GARDENERS' EXPOSURE TO VIRTUAL AGRICULTURAL CHANNELS BROADCASTED THROUGH YOUTUBE IN RELATION TO ROOFTOP GARDENING

A Thesis

By

Student Id: MS-210832

Approved as to style and content
By

Dr. Mohammad Bashir Ahmed
Professor
(Supervisor)

Dr. Md. Matiul Islam
Professor
(Co-Supervisor)

Professor Dr. Shamim Ahmed Kamal Uddin Khan
Chairman, Examination Committee
and
Head of Agrotechnology Discipline
Khulna University, Khulna-9208

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June 2023

The Author

DEDICATED

TO

MY HONORABLE TEACHERS

GARDENERS' EXPOSURE TO VIRTUAL AGRICULTURAL CHANNELS BROADCASTED THROUGH YOUTUBE IN RELATION TO ROOFTOP GARDENING

Abstract

Access to information is the key to improvement of agricultural production. The gardeners' can easily expose to information broadcasted through YouTube. The main purpose of the study was to determine the gardeners exposure to virtual agricultural channels broadcasted through YouTube in relation to rooftop gardening. Besides, the relationships between the selected characteristics of the gardeners and their exposure were also explored. Data were collected from purposively selected 80 gardeners of Sonadanga and Nirala residential areas of the Khulna city during January to February 2023. The overwhelming majority (77.4%) of the respondents had medium exposure whereas 13.8 and 8.8 percent of them showed the highest and lowest exposure respectively to the virtual agricultural channels broadcasted through YouTube. The rooftop gardeners were highly exposed to Shekh Seraj (96.25%) and Dipto Krishi (89.58) while they were less exposed to Green Agriculture BD (12.04%) and BD krishi view (16.67%). Sheikh Seraj was highly effective followed by Deepto Krishi. But BD Krishi view and Green agriculture BD are less effective from gardeners' perception point of view. The rooftop gardeners highly prefer content related to pest and diseases identification and treatments (93.5%) followed by irrigation and water management (92.75%), roof management (92.75%) and management of ornamental plants (85%,). Among 13 selected characteristics of the respondents, only cosmopolitanism of the respondents showed a significant and positive relationship with their exposure to virtual agricultural channels broadcasted through YouTube.

Key words: Gardeners exposure, virtual agricultural channel's, broadcast, YouTube.

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CHAPTER I

INTRODUCTION

1.1 General Background of the Study

At present, rooftop gardening is very popular. The art and science of growing plants on vacant lots next to or around a house is known as rooftop gardening. In other words, a green roof or rooftop garden is a building's roof that is entirely covered in a layer of plants (Sheel et al., 2019). There are three main types of rooftop farming that can be used. They are container gardening, green roofs, hydroponic rooftop farming (Harada & Whitlow, 2020).

Urban regions' rooftop green infrastructure can improve crucial ecosystem services. In addition to mitigating water runoff and regulating building temperatures, green roofs can provide food and nesting resources for wildlife. Rooftop gardens can also be utilized to cultivate food crops, giving them the potential to attenuate instances of food insecurity which are commonplace in many urban areas. Green roofs can offer food and habitat for wildlife in addition to reducing water runoff and moderating building temperatures. Rooftop gardens can also be used to grow food, which has the potential to lessen food insecurity issues that are prevalent in many metropolitan locations (Siddika, 2016). With the benefit of dual land use, using crops and rooftops for solar photovoltaic (PV) installation holds tremendous promise for increasing the worldwide renewable energy capacity. Geographical estimations show the enormous theoretical potential of solar PV on just two different types of land cover. A more precise, realizable potential can be assessed on local and regional sizes by taking socio-economic, policy, and meteorological elements into account (Yeligeti et al., 2023). Although the use of green roofs is not widespread, they are universally acknowledged as the solution to numerous urban environmental issues (Zhang et al., 2022).

Sustainable design refers to a design concept that aims to minimize adverse environmental effects through thoughtful design. Certain technologies are highlighted for efficiency enhancement using integrated design methods(Rahman & Ahmad, 2012). The purpose of the rooftop vegetable is to achieve a variety of sustainability when interior practices of urban infrastructure are used to produce fresh veggies. Urban sustainability is the idea that a city may be planned so that it doesn't rely too heavily on the countryside and that it can run on renewable

energy sources. The goal is to make the city's overall impact on climate change as small as possible by producing the least amount of pollution and ecological footprint, using land efficiently, composting used materials, recycling them, or turning them into energy. (Safayet et al., 2018).

Some fauna, notably birds, may visit rooftop gardens. Therefore, this gardening approach is advantageous from an ecological standpoint. There is a requirement for a few standard tools, such as a knife, waterer, spade, chemical and organic (natural) fertilizer, sand, pheromone trap, and just a few insecticides. Depending on the type of plants, the tub should be a different size and form. Flat tubs are required for bonsai plants. A large-sized tin container is required for a large-sized (grafting tree). Early crop production is suitable for hybrid fruit plants. In Bangladesh, vermicompost manure is becoming more and more popular for both rooftop and agricultural gardening (Kabir, 2019).

Germany is the country that invented the "green roof" (Rahman & Ahmad, 2012). A German roofer named H. Koch invented a method of roofing in the 1880s to solve the safety issue of replacing the highly flammable tar that was frequently used in roofs in Berlin. His method involved covering the tar with a layer of sand and gravel and then growing trees on top of it. Then, the method's inexpensive cost and fire resistance allowed it to be built throughout Berlin. Reinhard Bornkamm, known at the time as the "father of modern green roofs," began researching Karl Koch's roof in the late 1960s and later constructed the first modern green roof project in Berlin on a building owned by the Free University by combining extensive and intensive technologies in roof gardening (Rahman & Ahmad, 2012).

The first roof garden in Asia was constructed in Tokyo's Mitsukoshi roof in 1914. However, the urban heat island effect brought on by World War II greatly grew interest in modern green roof technology in Tokyo until 1939. The Japanese government is currently following Tokyo's example on green roof legislation, which mandates that homes and office buildings in urban areas have at least 20% of their rooftops covered in greenery (Rahman & Ahmad, 2012).

Rooftop gardens are well known for their many benefits, including serving as a source of wholesome food, promoting fresh air circulation, capturing carbon, serving an aesthetic purpose, and lowering building temperatures. The rooftop garden's underlying beauty and long-term

benefits include pollination systems, urban greenery, biodiversity conservation, and promotion. Rooftop gardens not only improve the biodiversity already existing but also draw a variety of insects, birds, and other animals to the urban green roof. One of the crucial components of the agricultural ecosystem is soil microbial diversity, which is now known to be supported in the rooftop garden. Volunteer crops, which are primarily weed species but occasionally even crop plants like Amaranthus, might promote the discovery of new plant species in RTG(Rooftop Greengouse) (Rawal, 2022).

The initial installation cost of a green roof is significantly more than that of a regular roof, which is the biggest drawback of green roofs. Due to the danger of roots penetrating the waterproof membrane, some green roofs require a water proofing system that meets stricter standards (Getter & Rowe, 2006). Due to the nature of the substrate and flora, green roofs absorb sound waves more effectively than hard surfaces in urban environments (Getter & Rowe, 2006).

Particulate and gaseous air pollutants can be removed by plants. Rainwater movement will eventually carry particles into the soil, where some of the pollutants will be absorbed by plant tissues. Green roofs help reduce a number of airborne pollutants (Getter & Rowe, 2006).

In order to sustain the weight of installation materials, soil, containers, and the plant itself, roofs for green vegetation must meet more stringent structural standards.

Birds and veggies have a contentious relationship. Although many birds are useful garden pest predators, it has been discovered that birds frequently cause trouble by consuming little plants of produce. The roof needs to be regularly washed because the plant leaves make it dirty. The challenge of finding high-quality plants is another. Most of the time, they purchase their plants from a nearby nursery. However, occasionally they give up and purchase poor-quality crops, which prevents them from producing the desired results (Safayet et al., 2018). The shadow cast by the next-door building reduces garden productivity. Therefore, the lack of height and (building) density zoning would be a bigger issue as the number of these professionals grows. Some land lords is unwilling to give permission for rooftop gardening (Safayet et al., 2018).

During learning activities, virtual media is utilized to inspire gardeners, stimulate their minds, and create a positive learning environment (Prawira et al., 2023). Social media platforms give users the chance to connect with one another, communicate, and take part in entertaining

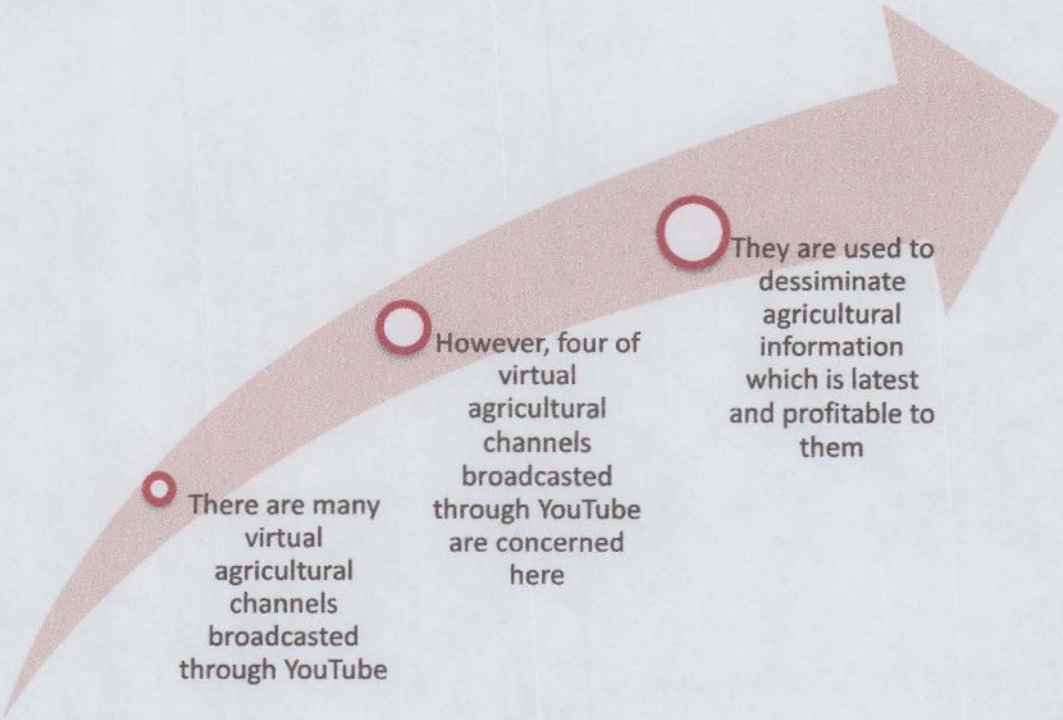
activities that promote learning. Social media are "computer-mediated communication channels that enable users to connect socially in real time with both large and targeted audiences. The most popular social networking sites, including Facebook, Instagram, Twitter, and TikTok, offer these components, enabling interaction with others, self-disclosure, and social support (B et al., 2023).

Most of the gardeners are new in this field. For them, YouTube is a development or social media tool for gathering information and knowing new techniques of gardening. Rooftop gardening is mainly done by urban educated people. YouTube is very popular social media to them (Chhachhar et al., 2014). These are some popular YouTube channels such as Math Krishi, Agamir Krishi, Krishi bioscope, Deepto Krishi, Shykh Seraj, Hridoyer Krishi, Agro One, Any Bd, Green Friends, Uddoktar Khoje, BD Krishi view, Green Agriculture BD etc, which provide information on different rooftop gardening. However four of those such as Shykh Seraj, Deepto Krishi, BD Krishi view, Green Agriculture BD provide information regarding rooftop gardening. Most agricultural land has been given up for homes, industry, highways, and other urban demands as population has increased (Islam & Shahriar, 2020). To meet the demands of the world's 9.3 billion people, it is predicted that by 2050, the demand for food would increase globally by 70%. Rooftop gardening is viewed as a major answer to the issue because it will be impossible to use natural resources to feed the expanding population (Rani et al., 2016). In these rooftop gardens, they most often grow fruits, vegetables, and flowers. Rooftop garden also provide direct roof shadowing, increased insulation values, and evapotranspiration, they can lower the energy demand for space conditioning and consequently, GHG emissions (Liu, 2002). But it is unknown about the exposure status of gardeners to virtual agricultural channels broadcasted through YouTube.

