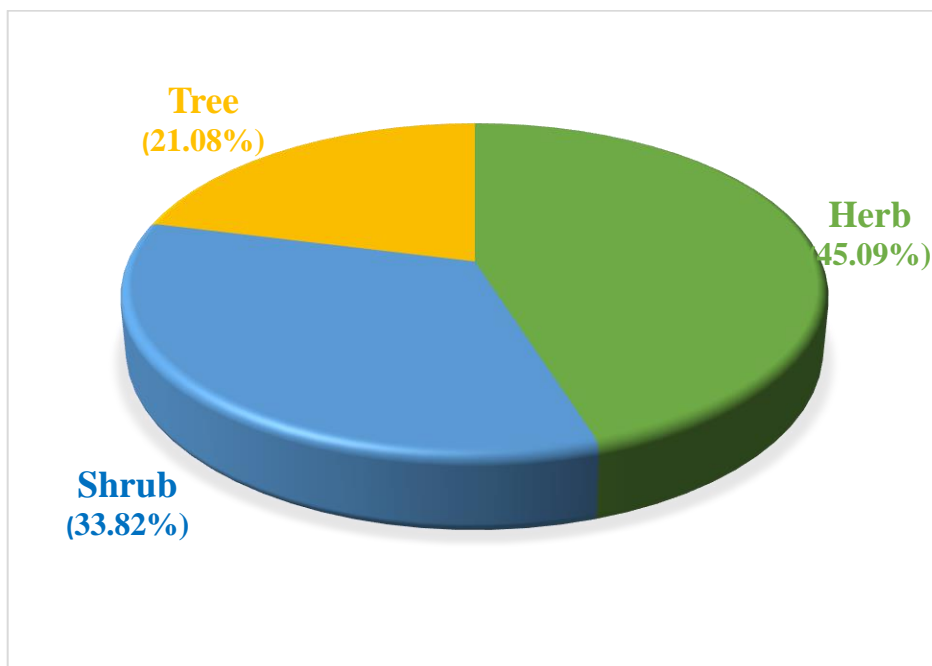


Figure 4: Percentage of herb, Shrub and tree in the study area

Table 4.9 Number of plant species planted by women in rooftop garden

Category	Number of plant	Percent
Herb	1968	45.09
Shrub	1476	33.82
Tree	920	21.08
Total	4364	

4.1.10 Importance of Rooftop Garden

Urban agriculture (UA) specifically rooftop gardening contributes to introduction of wholesome surroundings and meals security. It will increase grant of clean meals and by means of bettering the fantastic of perishable meals attaining city consumers. Bangladesh is blessed with many horticultural crops. More than ninety vegetables, 60 fruits and 25 spices are being grown in the country. But, now not all sorts of fruits can be produced on the rooftop. So, species resolution for roof gardening is a vital challenge for each gardener. Different fruits and greens had been determined to be grown by using the respondents. The inexperienced flowers and flowers in the residence have an effect on the feeling of harmony, simplicity and authenticity. Two most important divisions of garden types exist: extensive and intensive. Extensive gardens require minimal upkeep and behave as another form of roofing material. They are no longer intended for heavy foot site visitors nor do they want to meet any extra safety standards. The different extreme consists of intensive gardens created with the intent of lively human use. These gardens require landscaping and ordinary upkeep. In some cases, the roof shape should be bolstered via the addition of decking or extra bracing to accommodate the combined weight of soil, plants, and precipitation. Furthermore, intensive gardens may additionally need to comply with protection rules related to decks and public areas on raised structures. From the data it is visible that the production of food and fruits were the most important aspect of the rooftop gardening from the area under study followed by the medicinal and ornamental plant growing. (Table 4.10)

