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Rooftop Gardening: An Explorative Study in Urban Area of Cochin City

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Abstract: **Rooftop gardens are an ideal way for an urban gardener to expand their space. Many of the urban homemakers create their own garden, either vegetable or ornamental or a combination of both on the rooftop due to lack of space around their houses. The study explores the rooftop garden trends and identifies strength and weakness on various areas of rooftop gardening. The objectives of the study includes finding out the type of rooftop garden, identifying various plants, both vegetable and ornamental, grown in the rooftop, to understand the type of fertilizers and pesticides used in the garden and to analyze the effectiveness is the irrigation and waste management practices of the rooftop garden. A sample of 102 respondents residing in Ernakulam city, maintaining rooftop garden, has been selected for the study through purposive sampling technique. The study reveals that Covid 19 pandemic situation prevailing today, has instilled a great example towards self-sufficiency through rooftop garden. Urban homemakers are cultivating different varieties of vegetable plants and ornamental plants using different methods. Better irrigation techniques and Pest management among the sample should be improved.**

Index Terms: **Rooftop gardening, Organic farming, Ornamental gardening, Urban area,**

I. INTRODUCTION

A rooftop garden is a garden, either vegetable or decorative on the terrace of a building. Rooftop gardens, also called living roofs or green roofs, have many benefits such as utilizing space productively, converts CO_2 emissions and produces oxygen thereby improving air quality index, reduces the heat of buildings and energy costs and add beauty to the cityscape. Majority of the rooftop gardens also provides recreational opportunities for the family members. On hot summer days, rooftop gardens may also keep buildings cooler than traditional roofs.

A. Relevance of the Study

To support growing food demand of increasing population, food supply should be secure and sustainable. With an increasing trend towards urbanization, built-up urban areas are increasing; hence supply of roof space is also increasing. Rooftop farming can provide solution to increased food demand and also can promote a sustainable and livable city. Rooftop farming can benefit society by improving air quality, reducing carbon in the atmosphere, thereby creating a healthy environment. Moreover, the people will get pesticide free vegetables with their own effort. Besides, working in the garden gives them immense pleasure and satisfaction. The study will inculcate better food habits, better water and waste management practices and better cultivation techniques among urban people. Thus, planting the rooftops of urbanized areas brings many benefits to public, private, economic and social sectors, as well as to the local and global environments.

B. Objectives of the Study

- To find out type of rooftop garden and to identify various plants grown in the rooftop
- To ascertain how effective is the irrigation and waste management practices of the rooftop garden
- To know the type of fertilizers and pesticides used in the garden

II. LITERATURE REVIEW

Rooftop gardens are an ideal way for an urban gardener to expand their space. Many of the urban homemakers create their own garden, either vegetable or ornamental or a combination of both on the rooftop due to lack of space around their houses. According to Van Cotthem (2005) rooftop spaces otherwise

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which remain unused is made use of in urban area for organic vegetable production and horticulture.

A study conducted to explore the production capacity of rooftop gardens (RTGs) in urban agriculture explores the multifaceted benefits associated with the implementation of Rooftop gardens in the city of Bologna (Orsini et.al., 2014). In his study, Harada and Whitlow (2020) reveals that the roof top garden, the new trend of constructed ecosystems helps intensive vegetable production aiming to achieve diverse goals of sustainability within the practices of urban green infrastructure.

The study conducted by Triguero-Mas et.al. (2020) reveals the potential benefits of urban rooftop gardening in general, and specifically for those with intellectual disabilities and mental health disorders. Tuladhar (2019) through his study, ascertain the interest and desire of urban dwellers to harvest fresh, pesticide free edibles on one's own rooftops.

