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***RESEARCH ARTICLE***

# PRESENT STATUS AND PROSPECTS OF ROOFTOP FARMING IN KATHMANDU CITY

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**ABSTRACT**

Rooftop farming is the cultivation of different food crops in the roof of buildings which is usually done in the city areas where there is scarcity of open agricultural land. Rooftop farming is the best techniques to promote healthier environment and food in city areas. Among the different problems of rooftop farming; major are heavy rainfall, occurrence of diseases and pest, soil loss, lack of improved practices and poly tunnel. These factors restricted the House Holds (HH) to adopt rooftop farming technology. In this study, the focus was especially given to study the status and feasibility of rooftop farming in Kathmandu city. Specifically, this research tried to understand perception of people towards rooftop farming and to identity the major factors affecting rooftop farming, and its significance during covid-19 pandemic. Chandragiri and Tarakeshwar area of Kathmandu city were purposively selected for the study. Out of sample population 50 rooftop farmers were selected, 36 from Chandragiri and 14 from Tarakeshwar by random sampling technique sample size proportion to the population size. The total respondents were 50, out of which 2% were male and 98% were female having 67.27m$^2$ average area for rooftop cultivation. 96% respondents were satisfied from vegetable and fruit rooftop. The major problem was wilting having 2.09 mean weightage on Likert scale. The average total input cost was NRS. 7044. 76% respondents were using organic manure and biological control for diseases and pests. 14% of the respondents were facing input supply problem during Lockdown.

**KEYWORDS**

Agricultural Land, Poly Tunnel, Population, Likert Scale, Lockdown

## 1. INTRODUCTION

### 1.1 Background

Rooftop farming is the cultivation of fresh produce on the top of the buildings usually known as *kaushi kheti.* It allows for completely organic form of farming. It increases the availability of healthier and nutritious food in the city area and promotes local production. Various off season products can be produced under suitable controlled conditions. It is found that air pollution has been reduced in local areas surrounding rooftop gardens. In the recent time most of the household in the city areas have been seen readily doing planting in their roofs and terraces for their household. It makes the environment healthier promotes quality air and easily provides fresh and organic food products. Sometimes worn out town areas where there's no adequate agricultural lands. Rooftop gardens Rooftop farming is that the cultivation of various food crops within the roof of buildings which is provide nutritious food all-round the year sufficient for both high income and low-income households.

A large range of fruits and vegetables like spinach, cucurbits, cauliflower, citrus, tomatoes, garlic, onions, guava, strawberries, herbs and spices is grown on vacant spaces on the rooftops. Rooftop farming comprises of varied techniques like Aeroponic Agriculture (agriculture exhausted the air without soil), Hydroponic Agriculture (agriculture worn out a nutrient solution without using soil) and traditional agriculture (agriculture tired soil). The plants are kept on container pots, fish crates (foams), drums, plastic jars, bottles and plastic bags. Moreover, the full off the ground is crammed with soil for higher density planting by waterproofing the concrete roof. Coco peat, vermiculite, perlite, rice hulls and sand will be an alternate for the regular garden soil as they're more stable, water retaining and of lighter weight content (Paudyal and Parajuli, 2020).

It is estimated that the planet urbanization will increase to 69% by 2050 where urban citizens will 86% within the more developed regions and 66% within the less developed regions of the world's population. This disturbs the ecological equilibrium and therefore the relationship between nature & human beings. (Deelstra and Girarardet, 1999). Rooftop gardens and greenhouses are situated on the highest of homes or industrial buildings and represent an innovative alternative for promoting self-sufficiency and native living roofs and, eco-roofs by utilizing underused roof structures. Generally, in an exceeding rooftop garden, the roof of the building is roofed with substrate into which shrubs, trees and other plants are grown, and these roofs are called roof gardens. The primary rooftop garden was developed in Germany to enhance aesthetics. By the year 1996, one out of ten roofs were made green in Germany while 70% of apartment roofs were made green in Switzerland.

At present, rooftops are getting used worldwide for several purposes, like in Singapore, where rooftops are used for cooling and to scale back energy consumption. In Berlin, urban rooftop greenhouses are used as they're energy-efficient, depend upon local resources, and have social and academic aspects. Likewise, in port, there are lots of projects adding green rooftops to many governments, public, and faculty buildings for many years, Kathmandu has faced high numbers of immigrants from rural areas seeking better living facilities and employment opportunities (Khan and Akram, 2020). The 10-year-old conflict within the geographic area has forced quite 10,000 people to migrate to the Kathmandu Valley which is anticipated to determine further increase in coming years. In keeping with the 2011 census, Kathmandu Valley is home to 2.5 million people and Kathmandu district is that the most rapidly growing district in terms of population at 4.76 percent per annum in the country.