Table 4.10 Distribution according to importance of rooftop gardening

SL No.	Items	Extent of importance			Score	Rank order
		Very important	Less important	Not important		
01	Food and fruit	56	17	7	129	1 st
02	Medicinal plants	52	18	10	122	2 nd
03	Increase self-reliance	47	21	12	115	3 rd
04	Progress farming	46	16	18	108	4 th
05	Subsistence family income	42	19	19	103	5 th
06	Ecological balance	36	28	16	100	6 th
07	Reduce pressure on forest	25	31	24	81	7 th

4.1.11 Role of Women in Rooftop Garden Management

The observed score regarding role of women in rooftop garden management activities categorized as low, medium and high. The average role performance of women in rooftop garden was 11.09 with standard deviation 3.175. The distribution of the respondents according to their role performance in rooftop management activities has been shown in Table 4.11. Data presented in Table 4.11 shows that the highest proportion of rural women (43.75%) were found to perform medium

role in rooftop gardening activities, 40% had high and 16.25% of them performed low role in rooftop garden management activities. This means majority of the women performed medium to high role in rooftop garden management activities.

Table 4.11 Role of women in rooftop garden management

Category	Range (No.)		Respondents		Mean	SD
	Score	Observed	Number	Percent		
Low	Up to 7	5-15	13	16.25	11.09	3.175
Medium	8-12		35	43.75		
High	> 12		32	40		
Total						

4.1.12 Knowledge on rooftop gardening

Rooftop gardening knowledge scores of the respondents ranged from 06 to 18 against possible score of 0 to 24. The average score and standard deviation were 11.13 and 3.9 respectively. Based on the rooftop gardening knowledge scores, the respondents were classified into three categories namely Poor knowledge, Moderate knowledge and Sound knowledge on rooftop gardening (Table 4.12). Data presented in the Table 4.12 reveals that 46.25 percent of the respondents had medium rooftop gardening knowledge, 32.5 percent had poor knowledge and 21.25 percent had high knowledge on rooftop gardening. This led to understanding that rooftop gardening knowledge would reflect more by the medium knowledge on respondents in the present study. Knowledge on rooftop gardening of the respondents is definitely affected by the education of the respondents because education helps to enhance the eagerness to be acquainted with new variety or technology. Mithon (2016) also found the similar findings in his studies related to rooftop gardening in Dhaka city.

Table 4.12 Distribution of the respondents according to their knowledge on rooftop garden management

Category	Range (No.)		Respondents		Mean	SD
	Score	Observed	Number	Percent		
Poor knowledge	Up to 8	6-18	26	32.5	11.13	3.998
Moderate knowledge	9-14		37	46.25		
Sound knowledge	> 15		17	21.25		
Total			80	100		

4.1.13 Problems Faced Index (PFI) for selected 10 problems with rank order

Rank order of the ten strategies of problem faced by the respondents is presented in the following Table 4.13. As per Problem Faced Index (PFI), Costly management system positioned the 1st and lack of knowledge on soil preparation in last position. The problems faced by house owner in rooftop gardening according to descending order through the analysis of the collected data from respondents are costly management system, Scarcity of source of water, Difficult to make roof garden for a tenant, Lack of sunshine due to side building, Insect infestation, Unavailability of proper water drainage system, Lack of training, Lack of quality seed and seedlings and Lack of knowledge on plant nutrients respectively.

Table 4.13 Problems Faced Index (PFI) with rank order (N=80)

Sl. No.	Name of problems	Extent of problems					PFI	Rank order
		Very High (4)	High (3)	Medium (2)	Low (1)	Not at all (0)		
1	Scarcity of source of water	36	18	16	10	0	240	2 nd
2	Lack of quality seed and seedlings	24	20	16	8	12	196	8 th
3	Insect infestation	25	28	14	8	5	220	5 th
4	Lack of training	24	22	14	10	10	200	7 th
5	Costly management system	48	16	10	6	0	266	1 st
6	Difficult to make roof garden for a tenant	30	20	18	6	6	222	3 rd
7	Lack of sunshine due to side building	26	20	20	10	4	214	4 th
8	Lack of knowledge on soil preparation	22	16	22	10	10	190	10 th
9	Lack of knowledge on plant nutrients	24	18	20	4	14	194	9 th
10	Unavailability of proper water drainage system	24	20	20	12	4	208	6 th

The results showed that the highest problem faced by respondents in rooftop gardening is costly management system. The lowest problems in rooftop gardening at the study area was lack of knowledge on soil preparation. Rahman (2014) found roof leakage as main problem in his studies related to rooftop gardening in Dhaka city.