III. METHODOLOGY

The study ***'Rooftop Gardening – An Explorative Study in Urban Area of Cochin City'*** explores the rooftop garden trends, identifies its strength and weakness rooftop gardening through a household survey among urban homemakers. The study includes a baseline survey to explore the current trends of rooftop gardening, to find out type of rooftop garden, type of plants grown, how effective is the irrigation practices, type of fertilizers used, type of pesticides used, waste management practices, etc. A survey is a 'fact finding' study, a method of research involving collection of data directly from a population or a sample thereof a particular time. It is a field study which can be extensive or intensive, seeking responses directly from the respondents, covering a very large population and covers a definite geographical area. The baseline survey comprises selection of area, sample and tool.

A. Selection of Area

The selection of relevant area is an inevitable part of the study. The area selected for the study is Ernakulam City. Ernakulam is the most upcoming city in Kerala progressing on all levels with a large number of houses with minimum outside area. Due to urbanization people possess very little area around the house with no space for gardening. Thus, prefers rooftop gardening.

B. Selection of Sample

A sample of 102 respondents residing in Ernakulam city maintaining rooftop garden has been selected for the study. Purposive sampling technique is used for the selection of the sample. In purposive sampling, the researcher handpicks the cases to be included in the sample on the basis of their judgment of their typicality or possession of particular characteristics being sought.

C. Selection of Tool

The selection of an appropriate tool is the most important task of a research study. An interview schedule will be formulated for collecting information regarding rooftop gardening. An interview schedule is a written list of questions, open ended or close ended prepared for the use of an interview in a person- to -person interaction. One of the main advantages of structured interview is that it provides uniform information, which assures the comparability of data.

D. Collection & Analysis of the Data:

With the help of the structured questionnaire, the investigator collected the data through online from the respondents. The data gathered is consolidated, classified, tabulated and analyzed.

IV. RESULTS AND DISCUSSION

Today, especially in this Covid 19 pandemic situation, it is very important to retain our health by having pesticide free food. Moreover, moving towards self-sufficiency, rooftop gardens set an excellent example among urban community, for those who have less space around the house. When people are staying inside their house during lockdown period, gardening is considered as the best hobby that relieves everyone from stress, give better experience with fresh air and provides satisfaction to inmates. Rooftop gardening, whether it is ornamental plant or organic farming, is a blessing for those who have no enough space for gardening, especially in urban areas. The new observations pertaining to the study on 'Rooftop Gardening – An Explorative Study in Urban Area of Cochin City' is discussed under the following headings.

A. Period of Implementation of Rooftop Garden

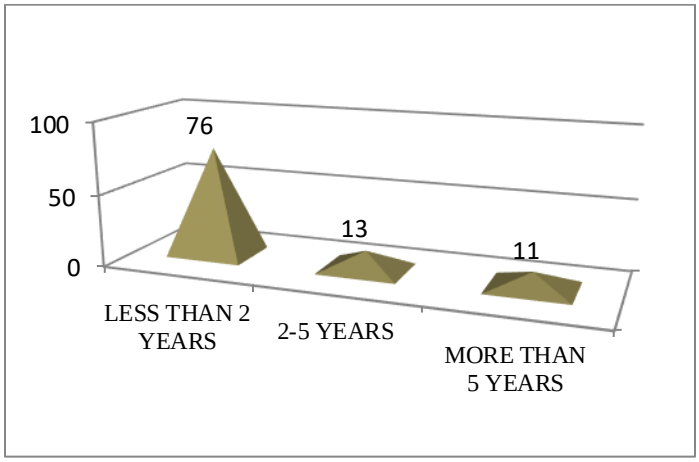

Figure 1: Period of Implementation of Rooftop Garden

Majority (76%) the sample started doing rooftop gardening in less than 2 years. Other 13% were doing between 2 to 5 years and only 11% of them had a rooftop garden history of more than 5 years.