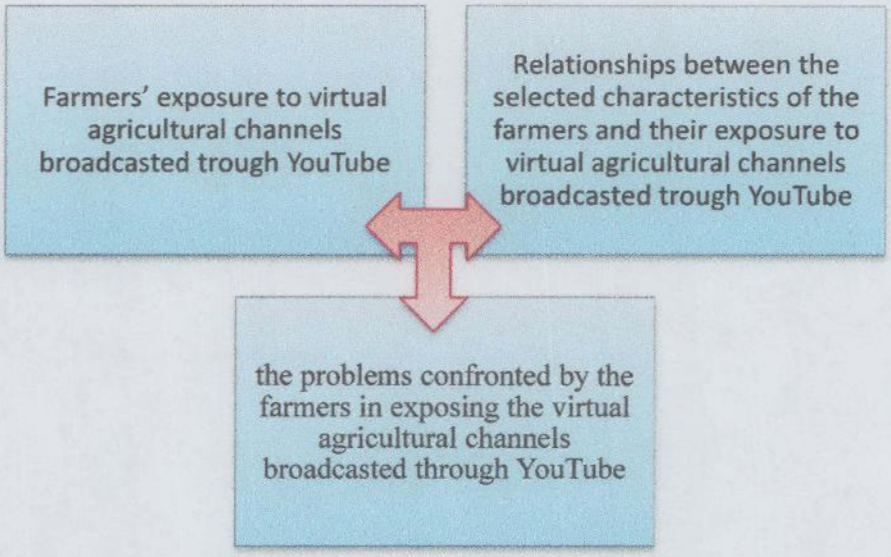
1.2 Statements of the Problem

Exposure assessment is the process of characterizing, estimating, measuring and modeling the magnitude, frequency and duration of contact with an agent as well as the number and characteristics of the population exposed (McKone and Small, 2006).

1.3 Research gap



(However, the followings are yet to be find out)



1.4 Specific objectives

Considering the point in view the present study will be conducted with the following objectives.

- To determine gardeners' exposure to Virtual agricultural channels broadcasted through YouTube for seeking information on rooftop gardening.
- To identify the nature of information disseminated by the selected channels.
- To explore relationships between the selected characteristics of the gardeners and their exposure to Virtual agricultural channels broadcasted through YouTube in relation to rooftop gardening.
- To identify the problems faced by the respondents in exposing to Virtual agricultural channels broadcasted through YouTube.

1.5 Scope of the Study

The current study offers important details on gardeners in Khulna city, including their understanding of virtual agriculture channels broadcast on YouTube and the level of gardeners' exposure to these channels. The study's findings would aid in the effective design and implementation of development initiatives by allowing for the level of gardener exposure as well as the challenges they experience when trying to increase it.

CHAPTER II

REVIEW OF LITERATURE

Reviews of the literature are required primarily to assess the historical data that supports the theories and claims made in the research. Exposing the work connected to the current study is the purpose of the "literature review" chapter. It offers support for the ongoing work and the foundation for additional study.

2.1 Rooftop Gardeners' Exposure to Virtual Agricultural Channels broadcasted through YouTube

2.1.1 Print Media Activities

Krishi Kotha

The most prestigious and renowned farm journal in Bangladesh, Krishi Kotha, is published and distributed by AIS. Currently, Krishi Kotha has more than 80,000 direct subscribers and more than 15 lakh readers (AIS, 2018).

Samprosharon Barta

It is the news bulletin that is distributed and published once a month. It includes information on agricultural achievement, progress, events, and current news.

Krishi Diary

It includes the most recent technical data that is required, agricultural statistics, and contact details for numerous government and non-government departments and individuals involved in agriculture.

Other Printing materials

Printed materials in the form of booklets, posters, folders, festoons, etc. are crucial for communicating agricultural knowledge and technologies. A total of 35.82 lakh printed copies were published and distributed to gardeners, extension workers, and other relevant stakeholders between 2009 and 2018 (AIS, 2018).

2.1.2 Electronic Media Activities

Bangladesh Television (BTV)

An incredibly popular TV program called Mati-O-Manush, which is broadcast on the BTV, is being made with the help of AIS. In addition, Banglar Krishi, a show that the BTV has been airing since 2014, receives the full collaboration and technical support of AIS.

Bangladesh Betar

Through the "Krishi Shomachar" and "Chashabad" radio programs, AIS has been providing its active support and collaboration to the Bangladesh Betar for the production and transmission of various agricultural programs for national and regional stations. With this assistance, national and regional stations of the Bangladesh Betar are able to broadcast programming for almost 14 hours each week.

Community Radio

With the motto "My radio, my voice," AIS developed the community rural radio station Krishi Radio 98.8 FM in Amtoli in the Borguna district. This station broadcasts daily for eight hours various need-based rural welfare and agricultural programs to the residents of 12 upazilas in the Borguna and Patuakhali districts.

Video materials (Cinema/ Pramanno Chitro)

Through BTV and private satellite channels, AIS produces a variety of agricultural technology-based video documentaries, films, fillers, dramas, chat shows, etc. Additionally, these are also broadcast via mobile cinema vans in remote regions.

2.1.3 ICT and Innovation Activities

AICC

The Agriculture Information and Communication System (AIS) is the pioneer in utilizing ICT to disseminate agricultural knowledge and technologies at the grassroots level by building 499 Agriculture Information and Communication Centers (AICC) around the country (AIS, 2018). These centers, which are administered by gardeners, were provided with a variety of ICT tools,

including computers, smartphones, internet modems, multimedia equipment, etc., as well as the necessary training.

Krishi Call Center

In order to give the public immediate access to professional solutions (for crops, fisheries, and livestock), AIS launched "Krishi Call Center-16123" in 2014. Anyone who wants advice can call 16123 from their mobile phone for just 25 paisa/minute.

Website

AIS has developed a large web portal (www.ais.gov.bd) containing huge amounts of agricultural information and it is regularly being updated. Besides, two mobile apps have been launched.

AisTube

AisTube is a digital effort that offers agricultural information to gardeners in order to raise their knowledge in a contemporary manner. This collection will present all the contemporary agricultural technologies in the form of documentaries, allowing the gardeners to quickly learn the necessary agricultural information in order to deliver efficient, high-quality agricultural information services..

Ki-osk

Additionally, ten ICT laboratories and eleven information kiosks have been built in agricultural zones (AIS, 2018). On Ki-osk, a digital information desk, gardeners can find any agricultural information.

2.1.4 Other initiatives

Krishi Mela

DAE assists AIS in hosting a number of agricultural fairs. Every year, there are fairs for trees, vegetables, and development where gardeners can learn about the most recent advancements in agriculture.

ICT laboratory

AICC members, extension staff, media professionals, and other relevant stakeholders routinely attend various training sessions on mass media and ICT organized by AIS at an ICT lab. As a result, skilled media and ICT professionals are being created, and they are fervently working to advance agriculture.

Other programs

On the occasion of national and international days and events, AIS organizes various rallies, seminars, workshops, and other events.

2.2 Studies Related to Exposure of the Gardeners' Exposure to Virtual Agricultural Channels broadcasted through YouTube

Hasan et al. (2016) carried out a study to identify the current gap in receiving agricultural knowledge from the most suitable sources, and then proposed an improved service design to facilitate the individualized agricultural knowledge distribution for Bangladeshi gardeners. It was discovered that Bangladeshi gardeners primarily rely on television to keep up with weather forecasts. Across the country, Bangladesh Television (BTV) receives 83% of total TV viewership. Since 69% of viewers are in urban areas and 92% are in rural regions, television programs are the best source of knowledge on farming techniques.

Alam & Haque (2014) did a study to determine the role that different television channels played in providing gardeners in Bangladesh with agricultural information. Their study found that the majority of respondents took only modest action to put the agricultural technologies and skills they had learned from watching television programs about agriculture to use.

Chakma et al. (2022) conducted a research evaluate the overall quality of YouTube videos related to hydroponic technology and found that a sizable percentage (52.5%) of YouTube content on hydroponic technology was of low quality. The majority of the evaluated content (15.3%) was of good quality, with only a tiny fraction (32.2%) being of medium grade. Variables like likes, views, and duration varied a lot depending on quality. The majority of the content was published in the USA, and the peak year for content release was 2020, according to video

demographics. The majority of information was created by businesses that placed a strong emphasis on practical applicability.

In the period of climate change and land growth, YouTube is a widely used media in the expansion of floating agriculture. In order to describe the significance of YouTube for streaming information about floating agriculture, including the approach of a countable number of viewers, the study examined a significant number of YouTube videos based on floating agriculture. Through the examination of the study, an overwhelmingly good and cheerful reaction has explained an acceptable attitude regarding YouTube in terms of expanding floating agricultural, which may help the thinkers to set up additional programs to increase this. Despite the dubious quality of some of the films, YouTube can be the most effective platform for communicating about floating agriculture. More videos about poor quality have been produced in recent years than in the past Chakma, Ruba, & Riya, (2022).

Kumari et al. (2014) conducted a study to evaluate radio's effectiveness as a teaching medium for gardeners in two regions in Bihar, India. The study found that between before and after intervention, gardeners' knowledge levels for every question had dramatically increased.

Chhachhar et al. (2012) conducted a study to evaluate the influence of television networks on the development of agriculture and the gardeners in Sindh, Pakistan. In the study, it was discovered that the majority of respondents (80.5%) believed television to be only moderately helpful in raising agricultural revenue, while the smallest percentage of respondents (5.5%) believed television to be extremely effective in doing so. 14% of the respondents, however, said that television had no impact at all on raising farm income.

Lucky and Achebe (2012) explains that the development of technology and technological devices, the medium of information storage, retrieval, and dissemination, has significantly increased the use of computers and internet facilities in accessing information in contrast to the traditional method.

Hossain and Islam (2012) conducted a study in Bangladesh and found that more than 83% of the respondents utilized television as a source of information, while just approximately 17% of the respondents said they used radio. The majority of the rural women who participated in the

study's response group required knowledge about farming and animal husbandry from the information sources.

Kadiam et al. (2012) outlined e-extension entails the powerful use of ICT, national and global information networks, internet, knowledgeable programs, multimedia finding out methods and PC based coaching methods to fortify information access to gardeners,

Sife el al. (2010) stated that the brand-new ICT digital contraptions such as desktops, email, internet, multimedia, video conferencing, cell telephones etc. which have the competencies of providing large amount of central knowledge to rural populace in well-timed and complete and cost amazing method.

According to Chauhan (2010) satellite-based communication via the internet is one of the most efficient, exact, quick, and economical ways to get information from a research system to gardeners.

Prathap and Ponnusamy (2006) conducted a study to evaluate the relative impact of radio, television, newspapers, and the internet on rural women who belonged to self-help groups' knowledge acquisition in three villages in Tamil Nadu, India. In order to evaluate the knowledge gained by rural women regarding the chosen technology, parallel messages on rabbit farming were distributed over all of the treatment mass media channels. The researchers discovered that there were notable variations in the four treatments' capacities for imparting knowledge. Duncan's Post Hoc Test was used in the study to determine whether groups differed. According to Duncan's Post Hoc Test, the radio and Internet treatment groups were homogenous, and the same could be said for the newspaper and Internet treatment groups. One group only stood out from the other two: the television treatment group. This finding suggests that the respondents who had access to television learned about rabbit husbandry very differently from the other three groups. The group mean of 15.08 suggests that, for the respondents, television was the most efficient and superior method of knowledge acquisition, followed by newspapers, the internet, and radio.

Muhammad et al. (2004) conducted a research to assess the role of television in agricultural technology transfer in Faisalabad, Pakistan. The study revealed that the majority (84.80%) of respondents obtained only up to 25% agricultural information through television while a few

respondents (12.80%) obtained 25-50% information through agricultural telecasts by television. Only a negligible number of respondents obtained more than 50% agricultural information through television.

Chauhan and Thakor (2004) mentioned that many groups are working to implement internet connectivity to make the greatest use of satellite-based communication technology; they said that the initial response of the rural population, particularly gardeners, has been quite promising.

Oyegbami and Fabusoro (2003) argued that some constraints, such as a lack of energy and terrestrial connections in rural Tanzania, limited the usage of television.

Perianayagam and Arokiasamy (2002) a study in the northern states of India found that women's education and media exposure are two crucial developmental variables that have a highly substantial positive link with contraceptive and a negative correlation with fertility across all regions.

Egbule and Njoku (2001) in their study on mass media for adult education in Nigeria found that mass media have performed poorly in disseminating requisite agricultural information to gardeners, although there is a positive correlation between mass media usage and farm yield.

Grudzinski and Panasiewicz (2000) argued that the goal can be achieved by the rapid advancement of electronics, telecommunication, computer multimedia, and online transmission and presentation of knowledge, as well as unique types of comprehending applied sciences and their use in planning, selling, and production.

2.3 Present scenario of rooftop gardening

Safayet et al. (2017) did a study on "Present practice and future prospects of rooftop farming in Dhaka city: a step towards urban sustainability". They claimed rooftop farming may help reduce the city's environmental impact and meet the growing need for food. They sought to investigate the difficulties faced by practitioners of rooftop farming today. One important finding of their survey was that the majority of people are willing to engage in rooftop gardening and wish to dedicate at least half of their roof space to it.