4.2 Relationship between the selected characteristics and role of women in Roof top garden management

In order to estimate the influential factors on role of women towards rooftop gardening from the independent variables, Pearson's Product Moment Coefficient Correlation (r) has been used to test the null hypotheses concerning the relationship between the variables. At least 0.05 level of significance was used as the basis for rejection of a null hypotheses, which is shown in the Table 4.2.1.

Table 4.2.1 Relationship between the selected characteristics and role of women in Rooftop Garden management (N=80)

Dependent Variable	Selected Characteristics	Observed 'r' value	Tabulated 'r' value at 78 degrees of freedom	
			0.05 Level	0.01 Level
Role of women in roof top garden management	Age of the respondents	-0.130 ^{NS}	0.217	0.283
	Educational status	0.778**		
	Family size	0.370**		
	Annual income	-0.398**		
	Roof top area	-0.179 ^{NS}		
	Training exposure	0.752**		
	Importance of roof top gardening	0.591**		
	Knowledge of roof top gardening	0.709**		

Note: ^{NS} Non-significant, * Significant at the 0.05 level, ** Significant at the 0.01 level

Table 4.2.1 shows that there is a significant contribution of respondent's level of education, annual income, training exposure and knowledge on rooftop gardening on role of women in roof top garden management. Among these, level of education and use of information sources on attitude towards rooftop gardening were the most important contributing factors (significant at the 1 percent level of significance). Training exposure and knowledge on rooftop gardening on attitude towards rooftop gardening was also significant at the 1 percent level of significance while coefficients of age and rooftop area don't have any significant contribution on attitude of respondents towards rooftop gardening.

4.2.1 Age and role of women in roof top garden management

The relationship between ages of the garden owners with role of women was measured by testing the following null hypotheses: "There is no relationship between age of the garden owners and role of women in rooftop garden management". The computed value of r (-0.130) was smaller than that of the tabulated value (0.217) with 78 degrees of freedom at 0.05 level of probability. Hence, the concerned null hypothesis was accepted. The result indicated that there was no significant relationship between age of the garden owners and role of women in rooftop garden management.

4.2.2 Educational status and role of women in roof top garden management

The relationship between education of the garden owners with role of women was measured by testing the following null hypotheses: "There is no relationship between education of the garden owners and role of women in rooftop garden management". The computed value of r (0.778) was bigger than that of the tabulated value (0.217) with 78 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. The result indicated that there was significant relationship between education of the garden owners and role of women in rooftop garden management.

4.2.3 Family size and role of women in roof top gardening

The relationship between family size of the garden owners with role of women was measured by testing the following null hypotheses: “There is no relationship between family size of the garden owners and role of women in rooftop garden management”. The computed value of r (0.370) was bigger than that of the tabulated value (0.217) with 78 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. The result indicated that there was significant relationship between family size of the garden owners and role of women in rooftop garden management.

4.2.4 Rooftop area and role of women in roof top garden management

The relationship between rooftop area of the garden owners with role of women was measured by testing the following null hypotheses: “There is no relationship between rooftop area of the garden owners and role of women in rooftop garden management”. The computed value of r (-0.179) was smaller than that of the tabulated value (0.217) with 78 degrees of freedom at 0.05 level of probability. Hence, the concerned null hypothesis was accepted. The result indicated that there was no significant relationship between rooftop area of the garden owners and role of women in rooftop garden management.