B. Reason for starting rooftop gardening

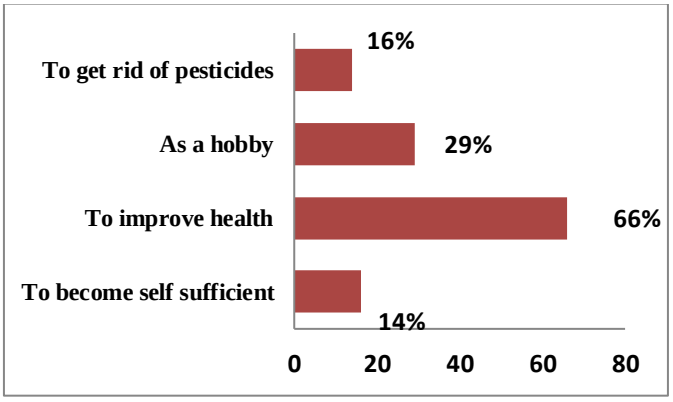

Figure 2: *Reason for Having Rooftop Gardening*

Majority of the respondents started doing roof top gardening to improve their health, 66% of family conscious about their health, 29% started as a hobby, 16% of them wanted to get rid of pesticides and 14% wanted to become self-sufficient.

C. Types of garden

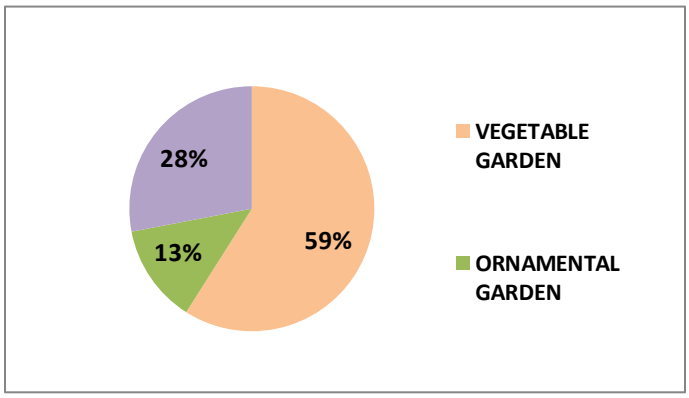

Figure 3: Distribution of Samples According to Types of Rooftop Garden

The study reveals that 59% of the sample were doing vegetable gardening, 28% combined garden -vegetable and ornamental and 13% doing ornamental plants only.

D. Type of Houses

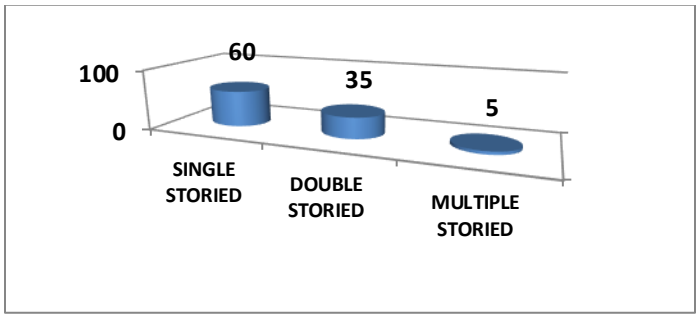

Figure 4: Type of Houses

Among the sample 60% were living in single storied houses, 35% were living in double storied houses and a minority of 5% were living in multi-storied houses.

E. Types of Vegetables Cultivated

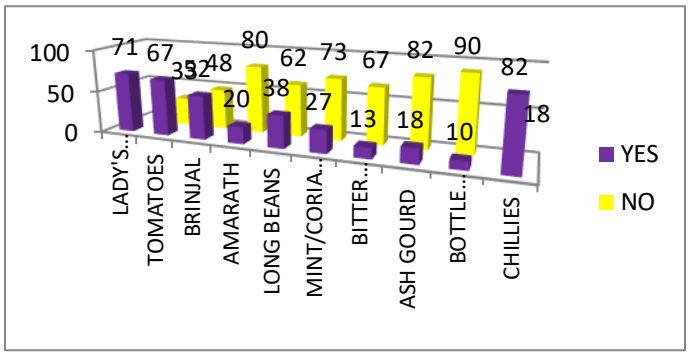

Figure 5: Type of Vegetables Grown in Rooftop Garden

Study reveals that majority of the sample have chilies (82%) in the rooftop garden. Followed by lady's finger (71%), tomatoes (67%), brinjal (52%) and long beans (38%). Bitter gourd, bottle gourd, amaranth and ash gourds were less cultivated in rooftop garden.