A study titled "Rooftop farming: a solution to food security and climate change adaptation for cities" was carried out by Gupta and Mehta (2017). They claim that urban agriculture has the potential to offer both immediate advantages (food) and some indirect ecosystem services at a large scale (such as biodiversity preservation).

Celik and Binatli (2017) carried out a study titled "Energy savings and economic impact of green roofs: a pilot study". They emphasize the financial benefits and energy savings of green roof systems. Based on sectoral employment multipliers over a ten-year period, the economic impact of rooftop gardening was evaluated.

Opitz et al. (2016) worked with an experiment named by "Toward sustainability: novelties, areas of learning and innovation in urban agriculture". Results of their study demonstrated that learning and innovation in urban agriculture occur in four areas as like as financing and funding, production, technology and infrastructure, markets and demands and social acceptance and cultural learning.

On the basis of ecological and economic views, Rahman et al. (2013) evaluated the "Present Status of Rooftop Gardening in Sylhet City Corporation of Bangladesh : an assessment based on ecological and economic perspectives." In Sylhet City Corporation in northeastern Bangladesh, rooftop gardening status, floristic composition, cost, and return are all described. They discovered the explanation for their interest in rooftop gardening, which was that it required less capital, labor, time, land, and cultural activities but produced great returns in the form of aesthetic enhancement and psychological fulfillment. According to the survey, practically all gardeners in the study area engage in rooftop gardening, which is typically done for leisure time activities (87.8%) and mental satisfaction (95.3%). Males (71.33%) were reported to perform the tasks like gathering planting materials, preparing locations, and selling items. The study also showed that middle income groups (43.78%) were more enthusiastic about rooftop gardening. The search identified 53 plant species from 35 families, with the Cucurbitaceae family having the highest number of species with eight. Among the most commonly planted plants shrubs included 28% the highest followed by herbs 26%, agro-crops 36% and flower species 30%. About 89% of the rooftop gardeners procured planting materials from nursery, market, fair, neighbor, relative and friends. The percentage of 48 people mostly prefers to use seedlings for rooftop gardening followed by 21% direct seed sowing. Again the study revealed that very few

people consider rooftop gardening commercially to get profit. They described the management and silvicultural techniques of rooftop gardening. They showed rooftop gardening as a small scale business that can be accelerate additional family income and also showed how rooftop gardens products marketed in the study area.

Eksi and Uzun (2013) conducted a study titled "Investigation of Thermal Benefits of an Extensive Green Roof in Istanbul Climate". They contend that green roofs are an environmentally friendly way to address urban areas' growing environmental issues. They provide advantages for the city and urban environment in terms of ecology and can be employed as decorative features.

According Brodhead (2009) green space expansion has positive effects on society, the economy, health, and the environment. Urban green space, especially in highly populated regions, is advantageous from the standpoints of health, the economy, society, and environmental safety. According to the study, urban green space can contribute to the creation of a framework for the growth of urban society and culture as well as a sense of belonging and community.

According Greenstone (2009) research, there is enough proof to show that rooftop gardens are an important component of urban ecology. For cities and their residents, they can offer general environmental, aesthetic, and health benefits.

The dangers associated with rooftop gardening were identified by Oberndorfer et al. (2007) in their paper "Green roofs as urban ecosystems: ecological structures, functions and services." These risks included moisture stress, severe drought, extreme (often higher) temperatures, high light intensities, and high wind speeds.

Sajjaduzzaman et al. (2005) conducted study on the social and financial benefits of roof gardening, in Bangladesh's Dhaka Metropolitan city. They believed that urban residents' strong motivation to engage in roof gardening could help transform the heavily polluted capital city into a healthier one. Clarifying the physical and cultural facets of roof gardening was the study's main goal. Islam (2004) carried out an experiment on the subject of rooftop gardening as a technique of urban agriculture for food security: the case of Dhaka city, Banglades. According to the study, guava, lemon, papaya, grapes, chili, pumpkin, squash, onion, garlic, coriander leaves, tomato, mushroom, red amaranth, cucumber, bean, bitter gourd, ribbed gourd, ladies finger, amaranth,

cowpea, brinjal, various spices, and medicinal plants are the fruits and vegetables most frequently grown in rooftop gardens. The findings indicated that over 90% of families had someone accessible to tend to the garden. He noted that consumers with modest incomes made up the majority of rooftop gardeners. Families with members who have knowledge of rooftop gardening and experience in farming and gardening accounted for 50% of the total. Approximately 65% of owners planned to start rooftop gardening in the future. Only 5% of property owners agreed to let tenants plant on their rooftops. Owners were hesitant to accept any outside assistance in about 75% of cases. Less than 15% of respondents asked relatives and nurseries for partial assistance, and over 40% of owners said they would be interested to join the Rooftop Gardeners Association.

2.4 The Conceptual Framework of the study

In scientific research, selection and measurement of variables constitute an important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. "a dependent variable" and "an independent variable." A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variables (Townsend, 1953). An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationships to an observed phenomenon. A simple conceptual framework for the study is made on the basis of review of literature which is shown below:

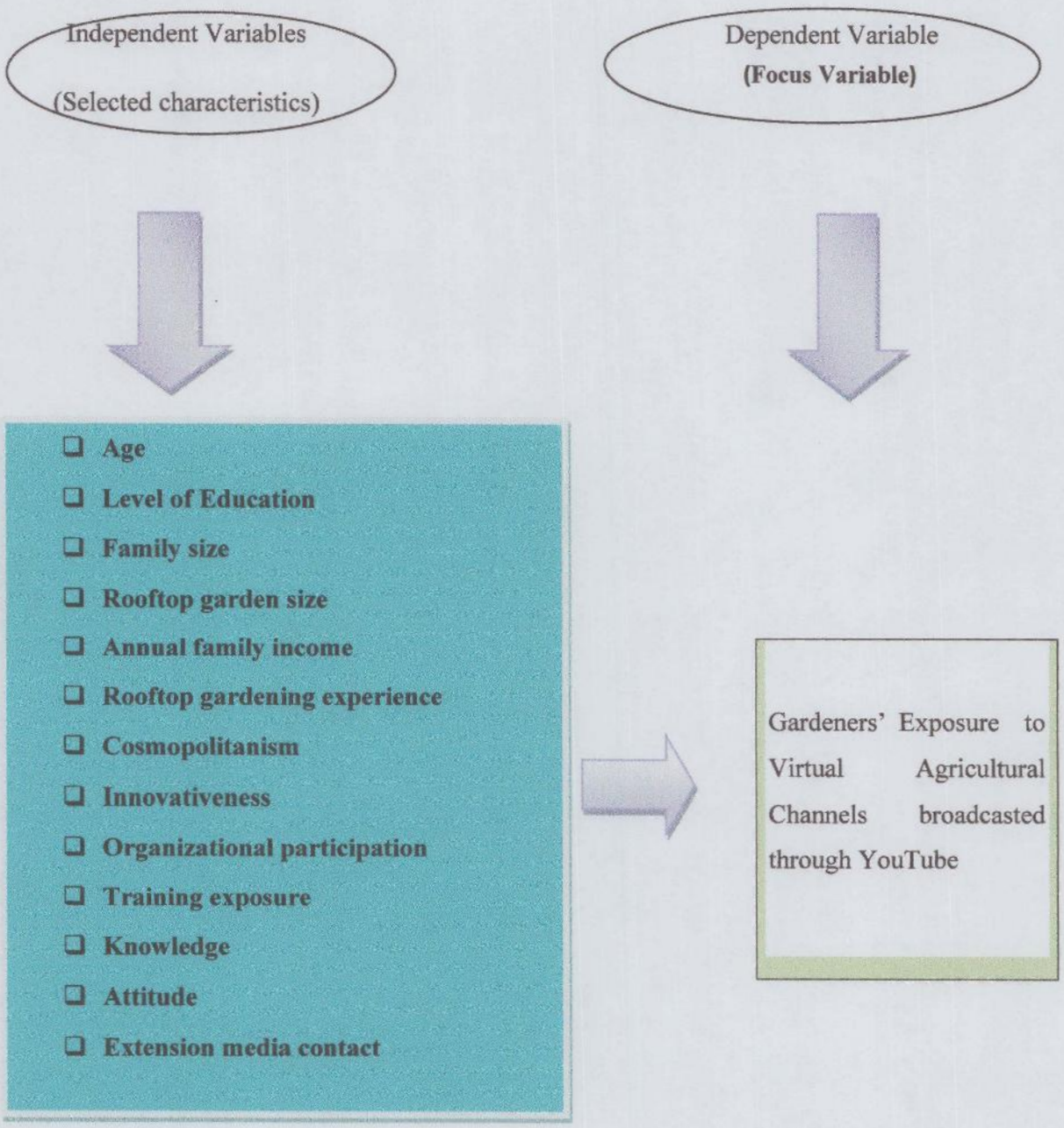


Figure 2.1 Conceptual Model showing relationship between Exposure rooftop gardener and independent variable

CHAPTER III

METHODOLOGY

It is essential for scientific research efforts to use the right methodology. The methodology of a study describes the steps taken to conduct the investigation. It describes all the procedures, strategies, and techniques employed to successfully finish a study. Giving an investigator information they can utilize to further replicate the study is the aim of methodology. When conducting research, methods and procedures must be carefully considered. The research methodology should allow the researcher to get reliable data and appropriately analyze it in order to make informed judgments. A research design is a detailed study strategy. The "descriptive and diagnostic research design" was used in this investigation. The facts will be discovered using a descriptive research design with appropriate interpretation. On the other hand, diagnostics or analytic design is concerned with defining and evaluating the relationship between the variables. The following describes the techniques and methods used to conduct this study:

3.1 Locale of the study area

Khulna city is adjacent to Khulna University. Khulna is a divisional city of Bangladesh. Rooftop gardening is popular enough in Khulna city. The research was undertaken carefully to Sonadanga and Nirala Residential Areas of Khulna City Corporation.

3.2 Population and sampling

The population of the study was made up of all rooftop gardeners who have access to YouTube-broadcasted digital agricultural channels. A number of 80 rooftop gardeners were selected purposively taking 40 rooftop gardeners from Sonadanga and 40 from Nirala Residential Area for this study.

3.3 Selection of Variables

The selected characteristics of the rooftop gardeners were independent variable, while their exposure to virtual agricultural channels broadcasted through YouTube was considered as the dependent or focus variable. The selected characteristics were age, level of education, family size, rooftop garden size, annual family income, rooftop gardening experience, cosmopolitanism,

innovativeness, organizational participation, training on rooftop gardening, knowledge of rooftop gardeners', attitude towards perceived ecosystem, extension media contact, effectiveness of selected channels etc.

3.4 Measurement of Variables

3.4.1 Measurement of rooftop gardeners' exposure to virtual agricultural channels broadcasted through YouTube (focus/dependent variable)

A number of four popular channels act on rooftop gardening was selected for the study purpose. Each of the rooftop gardeners in the sample was queried about the level of their exposure to YouTube-streamed virtual agricultural channels in relation to rooftop gardening considering the following rating scale.

Table 3.1 Scale of Exposure to Virtual Agricultural Channels Broadcasted through YouTube

Scale	Score assigned
Often	3 (If the gardeners contact frequently to Digital Agricultural Channels Broadcasted through YouTube)
Occasionally	2 (If the gardeners contact to Digital Agricultural Channels Broadcasted through YouTube as needed)
Rarely	1 (If the gardeners contact very casually Digital Agricultural Channels Broadcasted through YouTube)
Not at all	0 (If the gardeners do not at all exposed to Digital Agricultural Channels Broadcasted through YouTube)

Exposure score of the respondent was between 0 and 12, where a score of 12 denoting high exposure and 0 denoting no exposure. According to exposure score, the respondents were grouped into different categories as depicted in Table 3.2.

Table 3.2 Categories of the Respondents Based on Their Exposure to Virtual Agricultural Channels Broadcasted through YouTube

Categories	Score
Low exposure	1-4
Medium exposure	5-8
High exposure	9-12

The following formula was used to construct an Exposure Index (EI) to determine the relative position of the Digital Agricultural channels broadcasted through YouTube:

$$\text{EI (\%)} = \frac{\text{Obtained EI Scores}}{\text{Possible EI Scores}} \times 100$$

Where,

EI=Exposure Index

Further, EI score can be calculated using the following formula.

$$\text{EI Score} = N_{of} \times 3 + N_{oc} \times 2 + N_{ra} \times 1 + N_{na} \times 0$$

N_{of} = No. of the respondents exposed often to Digital Agricultural channels broadcasted through YouTube

N_{oc} = No. of the respondents exposed occasionally to Digital Agricultural channels broadcasted through YouTube

N_{ra}= No. of the respondents exposed rarely to Digital Agricultural channels broadcasted through YouTube

N_{na}= No. of the respondents not at all exposed to Digital Agricultural channels broadcasted through YouTube

The EI score could range from "0-240" where '0' denotes no exposure to Digital Agricultural channels broadcasted through YouTube and '240' denotes highest exposure to a particular channel.

