Urban Farming: An Alternative Strategy for Food and Nutritional Security

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In this e-book, the readers will be introduced to many aspects of urban farming, from types and benefits to strategies and regulations in a household structure and system. As the popularity of farming in cities have grown, there has been a multiplication of publications covering various aspects of urban agriculture. To assist the readers to sail through this wealth of information, this book provides an amalgam of important aspects of urban farming and includes a resource guide to success stories and for further reading. Neither the publisher nor the contributors, authors and editors assume any liability for any damage or injury to persons or property from any use of methods, instructions, or ideas contained in the e-book. No part of this publication may be reproduced or transmitted without prior permission of the publisher/editor/authors. Publisher and editor do not give warranty for any error or omissions regarding the materials in this e-book.

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PREFACE

Dr. P. Chandra Shekara, Director General, MANAGE

For more than six decades, environmentalist Wendell Berry has been pressing on agriculture that is local, culturally and contextually relevant; and that establishes a deep connection between people, community, food and the land. According to him, "eating is an agricultural act," meaning, whether we realize it or not, we all actively participate in agriculture. Given the great misunderstanding that arose between farming and the industrialization of agriculture during 1950-1960, it is probably safe to say that many of us did not realize we were participants in agriculture.

However, with the recent resurgence of farming in and around cities, people have been reconnecting to agriculture by growing food themselves, visiting farmer's markets, participating in community-supported agriculture programs or any number of other urban farming activities. In the modern-day world and present-day scenario, urban farming is establishing itself as an integral part of local and regional food systems. Today, urban farming has seen an increase in access to healthy food and providing social and economic opportunities for countless residents.

Urban agriculture makes up one aspect of a city's food system. Each of urban agriculture's components - production, processing, distributing and the associated activities, is linked to a variety of community benefits. The benefits vary according to the type of urban farming: personal consumption, institutional, educational, for-profit, non-profit and so forth. Successful community-based urban farming projects require considerable planning and commitment that grows out of the interests of a particular neighborhood or community. Similar to any other effective endeavor, when residents identify the goals and ideals; with urban farming, the aesthetic and the potential benefits escalate. Urban farming projects that reflect and evolve from a community's cultural values and future vision are much better positioned to have a lasting impact and lead to more ecologically sustainable ways of providing food.

Examples of urban agriculture abound, existing in many forms including community and backyard gardens; rooftop and balcony gardening; growing in vacant lots, right-of-ways, and parks; aquaculture; hydroponics; fruit trees and orchards; market farms; raising livestock and beekeeping. Urban agriculture also involves post-harvest activities such as creating value-added products in community kitchens, farmers' markets and road-side farm stands, marketing crops and products, and addressing food waste. Importantly, urban agriculture is context-specific, meaning that its forms and practices vary according to the conditions of the local environment – social, cultural, economic, physical, and political.

In this book, the readers will be introduced to many aspects of urban farming, from types and benefits to strategies and regulations in a household structure and system. As the popularity of farming in cities have grown, there has been a multiplication of publications covering various aspects of urban agriculture. To assist the readers to sail through this wealth of information, this book provides an amalgam of important aspects of urban farming and includes a resource guide to success stories and for further reading.

(P Chandra Shekara)

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from Authors…

Chapter-I

Introduction

Nearly 34.0 percent of the world's population lived in urban areas till 1961. Whereas projection for 2030 shows that figure will rise to over 60 percent, as cities and towns become home to more than 1.4 billion population. Nearly all of this growth will take place in the developing world. Rapid urbanization is one of the most important demographic trends of this century. Urbanization creates challenges, but it also offers unparalleled opportunities for inclusive growth, innovation, and prosperity (Siegner et al., 2018). In developing countries, urbanization and associated demographic changes pose unprecedented challenges in terms of hunger, food insecurity and malnutrition (Hatab et al., 2019).

According to Census of 2011, India's population rose to 1.21 billion people over the last 10 years -an increase by 181 million. Urbanization is taking place with a more rapid rate in India. Population residing in urban areas was 11.4%, according to 1901 census. This count increased to 28.53% by 2001 census, and crossing 30% as per 2011 census, standing at 31.16% (Awasthi, 2013).

Unplanned urbanization has led to serious problems in India. The major concerns were water-scarcity, non-resilient and unlivable, depriving the city dwellers of clean air, water and environment. There has been a ten-fold increase in paved area, 88.0% reduction in vegetation, 79.0% decline in wetlands, high increase in air pollution, huge increase in city traffic and steep decline in the depth of the water table from 1973 to 2016. The condition is similar in most of the major cities in India. There is an urgent need to reverse this trend, to prevent our cities where population is increasing day by day, from becoming dysfunctional (Ramachandra and Aithal, 2016).

Urban agriculture (UA) has the potential to contribute to more sustainable and resilient urban communities, for its pivotal role in implementation of circular economy strategies at the city level, closing energy and mass loops, while contributing to restore natural cycles and ecosystem's environmental services (Ferreira et al., 2018).

UA remains a relatively small, yet important percentage of the larger food distribution systems in cities: "few, if any, urban agriculture projects, are intended to replace traditional food retail or would claim to lead to food self-sufficiency for individuals or for cities" (Santo et al, 2016).

UA contribute to urban food security in different regions, based on a low threshold of urban land required to grow the daily vegetable intake for the urban poor (Badami, M. G and Ramankutty, N. 2015).

Turning the target of the SDGs into reality requires due recognition to good nutrition guaranteed through sustainable agriculture. Because all other SDGs are directly or indirectly linked to improving nutrition, funding to improve nutrition is indispensable to succeed the SDGs. The implementation strategies needs to be with greater focus and cooperation across disciplines to advance the science of program delivery and to understand the full contribution of nutrition to many desirable outcomes as part of development (Baye, 2017).

In India, the percentage of the urban population growing their own food is miniscule. Food and nutritional insecurity is often considered as a rural phenomenon. But, the truth is that the food and nutritional security of urban dwellers is negotiated by many factors such as non-availability of food, price fluctuations and poverty. There is a substantial prevalence of undernourishment and deficiency of calorie intake even in India's urban areas, other than the rural areas. UA or peri-urban agriculture can not only provide nutritional security, but also helps to find sustainable solutions to the growing challenge of wastewater and solid waste management in addition to helping in poverty alleviation (Sahasranaman, 2016).

10 Inspiring Urban Agriculture Projects around the World

Around 15 percent of the world's food is now grown in urban areas. According to the U.N. Food and Agriculture Organization (FAO), urban farms already supply food to about 700 million residents of cities, representing about a quarter of the world's urban population. By 2030, 60 percent of people in developing countries will likely live in cities.

The efforts of hundreds of urban farms and gardens to grow organic produce, cultivate food justice and equity in their communities, and revitalize urban land. Urban agriculture not only contributes to food security, but also to environmental stewardship and a cultural reconnection with the land through education.

"The 2015 Sustainable Development Goals (SDGs) recognize the importance of building sustainable cities," says Maurizio Baruffi, Chief of Staff of the Mayor of Milan, Italy. "The City of Milan is partnering with urban areas around the world to embark on this journey, starting from food."

Inspiring projects discussion in brief:

Abalimi

Abalimi is an urban agriculture and environmental action group located outside of Capetown, South Africa. The organization supports and assists groups and individuals looking to improve their livelihoods through organic farming.

Alternative's Feeding Citizenship

A nonprofit that promotes social and environmental justice in Montreal, Canada, Alternative's Feeding Citizenship is growing healthy food to fuel healthy communities. The project engages the community through horticultural training programs while supporting school and neighborhood gardens.

Baltimore Urban Gardening with Students (BUGS)

An after-school and summer program, BUGS provides children from low-income neighborhoods in Baltimore, Maryland with a safe place for learning. Kids can garden, visit local farms, and try new foods while improving math and reading skills as well as exploring creative entrepreneurial projects.

Camino Verde

Located in Puerto Maldonado, Peru, Camino Verde's mission is to plant trees and encourage environmental stewardship through educational programs and public awareness. The project's Living Seed Bank acts as a botanical garden with over 250 tree species and protects endangered varieties. Camino Verde has planted over 70 different fruit trees, 40 flowering species, and enough trees to cover seven hectares of land.

Representational pic from www.greensgrow.org

Canberra City Farm

Serving communities in Canberra, Australia, Canberra City Farms is dedicated to establishing learning hubs where people can collaborate and share their knowledge of sustainable and environmentally responsible food production.

Compost Pedallers

A 100 percent bike-powered compost recycling project in Austin, Texas, Compost Pedallers strives to reduce waste, strengthen the local food system, and connect the community with farms. Residents can sign up to redirect organic waste to local farms and gardens through the bicycle-powered network.

Detroit Dirt

Detroit Dirt is a compost company that helps complete the "circle of life" in food production by regenerating waste into resources. Through partnerships with community coffee houses and local businesses, the organization is hoping to instill a self-sustaining culture of recycling organic waste and provide a valuable resource to urban farms and gardens in Detroit.

Ferme de Paris

A municipal organic farm nestled in an expansive park, Ferme de Paris provides the public with vegetable gardens, orchards, medicinal plant gardens and a number of farm animals housed in sustainably-constructed buildings. City residents can even stay to volunteer if they want to.

Fresh & Local

Fresh & Local is looking to use urban agriculture to improve the health and wellbeing of Mumbai. The organization takes underutilized spaces and transforms them into places of community empowered food production.

Frisch vom Dach (Fresh from the Roof)

An aquaponics project starting on the rooftop of a former malt factory in Berlin, Germany, Frisch vom Dach uses nutrients from aquaculture to irrigate plants in a mostly closed loop.