F. Types of ornamental plants in Rooftop

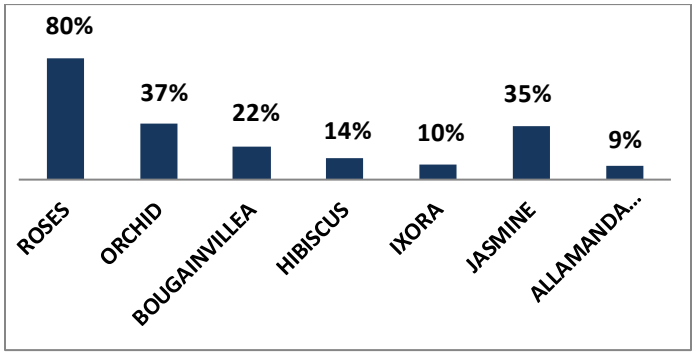

Figure 6: Distribution of Sample according to Types of Ornamental Plants

Rose is the major flower that 80% of the families grown in their garden, 37% had orchids, 35% jasmine, 22% bougainvillea, 14% hibiscus, 10% Ixora and 9% had Allamanda creeper.

*G. **Area of Rooftop Garden***

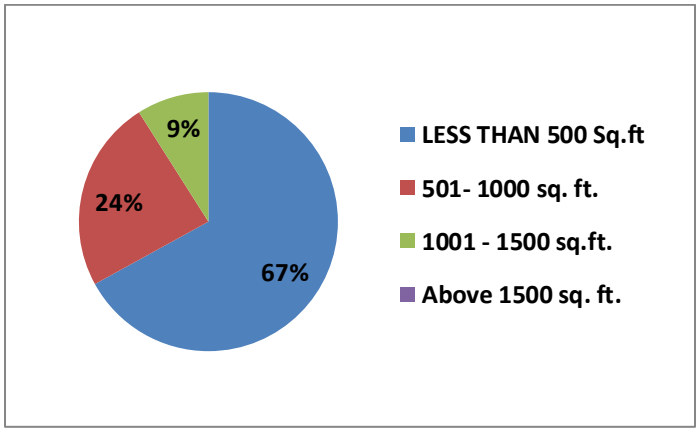

Figure 8: *Area of rooftop gardening*

The study reveals the total area in which rooftop garden is maintained, 67% of families have less than 500 sq.ft, 24% of

families have an area between 501 to 1000 sq.ft and only 9% of families have space more than 1000 sq.ft.

H. *Type of irrigation Practiced in Rooftop Garden*

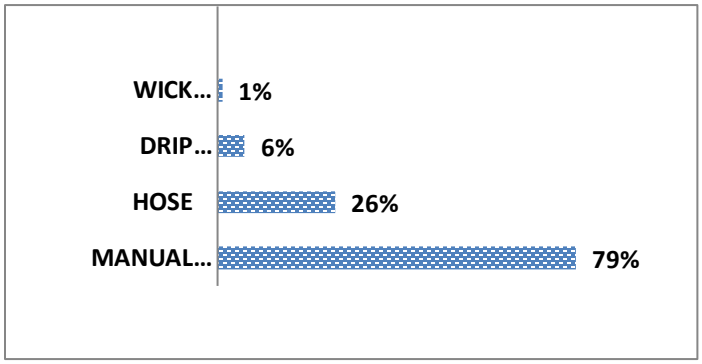

Figure 9: Type of Irrigation Practiced in Rooftop Garden

There are different types of irrigation methods used in rooftop such as, manual method like watering with hose, bucket and mug, advanced methods like drip irrigation, wick irrigation etc. The result shows that the irrigation method used by majority of families were manual (bucket and mug), ie., 79%, 26% of the families use hose, 6% practiced drip irrigation and only 1% practiced wick irrigation as method for watering.