3.4.2 Effectiveness of the exposed YouTube channel

Effectiveness means the degree of success in producing the desired result for the exposed YouTube Channel. Four popular channels were selected for measuring the effectiveness broadcasted through YouTube. Every rooftop gardener was asked about the degree of their satisfaction for the selected channel broadcasted through YouTube in relation to rooftop gardening considering the following rating scale.

Table 3.3 Scale of Exposure to Virtual Agricultural Channels Broadcasted through YouTube

Scale	Score assigned
Often	3 (If the gardeners contact frequently to Digital Agricultural Channels Broadcasted through YouTube)
Occasionally	2 (If the gardeners contact to Digital Agricultural Channels Broadcasted through YouTube as needed)
Rarely	1 (If the gardeners contact very casually Digital Agricultural Channels Broadcasted through YouTube)
Not at all	0 (If the gardeners do not at all exposed to Digital Agricultural Channels Broadcasted through YouTube)

Here the score range from 0-12, where 0 denotes not-effective and 12 denotes most effectiveness. According to the effectiveness score rooftop gardeners were categorized which is shown in Table 3.4.

Table 3.4 Categories of the respondents based on their Effectiveness to virtual agricultural channels broadcasted through YouTube

Categories	**Score**
Low exposure	1-4
Medium exposure	5-8
High exposure	9-12

The following formula was used to construct an Effectiveness Index (EI) to determine the relative position of the Digital Agricultural channels broadcasted through YouTube:

$$\text{EI (\%)} = \frac{\text{Obtained EI Scores}}{\text{Possible EI Scores}} \times 100$$

Where,

EI=Exposure Index

Further, EI score will be calculated from the following formula.

$$\text{EI Score} = N_{of} \times 3 + N_{oc} \times 2 + N_{ra} \times 1 + N_{na} \times 0$$

N_{of} = No. of the respondents effectiveness often to Digital Agricultural channels broadcasted through YouTube

N_{oc} = No. of the respondents effectiveness occasionally to Digital Agricultural channels broadcasted through YouTube

N_{ra}= No. of the respondents effectiveness rarely Digital Agricultural channels broadcasted through YouTube

N_{na}= No. of the respondents not at all effectiveness to Digital Agricultural channels broadcasted through YouTube

The EI score could range from "0-240" where '0' denotes no effectiveness to Digital Agricultural channels broadcasted through YouTube and '240' denotes highest effectiveness to a particular channel.

3.4.3 Content Preference

It means the strongest preference for any video or social content. Different types of contents are disseminated through virtual agricultural channels broadcasted through YouTube. A number of 10 f related to content was included in item no.16 of the interview schedule (Appendix A) and Table 3.18 to measure the preference of respondents. A five-point scales such as very highly (5), highly (4), moderately (3), less (2), very less (1) were employed against the 10 different contents as presented below:

Table 3.5 Showing Categories of the Respondents According to Their Contact Preference

Type of Contents	Assigned Score
1.Soil preparation	very highly (5) highly (4) moderately (3) less (2) very less (1)
2. Fertilizer application and organic fertilizer making	very highly (5) highly (4) moderately (3) less (2) very less (1)
3. Sowing/ planting	very highly (5) highly (4) moderately (3) less (2) very less (1)

4. Pest and diseases identification and treatments	very highly (5) highly (4) moderately (3) less (2) very less (1)
5. Pesticides, fungicides, herbicides application	very highly (5) highly (4) moderately (3) less (2) very less (1)
6. Intercultural operation	very highly (5) highly (4) moderately (3) less (2) very less (1)
7. Harvesting	very highly (5) highly (4) moderately (3) less (2) very less (1)
8. Roof management	very highly (5) highly (4) moderately (3) less (2) very less (1)
9. Irrigation and water management	very highly (5) highly (4) moderately (3) less (2) very less (1)
10. Management of ornamental plants	very highly (5) highly (4) moderately (3) less (2) very less (1)

To identify the most preferred content, a content preference index was (CPI) was calculated using following formula:

$$(\%)\ CP1 = \frac{Obtained\ CPl\ Scores}{Hghest\ Possible\ CPl\ Scores} \times 100$$

Where, CPI = Content Preference Index

CPI Score= $N_{pvh}\times5+ N_{ph}\times4+ N_{pm}\times3+ N_{pl}\times2+N_{pvl}\times1$

N_{pvh} = No. of the respondents prefer the content very highly which are disseminated by virtual agricultural channels broadcasted through YouTube

N_{ph} = No. of the respondents prefer the content highly which are disseminated by virtual agricultural channels broadcasted through YouTube

N_{pm} = No. of the respondents prefer the content moderately which are disseminated by virtual agricultural channels broadcasted through YouTube

N_{pl} = No. of the respondents prefer the content less which are disseminated by virtual agricultural channels broadcasted through YouTube

N_{pvl} = No. of the respondents prefer the content very less which are disseminated by virtual agricultural channels broadcasted through YouTube

The range of CPI scores was 80 to 400 where '80' indicate very less preferred content and '400' indicate very highly preferred content. Based on CPI (%), the contents were ranked.

3.4.4 Other issues related to exposure to virtual media

3.4.4.1 Exposure to other virtual media except YouTube

Contact with other virtual media refers to the contact of respondents with other popular virtual media. A number of eight virtual media such as Facebook, WhatsApp, Instagram, Twitteer, TikTok, Snapchat, Likee, and LinkedIn (item no. 14 of the interview schedule; Appendix A and Table 3.16) were considered to measure the contact with virtual media. A scale of four points, such as regularly (3), occasionally (2), rarely (1), and not at all (0), was employed against these different types of virtual media. The score of exposure to different virtual media related to rooftop gardening ranged from 0 to 24, where 0 indicates no exposure and 24 indicates the highest exposure score. The respondents were grouped into different categories according to exposure to other virtual media related to rooftop gardening, as shown in Table 3.17.

Table 3.6 Based on assigned score as presented below types of other virtual media ranked

Types of other virtual media	Assigned Score
Facebook	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
WhatsApp	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
Instragram	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
Twitter	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
TikTok	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
Snapchat	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
likee	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)
Linkedin	Regularly (3) Occasionally (2) Rarely (1) Not at all (0)

Table 3.7 Showing categories of the respondents according to their contact with other virtual media except YouTube

Categories	Score
Low contact	0-8
Medium contact	9-16
High contact	17-24

3.5 Measurement of selected characteristics (independent variables)

In this study personal, economic, social and psychological characteristic of the gardeners were considered as independent variables. Procedure for measuring independent variables described under section 3.5.1 to 3.5.13 has been discussed.

3.5.1 Age

The age of the gardeners was determined by the span or duration from his/her birth to the time of the interview. It was expressed in actual years based on his/her response to question No. 1 of the interview schedule (Appendix A). The respondents were grouped into different categories shown in Table 3.8.

Table 3.8 Categories of the respondents according to their age

Categories	Score (Years)
Young aged	≤35
Meddle aged	35-50
Old aged	>50

3.5.2 Level of Education

The transmission of knowledge, skills and character traits is known as education. The level of education of a respondent was measured by the number of years of formal schooling. A score of one (1) was assigned for each year of schooling completed. For example, if a respondent completed study of class five his education score was assigned as five (5). Based on level of education score, the respondents were grouped into different categories as presented in Table 3.9.

Table 3.9 Showing categories of the respondents according to their education

Categories	Scores (Years)
Secondary	1-10
Higher secondary	11-12
Graduation	13-16
Above graduation	>16

3.5.3 Family size

The term family size refers to the number of members of the respondents such as the husband, wife, children and other dependents living under the same roof and sharing the same kitchen. On the basis of family size, the respondent gardeners were classified into different categories as shown in Table 3.10.

Table 3.10 Showing categories of the respondents according to their family size

Categories	Score
Small size family	1-2
Medium size family	2-4
Large size family	>4

3.5.4 Rooftop garden size

It refers green covered area of the roofs. The respondents were categorized into three categories: small, medium and large based on the total rooftop garden area and that is presented in Table 3.11.

Table 3.11 Showing categories of the respondents according to their garden size

Category	Score (ft^2)
Small	≤1000
Medium	1001-2000
Large	>2000

3.4.2.5 Annual Family Income

A respondent's annual family income in BDT (Bangladeshi Taka) was calculated using all of his or her earnings from different sources. The income of 1000 BDT received a score of 1 (one). The respondents were divided into various categories based on the annual family income, as indicated in Table 3.12.

Table 3.12 Showing categories of the respondents according to their annual family income

Categories	Score ('000' BDT)
Low income	1-1000
Medium income	1001-1500
High income	>1500

3.5.6. Rooftop Gardening Experience

Gardening experience of a respondent was measured on the basis of duration of his/her involvement in rooftop gardening. It was measured in terms of year. For example, if a respondent involved in gardening for one year, his/her experience score is "1". According to gardening experience, the respondents were grouped into different categories as shown in Table 3.13.

Table 3.13 Showing categories of the respondents according to their farming experience

Categories	Score(years)
Low experience	1-10
Medium experience	11-20
Higher experience	>20

3.5.7 Cosmopolitanism

Cosmopolitanism refers to a person's tendency to travel outside of their own social system. The respondents were asked to indicate the places where they visited and the extent of their visit. The score was assigned as frequently (3), occasionally (2), rarely (1) and not at all (0). The cosmopolitanism score of respondent was range from 0 to 15 where '0' indicates no cosmopolitanism and "15" indicated highest cosmopolitanism.

This variable has been shown in the question no.7 of the interview schedule (Appendix A). Based on Cosmopolitanism score the respondents were classified into following categories as shown in Table 3.14.

Table 3.14 Showing categories of the respondents according to their cosmopolitanism

Categories	Score
No cosmopolitanism	0
Low cosmopolitanism	1-5
Medium cosmopolitanism	6-10
High cosmopolitanism	11-15

3.5.8 Innovativeness

Innovativeness is operationally defined as the degree to which the respondent is relatively earlier in adopting new ideas. The respondents were asked as to when they would like to adopt an improved practice in farming. The measurement of innovativeness was as follows:

Table 3.15 Categories of the respondents based on innovativeness

Categories	Score	Statement
Innovators	5	Other rooftop garden of own area
Early adaptor	4	Rooftop garden of other area
Early majority	3	Rooftop garden in Dhaka City
Late majority	2	Nearby NGO office
Laggard	1	Other cities (Barisal, Rajshahi, Sylhet, Rangpur, Chottogram)

3.5.9 Organizational Participation

It means the involvement of the rooftop gardener in different social organization. Each of the respondents was asked to indicate his/her involvement in different organization within their nature of participation (item no. 9 in the interview schedule; Appendix A). The respondents' organizational participation was measured on the basis of the number of organizations involved and according to their nature of participation. If a respondent is active in an organization, for example, his or her organizational participation score would be as follows: general member (1), executive member (2), executive officer (3), and no involvement (0) with duration.

By summing the scores against each of the organizations in which the participant involved as well as the type of participation, the organizational participation score was determined. According to their organizational participation scores, the respondents were divided into the following categories as indicated in Table 3.16.

Table 3.16 Showing categories of the respondents according to their organizational participation

Categories	Score
No participation	0
Low participation	1-6
Medium participation	7-14
High participation	15-21

3.5.10 Training on Rooftop gardening

Gardeners' training scores were determined by the number of trainings they received. For example, if a respondent received one training, his or her training score was "1," irrespective of duration. According to their agricultural training score, the respondents were grouped into different categories, as shown in Table 3.17.

Table 3.17 Showing categories of the respondents according to their agricultural training

Categories	Score
No training	0
Low training	1
Medium training	2-3
High training	>=4

3.5.11 Knowledge of Rooftop Gardeners

The knowledge level score on virtual agricultural channel broadcasted through YouTube was measured by asking 5 selected questions and a score of 2 was assigned to each of the questions. Full marks were given to appropriate answer and partial score was given for partially correct answer whereas '0' score was given to wrong or no answer. Knowledge score of a respondent was calculated by adding the scores obtained by him/her against 5 questions. Knowledge score could range from 0 to 10 where '0' indicated no knowledge while '10' indicated high knowledge

(question no. 11 of the interview schedule; Appendix A). According to knowledge scores, the respondents were grouped into different categories as shown in Table 3.18.

Table 3.18 Showing categories of the respondents according to their knowledge level on virtual agricultural channels broadcasted through YouTube

Categories	Score
Low knowledge	1-5
Medium knowledge	6-8
High knowledge	9-10

3.5.12 Extension Media Contact

Extension media contact refers to the mass dispersion of any information or technology to the mass community. The exposure of different sources for rooftop garden related information was collected by listing of different exposure source. They were asked to indicate their extent of exposure as regularly, often, occasionally and not at all. The scores assigned as 3, 2, 1 and 0 respectively. The score of extension media contact was assigned by the respondents score against 7 information source. The score of extension media contact was range from 0 to 21 where 0 indicate no contact and 21 indicate the highest contact. According to extension media contact scores, the respondents were grouped into different categories as shown in Table 3.19.