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About 2.5 million people within the valley, over 1 million board Kathmandu Metropolitan City, while the remainder sleep in four other municipalities and therefore the surrounding peri-urban areas. Rooftop gardens may thus have positive impacts on ambient and home temperatures, reducing heating and cooling requirements and thus reducing emissions and save costs, improve aesthetic value and air quality. Rooftop farming (RTF) has been introduced in Kathmandu as another solution to managing urban waste and wastewater through recycling and reusing organic waste and grey water generated at household level since RTF was initiated by the Kathmandu Metropolitan City (KMC) with technical support of development agencies - Environment and Public Health Organization (ENPHO) and Institute for Social and Environmental Transformation Nepal (ISETNepal). It had been found that 34% of the households in KMC are practicing some form of kitchen gardening and rooftop farming. Hence, it was assumed that these households will culturally accept RTF and thus total rooftop farming area in KMC was estimated to be 5.7 sq. km (Shakya and Shrestha, 2017).

### 1.2 Statement of Problems

Population of Kathmandu valley is increasing; hence there is lack of sufficient area for farm cultivation. Thus, import of product is more although the rooftop farming system is increasing day by day, but there is insufficient production to meet their demand. Its problem including improper cultivation practices, heavy rainfall management, fertilizer management and occurrence of disease and pest. The need of the study is to know about the status and prospects of rooftop farming in Kathmandu valley of Nepal. To fulfill the production deficit, products are imported from outside market. Considering this, the study was designed to address following questions:

- What is the present status of rooftop farming in Kathmandu city?
- What are the prospects of rooftop farming in Kathmandu city?
- What are the problems related to rooftop farming and their solution in farmers' view?
- What is the production cost in rooftop farming?
- What are the positive and negative impacts of rooftop farming during lockdown?

### 1.3 Rationale of The Study

The research is social science type which can reflect actual condition of urban Nepalese agriculture. Rooftop farming is done in some urban society but it is significant almost everywhere. Rooftop farming cannot replace natural habitat but they can be designed to be acceptable and extremely protected alternatives. The study will provide guidance to policy maker, government, non-government organization as well as to identify the ways to improve environment quality in urban areas through project planning. It will also be helpful in reduction of vegetables and flowers produced by the use of excessive chemical fertilizers, insecticides and pesticides. The overall objectives of this research is to make survey on status and prospect study of rooftop farming.

### 1.4 Objectives

General Objectives:

- To study the status and prospects of rooftop farming in Kathmandu.

Specific Objectives:

- To understand perception of peoples towards rooftop farming.
- To identify the major factor affecting promotion of rooftop farming.
- To understand the production cost in rooftop farming.
- To understand the organic potential of rooftop farming.
- To study lockdown impact during Covid-19 pandemic on rooftop farming.

## 2. Materials and Methodology

### 2.1 Selection of the Study Site

A survey on status and scope of rooftop farming was carried in Kathmandu district. In KMC we found high density of rooftop farming households with high involvement of private organizations like Sarbodaya and Caritas Nepal in Chandragiri and Tarakeshwar Municipality. So, Purposive selection of Tarakeshwar and Chandragiri Municipality as a Research site was done. Kathmandu lies in the mid hill of Nepal at an elevation of 1400m above sea level at 27º42"14" N and 85º18"31" E. The map Kathmandu district showing the study site is presented in figure 1.

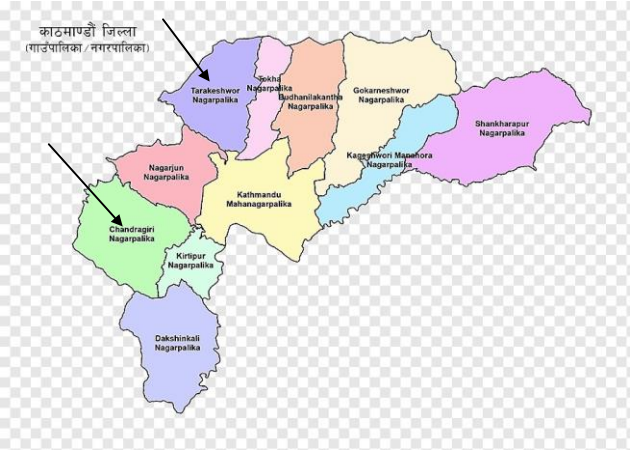


**Figure 1:** Figure showing Chandragiri and Tarakeshwar Municipality

### 2.2 Population and Sample

#### 2.2.1 *Selection and Respondent Farmers*

All the rooftop growing households of Chandragiri and Tarakeshwar Municipality were considered as a sampling frame for this research. Population density of Chandragiri was higher than Tarakeshwar Municipality. Selection was done based on sample size proportional to population size. Hence, 36 respondents were selected randomly from Chandragiri municipality in sampling frame of 100, while 14 respondents were selected randomly from Tarakeshwar Municipality in a sampling frame of 44. Around 35% rooftop growing households of the study population was taken as sample as shown in table 1.