Similarly the other projects also contributing to the urban food security. Namely:

- ✓ **Green Machine Mobile Food Market**
- ✓ **Grignon Energie Positive**
- ✓ **Grow City**
- ✓ **Huerto Tlatelolco**
- ✓ **La Finca del Sur**
- ✓ **The Last Organic Outpost**
- ✓ **Local Sprout**
- ✓ **Marathon Urban Farm**
- ✓ **Mazingira Institute**
- ✓ **Natural Sound Agriculture and Craft Education**
- ✓ **O'Hare International Airport Urban Garden**
- ✓ **Pasona O_2, etc.**

Urban agriculture is often difficult because of space limitations, but that has not stopped people from raising animals, growing fruits and vegetables, and even beekeeping in cities. These five examples of urban agriculture from around the globe demonstrate how small-scale and local agriculture in cities do more than simply nourish city-dwellers. These projects are not

the only examples of worldwide efforts to bring attention to growing populations and food systems, but represent the different forms that urban agriculture can take:

1. **Food Field, Detroit, Michigan**

   Food Field, an urban farm built on a unique site, offers a CSA (Community-Supported Agriculture) service that provides more nutritious food and economic opportunities for the neighborhood. Their goal is to create an alternative to the corporate food system, and local residents have been able to enjoy Food Field, whether eating the sustainable produce in weekly CSA boxes and local restaurants or volunteering on the farm itself. Food Field produces what the local community asks for, including farm favorites like salad greens and mulberries. Food Field is expanding with a new aquaponics system in order to raise fish, such as catfish and blue gill, in addition to collecting eggs from their chickens and ducks.

Representational pic from www.localdifference.org

2. FARM: shop and FARM: London, London, United Kingdom

The self-proclaimed first "urban farming hub," Dalston's FARM: shop offers small scale farming, workspaces, and a café for residents of the neighborhood. The goal of the project is not only to grow food for city dwellers, but also to prove to others in London that it is possible to grow food even without acres of space. The next step for Andrew Merritt and Paul Smyth of Something & Son is FARM: London, a plan to build a 3,000 square meter rooftop farm. The goal is to grow vegetables and raise fish in ways that are as environmentally friendly as possible, without waste or food miles.

3. Sky Greens, Singapore

In a small country where locally grown vegetables make up only seven percent of consumption, Sky Greens' vertical farming provides both an efficient and environmentally sound solution. Jack Ng founded Sky Greens, the world's first low-carbon hydraulic water-driven urban vertical farm that reduces the amount of energy and land needed for traditional farming techniques. Within a greenhouse, the three storeyed -high vertical systems are able to produce five to ten times more per unit area compared to conventional farms.

Representational pic from www.skygreens.com

4. The Distributed Urban Farming Initiative, Bryan, Texas

The Distributed Urban Farming Initiative (DUFi) has started to transform vacant lots in Bryan, Texas, demonstrating how urban farming can educate and inspire as much as it can produce healthy food to enjoy. The goal to sustaining the project is community, not only to build gardens in otherwise empty spaces, but also to inspire Bryan residents to eat healthy food and drive entrepreneurship and tourism. This past winter season, DUFI was able to grow broccoli, cauliflower, cabbage, and lettuce in a raised bed and pallet gardens. DUFI's goal is to get the farm's produce on plates at local restaurants to promote a healthier community.

5. Sharing Backyards, throughout Canada, the United States and New Zealand

Sharing Backyards offers a solution for people who lack land but want to grow their own food locally by linking them with people who have unused yard space. Through the initiative's

website, those with unused property can post their approximate location, and those looking for space to grow food locally can search locations nearby at no cost. While Sharing Backyards already has yard-sharing programs set up throughout Canada, the United States, and New Zealand, anyone is encouraged to start their own local program.

Representational pic from www.foodwork.ca

After noticing the importance and results from the earlier studies and success stories of urban farming, in order to contribute to the SDGs, MANAGE has initiated activities. Urban Vegetable Garden on roof top was initiated in the year 2014-15 to address nutritional security in urban areas under the Centre for Gender in Agriculture, Nutritional Security and Urban Agriculture (CGANS & UA), MANAGE. New technologies are being practiced and demonstrated to MANAGE trainees and other visitors.

MANAGE Household Vegetable Growing Models Adopted:

(i) Model Vegetable Garden:

A demonstration unit of model vegetable garden to ensure year round supply of fresh vegetables was initiated at MANAGE campus in December, 2016 with the Objective to promote nutritional security, safe food by sustainable production methods and mitigate micronutrient malnutrition in Urban areas. A balcony unit of 4 X 6 ft. is designed to accommodate maximum no. of vegetable plants. Depending on the preference of the

grower, plants are selected to meet the daily requirements. Vegetables like onion/potato/root crops are generally not preferred as production will not meet the needs of a family. Few leafy vegetables growing pots will be hanged on the grill utilizing vertical space to the fullest.

(ii) Stackable Unit / Square Foot garden:

Six containers were stacked vertically in one square foot area. Design is ideal for leafy vegetables. 6 types of leafy vegetables can be grown with 3 staggered sowings. 250 g of leafy vegetables will be harvested from one sowing.

(iii) Hanging pots:

Iron grill of moderate size can be installed in the kitchen balconies/ patios. Leafy vegetables like coriander, mint, fenugreek etc., can be grown in the hanging pots. These pots can be hanged along with few crotons that can add aesthetic value to the balconies. Grow bags of different sizes, earthen, plastic/fiber pots on raised platforms can be used to grow vegetables.

Hydroponics:

Hydroponics is a subset of hydro culture, which is a method of growing plants without soil, by using mineral nutrient solutions in water solvent. Tower model of Hydroponics has a capacity of 416 plants which was built from scrap material available at MANAGE by the engineering department in 6X6 m area. This can be replicated on rooftops of 387 sft and can get a clean harvest.

Organic Vegetable Garden:

More than twenty varieties of vegetables are grown organically in 250 Sq. m utilizing the area efficiently. The garden was initiated in February, 2018.

Protected structure (Shade net):

Protected structure of 35% shade is being used to raise nursery in portrays and pro-bags to grow vegetables in peak summer and to evaluate new improved/ high yielding /indeterminate varieties. Tomato, Cucumber were grown successfully. Capsicum, red cabbage and broccoli were sown in kharif, 2018. In 2 beds of size 16X1m, each accommodating 64 capsicum plants, 54 broccoli and 30 red cabbage.

Composting techniques adopted in Urban Garden, MANAGE

(i) Vermicomposting and Vermiwash

(ii) Amruth Jal

(iii) Amruth Mitti

(iv) Ghana-jeevamrutham

(v) Dhrava-jeevamrutham

(vi) Household kitchen waste decomposer

Mushroom unit:

Mushroom production unit was established at National Institute of Agricultural Extension Management (MANAGE), as part of Urban Agriculture initiatives at the center. The unit serves as a demonstration unit for trainees visiting MANAGE. The unit is 1500 sq ft. partially controlled environment is maintained inside the unit to boost mushroom growth. The unit is suitable for production of Oyster and Milky white varieties.

MANAGE practices and demonstrates new technologies of urban farming to popularize this concept in urban and peri-urban areas through its trainings, research and visits. URBAN FARM promotes the flagship technologies like HYDROPONICS and AQUAPONICS-a smart way of sustainable cultivation, that doesn't require soil and large space.

Initiatives implemented for the year 2019 at MANAGE

1. Online Marketing of Urban Farming:

2. Aquaponics unit:

3. Model Herbal Garden:

4. Multi-media production and documentation on Microgreens, Balcony garden, Ghana jeevamrutham and decoctions.

5. Ban on use of plastic carry bags in MANAGE Urban Garden by promoting eco-friendly bags

6. Decoction Preparation of Brahmastram and Neemastram for larvae's.

7. Application of Bio fertilizers to garden Soil

8. Red- Soil and Manure application in herbal garden

9. Soap water spray for caterpillars

10. Cow urine spray for various diseases.

As there is a growing demand for smart technology applications in production of vegetables at urban levels, new initiatives are proposed for 2020-21 as mentioned below:

Upcoming Urban Garden Initiatives for the year 2020-21

1. Pest Management with Solar Insect Trap:

2. Mushroom Cultivation:

Spawn running in sawdust media

White and pink mushroom raising with paddy straw

3. Vertical Garden using PVC pipes

After providing training programs and glance for visitors on urban farming MANAGE has formulated this current study entitled **"Household analysis of urban Farming: Alternative Strategy for food and nutritional security"**. This study was intended to measure the food and nutritional security attained through urban farming at the household level in Hyderabad city of Telangana State, India. The study was planned with the following objectives:

1. To study profile of the respondents
2. To analyze the practice of urban farming among the respondent
3. To determine extent of food security met out through 'urban farming'
4. To find out the constraints in adopting this practice

Chapter-II
Review of Literature

1. Urban farming-conceptual definitions

Urban agriculture (UA) is defined as the production of crop and livestock goods within cities and towns (UNDP, 1996).

Urban agriculture is a localized food system wherein the production, processing, distribution, access/consumption and disposal/recycling of food occur in and around the city (Smit et al., 1996).

Urban farming can help to create an improved micro-climate and to conserve soils, to minimize waste in cities and to improve nutrient recycling, and to improve water management, biodiversity, the O^2-CO^2 balance, and the environmental awareness of city inhabitants (Deelstra, T. and H. Girardet , 2000).

Urban agriculture has been defined as "the production, processing and distribution of a diversity of foods, including vegetables and animal products in intra-urban or at peri-urban areas (Baumgartner, B and Belevi, H. (2001).

The agricultural activities can enhance the value and quality of life in terms of economic, sociocultural aspects by growing plants and animals using various spaces in urban areas (Viljoen et al., 2005 and Mougeot, 2006).

The urban farmer, like any other farmer, will typically produce to satisfy household food needs or make profit or both. If the interest were in producing for home consumption, the farmer would want to obtain the optimum from his/her effort If on the other hand, the farmer produces for the market, then the cost of production and the returns accruable to the farmer's effort become important measure of performance. Either of the two objectives of production requires efficient use of farm resources (Umoh, 2006).

Urban agriculture makes up one aspect of a city's food system. Each of urban agriculture's components-production, processing, and distributing the associated activities, is linked to a variety of community benefits. The benefits vary according to the type of urban farming: personal consumption, institutional, educational, for-profit, nonprofit and so forth. Successful community-based urban farming projects require considerable planning and commitment that grows out of the interests of a particular neighborhood or community (Guthman, 2008).

The important and defining condition of urban agriculture is not only its location but its integration within the city's economic, social and ecological systems (Wilson, 2009).

Urban agriculture encompasses gardening in backyards, schools, public right-of-way and boulevards, community gardens, urban farms, rooftop, balcony gardens, hydroponic, aquaculture, vertical gardening, keeping micro livestock such as hens, rabbits, bees, greenhouses, permaculture design in parks, edible landscaping, public orchards or food forests and agricultural parks (La Rosa et al., 2014).