Table 3.19 Showing categories of the respondents according to their knowledge level on virtual agricultural channels broadcasted through YouTube

Categories	Score
Low contact	1-14
Medium contact	15-28
High contact	29-42

3.5.13 Perceived Attitude towards Ecosystem Services of Rooftop Garden

Perceived attitude towards ecosystem services of rooftop garden were measured by 28 statements which are in the question no. 13 in the interview schedule. A score was assigned as strongly agree (5), agree (4), unknown (3), disagree (2), strongly disagree (1). By summing the scores against each of the statements, the perceived attitude towards ecosystem services of rooftop

garden score was determined. The highest score was 140 and the lowest score was 28. According to the scores, the respondents were grouped into different categories as shown in Table 3.20.

Table 3.20 Showing categories of the respondents according to their response on perceived attitude towards ecosystem services

Categories	Score
Highly unfavorable	1-28
Unfavorable	29-56
Neutral	57-84
Favorable	85-112
Highly favorable	113-140

3.6 Identification of problems faced/confronted by the rooftop gardeners'

Problem is generally a task or situation that is difficult to face. A number of 11 problems were incorporated under item no. 17 of interview schedule (Appendix A and Table 3.18). Each of the respondents were deliberately asked about the problem they are faced with a rating scale of highly severe, moderately severe, less severe and not all. A score of 3, 2, 1 and 0 was assigned against the rating scales respectively.

Table 3.21 Identification of extent of problems

Scale	Score assigned
Highly sever	3 (If the problem of the farmer is too severe to expose virtual agricultural channels broadcasted through YouTube)
Moderately sever	2 (If the problem of the farmer is moderately severe to expose virtual agricultural channels broadcasted through YouTube)
Less sever	1 (If the problem of the farmer is less severe to expose virtual agricultural channels broadcasted through YouTube)
Not at all	0 (If the problem of the farmer is not at all an obstacle to expose virtual agricultural channels broadcasted through YouTube)

The problem configuration score was obtained by summing the score from the 11 statements, where 0 is the lowest and 33 is the highest score. The categories of the score are given in Table 3.19.

Table 3.22 Categories of the respondents based on extent of problems

Categories	Score
Low	0-10
Medium	11-21
High	22-33

3.7 Instrument for Data Collection

A schedule of interviews was created in order to get information from the respondents. The aims of this research were carefully considered when creating the schedule. Both closed-ended and open-ended questions were listed on the schedule. A range of scales and simple, fundamental questions were employed to collect the data. Direct questions were asked regarding a variety of subjects, including age, education, farm size, family income, organizational membership, and agricultural training. Several measures were used to rate the gardeners' various traits and their exposure to agriculturally-related virtual channels broadcast on YouTube. Both closed-ended and open-ended interview questions are included in the interview schedule (Appendix-A). Before being selected, the interview schedule underwent testing. Taking into account the results of the pretest, necessary correlations and modifications were made. An English version of the interview schedule is enclosed.

3.8 Collection of Data

Face-to-face interviews were used by the researcher to directly collect data. The researcher took assistance from familiar local people to gain local support. The researcher did everything in her power to clarify the study's goals to the rooftop gardener. Prior to the interview, a rapport had already been created with the rooftop gardener and the aims had been made as obvious as possible by utilizing local language and polite behavior. Data were gathered during January to February, 2023.

3.9 Compilation of Data

All the information from the interview schedule was gathered after the field survey was finished. Standard units were changed from local units. The qualitative data were transformed into quantitative representations using appropriate coding and scoring techniques. The interview schedule responses from each respondent were moved to a master sheet so that the data could be entered into the computer. Data was examined in accordance with the study's goals as soon as it was entered into the computer.

3.10 Compilation of Data

The independent and dependent variables of the study were described using statistical measures such as number, percentage, range, rank order, mean, and standard deviation. The data were presented in tables for quick understanding. Spearman's Ranked Correlation Coefficient (p) and was computed to examine the relationships between the respondents' chosen characteristics and their exposure to virtual agriculture channels broadcast on YouTube. Data were examined using SPSS version 15 software.

CHAPTER IV

RESULTS AND DISCUSSION

Data were collected from the respondents who were rooftop gardeners and were carefully accomplished, coded, computed, tabulated and analyzed in accordance with the objectives of the study. After completion of those processes, this chapter was written carefully. The findings of the study and logical interpretations of the results have been presented in this chapter. This chapter is divided into four sections.

- The first section deals with the focus variable of the study i.e gardeners'exposure and related issues
- The independent variables (selected characteristics of the rooftop gardeners) have been discussed in second section.
- In the third section, the relationships between the selected characteristics of the rooftop gardeners and their exposure to virtual agricultural channels broadcasted through YouTube.
- Lastly, the problems faced by the rooftop gardeners.

4.1 Rooftop Gardeners' Exposure to Virtual Agricultural Channels broadcasted through YouTube

The range of exposure scores of the respondents was 4 to 10 with the mean value 6.437 and standard deviation 1.549. Possible range was 1 to 12. The overwhelming majority (77.4%) of the respondents had medium exposure whereas 13.8 and 8.8 percent of them showed the highest and lowest exposure respectively to the virtual agricultural channels broadcasted through YouTube (Table 4.1).

Table 4.1 Distribution of the respondents based on their Exposure to virtual agricultural channels broadcasted through YouTube

Categoies	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No							
Low	1-4	7	8.8				
Medium	6-8	62	77.4	4	10	6.437	1.549
High	9-12	11	13.8				
Total		**80**	**100**				

4.1.1 Rank order of virtual agricultural channels broadcasted through YouTube

The respondents of the study exposed to four selected agricultural channels to different extent (Figure 4.1). The rooftop gardeners were highly exposed to Shekh Seraj (96.25%) and Dipto Krishi (89.58) while they were less exposed to Green Agriculture BD (12.04%) and BD krishi view (16.67%).

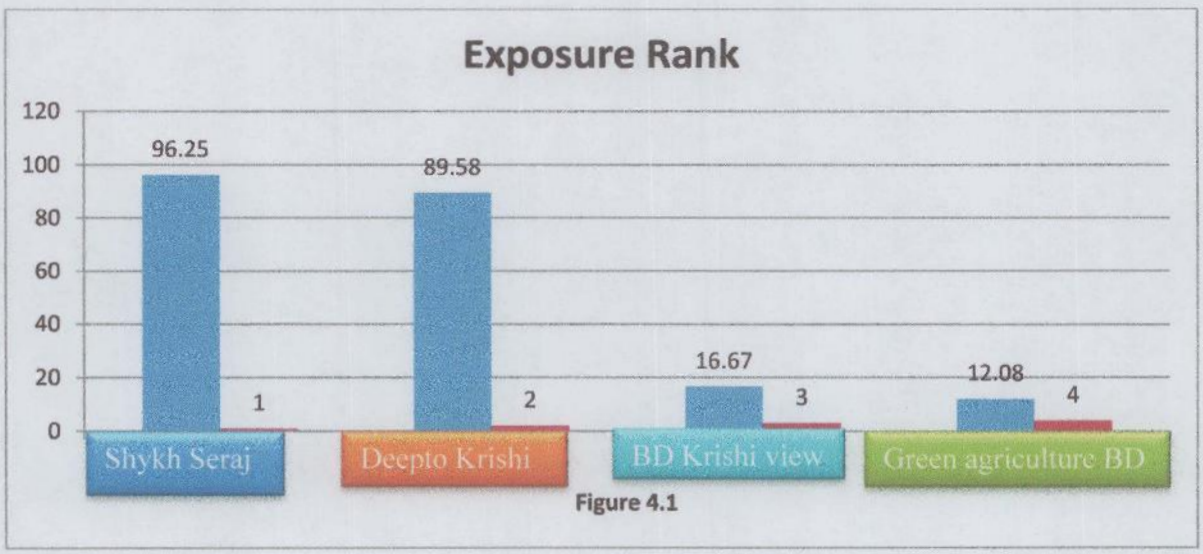


Figure 4.1

All of the rooftop gardeners were educated and exposed to virtual media. The respondents were highly exposed to Shykh Seraj and Deepto Krishi because their contents are understood easily. Especially Shykh Seraj dedicatedly make almost 300 episodes about rooftop gardening. There are many celebrities; ministers and important focus persons have shown their rooftop garden in

his episode. Many people become influenced by seeing his program and started own roof gardening. BD Krishi view and Green agriculture BD is not much popular because of their less content.

4.1.2 Effectiveness of the virtual agricultural channels broadcasted through YouTube The perceived effectiveness score ranged from 3-10 for the rooftop gardeners. The average effectiveness score was 6.287 and standard deviation was 1.468. According to the perceived effectiveness scores, rooftop gardeners were distributed into different categorized which is shown in Table 4.2.

Table 4.2 Distribution of the respondents based on their perceived effectiveness scores related to virtual agricultural channels broadcasted through YouTube

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min.	Max.		
Less effective	1-4	8	10				
Moderately effective	6-8	64	80	3	10	6.287	1.468
Highly effective	9-12	8	10				
Total		**80**	**100**				

Most (80%) of the respondents thought that the virtual agricultural channels broadcasted through YouTube are moderately effective. However one-tenth of the respondent thought that those channels are highly (10%) and less (10%) effective (Table 4).

4.1.2.1 Rank order of the virtual agricultural channels broadcasted through YouTube based on effectiveness index

The respondents of the study were exposed in four selected channels. Data of Table 4.3 show that Sheikh Sheraj was highly effective followed by Deepto Krishi. But BD Krishi view and Green agriculture BD are less effective from gardeners' perception point of view.

Table 4.3 Rank order of the virtual agricultural channels broadcasted through YouTube based on effectiveness index (EI)

Sl	Channel(s)	Effectiveness Index (EI)		Rank Order
		Score	Percentage	
1	Sheikh Sheraj	220	91.67	1
2	Deepto Krishi	204	85.00	2
3	BD Krishi view	43	17.91	3
4	Green agriculture BD	36	15.00	4

Content of the Sheikh Seraj (91.67%) was the most effective to the respondents. According to the respondents Sheikh Seraj dedicatedly make the content for his viewers. Some of the respondents thought Sheikh Seraj is the pioneer for rooftop gardening in Bangladesh. Many of the respondents got influenced by Sheikh Seraj and started their own rooftop gardening. Deepto Krishi (85%) is also effective to the respondents. BD Krishi view (17.91%) and Green agriculture BD (15%) were less effective to them for their few number of informative content.

4.1.3 Content Preference

The gardeners prefer a variety of content including land preparation, fertilizer application and organic fertilizer making, sowing and planting, pest and disease identification and treatment, application of pesticides, fungicides, and herbicides, intercultural operations, harvesting operations, roof management, etc. Data Table 4.4 show that the rooftop gardeners highly prefer content related to pest and diseases identification and treatments (93.5%) followed by irrigation and water management (92.75%), roof management showed the second high (92.75%), management of ornamental plants (85%,) pesticides, fungicides, herbicides application (78.5%), fertilizer application and organic fertilizer making (76.5%), land/pot soil preparation (64%), Sowing/ planting (54.5%), harvesting (25.5%) and intercultural operation (22.5%). Rooftop gardeners preferred informative content other than decorative influencing rooftop garden.

Table 4.4 Rank order of content preferred by the respondents

Content preference	Content Preference Index		Rank
	Score	Percentage	
1. Land preparation	256	64.00	6
2. Fertilizer application and organic fertilizer making	306	76.50	5
3. Sowing/ planting	218	54.50	7
4. Pest and diseases identification and treatments	374	93.50	1
5. Pesticides, fungicides, herbicides application	341	78.50	4
6. Intercultural operation	90	22.50	9
7. Harvesting operations	102	25.50	8
8. Roof management	371	92.75	2
9. Irrigation and water management	371	92.75	2
10. Management of ornamental plants	340	85.00	3

The respondents of rooftop gardeners showed highly content preference for to pest and diseases identification and treatments. Many of the rooftop gardeners become failed to identify pest and disease so that they preferred it highly. Irrigation and water management, roof management showed the second highly preferred issue as roof and water are very important to them. They were very interested to know and learn about the management of the issues. Ornamental plants have aesthetic value to the respondents so they also preferred it very much which is third in rank.

4.1.4 Other issues related to exposure to virtual media

4.1.4.1 Exposure to other virtual media except YouTube

The respondents' exposure to other virtual media except YouTube score varied from 2-12. The respondents were grouped into different categories according to exposure to other virtual media as shown in Table 4.5.

Table 4.5 Distribution of respondent (rooftop gardener) according to their contact with other virtual media except YouTube

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No							
Low	0-8	51	63.8				
Medium	9-16	29	36.2	2	12	7.375	2.285
High	17-24	0	0				
Total		**80**	**100**				

Majority (63.8%) of the respondents had low exposure to other virtual media except YouTube followed by medium exposure (36.2%).