I. *Waste water management*

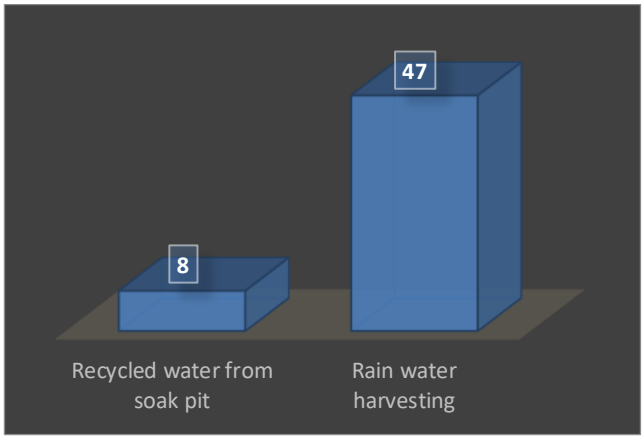

Figure 10: Waste Water Utilization

Nearly half (47%) of the families were practicing rain water harvesting system and a minority of 8% were using soak pit for water recycling.

J. *Leak proof treatment for Terrace*

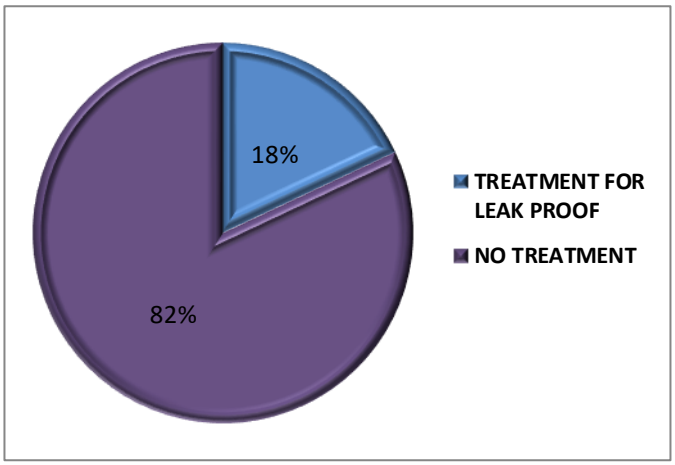

Figure 11: ***Leak Proof Treatment for Terrace***

The study result shows that 82% of the families has not taken any treatment to protect their terrace leak proof while 18% of the families did some treatments for the protection of roof.

K. *Manures and Pesticides used in Rooftop Garden*

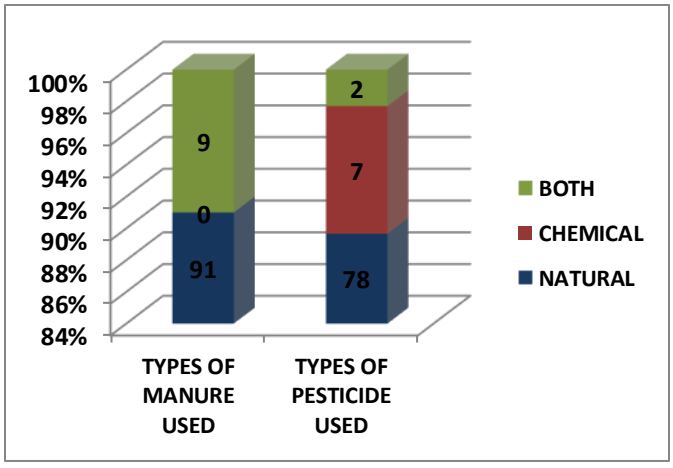

Figure 12: Manures and Pesticides used in Rooftop Garden

The study reveals that 91% of the families were using organic manure where as 9% of them were using a combination of both organic and chemical manures. While considering pesticides, 78% of the sample were using natural pesticide and only a minority of them were using chemical pesticides (7%) or both organic and chemical pesticide (2%).