The term 'urban agriculture' (UA) is spreading across developed and developing countries worldwide. In the Global North, it refers to a specific form of agriculture that fits the requirements of certain urban lifestyles and is adapted to basic conditions of land and landscape in urban areas (FAO, 2015).

UA as "plant and animal production on comparably small inner-city areas, where practitioners often do not have a professional education in agriculture, usually are non-profit oriented and distribute their produce along short supply chains. Examples are allotments, house gardens, balconies and increasingly, community gardens and start-up entrepreneurs such as new entrants into commercial farming. These initiatives make use of currently unused spaces, combining multiple objectives in new ways and developing new concepts and techniques" (Opitz et al., 2016).

2. Demographic and socio-economic profile of the Urban farming practitioners

A detailed study on the present status of UA was collected by Maconachie, R., Binns, T., & Tengbe, P. (2012) from a sample of 483 urban farmers revealed that many of the respondents were young people (below 15 yrs).

A Study conducted by Chagomoka et al. (2017) noticed that their respondents consisted of 52% men and 48% women involved in urban agriculture. The majority of the respondents was aged between 21 and 59 year (84%) and had not attended school (55%). Muslim (46%) and Christians (45%) constituted the majority of the survey sample.

Another study conducted in Malaysia by Othman et al. (2018) had 100 males (41.2%) and 143 females (58.8%). Respondents aged between 31 to 40 years old constitute the largest percentage (33.7%) and those aged from 41 to 50 years old constitute the second high percentage of 25.9%. These two statistics showed that respondents were in the productive workforce category of the population. Respondents aged over 60 years old constitutes 14.8%. Thus, it is fair to say that this respondent

group is retirees. The least number of respondents were aged below 20 years old. This implied the relative lack of interest among the young in urban farming.

3. Urban farming practice

According to some accounts, 200 million people are employed in urban farming and related enterprises, contributing to the food supply of 800 million urban dwellers (UNDP, 1996).

In African countries 40% of urban dwellers are said to be engaged in some sort of agricultural activity and this percentage rises to 50% in Latin American countries (Ruel et al., 1998).

A study showed that majority of respondents (168 out of 243) practices urban farming for long as 2 to 4 years. Practitioners in the 2 to 4 years of experience category highly practiced urban farming (1 to 3 days per week). This time amount spent implies the existence of time constraints among these practitioners due to work and family obligations. A high number of pensioner practitioners spent 6 to 7 days per week at the community garden (Othman et al., 2018).

About 17 per cent of the households produce food in towns. Vegetables are the most common crops in urban areas as 72 per cent of urban farmers reported that they cultivate vegetables in the research area (Omondi, S. O., Oluoch-Kosura, W and Jirström, M. 2017).

4. Role of Urban farming in Food and nutritional security

Urban Farming was implemented in cities around the world urban agriculture could produce 10% of the global output of legumes, roots and vegetables (Clinton et al., 2018).

Urban farming may not solve food security on its own according to this definition, and one method specifically would be too limited to ensure everyone had their preferred choice of foods, but it could significantly increase the amount of food available to an urban area, especially in special emergency circumstances. Urban Farming may not produce enough food to replace traditional farming, however, it can be a major contributor to the food security of urban areas both systemically, and in Emergency Readiness (Darcel et al., 2019).

The study of Ramaloo et al. (2018) found that economic benefit were of little significant to many gardeners in the study area. Although the income was not fully supported, however the gardeners have a little bit of economic saving through food

production by own production and community food exchange. Establishing community's urban agriculture allows urban residents to plant and consume their home-grown vegetables, fruits, and herbs was noticed.

The food security status of respondents in the study area was shown only 16.7% of the respondents were food secure, 52% were food insecure without hunger, 19.3% were food insecure with hunger while 12% were food insecure with severe hunger. An average urban farmer in the study area was food insecure without hunger (Edeoghon, C. O and Idowu, A. A. 2017).

Own food production has been found to be important for improving households' food security, reducing their dependence on purchased food and supporting agricultural practicing households for five months a year. In addition, perceptions about the importance of own food production demonstrate that urban farming households regard such production as important for their survival (Omondi, S. O., Oluoch-Kosura, W and Jirström, M. 2017).

Through direct participation in UA, in particular (whether volunteering on urban farms or adopting plots in community gardens) food insecure individuals can offset significant percentages of fresh vegetable expenditures (Participants saved between $240–$720 per household per year from establishinghomegardensorhavingaccessto10×200 plots, according to Santo, Palmer & Kim (2016) literature review from Johns Hopkins Center for a Livable Future.

UA remains a relatively small, yet important percentage of the larger food distribution system in cities: "few, if any, urban agriculture projects, are intended to replace traditional food retail or would claim to lead to food self-sufficiency for individuals or for cities" (Santo et al, 2016).

UA to contribute to urban food security in different regions, based on a low threshold of urban land required to grow the daily vegetable intake for the urban poor (Badami, M. G and Ramankutty, N. 2015).

5. Constraints In Adopting Urban Farming

A study by Othman et al. (2018) found that the expectation of urban farming for economic benefits had the lowest scores despite the majority of the respondents coming from the low-income group and a significant number of pensioner respondents. This implies that the respondents were not convinced of the economic benefits as they have yet to see strong evidence of economic benefits of urban farming by other people.

During the survey conducted in Dhaka, Bangladesh most of them answered that they did not have sufficient leisure or free time to implement and look after the garden. 33.3% people told that they are busy with their personal and official works and do not have enough time to spend on gardening or farming. Lack of technological knowledge is also a constraint for not practicing. There is very few opportunities for acquire technological and farming knowledge was mentioned by non-practitioners. Whereas sometimes birds create disturbance by eating the small vegetable and fruit plants, leaves of the plants make the roof unclean so it is necessary to clean the roof in a regular basis. Another problem is to find good quality plants. There is no further help and follow up from government or any other organizations for improving their rooftop farming. Tenants usually do not take part in improvement of the garden. Moreover, if practitioner wants to expand the garden, skilled gardener would be required. Another issue is that shadowing of neighbor building, hampers production was quoted by urban farming practitioners (Safayet, M., Arefin, M. F., & Hasan, M. M. U. (2017).

The major constraints were incidence of insect, pest and diseases, inadequate irrigation facilities, fear of weed problem, high cost of seeds, lack of quality seeds, labor scarcity and high labor charges, non-availability of credit, non-availability of suitable inputs, lack of confidence, lack of knowledge, non-availability of crop insurance was mentioned in the study of Sharma, L., Pradhan, B., & Bhutia, K. D. (2017).

Literature suggests that urban farming produces an income and can diversify diet. Community-based projects can promote social interaction and outdoor activity for a double dose of health benefits. Areas designed with urban farming in mind -such as vertical farms (growing plants up the sides of buildings, for example) and patchworks of fields between, on top of or within blocks of buildings -could shape our future cities. Awareness on Rooftop and indoor farming would further increase in future. There was very few studies available with regard to the urban farming and food & nutritional security. Hence this present study will contribute to the scientific community who are interested in urban farming.

Chapter-III

Materials and Methods

The research work entitled **"Household analysis of urban Farming: Alternative Strategy for food and nutritional security"** was conducted during the year 2018-19. The materials and methodology used for conducting the study and analysis of data are given in the following heads:

1 Research design

2 Location of study

3 Selection of sample

4 Selection of tool

5 Data analysis

1 Research Design

The term "research design" refers to how a researcher puts a research study together to answer a question or a set of questions. Research design works as a systematic plan outlining the study, the researcher's methods of compilation, details on how the study will arrive at its conclusions and the limitations of the research.

An exploratory research design was adopted to conduct the study. Exploratory research design is a type of research conducted for a problem, when the problem itself has not been clearly understood. In other words, exploratory research is a process of gathering facts and doing research that later allows for the team to create the best research design or data collection method available for specific subjects. This research design was adopted to explore the consumption of millets and their impact on metabolic disorders.

2 Location of study

The location selected for the study were Hyderabad district, Telangana.

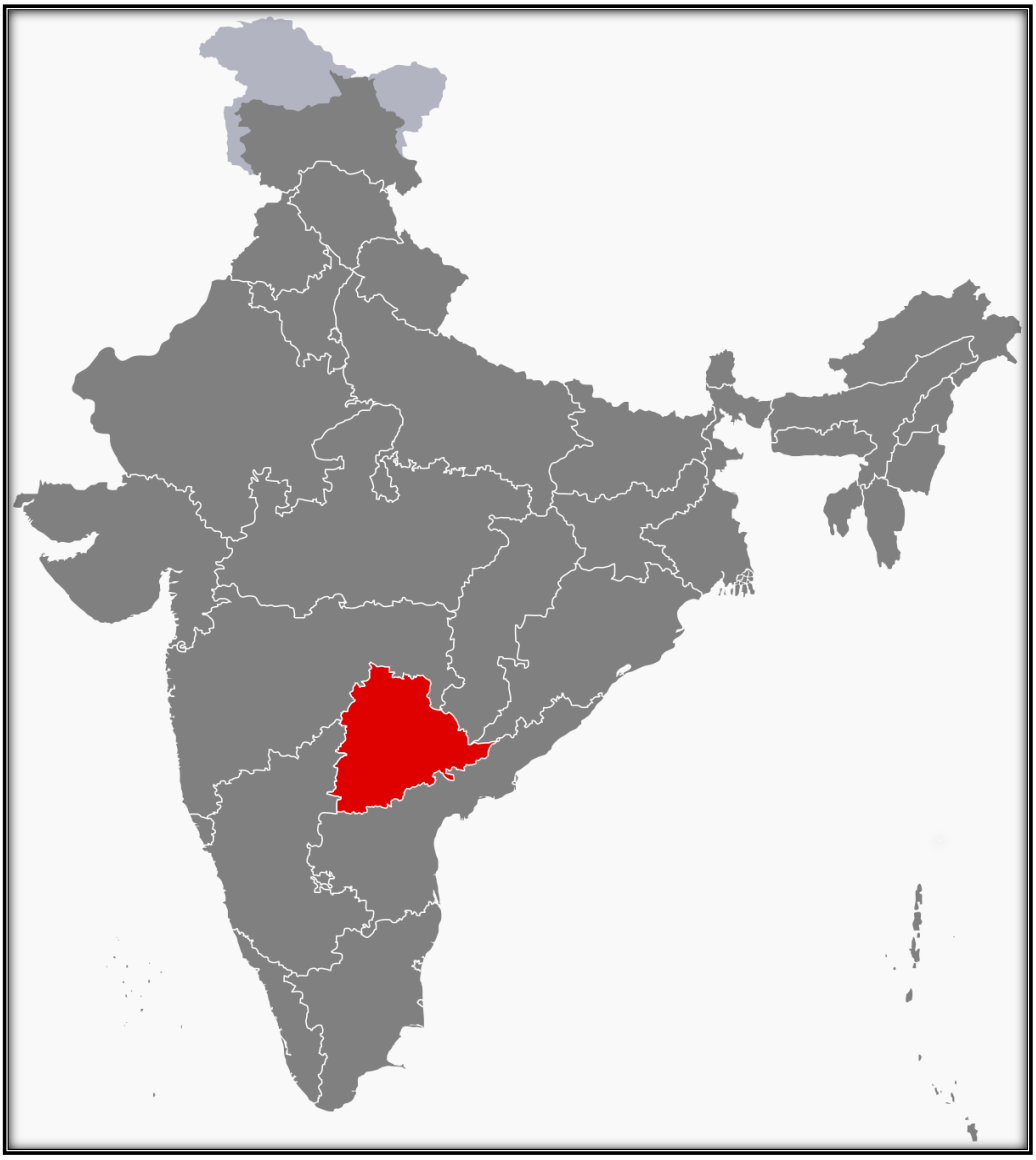

Figure 3.1: Location of Telangana state within India.