**Table 1:** Sampling Frame of the study

| Municipality | Sampling Frame | No. of Respondents |
|---|---|---|
| Chandragiri | 100 | 36 (36%) |
| Tarakeshwar | 44 | 14 (31.8%) |

(Source: Telephone Survey, 2021)

### 2.3 Sources of Data

#### *2.3.1 Primary Data*

The pre-tested interview schedule was conducted. Primary data were obtained through telephone survey for understanding cultivated area, production and production cost, existing problems and adopted solutions, perception, lockdown impact and so on.

#### *2.3.2 Secondary Data*

The secondary information was obtained through reviewing different report published by organizations like Sarbodaya and Caritas Nepal. Similarly, the source of secondary information as also the Agriculture Knowledge Centre, Lalitpur.

### 2.4 Survey Design and Data Collection Procedure

#### *2.4.1 Interview Schedule Design*

Interview schedule was prepared for the collection of Primary data from farmers. A coordination schema was prepared to identify variables and interview schedule was prepared accordingly. The major variables included in interview schedule were household, socioeconomics characteristics, rooftop characteristics, production, farmer's perception and lockdown impact and farm access to information and support services regarding rooftop farming.

#### *2.4.2 Pre-Testing*

The pre-testing of the interview schedule was carried out on 8 rooftop growers outside the study area through telephone survey. The required correction of schedule was done accordingly.

#### 2.4.3 Telephone Survey

The telephone survey was conducted during 2oct 2021 to 27oct 2021. The respondents were interviewed by telephone in daytime. The timing of interview was adjusted based on respondent's convenience. Regular checking & validation of info was done immediately after filling the interview schedule.

### 2.5 Methods and Techniques of Data Analysis

The collected data were edited, and local units of measurement were standardized into scientific one. Socio-demographic variation like sex, distribution, occupation, education level, building area, etc. and rooftop characteristics like production & production cost, techniques adopted, etc. were analyzed by using descriptive tools like frequencies percentage, means, mode, standard deviation, Likert scale wherever applicable.

## 3. Results and Discussion

### 3.1 Household and Farm Characteristics

#### 3.1.1 Population Distribution

Majority of the respondents were from Chandragiri (72%) followed by Tarakeshwar (28%). The majority of respondents were female (98%), this result seems that the female being housewife were involved in rooftop farming and feel comfortable in sharing the information.

**Table 2:** Distribution of Population of The Respondents by Gender and Location

| Gender | Chandragiri | Tarakeshwar | Total |
|---|---|---|---|
| Male | - | 7.14% | 2% |
| Female | 100% | 92.86% | 98% |
| Total | 72 % | 28% | 100% |

(Source: Telephone Survey, 2021)

#### 3.1.2 Respondents' Religion and Ethnicity

Majority of the respondent were Hindu (90%) followed by Buddhist (10%). Similarly, the ethnicity of the respondent was Brahmin (40%), Chhetri (20%) and Janjati (40%) representing mixed combination by ethnicity and religion.

**Table 3:** Distribution of The Respondents by Religion and Ethnicity

| Variables | Percentage |
|---|---|
| Religion | |
| Hindu | 90 |
| Buddhist | 10 |
| Ethnicity | |
| Brahmin | 40 |
| Chhetri | 20 |
| Janjati | 40 |
| Total | 100 |

(Source: Telephone Survey, 2021)

#### 3.1.3 Years of Schooling of Respondent in The Study Area

Majority of the respondent (54%) were with 13-16 years of schooling, followed by 9-12 years of schooling (28%) and only 8% of the respondent were illiterate.

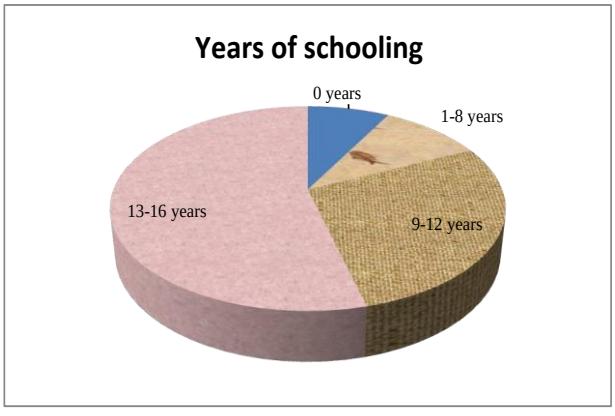


**Figure 2:** Years of schooling of respondent in the study area

#### 3.1.4 Occupation

Government job (32%) was the major occupation of the respondent followed by Business (28%) and only 4% of the respondent had the occupation as agriculture. This result showed the speed of the urbanization occurring in the Kathmandu valley that result in decrease in the total land for cultivation.