4.1.4.2 Rank order of other virtual media except YouTube

The respondents were exposed a number of eight virtual media such as Facebook, WhatsApp, Instagram, Twitteer, TikTok, Snapchat, Likee, and LinkedIn in to different extent (Table 4.6). The respondents were highly exposed to Facebook (97.5%) followed by WhatsApp (76.25%), TikTok (34.58%), and Instagram 34.16%, while they were least exposed to Likee (0.41%) and twitter 2.91%. . Snapchat and Linkedin were not exposed by the respondents.

Table 4.6 Rank order of other virtual media except YouTube based on exposure index

Sl.	Virtual media	score	parcentage	rank
1	Facebook	234	97.5	1
2	WhatsApp	183	76.25	2
3	Instragram	82	34.16	4
4	Twitter	7	2.91	5
5	TikTok	83	34.58	3
6	Snapchat	0	0	7
7	Likee	1	0.41	6
8	Linkedin	0	0	7

4.2 Selected Characteristics of the Respondents

Fourteen characteristics of the rooftop gardeners were selected to find out their relationship with the exposure to Virtual Agricultural Channels broadcasted through YouTube. The selected characteristics included age, education, family size, garden size, annual income, farming experience, cosmopolitanism, innovativeness, organizational participation, training on rooftop gardening, knowledge level, attitude towards perceived ecosystem, extension media contact, effectiveness of selected channels etc. These characteristics of the rooftop gardeners have been described in this section.

4.2.1 Age

The respondents' age ranged from 20 to 82, with a mean age of 42.92and a standard deviation of 14.26. The distribution of the respondents by age categories is shown in Table 4.7.

Tables 4.7 Distribution of respondent rooftop gardeners according to their age

Categories	Score (Years)	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
Young	0-35	27	33.8				
Middle aged	36-50	27	33.8	20	82	42.92	14.26
Old aged	>50	26	32.5				
Total		**80**	**100**				

According to Table 4.3 young and middle aged people constituted the highest percentage (33.8%) and both of them have shared the equal percentage. Old people were 32.5% which was the nearest percentage like the previous ones. Usually young people are more enthusiastic about gardening and they are very much exposed to YouTube. Most of the young people do rooftop gardening as their passion. Middle aged people are doing by the social influence, pressure of peer group and own latent interest by seeing rooftop gardening in virtual media. Old aged people are doing as their recreation and time pass. Sheel et al., (2019) found that two-fifth (40%) of the respondents were in middle aged categories.

4.2.2 Level of Education

The respondents' level of education ranged from 7 to 23, with a mean of 14.125 and a standard deviation of 3.85. The distribution of the respondents by level of education categories is shown in Table 4.8.

Tables 4.8 Distribution of respondent rooftop gardeners according to their educational level

Categories	Score	Respondents (N=80)		Range		Mean	Standard Deviation
		Number	Percent	Min.	Max.		
Secondary	1-10	17	21.3				
Higher secondary	11-12	24	30				
Graduation	13-16	22	27.4	7	23	14.125	3.85
Above graduation	>16	17	21.3				
Total		**80**	**100**				

All of the respondents are educated having different level of education. However the highest proportion (30%) of the respondents possessed higher secondary level of education followed by graduation (27.4%), above graduation (21.3%) and secondary (21.3%) level of education. Most of the city dwellers are educated and day by day their interest is growing for rooftop gardening. Most of them are doing gardening with the concern to ecosystem. Sheel et al., (2019) found that

highest educated respondents (33.3%) were those with above bachelor degrees, followed by bachelor's degrees and higher secondary education (28.3% and 18.3%, respectively)

4.2.3 Family Size

Family size of the respondents ranged from 2-7, with a mean of 3.937 and standard deviation of 1.37. The distribution of the respondents according to their family size is shown in Table 4.9.

Table 4.9 Distribution of respondent rooftop gardeners according to their family size

Categories	Score	Respondents (N=80)		Range		Mean	Standard Deviation
		Number	Percent	Min.	Max.		
Small sized family	1- 4	55	68.8				
Medium sized family	5-6	21	26.2	2	7	3.937	1.37
Large sized family	>=7	4	5				
Total		**80**	**100**				

Data of Table 4.9 show that the majority (68.8%) of respondents belonged to small-sized families, whereas 26.2% and 2% of them respectively, belonged to medium-sized and large-sized families. The average family size of the study area (3.937) is less than that of national average (4.01; BBS 2022). This indicates that the respondents in the study area are aware of the issues related to family size and overpopulation. Most of the urban family is nuclear. The finding of the present study has harmony with the findings of Sheel, et al. (2019). She found that majority (55%) of the respondents had small sized family categories.

4.2.4 Rooftop garden Size

The observed rooftop garden size scores of the rooftop gardener (respondents) varied from 360 square feet to 3600 square feet. The average rooftop garden size was 1464 square feet and the standard deviation was 812.175. The distribution of the rooftop gardeners (respondents) according to their garden size is shown in Table 4.10.

Table 4.10 Distribution of respondent rooftop gardener according to their garden size

Categories (ft^2)	Score	Respondents (N=80)		Range		Mean	Standard Deviation
		Number	Percent	Min.	Max.		
Small sized garden	upto 1000	29	36.3	360	3600	1464	812.175
Medium sized garden	1001-2000	24	30				
Large sizd garden	>2000	87	33.7				
Total		**80**	**100**				

The findings of the study show that 36.3% of the rooftop gardeners had small sized garden which is under 1000 square feet followed by large(33.7%) and medium (30%) sized gardens.

4.2.5 Annual Family Income

The computed income of the rooftop gardeners ranged from 120 to 2400 thousands BDT (Bangladeshi Taka). The average income was 727.45 thousand BDT and the standard deviation was 449.26. The distribution of the rooftop gardeners (respondents) according to their annual income by categories is shown in Table 4.11.

Table 4.11 Distribution of rooftop gardener according to their annual income

Categories	Scores ('000 BDT)	Respondents (N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
Low income	≤1000	62	77.5	120	2400	727.45	449.26
Medium income	1001-1500	14	17.5				
High income	>1500	4	5				
Total		**80**	**100**				

According to Table 4.7 an overwhelming majority (77.5%) of the respondents belonged to the low income categories while the medium and high income categories of the respondents

constituted of 17.5% and 5% respectively. (Sheel et al., 2019) found that 41.7% of the respondents were from the high income category whereas low and medium categories of the respondents constituted 38.3% and 20% respectively.

4.2.6 Rooftop Gardening Experience

The score related to rooftop gardening experience of the respondents (rooftop gardeners) ranged from 1- 32 years with a mean of 7.35 years and standard deviation of 7.15. The distribution of the respondents according to their rooftop gardening experience by categories is shown in Table 4.12.

Table 4.12 Distribution of the rooftop gardener according to their gardening experience score

Categories	Scores	Respondents (N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
Low	1-15	72	90.0				
Medium	16-30	7	8.8	1	32	7.35	7.15
High	>30	1	1.2				
Total		**80**	**100**				

Data of Table 4.8 demonstrate that very few (1.2%) of the respondents were highly experienced whereas 8.8%% and 90.0% respondents were medium and low experienced respectively. Rooftop gardening is becoming popular in the recent days. Rooftop Agriculture is a challenging industry. In order to make the right judgment, one requires multiple sources of knowledge. An individual's rooftop gardening experience aids in his learning of new technology and may assist him/her make wise selections. Two-fifth (40%) of the respondent rooftop gardeners had low experience in rooftop gardening, while about one-third (33.3%) had high experience and 26.7% had medium experience (Sheel et al., 2019).

4.2.7 Cosmopolitanism

The cosmopolitanism scores of the respondents ranged from 0-8 with an average of 3.512 and a standard deviation of 2.233. The distribution of gardeners (respondents) according to their cosmopolitanism by categories is shown in Table 4.13

Table 4.13 Distribution of rooftop gardener according to their cosmopolitanism

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No	0	13	16.3				
Low	1-5	52	64.2				
Medium	6-10	15	18.7	0	8	3.512	2.233
High	11-15	0	0				
Total		**80**	**100**				

Data of Table 4.13 show that the majority (64.2%) of respondents had low levels of cosmopolitanism; while 18.7% of them had medium level of cosmopolitanism. None of the respondents belonged to high cosmopolitanism category. The majority of respondents (81.7%) fell under the low cosmopolitanism category, while 16.7% and 1.7% falling under the medium and no cosmopolitanism categories, respectively (Sheel et al., 2019).

4.2.8 Innovativeness

The score for innovativeness of the respondents was 1-5. The distribution of the respondents according to their innovativeness by categories is shown in Table 4.14.

Table 4.14 Distribution of respondents according to their innovativeness

Innovativeness	Score	Frequency	Percent
Innovators	5	8	10
Early adaptor	4	16	20
Early majority	3	13	16.2
Late majority	2	6	7.5
Laggard	1	37	46.3
Total		**80**	**100.0**

According to the data presented in Table 4.14, highest proportion (46.3%) of the respondents fell into the laggard categories while the lowest proportion (7.5%) fell in the late majority categories while early adaptor, early majority and innovators are 20%, 16.2% and 10% respectively.

The laggard gardeners claimed that their peer networks provided them with agricultural information on the roof, but the others obtained their cultural information from interpersonal,

group, and mass media sources. These findings would aid in the development of future extension programs for the dissemination of novel concepts.

4.2.9 Organizational participation

The observed organizational participation score of the rooftop gardeners ranged from 0 to 2 with a mean of 0.125 and standard deviation of 0.401. The distribution of the respondents according to organizational participation by categories is presented in Table 4.15.

Table 4.15 Distribution of the rooftop gardener according to their organizational participation

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No	0	72	90				
Low	1-5	8	10				
Medium	6-10	0	0	0	2	0.125	0.401
High	11-15	0	0				
Total		**80**	**100**				

According to the findings shown in Table 4.15, most (90%) of respondents fell into the no participation category and one-tenth (10%) of them fell into the low participation categories. None of the respondents fell in medium and high participation categories. Most of the respondents reported that lack of time and low interest are main causes for low participation in different organizations. The majority of responders (58.3%) had no participation in any organizations while two-fifth ((40%) and very few (1.7%) of respondents, had low and medium participation as reported by (Sheel et al., 2019).

4.2.10 Training on Rooftop Gardening

The observed training score of the rooftop gardeners were zero. None of the respondents had got any training for roof gardening (table 4.16). All of the respondents were uninterested about

training. The explanation of the respondents was that they were doing roof gardening on internet base information and all of their necessary information are available in virtual media.

Table 4.16 Distribution of respondents according to Training Exposure

Categories	Scores	Respondents (N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No	0	0	0				
Low	1	0	0				
Medium	2-3	0	0	0	0	0	0
High	≥ 4	2	0				
Total			**0**				

4.2.11 Knowledge of the Rooftop Gardeners

The computed knowledge scores of the respondents ranged from 6-10 with an average of 9.637 and a standard deviation 0.799 of against the possible range of 1-10. Based on their extent of exposure scores the respondent rooftop gardeners were classified into three categories (Table 4.17).

Table 4.17 Distribution of respondent rooftop gardeners according to their knowledge level of virtual agricultural channel broadcasted through YouTube

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
Low	1-5	0	0				
Medium	6-8	11	13.8	6	10	9.637	0.799
High	9-10	69	86.2				
Total		**80**	**100**				

According to Table 4.17 highest percentage of the respondents (86.2%) possessed high knowledge followed by medium knowledge (13.8%). Almost all of the roof gardeners are aware about rooftop gardening and highly knowledgeable. Sheel et al. (2019) reported that above three-fourths (76.7%) of the respondents had high knowledge on rooftop gardening while about one-fourth (23.3%) had medium knowledge on rooftop gardening.

4.2.12 Extension Media Contact

The range of scores on extension media contact was 5-21 against the possible range of 0-21. The average extension media contact was 12.1 and the standard deviation was 2.81. According to extension media contact scores, the respondents' distribution is shown in Table 4.18.

Table 4.18 Distribution of respondent rooftop gardeners according to their extension media contact

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
Low	1-7	0	0				
Medium	8-14	64	80	5	21	12.1	2.81
High	15-21	16	20				
Total		**80**	**100**				

Table 4.18 shows that most (80%) of the roof gardeners had medium extension contact compared to one-fifth (20%) of them maintained high extension contact. Rooftop gardeners gain knowledge and gather information from different extension media sources. Sheel et al. (2019) found that low extension contact behavior was demonstrated by two-thirds (66.7%) of respondents, followed by medium (23.37%) and high (8.3%).

4.2.13 Perceived Attitude towards Ecosystem Services of Rooftop Garden

Scores on perceived attitude towards ecosystem services of rooftop garden ranged from 106 to 127. The average attitude score towards ecosystem service was 121.1 with 4.541standard deviation. According to the scores on attitude towards ecosystem services of rooftop gardeners, the respondents were grouped into different categories as shown in Table 4.19.