The district of Hyderabad is located between 1° 11' of the Northern Longitude and 78° 27' of the Eastern Longitude. Situated on the Deccan plateau, it occupies an area of 217 square kilometers. The district known as the city of Nizams. Magnificent architectural legacy left behind by the Nizams, the district is now hosting a contemporary and modern lifestyle, catering to the many different communities of people residing in the state. Predominantly the climate of Hyderabad district is tropical wet and dry. During summer the maximum temperature is 40° Celsius and the minimum temperature is 22° Celsius and during winter the minimum is 13.8°

Celsius. During the Monsoons also the temperature goes down at times. Thus, for most parts of the year the weather and climate of Hyderabad district remains fairly moderate. The average rainfall in the district is 89 cm, from June to September.

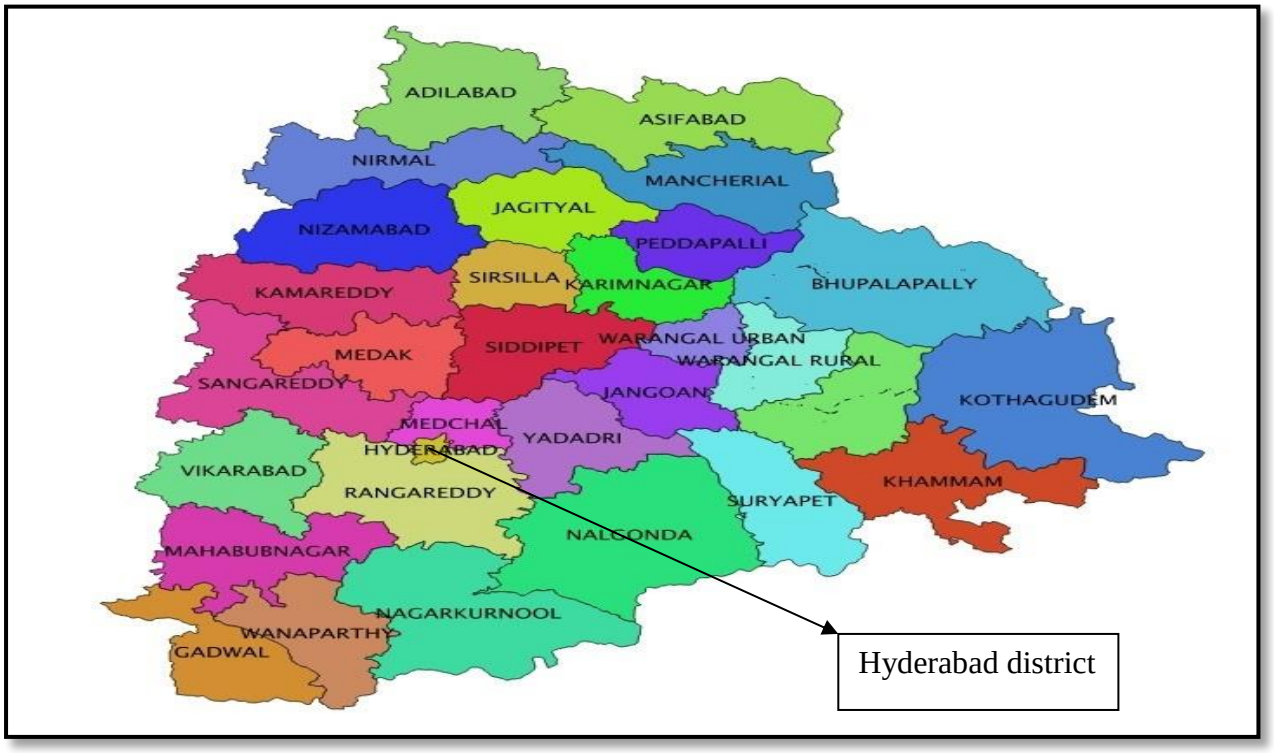

Figure 3.2: Location of Hyderabad district of Telangana state.

3 Selection of sample

Hundred adults were selected from Hyderabad district of Telangana. Random sampling procedure was used for sample selection.

4 Selection of Tool

A detailed interview schedule was developed to collect information from the population.

4.1 Interview schedule

Interview schedule is a data collection technique in which the interviewer physically meets the interviewee and asks the questions related to the research topic in a predetermined order, and records his or her response to each (given appendices).

Interview schedule was prepared with questions related to urban farming practices and food & nutritional security with the following broad heads:

S. No.	Broad heads	Information collected on:
1	Demographic and socio-economic profile of the respondents.	Name, place and district of the respondents, gender, educational level, marital status, religion, caste category, family size, occupation and annual income and it's sources, Expenditure pattern of food, clothing, education and health.
2	Urban farming practices among the respondents.	Types and number of foods grown, area utilization, reasons and source of motivation for urban farming, trainings attended, models adopted, duration of practice and types of containers used.
3	Food security through urban farming.	Foods percentage contribution from urban farming, dietary diversity, food groups and nutrients consumption.
4	Constrains in urban farming practice.	List of constraints faced by the respondents.

Each respondent was interviewed separately and the data was directly recorded in the schedule. Each collected information was coded and classified into different categories and presented in the results and discussion chapter.

Figure 3.3: Data collection from the respondents

Figure 3.4: Urban farming gardens of the respondents

Figure 3.5: Different garden models adopted by the respondents

Figure 3.6: Vegetables produced from the gardens of the respondents

Figure 3.7: Fruits produced from the gardens of the respondents

Figure 3.8: Ornamental flowering plants from the gardens of the respondents

4.2 Dietary Assessment

4.2.1 24-hr recall: The dietary intake component of the nutritional assessment examines adequacy of the current diet for micronutrient as well as macronutrient composition, identifies factors affecting adequate intake, and identifies food intolerances that may affect intake and proper medication regimens (ADA, 1998). It is the goal of dietary assessment and subsequent education and counselling to prevent loss of weight and lean body mass and to determine measures that may improve the overall health of a patient. Both 24-h recall and diet history have been shown to provide good estimates of dietary intake for a baseline assessment.

4.2.2 Food Consumption Scores (FCS): Dietary diversity is a qualitative measure of consumption that reflects household access to a variety of foods and is also a proxy for nutrient adequacy of the diet. The dietary diversity scores were given based on simple count of food groups that a household or an individual has consumed over the preceding 24 hours. FCS meant to reflect, in a form, the economic ability of a household to access a variety of foods. Scoring were given based on consumption of each food groups i.e., score 1 for consumption of particular food group and score 0 for no consumption of particular food group.

5 Data analysis

The collected data from interview schedule were coded, tabulated, analyzed and presented as tables to make the findings easily understandable. The findings emerged from the data were suitably interpreted and necessary conclusions and inferences were drawn.

5.1 Arithmetic Mean ($\bar{X}$)

The arithmetic mean ($\bar{X}$) is the quotient that results when the sum of all the items in the series is divided by the number of items. The formula for calculating arithmetic mean is:

$$\bar{X} = \frac{\sum(X)}{n}$$

Where, $\bar{X}$ =Arithmetic mean

$\sum$=Summation of

X=Individual item score

n=No. of items

5.2 Standard Deviation (SD)

The standard deviation is derived by taking the difference of each item in the series from the arithmetic mean, squaring this difference, summing all the squared difference, dividing by number of items and then extracting the square root. In other words, it is the square root of mean of the squares of deviations from the mean of the distribution. The formula for standard deviation is:

$$i.SD = \sqrt{\frac{\sum d^2}{n}}$$

Where, SD =Standard deviation

∑=Summation of

d^2=Sum of squared deviations from mean

n=Number of items

$$ii.SD = \sqrt{\frac{1}{n}\sum X^2} -$$

Where, n=Number of observations

∑X=Sum of deviations of scores from mean

5.3 Frequency and Percentages

Some of the data was subjected and interpreted in terms of frequency and percentages. Data compilation was done by Microsoft Excel.

Chapter-IV

Results and Discussion

The research study entitled "**Household analysis of urban Farming: Alternative Strategy for food and nutritional security"** was carried out in Hyderabad district of Telangana, India. The aim of the study was to assess the extent of urban farming technologies practice by the respondents and its impact on food and nutritional security at household level. Hundred respondents were selected and surveyed. The conceptual frame work and semi structured interview schedule was developed to ascertain the proposed objectives; the evidences obtained through objective research procedures were analyzed using appropriate statistical tests.

The findings are presented and discussed in this chapter under the following heads.

1. Demographic and socio-economic profile of the respondents.
2. Urban farming practices among the respondents.
3. Food security through urban farming.
4. Constrains in urban farming practice.

1. Demographic and socio-economic profile of the respondents:

The demographic profile of the respondents was obtained through a semi structured interview schedule. Data on the respondent's profile details such as age, marital status, type of family and size, education, occupation and spouse's occupation were collected and presented under the following sections.