**Table 4:** Occupation of The Respondents

| Occupation | Frequency | Percentage (%) |
|---|---|---|
| Agriculture | 2 | 4 |
| Business | 14 | 28 |
| Government Job | 16 | 32 |
| Non-Government | 6 | 12 |
| Abroad | 5 | 10 |
| Others | 7 | 14 |

(Source: Telephone Survey, 2021)

#### 3.1.5 Gender of The Respondents

The majority of respondents were female (98%), this result seems that the female being housewife were involved in rooftop farming and feel comfortable in sharing the information.

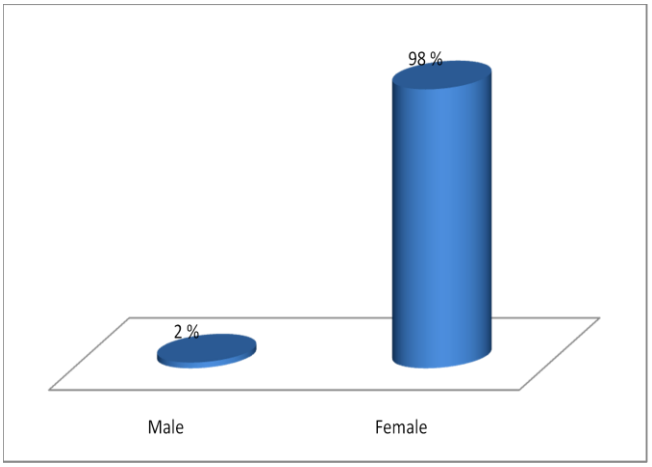


**Figure 3:** Gender of the respondents (Source: Telephone Survey, 2021)

#### 3.1.6 Average Annual Income of Household

The average annual income of household was NRs. 587300. This showed that the respondents were of good economic condition and can afford the basic material required for rooftop farming.

### 3.2 Area of Roof and Area of Cultivation

The minimum and maximum area of roof and area of cultivation were 17 and 15: 154.98 and 127.18 respectively (Table 4). In average out of 111.34 of roof area, 67.27 (60.41% of roof area) was found to be used for cultivation. About 68% of the respondent uses land other than rooftop for cultivation. In average 1.68 people were found to involved in roof top farming.

**Table 5:** Area of Roof and area of cultivation

| Description | Minimum | Maximum | Mean |
|---|---|---|---|
| Area of Roof | 17 | 154.98 | 111.34 |
| Area of Cultivation | 15 | 127.18 | 67.27 |

(Source: Telephone Survey, 2021)

### 3.3 Cultivating Materials

The cultivating material was different with different respondent. Only 6% of the respondent response positive for roof soil as cultivating material. Similarly, 96%, 26%, 6%, 40% of the respondent response positive for Vessels, crates, jars and other material as cultivating materials respectively.

| **Table 6:** Response to Cultivating Materials by Respondent | |
|---|---|
| **Variables (n=50)** | **Percent** |
| Roof soil | |
| Yes | 6 |
| No | 94 |
| Total | 100 |
| Vessels | |
| Yes | 96 |
| No | 4 |
| Total | 100 |
| Crates | |
| Yes | 26 |
| No | 74 |
| Total | 100 |
| Jars | |
| Yes | 6 |
| No | 94 |
| Total | 100 |
| Others | |
| Yes | 40 |
| No | 60 |
| Total | 100 |

(Source: Telephone Survey, 2021)

### 3.4 Response to Fruit Cultivation

The respondent response for fruit cultivation was yes for Lime, Guava, Avocado, Pomegranate and other fruits 46 40%, 52%, 14%, 14% and 46% respectively.

| **Table 7:** Response to Fruit Cultivation | |
|---|---|
| **Variables (n=50)** | **Percent** |
| Lime | |
| Yes | 40 |
| No | 60 |
| Total | 100 |
| Guava | |
| Yes | 52 |
| No | 48 |
| Total | 100 |
| Avocado | |
| Yes | 14 |
| No | 86 |
| Total | 100 |
| Pomegranate | |
| Yes | 14 |
| No | 86 |
| Total | 100 |
| Other fruits | |
| Yes | 46 |
| No | 54 |
| Total | 100 |

(Source: Telephone Survey, 2021)

### 3.5 Response to Vegetable Cultivation

Majority of respondent cultivate cauliflower (68%), Beans (54%) and chilli (60%) as their vegetables.

| **Table 8:** Response to vegetable cultivation | |
|---|---|
| **Variables (n=50)** | **Percent** |
| Cabbage | |
| Yes | 18 |
| No | 82 |
| Total | 100 |
| Cauliflower | |
| Yes | 64 |
| No | 36 |
| Total | 100 |
| Beans | |
| Yes | 58 |
| No | 42 |
| Total | 100 |
| Brinjal | |
| Yes | 42 |
| No | 58 |
| Total | 100 |
| Chilli | |
| Yes | 60 |
| No | 40 |
| Total | 100 |
| Bitter-gourd | |
| Yes | 26 |
| No | 74 |
| Total | 100 |
| Tomato | |
| Yes | 28 |
| No | 72 |
| Total | 100 |
| Spinach | |
| Yes | 24 |
| No | 74 |
| Total | 100 |
| Other | |
| Yes | 84 |
| No | 16 |
| Total | 100 |

(Source: Telephone Survey, 2021)

### 3.6 Years of Beginning

Average years of Beginning of rooftop farming was 1.62 years.