4.2.5 Training exposure and role of women in roof top garden management

The relationship between training of the garden owners with role of women was measured by testing the following null hypotheses: “There is no relationship between training of the garden owners and role of women in rooftop garden management”. The computed value of r (0.752) was bigger than that of the tabulated value (0.217) with 78 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. The result indicated that there was significant relationship between training of the garden owners and role of women in rooftop garden management.

4.2.6 Importance of rooftop gardening and role of women in roof top garden management

The relationship between importance of the rooftop gardening with role of women was measured by testing the following null hypotheses: “There is no relationship between importance of the rooftop gardening and role of women in rooftop garden management”. The computed value of r (0.591) was bigger than that of the tabulated value (0.217) with 78 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. The result indicated that there was significant relationship between importance of the rooftop gardening and role of women in rooftop garden management.

4.2.7 Knowledge of rooftop gardening and role of women in roof top garden management

The relationship between knowledge of the garden owners with role of women was measured by testing the following null hypotheses: “There is no relationship between knowledge of the garden owners and role of women in rooftop garden management”. The computed value of r (0.709) was bigger than that of the tabulated value (0.217) with 78 degrees of freedom at 0.01 level of probability. Hence, the concerned null hypothesis was rejected. The result indicated that there was significant relationship between knowledge of the garden owners and role of women in rooftop garden management.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

The study was conducted in the Mohammadpur to find out the role of women in rooftop garden management at Dhaka city. Total 280 rooftop gardeners were selected from the study area. A sample of 28% rooftop gardeners were selected based on stratified random sampling procedure. However, 80 women were selected from the different families by using Yamane formula. And these 80 women constitute the sample of the study. A well-structured interview schedule was developed based on objectives of the study for collecting information. The independent variables were: age, level of education, family size, annual family income, rooftop area, gardening duration, training exposure and knowledge on rooftop gardening. The dependent variable of this study was the role of women in rooftop garden management. Data collection was started in 01 December, 2020 and completed in 30 December, 2020. Various statistical measures such as frequency counts, percentage distribution, average, and standard deviation were used in describing data. In order to estimate the contribution of the selected characteristics of role of women in rooftop garden management, correlation analysis was used. The major findings of the study are summarized below:

5.1 Summary

The age of the respondents has been varied from 18 to 60 years with a mean and standard deviation of 36.99 and 9.57 respectively. It was revealed that the middle-aged respondents comprised the highest proportion (50 percent) followed by young aged category (38.8 percent). Respondents under above secondary education category constitute the highest proportion (37.5 percent) followed by secondary education (35 percent) category. On the other hand, the lowest (27.5 percent) in primary education category. Family size of the respondents ranged from 2 to 7 with the mean and standard deviation of 5.06 and 1.27 respectively. The score of annual income of the rooftop gardeners ranged from 12 to 60 lac (BDT) with a mean and

standard deviation of 27.52 and 8.7 respectively. On the basis of annual income, the rooftop gardeners were classified into three categories namely 'low', 'medium' and 'high' annual family income. Data reveals that the rooftop gardeners having medium annual family income constitute the highest proportion (40 percent), while the lowest proportion in low family income (26.25 percent). The high family income category constituted with 33.75 percent respondents. Majority (40 percent) rooftop gardeners have medium to high level annual family income.

The observed data shows that most of the respondents (40 percent) had medium rooftop area while 25 and 35 percent of them had low and high rooftop area respectively. Based on the house ownership among the respondent's house owner tenant and govt. quarters was the criteria to look for. 65 percent of the respondents were tenant as the ownership of the house. Whereas, only 35 percent were the house owner and use their own rooftop space for gardening. the highest proportion (56.25 percent) of the rooftop gardeners had medium training exposure compared to 18.75 percent in short training exposure and 6.25 percent in no training exposure category, respectively. 18.75 percent of the respondents had high training exposure category. The result revealed that 45.09 percent garden owners have the herbs type plants while 21.08 percent rooftop garden owners have the tree type of plants (920 plants in total) from the area under the following study.