Age, marital status, type of family and size of the selected population was tabulated and presented as frequency and percentage under each category as presented in table 1.

Table 4.1. Demographic profile of the respondents

Category	Male (n=57)	Female (n=43)	Total (n=100)
Age			
Young age (up to 35 years)	11	9	20
Middle age (35-50 years)	19	15	34
Old age (above 50 years)	27	19	46
Marital status			
Married	42	56	98
Un-Married	0	0	0
Widow	0	1	1
Divorced	1	0	1
Type of Family			
Nuclear	40	31	71
Joint	17	12	29
Family size			
<4	39	28	67
4-6	9	13	22
>6	9	2	11

Note: Percentage and number are same.

1.1 Age

The chronological age of the respondent's classified under the respective age groups of young age (up to 35 years), middle age (35-50 years) and old age (above 50 years). Age-wise classification of the respondents showed that 11% male and 9% female were in the young age group, while 19% male and 15% female were in the middle age group and 27%

male and 19% female were in the old age group. Overall, majority of the respondents were old age (46%) followed by middle aged (34%) and young (20%) (Same was depicted in figure 4.1).

Majority of the respondents were observed in the old age group which might be due to the fact that after retirement people might have settled down in urban areas is staying with their sons or daughters as they are in need of health care and supervision. The trend of the respondents was showing that as the age was increasing the practice of urban farming also increased. Other possible reason for increasing trend of the respondents engaged in UF practices with age might be that with the advancement of age, work responsibilities lesser and people have more available free/leisure time.

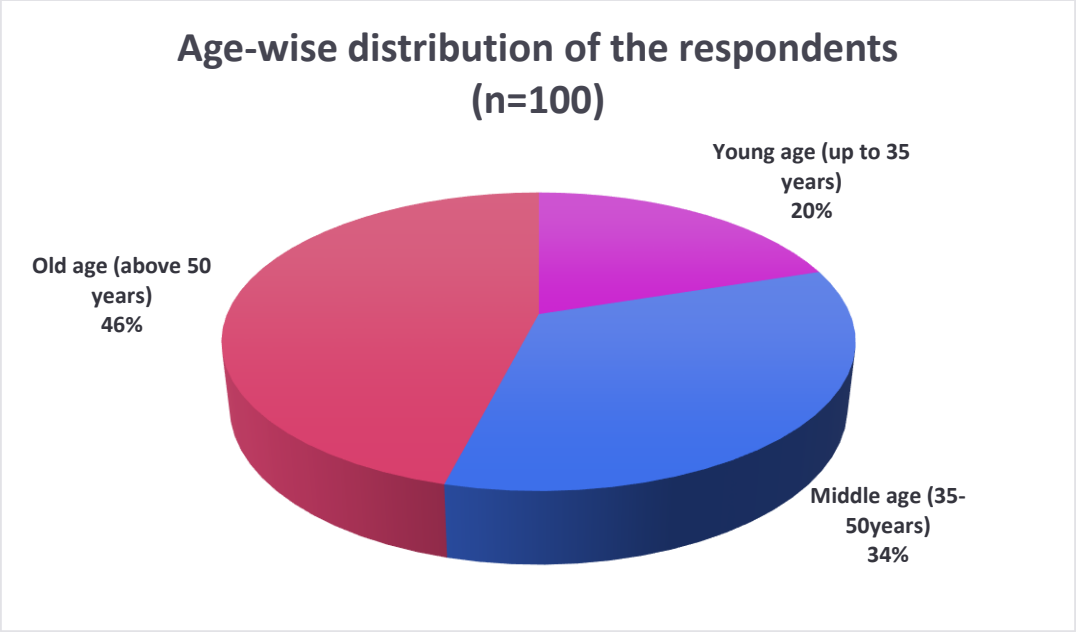

Figure 4.1. Age-wise distribution of the respondents

So it will be very apt to target this group for intensification of UF practices among the urbanites. On the contrary, it also implicit that the young population has to be encouraged/motivated to take up UF practices on wider scale in order to ensure safe and nutritious food for the family. Each of category of the respondents can be targeted for different purpose.

1.2 Marital status

Based on the marital status of the respondents, they were categorized as married, un-married, widow and divorced. Majority of the respondents- 42% males and 56% females were married, followed by divorced 1 per cent each male and female as shown in the figure 4.2.

The below mentioned results revealed that the percentage of married respondents was high followed by divorced and widowed. There is none un-married respondents.

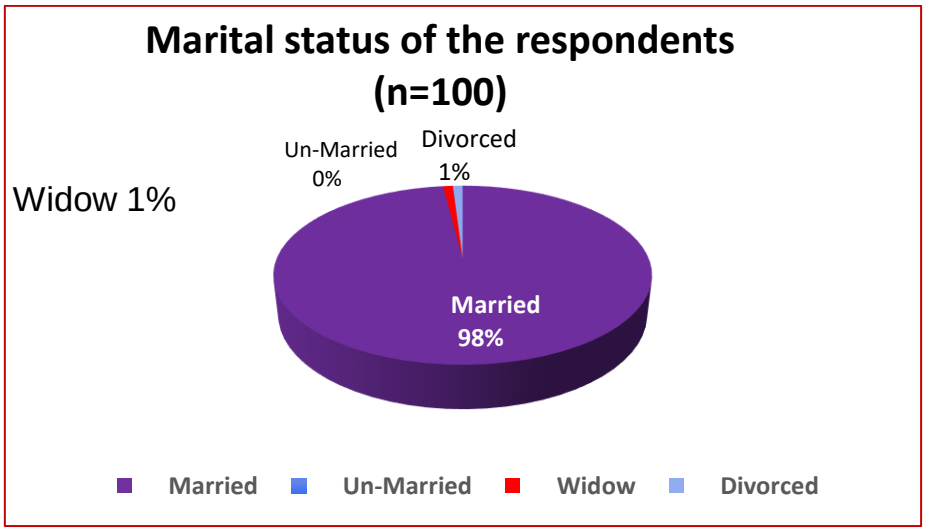

Figure 4.2. Marital status of the respondents

1.3 Type of Family and size

Based on the family type, respondents were categorized into nuclear and joint family categories. Majority of the respondents (71%) was living in nuclear family followed by joint family (29%) as shown in figure 3.

The total number of family members living in a family was collected and classified into 3 categories such as less than 4 members, 4 to 6 members and more than 6 members. It was found that majority of the respondents (67%) had a family size of < 4 members, followed by 22% with 4-6 members and 11% with a family size of > 6 members, results are illustrated in figure 4.4.

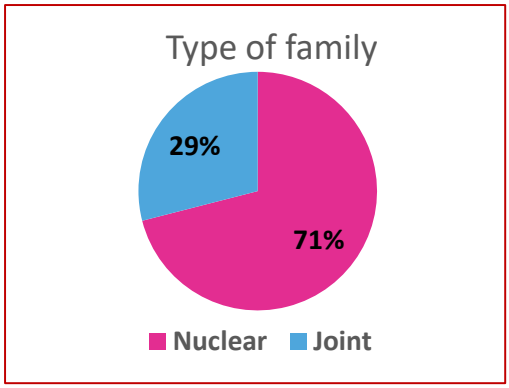

Figure 4.3. Respondent's family type

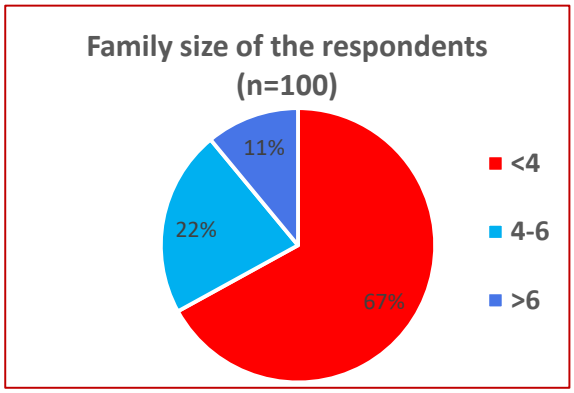

Figure 4.4. Family size of the respondents

1.4 Education

Educational level of the respondents is given in table 4.2. From the results of this table, it is evident that majority of the respondents (41%) were post graduate qualified followed by 39 per cent with graduation degree. Very few of the respondents had low level of education.

Gender-wise data also reflected similar trend. But the relative percentage of the respondents, gender-wise reflected slightly lower percentage of qualification, for females as compared to males under different categories.

From the results it can be observed that majority of the respondents fell in the <4 category. Nearly $7/10^{th}$ of them were living in nuclear families. The results proved that small family trend is high in urban areas. Urban population are shifting to small and nuclear families due to high cost of living, frequent shift in professional life and education of the children etc.

Table 4.2: Distribution of the respondents based on education and occupation

Category	**Male (n=57)**	**Female (n=43)**	**Total (n=100)**
Education			
Below matric	3	5	8
Matric	1	3	4
Intermediate	4	4	8
Graduate	25	14	39
Post graduate	24	17	41
Respondent's Occupation			
Home maker/Retired	13	22	35
Business	10	5	15
Private job	24	10	34
Government job	10	6	16
Spouse's occupation			
Home maker/Retired	43	9	52
Business	2	10	12
Private job	12	19	31
Government job	0	5	5

Note: Percentage and numbers are same.

The urban males had higher percentage of higher education than the female from graduation to post-graduation whereas female education percentage was higher than the male's percentage up to matriculation. This could be attributed due to opportunities for girls and women for higher and better education. Moreover, they are married at an early age hence limiting the scope for higher education and job opportunities.

Analysis from 409 Indian districts showed that girls have relatively lower literacy when compared to boys in areas where more women are in the labor force. The reason was explained by the authors that the areas with higher women's labor force participation suppressed or deprived the opportunities of the women for continuing their education was reported by Sundaram and Vanneman (2008).

From various perspectives women in South Asia find themselves in subordinate positions to men and are socially, culturally and economically dependent on them (Narayan *et al*., 2000).

1.5 Occupation

The occupational information of the respondents was collected and categorized into 4 sections as given in table 4.2. Majority of the respondents (35%) were either retired or home makers, followed by private job holders (34%), government job employees (16%) and businessman (15%) as illustrated in figure 4.6.

The data on the respondent's spouse occupational details was also collected and presented in table 2. A majority of them were noticed to be in the category of either a home maker or retired, followed by 31% in private jobs, 12% in business and very low (5%) were into government jobs. The same has been depicted in pictorial form in figure 4.7.