### 3.7 Changes in Cultivation Practices

Majority of the respondents feels that there was some change in the cultivation practices in rooftop farming as compared to field cultivation. The major change in cultivation practices were soil management, stands, jars and creates and some other changes.

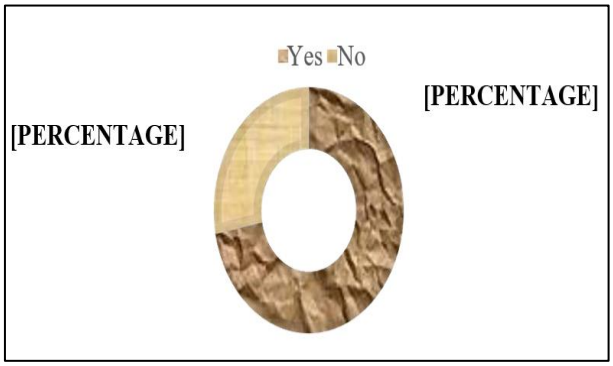


**Figure 4:** Response to changes in cultivation practices

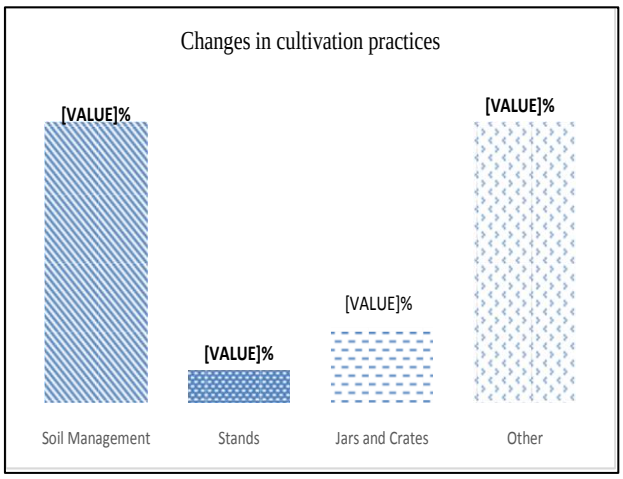


**Figure 5:** Response to types of changes in cultivation practices (Source: Telephone Survey, 2021)

### 3.8 Nature of Initial Investment

The nature of investment was found to be medium as per majority of the respondent (88%).

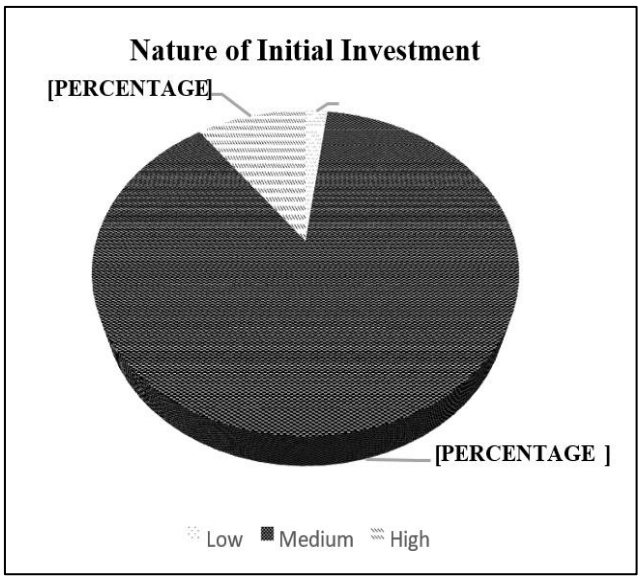


**Figure 6:** Response to nature of Investment

### 3.9 Average Total Input Cost

The average total input cost was found to be NRs. 7044.

### 3.10 Differences in production technique from normal cultivation

Various differences in production techniques of rooftop farming from normal cultivation was observed. Among various respondent 64% of respondent response positive to frequent irrigation, 40% response positive to excessive care and 76% response positive to other differences.

**Table 9:** Response to Differences in Production Technique from Normal Cultivation

| Variables (n=50) | Percent |
|---|---|
| Frequent Irrigation | |
| Yes | 64 |
| No | 36 |
| Total | 100 |
| Excessive Care | |
| Yes | 40 |
| No | 60 |
| Total | 100 |
| Other | |
| Yes | 76 |
| No | 26 |
| Total | 100 |

(Source: Telephone Survey, 2021)

### 3.11 Source of Input

The major source of input was Agro-vets (65%) followed by cooperatives (18%).