Table 4.19 Showing categories of the respondents according to their response on perceived attitude ecosystem services

Categories	Score	Respondents (N=80)		Range		Mean	Standard Deviation
		Number	Percent	Min.	Max.		
Highly unfavorable	1-28	0	0				
Unfavorable	29-56	0	0				
Neutral	57-84	0	0				
Favorable	85-112	6	7.5	106	127	121.1	4.541
Highly favorable	113-140	74	92.5				
Total		**80**	**100**				

Most (92.5%) of the gardeners had highly favorable attitude and the rest (7.5%) of them had neutral attitude (Table 4.19). None of them had neutral, unfavorable and highly unfavorable attitude. Findings of the study indicate that all of the respondents showed the positive attitude towards ecosystem service of rooftop gardeners. According to (Sheel et al., 2019) , most (98.3%) of the respondents do rooftop gardening as a hobby and for aesthetic value (90%).

4.2.13.1 Rank order of the statements related to attitude towards ecosystem service

Data of Table 4.20 indicate that the respondents had very highly favorable attitude towards rooftop gardening as it "affords organic fruits and vegetables that prevent consuming chemically treated foods and reduce health risks" and which ranked first (97.25%). Most of the respondents shows the positive attitude towards perceived ecosystem services of rooftop gardening. Twelve statements secured above 90% score in the attitude towards perceived ecosystem services of rooftop gardening. Different flowers and ornamental plants of the rooftop garden helps celebrate different rituals and offer income by selling in the market shows 62.5% score with 20th rank which was the last rank of the 28 statements. The respondents expressed that gardening was their passion and was a recreation media for them. They were not interested in making money by selling the product in market and making money.

Table 4.20 Rank order of the respondent according to their attitude towards ecosystem service

Statements	Score	Percentage	Rank
1.Afford organic fruits and vegetables that prevent consuming chemically treated foods and reduce health risks	389	**97.25**	**1**
2.Cooling effect of the garden is effective in reducing the ambient temperature	349	87.25	10
3.Creates corridors of walking, cycling, and connecting people through roofs	370	92.5	5
4.Creates habitat for wildlife e.g. birds, butterflies, etc and enhances pollination	333	83.25	14
5.Different flowers and ornamental plants of the rooftop garden helps celebrate different rituals and offer income by selling in the market	250	62.5	20
6.Diversifying income opportunities: the creation of "green jobs"; safety nets in times of economic crisis	310	77.5	18
7.Enabling productive reuse of organic wastes, thereby reducing methane emissions from landfill and reducing energy use in the production of fertilizers	365	91.25	6
8.Enhancing carbon sequestration by planting trees in the roof garden	372	93	3
9.Enjoy distributing garden produces to relatives and neighbors that help to build strong social bonds among the community members	360	90	8
10.Farm work and gardening helps maintain physical and mental well-being	354	88.5	9
11.Fruits and vegetables produced in the rooftop garden meets the vitamins and nutrient requirements of the family members	367	91.25	6
12.Get many medicare facilities from different medicinal plants	362	90.5	7
13.Helps beautification of the environment, create peaceful moments, and supports mental relaxation and recreation	360	90	8
14.Improves utilization of area that is already in use and increase property value	348	87	12
15.Increase aesthetic experience through changing colors of living roofs	360	90	8
16.It has the potential to be used as teaching resources and natural laboratory	330	82.5	16
17.Mitigating land consumption, fragmentation, and soil sealing	331	82.75	15
18.Opportunities for children's play, exercise, visiting with friends, and	374	**93.5**	**2**

"taking a break"			
19.Opportunities for education, training, and social interactions	365	91.25	6
20.Opportunities for working with and solving social problems	334	83.5	13
21.Prolongation of the lifetime of the roof material through protection from UV radiation and reduction of surface temperatures on the roof and property value	348	87	12
22.Reducing energy requirements for heating and cooling by providing a layer of insulation on buildings	371	92.75	4
23.Reducing the urban heat island effect by increasing green surface areas	350	87.5	11
24.Rooftop garden is developed with numerous plant species that helps to restore agrobiodiversity, habitats, and nutrient cycling	356	89	8
25.Rooftop gardening potentially alters consumer diets towards low carbon foods and reduce the carbon footprint	290	72.5	19
26.Short-chain food provision and reducing "food miles" and carbon footprint	333	83.25	14
27.Small-scale and avoidance of monocultures minimize the incidence of pests	331	82.75	16
28.Use of rainwater for watering the garden and	326	81.5	17

4.3 Relationship between the Selected Characteristics of the Respondent Rooftop Gardeners and their Exposure to Virtual Agricultural Channel Broadcasted through YouTube

The Spearman's Ranked Correlation Coefficient (ρ) was utilized to determine the coefficient of correlation in order to examine the relationship between the respondents' selected characteristics and their exposure to Virtual Agricultural Channel Broadcasted through YouTube. The exposure to virtual agricultural channels broadcasted through YouTube was considered as the dependent or focus variable, while the characteristics of the rooftop gardeners were its independent variables.

Spearman's Ranked Correlation Coefficient (ρ) has been used to theorize and test the relationship between two variables. The 5% and 1% levels of significance were used as the justifications for adopting and rejecting a hypothesis, respectively. The tabulated value of "ρ" was calculated at (80-2) = 78 degrees of freedom. The summary of the results of the co-efficient of correlation indicating the relationships between the selected characteristics of the respondents and their exposure to virtual agricultural channels broadcasted through YouTube has been shown in Table 4.21.

Table 4.21 Relationship between the Selected Characteristics of the Respondent Rooftop Gardeners and their Exposure to Virtual Agricultural Channel Broadcasted through YouTube

Characteristics (Independent variables)	**Focus Variable (Dependent variable)**	**Correlation coefficient**
		Spearman (ρ)
1. Age	Extent of Exposure	-0.102 NS
2. Level of Education		-0.004 NS
3.Family Size		-0.167 NS
4. Rooftop garden Size		-0.006 NS
5. Annual family income		-0.182 NS
6. Rooftop gardening experience		-0.017 NS
7. Cosmopolitanism		0.282*
8.Innovativeness		0.134 NS
9. Organizational participation		-0.074 NS
10.Training on rooftop gardening		0.00
11. Knowledge		-0.014 NS
12. Attitude		-0.069 NS
13. Extension media contact		-0.114 NS

NS= non-significant **. Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed)

Among the 13 selected characteristics, only cosmopolitanism of the respondents showed a positive significant relationship with their exposure to virtual agricultural channel broadcasted through YouTube in rooftop gardening at 5% level (Table 4.21). It means that the higher is the cosmopolitanism of the respondents, the higher is their exposure to virtual agricultural channels broadcasted through YouTube. The finding has harmony with the finding of Hossain (2022). He found that cosmopoliteness of the respondents has positive significant relationship with their exposure to development communication tools of AIS.

Other eleven variables i.e. age, level of education, family size, rooftop garden size, annual income, rooftop gardening experience, organizational participation, knowledge, attitude, extension media contact had non-significant and negative relationship with their exposure to virtual Agricultural Channel Broadcasted through YouTube. Besides, respondents' innovativeness showed positive and non-significant relationship with their exposure to virtual Agricultural Channel Broadcasted through YouTube. As none of the respondents received any training that is why it has been excluded for exploring its relationship with respondents'exposure.

4.4 Problem confrontation

The observed problem confrontation scores of the rooftop gardeners ranged from 6 to 29. The standard deviation was 3.346, while the average score was 23.237. Based on problem confrontation scores, the respondents were distributed into the following three categories in Table 4.22.

Table 4.22 Distribution of respondent rooftop gardeners according to the problems confronted by them related to exposure to virtual agricultural channel broadcasted through YouTube

Categories	Score	Respondents(N=80)		Range		Mean	SD
		Number	Percentage	Min	Max		
No							
Low	0-10	1	1.2				
Medium	11-21	23	28.8	6	29	23.237	3.346
High	22-33	56	70				
Total		80	100				

Computed data of Table 4.22 show that majority (70%) of the respondents faced a high problem followed by medium (28.8%) and low (1.2%) problem.

4.4.1 Severity of Identified Problems

The respondents faced more or less faced problem were ranked according to their score of – problems to different extent. The shadow of the adjoining building hampers the production of the roof garden is the most severe problem (91.67%) among the problems faced by the rooftop gardeners. The shadow of the adjoining building hampers the production of the roof garden by making hindrance for photosynthesis of plants grown in rooftop garden. If there is less photosynthesis there is less food production. As a result the production of the plant will be reduced. Sufficient time is not available to maintain the garden (90%) is the 2nd rank problem. City life is a busy life for the people so the respondents has a less time for rooftop gardening.

Table 4.23 Rank order of the respondent rooftop gardeners according to the problems confronted

Sl	Problem statements	Score	Percentage	Rank
1.	Lack of notification of video upload.	33	13.75	11
2.	High price of android mobile.	173	72.08	8
3.	Possibility of damage of roof due to fallen leaves decomposition	198	82.5	4
4.	Lack of space and sufficient knowledge.	181	75.41	6
5.	Sufficient time is not available to maintain the garden.	216	90	2
6.	Clear idea about planting materials.	129	53.75	10
7.	The shadow of the adjoining building hampers the production of the roof garden	220	91.67	1
8.	The fallen leaves of the tree make the roof dirty so the roof has to be cleaned regularly	205	85.41	3

9.	There is no proper training and technical guidance by the Department of Agricultural Extension (DAE)	141	58.75	9
10.	Possibility of damages caused by children, pets, and thieves	186	77.5	5
11.	Different kinds of birds disturb the garden by eating small vegetables and fruit trees	177	73.75	7

The fallen leaves of the tree make the roof dirty so the roof has to be cleaned regularly (85.41%) was the 3rd rank problem. Especial management of the roof is necessary for rooftop gardening. Possibility of damage of roof due to fallen leaves decomposition (82.5%) was the 4th rank in the problem configuration. Roof may be damaged by damp of the water and lack of proper care of the roof. Possibility of damages caused by children, pets, and thieves (77.5%) ranked 5th , Lack of space and sufficient knowledge (75.41%)ranked 6th , Different kinds of birds disturb the garden by eating small vegetables and fruit trees (73.75%) ranked 7th, High price of android mobile (72.08%) ranked 8th, There is no proper training and technical guidance by the Department of Agricultural Extension (DAE) (58.75%) ranked 9th, Clear idea about planting materials (53.75%) ranked 10th , Lack of notification of video upload (13.75%) ranked 11th .

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

At present, rooftop gardening is very popular for its provided fresh and healthy vegetables and fruits. Beside these, it has environmental, economical and social benefits, important key to any production process of any plants aspects. Considering the point of view the present study will be conducted with the following objectives.

- To determine gardeners' exposure to Virtual agricultural channels broadcasted through YouTube for seeking information on rooftop gardening.
- To identify the nature of information disseminated by the selected channels.
- To explore relationships between the selected characteristics of the gardeners and their exposure to Virtual agricultural channels broadcasted through YouTube in relation to rooftop gardening.
- To identify the problems faced by the respondents in exposing to Virtual agricultural channels broadcasted through YouTube.

Data were collected from purposively selected 80 gardeners of Sonadanga and Nirala residential area in Khulna City Corporation using a pretested interview scheduled by face to face interview during January to February, 2023. Data was described statistically using terms like number, percent, range (minimum, maximum), mean, standard deviation, etc. Spearman's Product Moment Correlation (ρ) was used to determine the relationship between the independent and dependent variables.

5.2 Summary of Findings

The overwhelming majority (77.4%) of the respondents had medium exposure whereas 13.8 and 8.8 percent of them showed the highest and lowest exposure respectively to the virtual agricultural channels broadcasted through YouTube. The rooftop gardeners were highly exposed to Shekh Seraj (96.25%) and Dipto Krishi (89.58) while they were less exposed to Green Agriculture BD (12.04%) and BD krishi view (16.67%).

Most (80%) of the respondents thought that the virtual agricultural channels broadcasted through YouTube are moderately effective. However one-tenth of them thought that those channels are highly (10%) and less (10%) effective. Sheikh Sheraj was highly effective followed by Deepto Krishi. But BD Krishi view and Green agriculture BD are less effective from gardeners' perception point of view.

The rooftop gardeners highly prefer content related to pest and diseases identification and treatments (93.5%) followed by irrigation and water management (92.75%), roof management (92.75%), management of ornamental plants (85%,) pesticides, fungicides, herbicides application (78.5%), fertilizer application and organic fertilizer making (76.5%), land/pot soil preparation (64%), Sowing/ planting (54.5%), harvesting (25.5%) and intercultural operation (22.5%).