From the results it can be inferred that majority of the respondents and their spouses were either home makers or retired personnel, followed by private job, business and government employees. The earlier data on age group also revealed that majority of the respondents were old aged, which is associated due to retirement partly. So, many of them are utilizing their time by involving themselves in urban farming or garden activities.

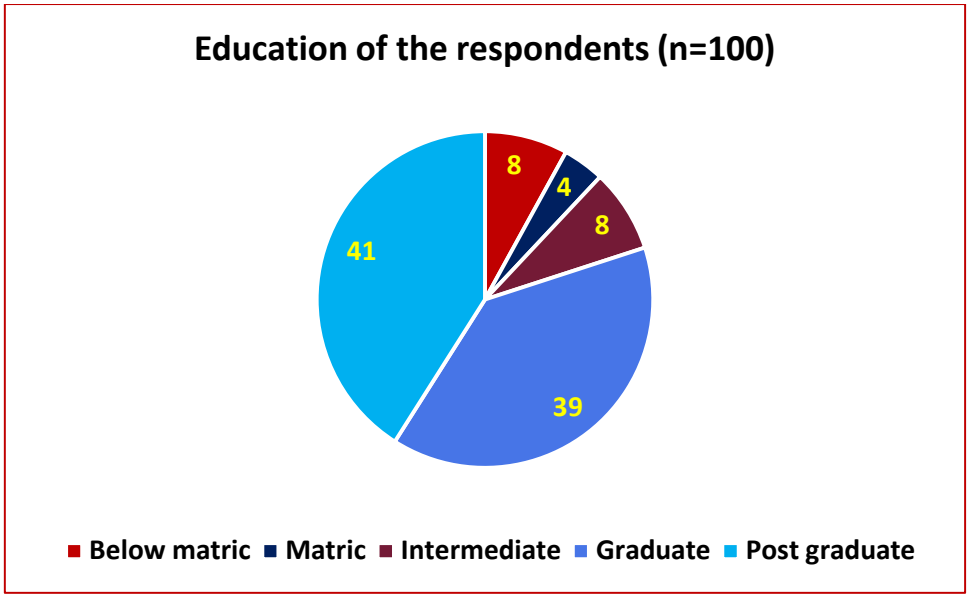

Figure 4.5. Education of the respondents

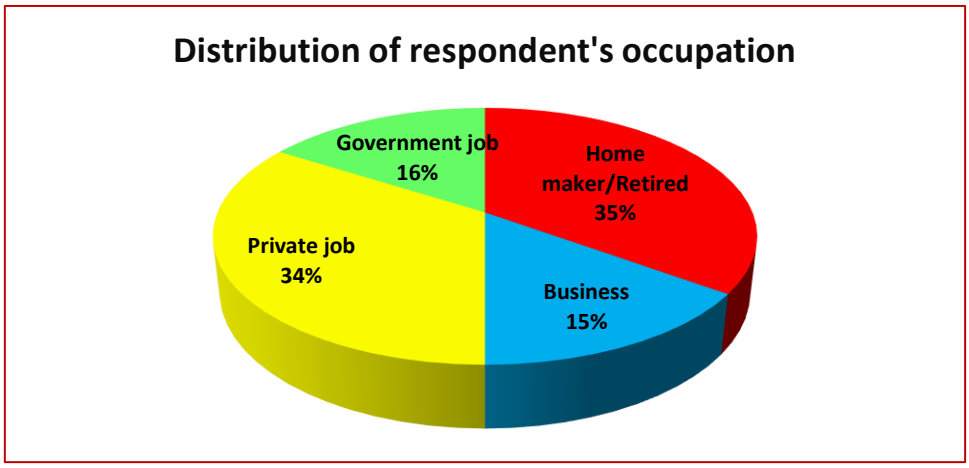

Figure 4.6. Occupation of the respondents

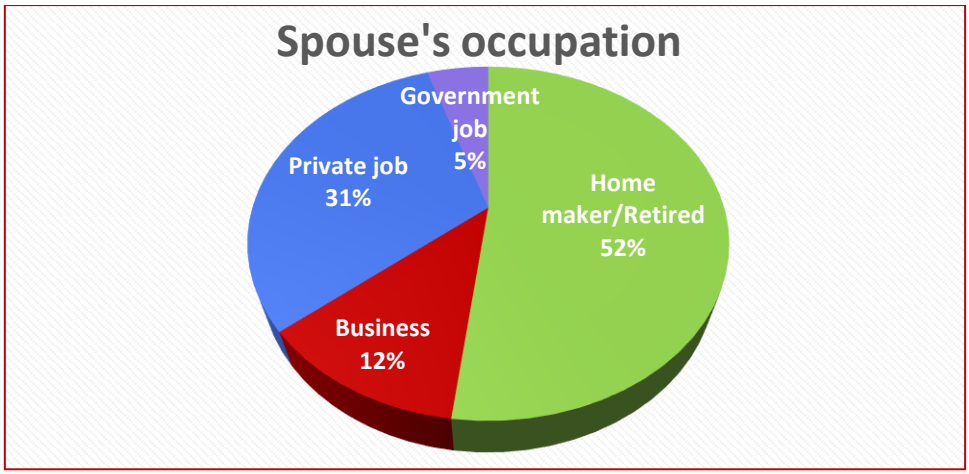

Figure 4.7. Occupation of the respondent's spouses

One of the important indicator to evaluate the health and nutritional status of a family is to assess their Socio-economic status (SES). Miner *et al*. (2015) defined socio-economic status as "a position attained by any individual within a system of hierarchical social structure". According to Institute of Medicine (US) Committee on Assuring the Health of the Public (2002) SES has a major role to play in seeking all the services accessibility and utilization by the people. In other words, the SES of any community has an influence on morbidity and mortality patterns in that particular community or geographic region. Mostly in scientific and social studies, many a time's determining patients SES sometimes help in arriving diagnosis of an individual or family. That is why SES is always a pre-requisite in taking history for health care individuals.

In context to the present study, studying the SES of the respondents was important to analyze the factors that may favor for the respondent's engagement in urban farming practices.

1.6 Income

Income was collected from different sources that the respondents were earned in a month and the data was presented in the table 4.3. The average income of the respondents was 49,152 Rs. and the Standard deviation was 36,607 Rs. The categories of low (Mean-S.D), medium (>Mean-SD to < Mean +S.D) and high (Mean +S.D) was by using the mean and S.D.

The majority of the respondents (87%) was earning income range of 12545 to 85759 Rs. and belongs to medium level income group, followed by low income group with the 7% and their income was less than 12545 Rs. and least percent (6%) was earning 85759 Rs. and belongs to high income group (the pictorial representation was given in figure 4.8).

Table 4.3: Monthly income of the respondents (in INR)

Description	Respondents (n=100)
Low (<12545)	7
Medium (12545 to 85759)	87
High (>85759)	6

* Note: Percentage and number are same. Mean= 49152 and S.D=36607

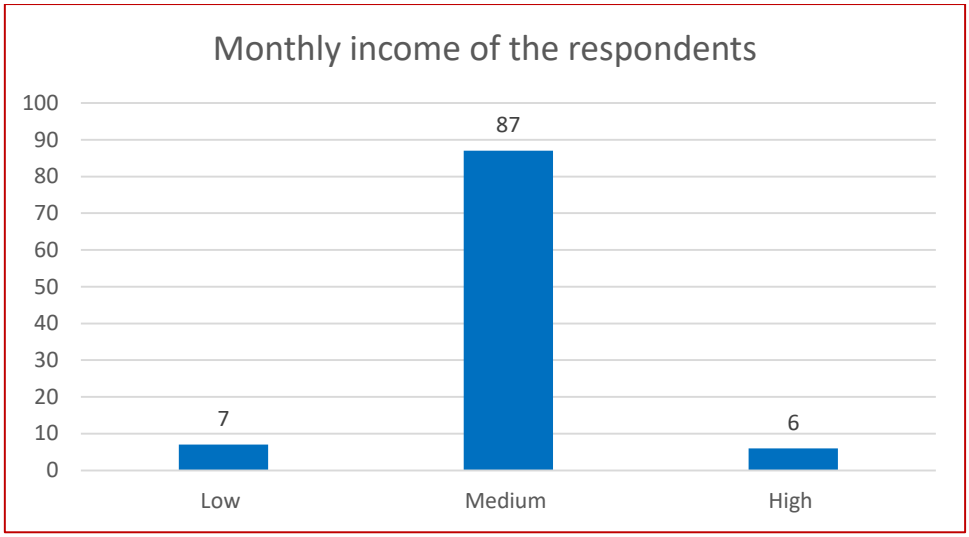

Figure 4.8. Monthly income of the respondents

From the results it can be inferred that majority (87%) respondents belonged to medium income group, followed by low and high income groups. The data suggests that there was not much difference in the income among the respondents since majority of them were distributed in the medium income group. Majority of them were earning income through retirement pension, private jobs and government jobs. Very less percentage of the respondents were engaged in business which do not give stable income, as is reflected in the vast deviation of high and low income group among the respondents.

Table 4.4: Distribution of the respondents based on the monthly income (in INR)

Household monthly income	Total (n=100)
≤6323	5
6327-18,949	14
18,953-31,589	14
31,591-47,262	20
47,266-63,178	23
63,182-1,26,356	21
>1,26,360	3

Source: Saleem, 2018. Note: Percentage and number are same.

Table 4.4 provides details about distribution of the respondents based on their monthly income according to Saleem, 2018. The income range was classified into 7 categories such as less than or equal to Rs.6323, followed by 6327 to 18949, 18953 to 31589, 31591 to 47262, 47266 to 63178, 63182 to 126356 and above 126360 in INR respectively.

The results show that majority of the respondents (23%) fall under the 5th category with the income of Rs. 47266 to 63178, followed by 21% of them noticed in the 6th category with Rs. 63182 to 126356 as their income, 20% of them earned Rs. 31591 to 47262, 14% from each of the 2nd and 3rd categories with the 6327 to 18949 INR and 18953 to 31589 INR respectively whereas only 5% were noticed in the 1st category with the least income range of less than 6323 INR and the least percent of the respondents (3%) was found in the high income range i.e. more than 126360 INR.