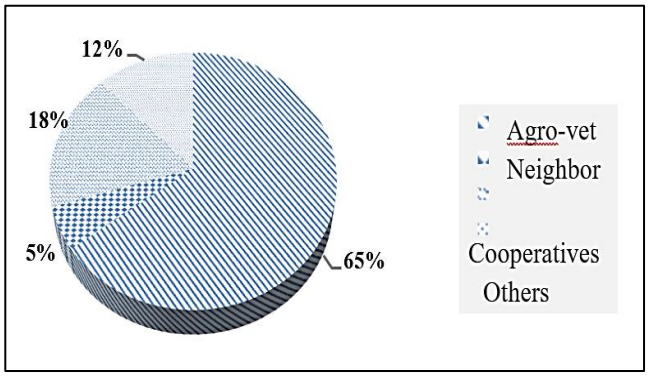


**Figure 7:** Response to source of Input

### 3.12 Difficulty in Input Procurement

There was no any difficulty in input procurement as 88%.

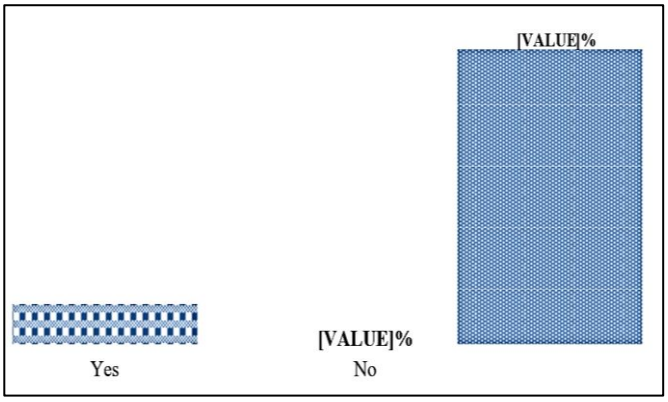


**Figure 8:** Response to difficulty in input procurement

### 3.13 Amount of Harvest

The minimum, maximum and average amount of harvest was 15, 275 and 124.7 respectively.

**Table 10:** Amount of Harvest Done by The Respondent

| Particulars | Minimum | Maximum | Average |
|---|---|---|---|
| Amount of Harvest | 15 | 275 | 124.7 |

(Source: Telephone Survey, 2021)

### 3.14 Production Period

About 88% of the respondent had the production period of 12 months and 6% for each 6 months and 8 months of production period.

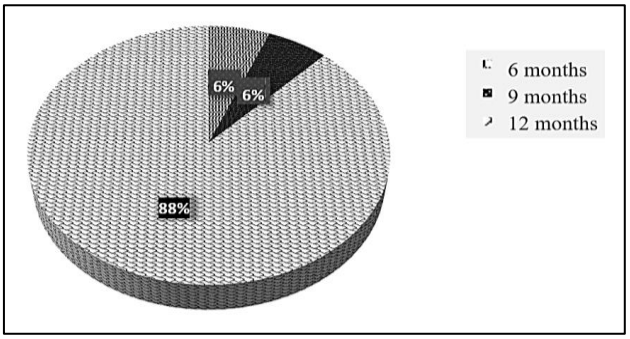


**Figure 9:** Production Period

### 3.15 Surplus Production

78% of the respondent produce surplus production of agriculture product from rooftop farming. Among the surplus product produced 72% of the product is shared between the relatives and neighbors.