The average role performance of women in rooftop garden was 11.09 with standard deviation 3.175. It showed that the highest proportion of women (43.75%) were found to perform medium role in rooftop gardening activities, whereas 16.25 % had low role rooftop gardening activities. Rooftop gardening knowledge scores of the respondents ranged from 06 to 18 against possible score of 0 to 24. The average score and standard deviation were 11.13 and 3.9 respectively. 46.25 percent of the respondents had medium rooftop gardening knowledge, 32.5 percent had low knowledge and 21.25 percent had high knowledge on rooftop gardening. This led to understanding that rooftop gardening knowledge would reflect more by the medium knowledge on respondents in the present study.

Rank order of the ten strategies of problem faced by the respondents was measured. As per Problem Faced Index (PFI) Costly management system positioned the 1st and scarcity of source of water was in last position.

There was significant contribution of respondent's level of education, annual income, rooftop area, training exposure and knowledge on rooftop gardening on role of women in roof top garden management activities. Among these, level of education and use of information sources on attitude towards rooftop gardening were the most important contributing factors (significant at the 1 percent level of significance). Training exposure and knowledge on rooftop gardening on role of respondents in rooftop garden management activities was also significant at the 1 percent level of significance while coefficients of age and rooftop area don't have any significant contribution on role of women in rooftop garden management activities.

5.2 Conclusions

The overall facts lead to the conclusion that necessary arrangements should be made to increase the rooftop gardening knowledge which would ultimately increase the role of women in rooftop garden management activities;

- a. The middle-aged respondents were more interested in participation in rooftop garden management activities.
- b. The highest proportion of the women had medium size family.
- c. Family size had significant positive relationship with their role in rooftop garden management activities. It was assumed that more the number of family members, more in the opportunity in role in rooftop garden management activities.
- d. Family annual income of the respondents had contributed in increasing the role of women in rooftop garden management activities. That means, sufficient income may encourage women in participation in rooftop garden management activities.
- e. The highest proportion of women (43.75%) were found to perform medium role in rooftop gardening activities.
- f. The statistical analysis revealed that the characteristics such as age and rooftop area were not related with their role in rooftop garden management activities. This means that these characteristics were independent to the role in rooftop garden management activities by the women.
- g. The role of the women in rooftop garden management activities may be influenced by education, family size, annual income, training exposure, importance and knowledge in rooftop garden management activities.

5.3 Recommendations

Comprehensive initiatives need to be taken by government organizations, non-government organizations, agencies and the society as means to improve the existing socio-economic condition of the people. The following points can be recommended by considering the total aspect of this present study:

- i. The DAE should take necessary steps that will increase the training facilities for the respondents in rooftop gardening. Therefore, it is recommended that the extension workers should encourage the respondents to participate in training program so that respondents themselves could come in contact training facilities.
- ii. The present study was concerned only with the role of women in rooftop garden management. It is suggested, future studies should be included with attitude and practice of rooftop gardening.
- iii. The present study was conducted in Mohammadpur. It is recommended that similar studies should be conducted in other areas of Dhaka city.
- iv. This study investigated the contribution of ten characteristics of the respondents with their role in rooftop garden management as dependent variable. Therefore, it is recommended that further study should be conducted with other characteristics of the respondents with role of women in rooftop garden management.

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APPENDIX-I

ENGLISH VERSION OF THE INTERVIEW SCHEDULE

Department of Agroforestry and Environmental Science

Sher-e-Bangla Agricultural University

Dhaka-1207

An Interview Schedule for the Study Entitled
**ROLE OF WOMEN IN ROOFTOP GARDEN MANAGEMENT: A CASE
STUDY OF MOHAMMADPUR THANA IN DHAKA CITY**

Name of the respondent:

Serial No.:

.....

Address:.....

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

1. Age

How old are you? _____ years.

2. Education

Please mention your level of education.

a) I can't read and write

b) I can sign only

c) I have passed.....class.

3. Family size

How many members are there in your household including you?

4. Annual family income

What about your average annual family income?