From this data it can be seen that majority of the respondents were distributed in the medium income category with an equal percentage of the respondents distributed in the low and high income category ranges. This distribution will provide a better the picture about the income ranges within each of the category.

1.7 Expenditure pattern

The data of table 4.5 and figure 4.9 provides a detail monthly expenditure pattern of the respondents. It was observed that majority of the respondents spent < Rs.1000 and Rs.1000 to 3000 on travelling i.e. 31% each, followed 27% of the respondent's expenditure between Rs.3000 to 5000 and 11% whose expenditure was above Rs.5000 respectively.

Whereas majority of the respondents (62%) spent less than Rs.1000 on education, followed by 29% of them who spent more than Rs.5000, 5% who spent Rs.1000 to 3000 and the least was 4 percentage spent between Rs. 3000 to 5000.

In case of medical expense majority of the respondents (46%) spent more than Rs. 5000 followed by 26% who spent less than Rs. 1000, 24% who spent about Rs. 1000 to 3000 and the least was 4 percentage of who spent in the range of Rs.3000 to 5000 respectively.

Majority (85%) of the respondents spent Rs.1000 to 3000 on shopping, whereas 8% of them spent in the range of Rs.3000 to 5000, 5% spent less than Rs. 1000 and only 2% of them spent more than Rs. 5000 on shopping on an average in a month.

The miscellaneous expenditure includes the amount spent on mobile recharge, cylinder, electricity bill, maid etc. The data showed that majority of the respondents (69%) spent less than Rs. 1000, followed by 18% of who spent in the range of Rs.1000 to 3000, 11% who spent between Rs. 3000 to 5000 and only 2% of them spent more than Rs .5000 respectively.

Table 4.5: Monthly expenditure pattern of the respondents (in INR)

Sl. No.	Items	Expenditure pattern				Total (n=100)
		<1000	1000-3000	3000-5000	>5000	
1	Travel	31	31	27	11	100
2	Education	62	5	4	29	100
3	Hospital	26	24	4	46	100
4	Shopping	5	85	8	2	100
5	Miscellaneous (Mobile recharge, cylinder, electricity and maid)	69	18	11	2	100
6	Food	-	3	13	84	100

Food expenditure was assessed through average monthly expenditure spent on groceries, vegetables, fruits, meat and milk etc. that was consumed by the households. Majority of the respondents (84%) spent more than Rs. 5000, followed by 13% who spent between Rs.3000 to 5000 and 3% of them spent between Rs.1000 to 3000 respectively.

From the results in can be noticed that majority of the respondents were spending their income on food (84%) followed by health (46%) and education (29%). Though spending high amount on food is a good indication but almost half of them spent high amount on health, is a major concern. The respondents need to modify their food habits, rather than spending on unhealthy foods and visiting hospitals, they should inculcate healthy habits.

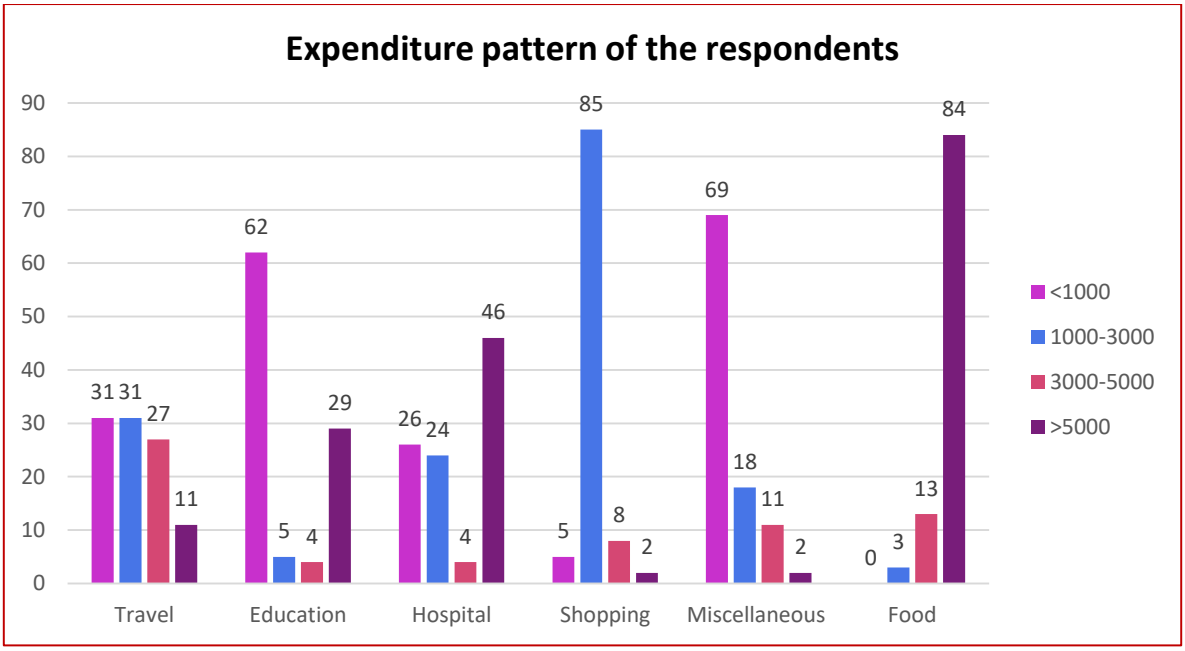

Figure 4.9. Expenditure pattern of the respondents

The data of table 4.6 highlights percentage expenditure on food and non-food items to the total average income of the respondents. The percentage expenditure was 24.66% of their income for the respondents, whereas on non-food sources such as travel, education, hospital, shopping and miscellaneous items it was about 46.14% of their total income. The results indicate that the expenditure on non-food items compared to the food expenditure among the respondents. The same results is depicted graphically in figure 4.10).

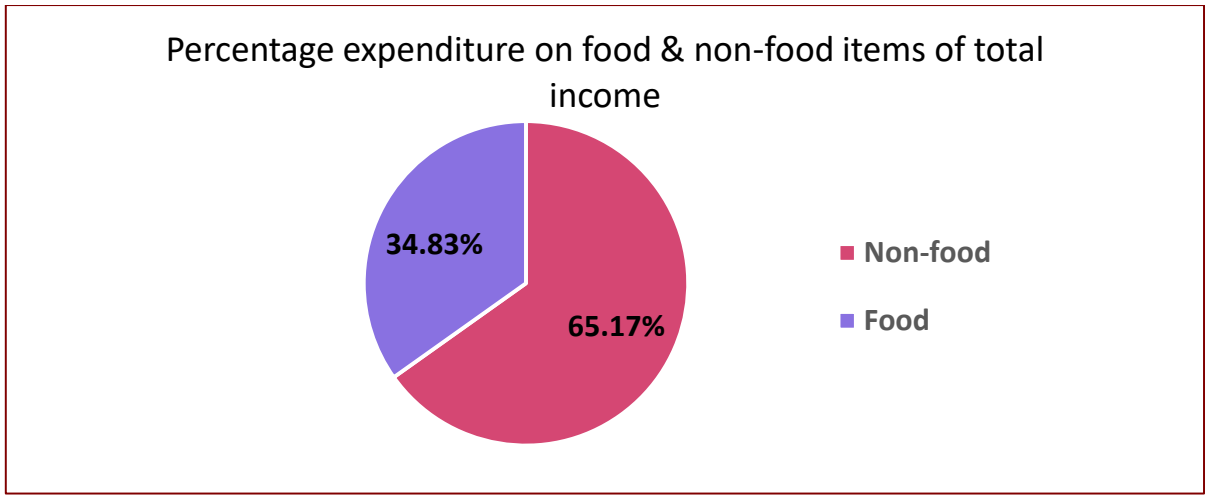

Figure 4.10. Percentage expenditure on food and non-food items of total income.

Table 4.6: Percentage expenditure on food & non-food items from the total average income of the respondents

Sl. No.	Items	Percentage
	Non-food	
1	Travel	46.14
2	Education	
3	Hospital	
4	Shopping	
5	Miscellaneous (Mobile recharge, cylinder, electricity and maid)	
6	**Food**	24.66

Similar trend was observed by Deshmukh and Vyavahare, 2018. According to their study, Non-food expenditure steadily increased over time in urban as well as rural areas. In the urban sector, the share of this category increased from 19.23 per cent to 37.42 per cent and in the rural sector the share increased from 8.8 per cent to 24.36 per cent.

*Note: The percentage cannot be 100 as there will be other savings and investments which was not revealed by the respondents.

The data of table 4.7 presents the information on food expenditure pattern of the respondents in a month. The expenditure was categorized into 4 categories i.e. less than Rs.1000, Rs.1000 to 3000, Rs. 3000 to 5000 and more than Rs.5000.

Vegetables: Majority of the respondents (52%) spent from Rs. 1000 to 3000 per month, followed by 47% who spent less than Rs.1000 and only 1% of them spent between Rs.3000 to 5000.

Fruits: Expenditure on food indicated that majority (57%) of them spent less than Rs.1000 , followed by 41 per cent who spent Rs.1000 to 3000 and only 2 percentage spent between Rs. 3000 to 5000 on a monthly basis.

Table 4.7: Monthly detailed food expenditure by the respondents (in INR)

Sl. No.	Food items	Expenditure on food				Total (n=100)
		<1000	1000-3000	3000-5000	>5000	
1	**Vegetables**	47	52	1	-	100
2	**Fruits**	57	41	2	-	100
3	**Milk and milk products**	18	76	6	-	100
4	**Meat and meat products**	28	13	-	-	41*
5	**Egg and Poultry**	35	4	-	-	39*
6	**Fish and other sea foods**	29	5	-	-	34*
7	**Mushroom**	8	1	-	-	9*
8	**Cereal and Cereal products**	58	36	2	-	100
9	**Pulses and Legumes**	91	7	2	-	100
10	**Oils and Fats**	95	5	-	-	100
11	**Sweets**	100	-	-	-	100

**Note: Since some of the respondents were vegetarian so total percentage is not equal to 100.*

Milk and milk products: Expenditure pattern showed that majority of the respondents (76%) spent between Rs.1000 to 3000, followed by 18% who spent less than Rs.1000 and only 6% of them spent Rs. 3000 to 5000.