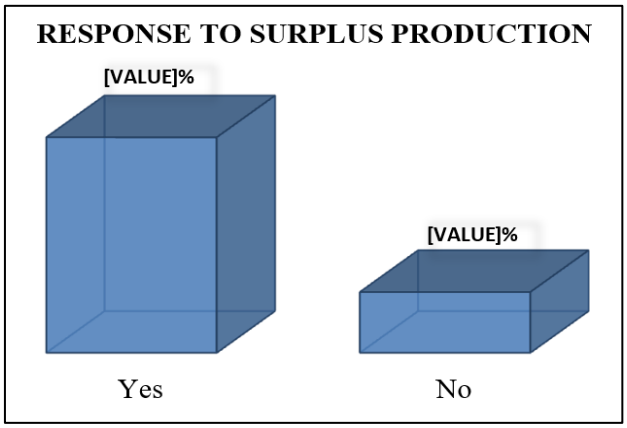


**Figure 10:** Response to Surplus Production

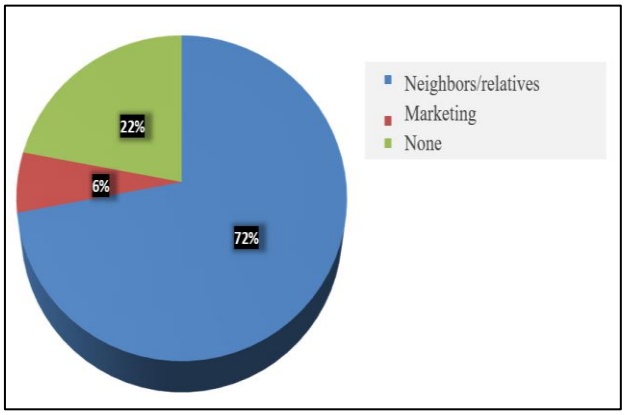


**Figure 11:** Pie chart showing response to Surplus Production

The revenue of the market surplus was found to be NRs. 10,333.33.

### 3.16 Buy Vegetables from Market

Majority of the respondent (68%) bought vegetables from market. This represent that the vegetable produced from rooftop farming was insufficient for demand household of respondent.

The respondent buys vegetables in both the season (32%), in rainy season (28%) and in rainy season (12%) and 28% of respondent don't buy vegetables in any season.

### 3.17 Manure Used

Majority of the respondent (76%) uses organic manure only and remaining 24% uses both organic manure as well as synthetic manure.

### 3.18 Disease Suffered

During rooftop farming about 28% of the respondents were suffered from blight diseases and 46% were suffered from Damping off disease, 8% were suffered from mildew diseases and 68% were suffered from various other diseases.

### 3.19 Insect Suffered

Respondents were suffered from the infestation of various insect such as Aphid (68%), Fruit fly (44%), Borer (18%), Caterpillar (46%) and other insects (82%).

### 3.20 Major Problems in Roof-Top Farming

**Table 11:** Major Problems in Roof-Top Farming Listed Based on Likert Scale

| Statements | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Soil loss | 50 | 1 | 2 | 1.02 | 0.12 |
| Wilting | 50 | 1 | 3 | 2.09 | 0.51 |
| Diseases and Insect | 50 | 1 | 3 | 1.67 | 0.66 |
| Other Problems | 50 | 1 | 3 | 2.82 | 0.57 |

Note: 1=Major Problem, 2=Medium Problem and 3=Normal

### 3.21 Solutions Adopted for Solving The Problem

Among various solutions adopted for solving problem Botanical pesticides was ranked first with index of 0.79 followed by Insect traps which was ranked second with the index of 0.77 (Table 11).

**Table 12:** Ranking of Solutions Adopted for Solving Problem

| Major Solution | Scores | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 0.8 | 0.6 | 0.4 | 0.2 | Total | Index | Ranks |
| Botanical Pesticides | 20 | 14 | 5 | 5 | 6 | 50 | 0.79 | I |
| Insect Traps | 14 | 22 | 10 | 2 | 2 | 50 | 0.77 | II |
| Others | 9 | 20 | 14 | 6 | 1 | 50 | 0.72 | III |
| Establishment of Poly Tunnel | 3 | 25 | 10 | 8 | 4 | 50 | 0.66 | IV |

(Source: Telephone Survey, 2021)

Majority of the respondent were satisfied (96%) with the rooftop farming of vegetables and fruits.

### 3.22 Initiation of Rooftop Farming

Majority of the respondent initiated the rooftop farming by self (36%) followed by neighbors (32%).

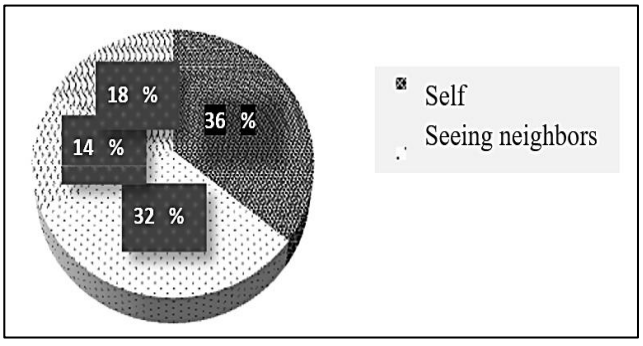


**Figure 12:** Initiation of Rooftop farming

### 3.23 Training Received by Respondent

Majority of respondent (96%) received training related to cultivation of rooftop farming. Majority of training was related to soil mixture preparation (56%) followed by IPM (36%) and other remaining (8%) received training related to other topic.

### 3.24 Government and Other Organization Support

Government and other organization support was found by 48% and 84% of the respondents. The government support obtained by the respondent was mainly on seed, cash subsidy and others. Similarly, organization support obtained by the respondent was mainly on training, polybags and some other support.