L. Source of Getting Seeds or Seedlings for Gardening

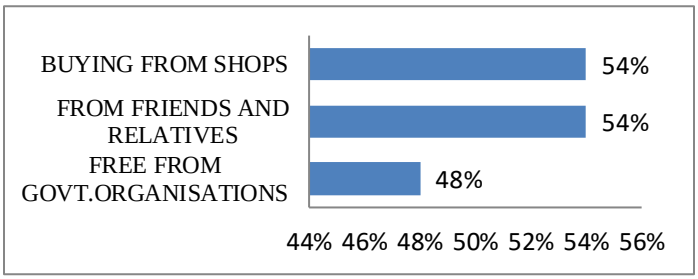

Figure 13: Source of Getting Seeds or Seedlings for Gardening

Seeds and seedlings are fundamental requirement to garden. In a broad sense, it is that part of a plant which is used for propagation, planting, or regeneration purpose. Hence, the selection of seeds is crucial. The study points out that the more than half of the respondents (54%) gets the seeds/saplings from the friends, relatives or from shops and 48% of them also get it free from the government organizations.

M. Disposal of Garden Waste

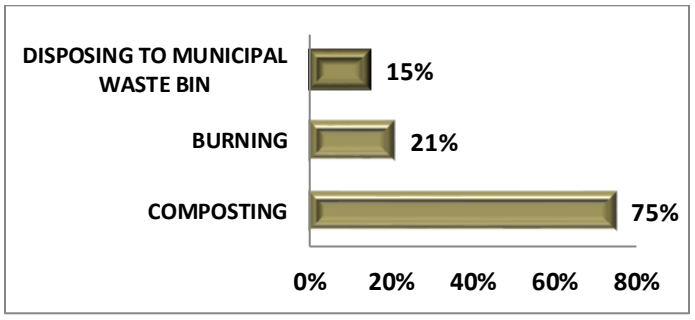

Figure 14: Disposal of Garden Waste

While analysing disposal practices of garden waste, it is found out that 75% of the respondents were managing their waste from rooftop through composting, 21% of them burn the waste and 15% were disposing the waste to municipal waste bin.

N. Persons involved in Maintaining Rooftop Garden

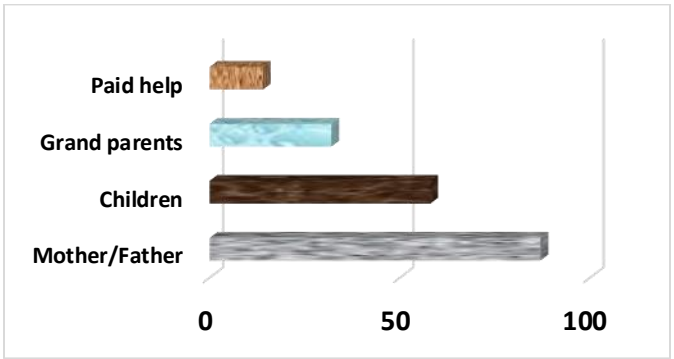

Figure 15: Persons involved in Maintaining Rooftop Garden

Gardening is mainly a leisure time activity where all family members are together doing garden work. But, one person take the leadership in maintaining the garden. The study result convey that in majority of houses (87%) the rooftop garden is maintained by the father/mother, in 9% of the houses it is maintained by children, in 3% houses garden is maintained by grandparents and in 1% of houses rooftop garden is maintained by the paid help.

O. Tools Possessed by the families for Garden Work

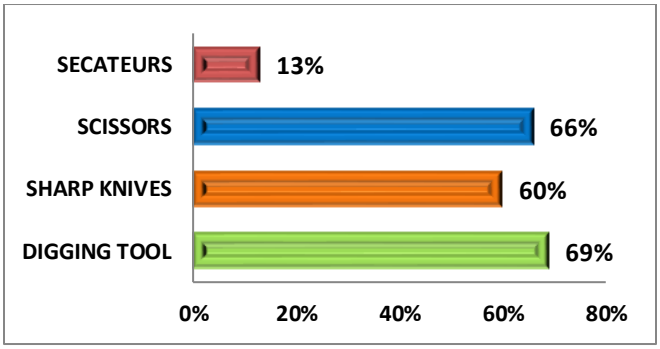

Figure 16: Tool Possessed for Garden Work

For all types of garden work, there is a need for minimum garden tools. Here 69% of the respondents had various types of digging tools, 66% of the respondents possess scissors, 60% of them have sharp knives and only 13% of them were having secateurs.