5. Rooftop area

Mention total area of your house's roof sq. ft.

6. How many years you are performing this roof gardening? _____ years

7. Training exposure

Have you participated any in training programs regarding RTG?

A) No

B) Yes

SL. No	Name of the training course	Organization	Days
1			
2			
3			

8. No. of plant species found in the Rooftop Garden

Name of crop	Number
Herb 1. 2. 3. 4. 5.	
Shrub 1. 2. 3. 4. 5.	
Tree 1. 2. 3. 4. 5.	

9. Role of women in Rooftop Garden Management

Works	Yes (Women)	No (Man)
Collection of seed		
Collection of seedling		
Arranging gardening tools		
Collecting containers		
Seed sowing		
Seedling raising		
Watering		
Fertilizing		
Weeding		
Dead-branch collection		
Pest management		
insect management		
Harvesting of fruits		
Harvesting of vegetables		
Training		

10. Importance of Rooftop Garden

Items	Very important	Less important	Not important
Food and fruit			
Subsistence family income			
Medicinal plants			
Ecological balance			
Reduce pressure on forest			
Increase self-reliance			
Progress farming			

11. Knowledge on rooftop gardening

Please answer the following questions:

Sl. No.	Questions	Full marks	Marks obtained
1	What do you understand by Rooftop Garden? (a) A garden on the roof of a building (score-1) (b) A garden on anywhere (score-0)	2	
2	Do you think Rooftop Garden is ideal for vegetables cultivation? (a) Yes, I do (score-1), (b) No, I don't (score-0)	2	
3	What is optimum time for planting tomato? (a) October-November (score-1), (b) March-April (score-0)	2	
4	Do you think rooftop gardening could be an earning source? (a) Yes (score-1), (b) No (score-0)	2	
5	Name two diseases of tomato? (a) Early blight & Cercospora leaf spot (score-1), (b) Blast & Leaf spot (score-0)	2	
6	Name two major insects of okra? (a) Aphid & Stink bug (score-1), (b) Rice weevil & Sugarcane top shoot borer (score-0)	2	
7	Name two organic fertilizers used in vegetables cultivation? (a) Cowdung & Rotten leaves (score-1), (b) Urea & Phosphate (score-0)	2	
8	Name two vegetables which you cultivated in your Rooftop Garden? (a) Bean & Okra(score-1), (b) Potato (score-0)	2	
9	Name two fruits which you in your Rooftop Garden? (a) Mango & Guava (score-1), (b) Coconut & Jackfruit (score-0)	2	

12. Problems faced during rooftop gardening

Please express your opinion on the following problems

Sl. No	Name of problems	Extent of problems				
		Very High (4)	High (3)	Medium (2)	Low (1)	Not at all (0)
1	Scarcity of source of water					
2	Lack of quality seed and seedlings					
3	Insect infestation					
4	Lack of training					
5	Costly management system					
6	Difficult to make roof garden for a tenant					
7	Lack of sunshine due to side building					
8	Lack of knowledge on soil preparation					
9	Lack of knowledge on plant nutrients					
10	Unavailability of proper water drainage system on the roof					

Thanks for your kind cooperation.

Dated:

(Signature of interviewer)

Appendix II: Correlation matrix

	Age	Education	Family size	Annual income	Rooftop area	Training	Role of women	Importance of rooftop gardening	Knowledge of rooftop gardening
Age	1								
Education	0.196	1							
Family size	-0.232	-0.419	1						
Annual income	0.013	0.292	-0.145	1					
Rooftop area	0.199	0.512	-0.291	0.616	1				
Training	0.160	0.795	-0.333	0.465	0.620	1			
Role of women	-0.130	-0.778	0.370	-0.398	-0.179	-0.752	1		
Importance of rooftop gardening	-0.352	-0.692	0.310	-0.339	-0.574	-0.729	0.591	1	
Knowledge of rooftop gardening	0.119	0.708	-0.297	0.381	0.547	0.941	-0.709	-0.637	1