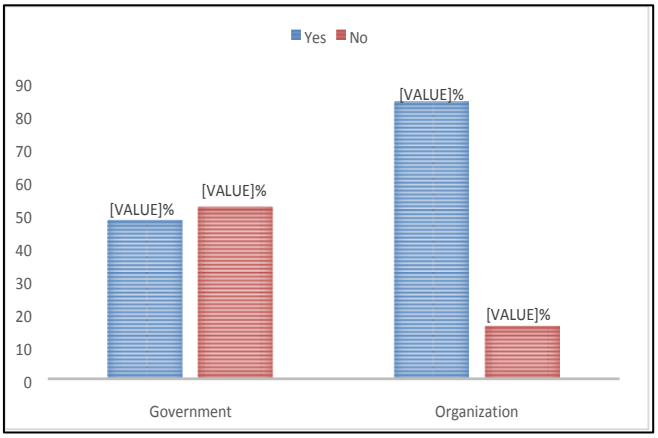


**Figure 13:** Government and Organization Support

### 3.25 Expectations from Government Bodies

Various expectations were found within the respondent such as training, start-up support, drip irrigation, poly tunnel and other expectations. Among above mentioned expectation Training was ranked first with index 0.87 followed by start-up support with index 0.65.

**Table 13:** Ranking of Respondents Expectations from Government Bodies

| Expectations | Index | Rank |
|---|---|---|
| Training | 0.87 | I |
| Startup support | 0.65 | II |
| Drip irrigation | 0.60 | III |
| Poly-tunnel | 0.50 | IV |
| Other expectations | 0.49 | V |

(Source: Telephone Survey, 2021)

### 3.26 Positives During Lockdown

Various positives were felt by respondent in lockdown period of pandemic disease COVID-19 which includes no need to go outside (72%), Utilization of leisure time (92%), Recreation (32%) and other (60%).

**Table 14:** Response on positives during lockdown period by the respondent

| Variables (n=50) | Percent |
|---|---|
| No need to go outside | |
| Yes | 72 |
| No | 28 |
| Total | 100 |
| Utilization of leisure time | |
| Yes | 92 |
| No | 8 |
| Total | 100 |
| Recreation | |
| Yes | 32 |
| No | 68 |
| Total | 100 |
| Other | |
| Yes | 60 |
| No | 32 |
| Total | 100 |

(Source: Telephone Survey, 2021)

Only 14% of the respondent were suffered by lockdown in supply of input material required for rooftop farming. Similarly, no training was conducted in lockdown period and 86% of the respondent were no suffered from any negative impact of lockdown due to COVID-19.

## 4. Conclusions

Rooftop farming is the cultivation of different agricultural crops in the roof area and other areas of building which is usually done in city area where there is scarcity of agriculture land. Rooftop farming is considered to be best technique to promote healthy environment and organic food in city area. Regarding rooftop farming, farmers are facing few production problems like heavy rainfall causing soil loss, occurrence of diseases and pests, lack of improved techniques like poly tunnel etc. This study was mainly focused on status and feasibility of rooftop farming in Kathmandu city. Specifically, the study was designed to understand the perception of people towards rooftop farming, to identify the factors affecting its adoption, to estimate production, production technique and cost and so on. The study was carried out in two municipalities of Kathmandu city namely Chandragiri and Tarakeshwar. 36 respondents rooftop growers were selected randomly from Chandragiri municipality in a sampling frame of 100 while 14 respondents were from Tarakeshwar municipality in a sampling frame of 44.

The total respondents were 50, out of which 2% were male and 98% were female having 67.27m$^2$ area on an average for rooftop cultivators. 96% respondents were satisfied from rooftop farming. The major problem was wilting having 2.09 mean weightage based on Likert scale. The average total input cost was NRS. 7044. 76% respondents were using organic manure and biological control for diseases and pests control. 14% of respondents were facing input supply problem during lockdown. Since majority of respondents were female (98%), this shows potential for utilizing leisure time of housewife and utilizing that time for producing healthy vegetables for their family compared to available area, actual cultivation area seems to be low on an average. Enough incentive is carried out, then cultivation area can be expanded which not only fulfill family demand but also produce for selling. Wilting, diseases and insects and soil loss were major factor affecting the rooftop farming. These problems can be controlled by the establishment of poly tunnel, botanical pesticides and insect traps.

Establishment of poly tunnel needs technical and financial support for which local government have to play crucial role. The normal production cost and simpler techniques for cultivation indicates that rooftop farming can be adopted easily by all class of people and people's perception from our study seems to favor this. Most of the growers (76%) were using organic techniques for its cultivation. This shows the potential for replacing chemical contaminated agro-products, mainly found in Kathmandu market. Lockdown due to COVID-19 impact on supply chain of agro-inputs as well as agro-products like vegetables but rooftop growers were very less affected as only 14% were suffered in terms of supply like seeds. As rooftop farming don't need sophisticated equipment's so it was very less affected. Since they were producing vegetables for their family requirements, they don't face any problems during shortage of vegetables in market during lockdown period.

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