Majority (63.8%) of the respondents had low exposure to other virtual media except YouTube followed by medium exposure (36.2%). The respondents were highly exposed to Facebook (97.5%) followed by WhatsApp (76.25%), TikTok (34.58%), and Instagram 34.16%, while they were least exposed to Likee (0.41%) and twitter 2.91%. . Snapchat and Linkedin were not exposed by the respondents. Young and middle aged people constituted the highest percentage (33.8%) and both of them have shared the equal percentage. Old people were 32.5% which was the nearest percentage like the previous ones. All of the respondents are educated having different level of education. However the highest proportion (30%) of the respondents possessed higher secondary level of education followed by graduation (27.4%), above graduation (21.3%) and secondary (21.3%) level of education. Majority (68.8%) of respondents belonged to small-sized families, whereas 26.2% and 2% of them respectively, belonged to medium-sized and large-sized families. The average family size of the study area (3.937) is less than that of national average. The findings of the study show that 36.3% of the rooftop gardeners had small sized garden which is under 1000 square feet followed by large (33.7%) and medium (30%) sized gardens. An overwhelming majority (77.5%) of the respondents belonged to the low income categories while the medium and high income categories of the respondents constituted of 17.5% and 5% respectively.

Very few (1.2%) of the respondents were highly experienced whereas 8.8%% and 90.0% respondents were medium and low experienced respectively. Majority (64.2%) of respondents had low levels of cosmopolitanism; while 18.7% of them had medium level of cosmopolitanism.

None of the respondents belonged to high cosmopolitanism category. Highest proportion (46.3%) of the respondents fell into the laggard categories while the lowest proportion (7.5%) fell in the late majority categories while early adaptor, early majority and innovators are 20%, 16.2% and 10% respectively. Most (90%) of respondents fell into the no participation category and one-tenth (10%) of them fell into the low participation categories. None of the respondents fell in medium and high participation categories. None of the respondents had got any training or roof gardening. Highest percentage of the respondents (86.2%) possessed high knowledge followed by medium knowledge (13.8%). Most (80%) of the roof gardeners had medium extension contact compared to one-fifth (20%) of them maintained high extension contact. Most (92.5%) of the gardeners had highly favorable attitude and the rest (7.5%) of them had neutral attitude.

Among the 13 selected characteristics, only cosmopolitanism of the respondents showed a positive significant relationship with their exposure to virtual agricultural channel broadcasted through YouTube in rooftop gardening at 5% level.

Majority (70%) of the respondents faced problem problems followed by medium (28.8%) and low (1.2%) problem.

5.3 Conclusion

- The exposure of the gardeners was highly satisfactory as most (91.2%) of the respondents had medium to high exposure to the virtual agricultural channels broadcasted through YouTube.
- The rooftop gardeners were highly exposed to Shekh Seraj (96.25%) and Dipto Krishi (89.58) while they were less exposed to Green Agriculture BD (12.04%) and BD krishi view (16.67%).
- Most (80%) of the respondents thought that the virtual agricultural channels broadcasted through YouTube are moderately effective. However one-tenth of them thought that those channels are highly (10%) and less (10%) effective.
- Sheikh Sheraj was highly effective followed by Deepto Krishi. But BD Krishi view and Green agriculture BD are less effective from gardeners' perception point of view.

- The rooftop gardeners highly prefer content related to pest and diseases identification and treatments (93.5%) followed by irrigation and water management (92.75%), roof management (92.75%), management of ornamental plants (85%,) pesticides, fungicides, herbicides application (78.5%), fertilizer application and organic fertilizer making (76.5%), land/pot soil preparation (64%), Sowing/ planting (54.5%), harvesting (25.5%) and intercultural operation (22.5%).
- Among the 13 selected characteristics, only cosmopolitanism of the respondents showed a positive significant relationship with their exposure to virtual agricultural channel broadcasted through YouTube in rooftop gardening at 5% level.

5.4 Recommendations for policy implication

The findings of the study will play an important role for the policy makers and extension practitioners for policy formulation regarding the dissemination of agricultural information using social media platform.

5.5. Recommendations for further study

A limited amount of research cannot give sufficient details for an accurate comprehension of the exposure to virtual agricultural channel broadcasted through YouTube. There have been several gaps in the research on rooftop gardening. The current study has limitations that must be acknowledged. The following suggestions for additional research are provided in light of the reach and constraints of the current study and observation:

- The study solely covered the Nirala and Sonadanga R/A Khulna City Corporation. It should be necessary to do similar investigations in other cities of Bangladesh.
- The influence of green roofs on ambient air constituents including O2, CO2, SO2, NO, NO2, NOx, CO, and dust particles could not be measured in the current investigation. To find many repercussions related to diverse climatological and material components, more research is needed.

- Although many buildings held plants on balconies, the research's major focus is on roof gardens. Therefore, more research should be required when taking balcony gardens into account.

CHAPTER VI

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APPENNDIX-A

Agrotechnology Discipline

Life Science School

Khulna University, Khulna-9208

Interview Schedule

(English version of the questionnaire)

Gardeners' Exposure to Virtual Agricultural Channels Broadcasted through YouTube in Relation to Rooftop Gardening

(Confidentially will be maintained and all information will be used only for study purpose)

Sample no.....

Name:.....

Address:

a. Area.....
b. Road no.....
c. House no.....
d. Word no.....
e. Contact no.....

Gardeners' Exposure to Virtual Agricultural Channels Broadcasted through YouTube in Relation to Rooftop Gardening

(Confidentially will be maintained and all information will be used only for study purpose)

Sample no.....

Name:.....

Address:

a. Area.....
b. Road no.....
c. House no.....
d. Word no.....
e. Contact no.....

1. Age (years):

2. Level of Education (years) ☐

Number of educational years……..

3. Family size (number of family membe

4. Rooftop Garden size:

Sl no.	Type of rooftop	Area	
1.	Garden under own cultivation	Local unit (katha)	Squre ft
2.	Garden under share cultivation		
4.	Garden under rent (gardener's lives in rent)		
5.	Others		

5. Income of the respondents …… (tk/year)

6. Rooftop Gardening experience:…… (years)

How long experiences do you have in gardening?..... (years)

7. Cosmopolitanism: please state your frequency of visits outside of your own area to the following places:

Sl No	Place of visit	Extent of visit			
		Frequently(3)	Occasionally(2)	Rarely (1)	Not at all (0)
1	Other rooftop garden of own area				
2	Rooftop garden of other area				
3	Rooftop garden in Dhaka City				
4	Nearby NGO office				
5	Other cities (Barisal, Rajshahi, Sylhet, Rangpur, Chottogram)				

8. Innovativeness

Kindly furnish your innovativeness by putting (√) against the following with which you are agree.

Sl no.	Statement	Tick mark
1.	As soon as it come to my knowledge, I have adopted the Innovation.	
2.	Having seen the success of others, I have adopted the Innovation.	
3.	I adopt innovation to see my peers who have already adopt technology.	
4.	I adopt technology by the pressure of my peers group.	
5.	I prefer to wait before adoption of innovation.	

9. Organizational participations:

A) Are you involved in any organization? Yes ( ) /No ( )

B) If yes, then answer the following question:

Serial	**Name of the organization (Non-political)**	**Extent of involvement**				**Duration (year)**
		No involvement (0)	General member (1)	Executive member (2)	Excecutive officer (3)	
1	Youth organization					
2	Gardener club					
3	Committee (mosque/temple/church/mondir)					
4	Institutional organization (other than NGO and GO)					
5	NGO maintained association					
6	GO maintained association					
7	Other (specify)					

10. Training exposure:

Have you exposed to training schedule agriculture of rooftop gaedening.

'Yes' or 'No' If yes, provide the following information.

Serial No.	Tittle of training (s)	Duration (days)	Venue of training	Organized by
1.				
2.				
3.				

11. Knowledge of the rooftop gardener.

Sl no.	Statement	Mark assign	Obtain mark
1.	Do you know about the environmental benefit from rooftop gardening?		
2.	What kind of information provided by virtual channels broadcasted through YouTube about rooftop gardening?		
3.	Can you tell two YouTube channels name about rooftop gardening?		
4.	What type of information is provided by Shikh Seraj?		
5.	What do you like most about the episode of "shadekrishi''		

12. Perceived Attitude Ecosystem Services of Rooftop Garden

(SA=Strongly agree, A= Agree, UK=Unknown, DA=Disagree, SDA=Strongly disagree)

Services	Response				
	SA (5)	A (4)	UK (3)	DA (2)	SDA (1)
1.Afford organic fruits and vegetables that prevent consuming chemically treated foods and reduce health risks					
2.Cooling effect of the garden is effective in reducing the ambient temperature					
3.Creates corridors of walking, cycling, and connecting people through roofs					
4.Creates habitat for wildlife e.g. birds, butterflies, etc and enhances pollination					
5.Different flowers and ornamental plants of the rooftop garden helps celebrate different rituals and offer income by selling in the market					

6.Diversifying income opportunities: the creation of "green jobs"; safety nets in times of economic crisis					
7.Enabling productive reuse of organic wastes, thereby reducing methane emissions from landfill and reducing energy use in the production of fertilizers					
8.Enhancing carbon sequestration by planting trees in the roof garden					
9.Enjoy distributing garden produces to relatives and neighbors that help to build strong social bonds among the community members					
10.Farm work and gardening helps maintain physical and mental well-being					
11.Fruits and vegetables produced in the rooftop garden meets the vitamins and nutrient requirements of the family members					
12.Get many medicare facilities from different medicinal plants					
13.Helps beautification of the environment, create peaceful moments, and supports mental relaxation and recreation					
14.Improves utilization of area that is already in use and increase property value					
15.Increase aesthetic experience through changing colors of living roofs					
16.It has the potential to be used as teaching resources and natural laboratory					
17.Mitigating land consumption, fragmentation, and soil sealing					
18.Opportunities for children's play, exercise, visiting with friends, and "taking a break"					
19.Opportunities for education, training, and social interactions					
20.Opportunities for working with and solving social problems					
21.Prolongation of the lifetime of the roof material through protection from UV radiation and reduction of surface temperatures on the roof and property value					
22.Reducing energy requirements for heating and cooling by providing a layer of insulation on buildings					
23.Reducing the urban heat island effect by increasing green surface areas					
24.Rooftop garden is developed with numerous plant species that helps to restore agrobiodiversity, habitats, and nutrient cycling					

25.Rooftop gardening potentially alters consumer diets towards low carbon foods and reduce the carbon footprint					
26.Short-chain food provision and reducing "food miles" and carbon footprint					
27.Small-scale and avoidance of monocultures minimize the incidence of pests					
28.Use of rainwater for watering the garden and					

13. Extension media contact (score)

Please state where you get the information about rooftop gardening.

Sl No.	Communication media	Frequency of contact			
		Regularly (3)	Often(2)	Occasionally (2)	Not at all (0)
A.	**Group media contact**				
1.	Different family function				
2.	Krishi mela				
C.	**Mass media contact**				
1.	Television				
2.	Radio				
3.	Internet/Web media				
D.	**Printed materials**				
1.	Newspaper				
2.	Mezagin				

14. Exposure to different virtual media related to agriculture:

Sl.	Virtual media	Nature of Participation			
		Regularly(3)	Occasionally(2)	Rarely(1)	Not at all(0)
1	Facebook				
2	WhatsApp				
3	Instragram				
4	Twitter				
5	TikTok				
6	Snapchat				

7	Likee				
8	Linkedin				

15. Do you watch or enjoy Agricultural related channel in YouTube: Yes of No

If yes, what channels do you watch in YouTube and mention the frequency of watching?

Sl.	Name of the YouTube channel	Exposure to the selected channel				Effectiveness			
						Highly effective (3)	Medium effective (2)	Less effective (1)	Not at all effective (0)
		Often (3)	Occasionally (2)	Rarely(1)	Not at all(0)				
1	Sheikh Sheraj								
2	Deepto Krishi								
3	BD Krishi view								
4	Green agriculture BD								

16. Content preference

Please check the content which do you will adjust to your vector to be broadcast through virtual agricultural channel.

Types of content	Order of preference				
	Very much (5)	Much (4)	Medium (3)	Less (2)	Very less (1)
1.Soil preparation					
2. Fertilizer application and making organic fertilizer					
3. sowing/ planting					
4. pest and diseases identification and treatments					
5. pesticides, fungicides, herbicides application					
6. intercultural operation					
7. harvesting					
8. roof management					
9. irrigation and water management					
10.taking care of ornamental plant					

17. Problem configaration

Sl no	Problems statements	Frequency of problem			
		Highly	Moderately	Less	Not at all
1.	Lack of notification of video upload.				
2.	High price of android mobile.				
3.	Possibility of damage of roof due to fallen leaves decomposition.				
4.	Lack of space and sufficient knowledge.				
5.	Sufficient time is not available to maintain the garden.				
6.	Clear idea about planting materials.				
7.	The shadow of the adjoining building hampers the production of the roof garden				
8.	The fallen leaves of the tree make the roof dirty so the roof has to be cleaned regularly				
9.	There is no proper training and technical guidance by the Department				