P. Utilization of Rooftop Cultivated Vegetables

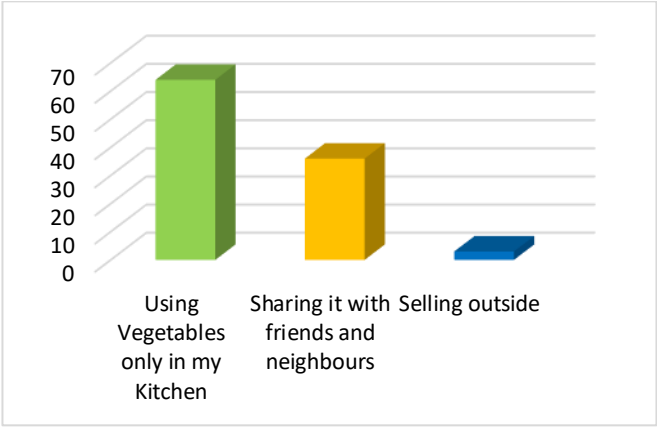

Figure 17: Utilization of Rooftop Cultivated Vegetables

In 64% families the products are used only in their own kitchen where as 36% of the families were giving excess to their friends and neighbours. A minority of 3% were selling their products outside.

Q. ***Satisfaction derived from Rooftop Gardening***

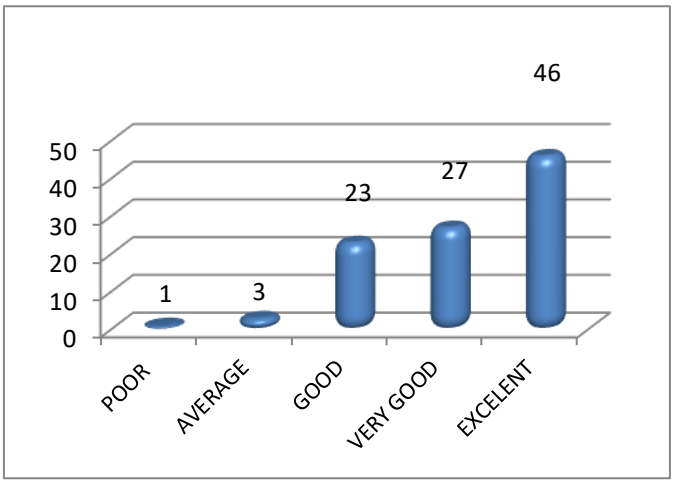

Figure 18: ***Satisfaction derived from Rooftop Gardening***

Organic farming has been a way of life for man since the beginning. Harvesting and growing one's own food has always been a necessary resource for man, especially in this pandemic condition. Gardening reduce the stress level and provides fresh mind and healthy body. From the above figure it is evident that 47% of the sample feels excellent/full satisfaction, 27% feels very good, 23% graded their satisfaction level as good, 3% of the sample the satisfaction level is average where as 1% of the sample felt unsatisfied for their rooftop gardening.

CONCLUSION

The study reveals that Covid 19 pandemic situation prevailing today, has instilled a great example towards self-sufficiency through rooftop garden. Urban homemakers are cultivating different varieties of vegetable plants and ornamental plants using different methods. Rooftop gardening provides good satisfaction for all the family members. Better irrigation techniques and natural pest management techniques among the sample should be improved through awareness class. Techniques of aquaponics, hydroponics and vertical garden should be popularized among urban homemakers.

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