Meat and meat products: Consumption of the total respondents surveyed, only 41 percent of them consumed meat and meat products. Out of this, 28 percent of them spent less than Rs.1000 followed by the remaining 13 percent who spent between Rs. 1000 to 3000 per month.

Similarly the data on egg and poultry consumption revealed that the 35% of the respondents were spent less than 1000 Rs and only 4% of them were spent in the range of 1000 to 3000 Rs. Out 100 members only 39 members was consumed egg and poultry during the survey period.

Fish and other sea foods: Out of the total respondents surveyed only 34 percentage consumed fish and other sea foods. Out of that majority of them (29%) spent less than Rs.1000 and remaining (5%) spent between Rs.1000 to 3000 per month.

Mushroom: It was surprising to note that in a metro city like Hyderabad, only 9 percent of them consumed mushroom, which is very low, owing to the increased awareness and acceptance of mushroom not only and urban areas but rural areas as well.

Cereals and their products: Expenditure pattern on cereals and cereal products showed that majority (58%) of the respondents spent less than Rs.1000, followed by 36% who spent between Rs.1000 to 3000, 2% every month spent between Rs.3000 to 5000.

Pulses and legumes: Majority of the respondents (91%) spent less than Rs.1000, followed by 7% of them who spent between Rs.1000 to 3000 and only 2% of them spent in the range of Rs. 3000 to 5000 respectively.

Oils and fats: Majority of them spent (95%) less than Rs.1000 and the remaining percent between Rs.1000 to 3000 per month towards oils and fats expenditure.

Sweets: Expenditure on sweets was noticed to be less than Rs.1000, by cent percent of the respondents the same has been depicted graphically in figure 11.

From the results of this table it can be observed that the respondents spent less than Rs.5000 on all the food items individually in a month. There were less percentage of the respondents who consumed high quality protein sources such as meat and meat products, eggs and poultry, fish and other sea foods and mushrooms but such vegetarian respondents might be compensating it by consumption of adequate quantity of pulses and legumes and milk and milk products. Oils, fats and sweets expenditure was noticed to be less than Rs.1000 for majority of them in a month, on an average.

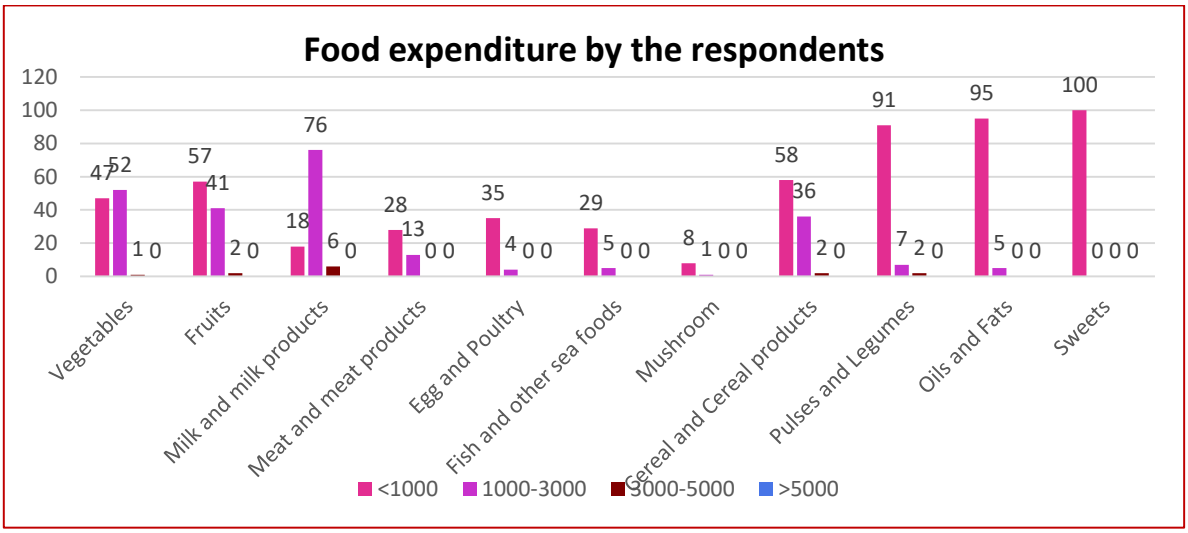

Figure 4.11. Food expenditure by the respondents

2. Practice of urban farming among the respondents:

This section discusses about the major urban farming practices followed by the respondents. It includes types of foods grown, total number of fruits and vegetables grown, area under cultivation, reasons and source of motivation for urban farming, training programs attended, models and containers used and duration of practice.

The respondents were growing different types of foods as indicated in table 8, like vegetables, fruits, mushroom, fish etc. Accordingly they were categorized into different categories based on

The no. of different type of foods grown by them. Respondents were categorized into 3 groups as per the number of foods grown i.e. upto 2, 3 to 4 and more than 4 food groups. Majority of them

Table 4.8: Types of food grown by the respondents through urban farming

Type of foods grown	Number of respondents	Percentage
Upto 2	41	41
3-4	43	43
>4	4	4
Total	100	100

(43%) were growing 3 to 4 food groups consisting of fruits and vegetables, followed by 41% of them who grow upto 2 food groups i.e. vegetables, fruits, mushroom etc. and only 4% of them were growing more than 4 types of foods groups, the same has been depicted graphically in figure 4.12.

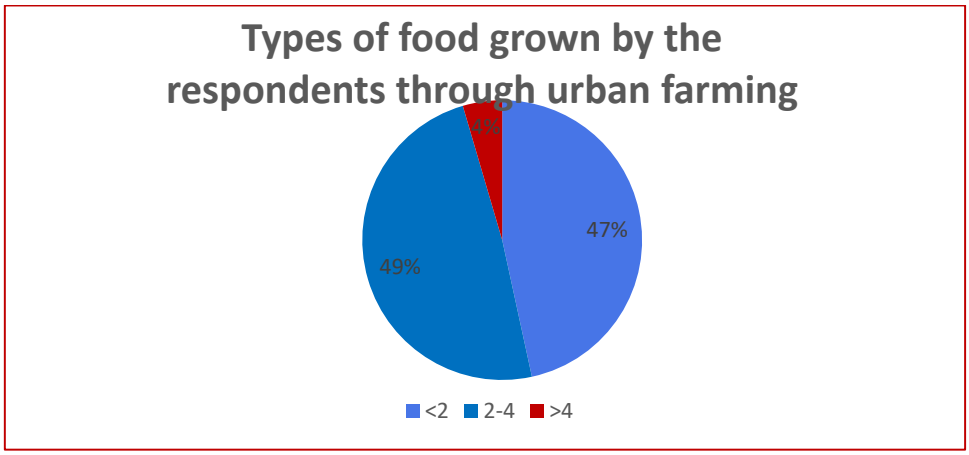

Figure 4.12. Types of food grown by the respondents through urban farming

From the results it was noticed that majority of the respondents were growing 3 to 4 varieties of food groups such as fruits, green leafy vegetables, vegetables and medicinal plants and very less percentage of the respondents were growing more diverse types of foods. Hence more training programs on diversified urban farming or gardening should be conducted, in order to give hands-on-experience.

Table 4.9: Total number of fruits and vegetables grown by the respondents through urban farming

No. of foods grown	Number of respondents	Percentage
1-5	45	45
5-10	40	40
Above 10	15	15
Total	100	100

The respondents were also surveyed regarding no. of fruits and vegetables grown by them through urban farming, such as brinjal, tomato, ladies finger, chilies, ridge gourd, bitter gourd and so on. Among the fruits group papaya, lemon, sweet lime, plums etc. was grown in their home garden. The data on number of fruits and vegetables grown by the respondents is given in table 9 and the same has been presented in pictorial form in figure 4.13. The results showed that majority of the respondents (45%) were growing at least 1 to 5 types of fruits and vegetables at their home, followed by 40% of them who were growing 5 to 10 types of fruits and vegetables and 15% of them with more than 10 number of fruit and vegetable varieties growing in their home garden respectively.

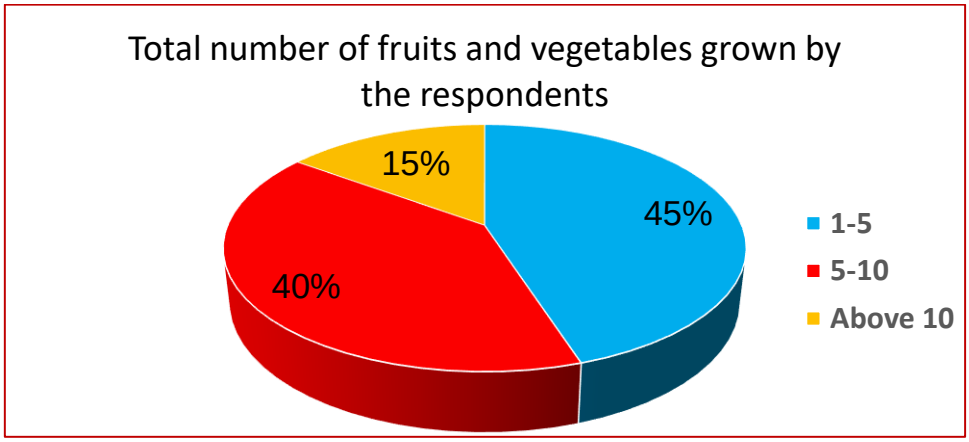

Figure 4.13. Total number of fruits and vegetables grown by the respondents

Table 4.10: Area utilization under urban farming practice by the respondents

Area (sqft)	Vegetables (n=100)		Fruits (n=28)	
	N	%	N	%
< 500	31	31	21	75
500-1000	35	35	6	21.4
>1000	34	34	1	3.6
Total	100	100	28	100

The area utilized for urban farming by the respondents is given in table 4.10. Majority of the respondents (35%) utilized 500 to 1000 sqft, followed by 34% who used more than 1000 sqft and 31% who grow vegetables in an area of less than 500 sqft respectively.

The utilization of the area for fruits cultivation was noticed as majority of them (75%) was used less than 500sqft, followed by 21.4% who used 500 to 1000 sqft and the rest (3.6%) used more than 1000 sqft of area.

The data on area utilization showed that majority of the respondents used 500 to 1000 sqft for the vegetable cultivation whereas for fruits cultivation area was less than 500 sqft. The area under of vegetables cultivation was high when compared with fruits cultivation, in terms of both area and number of respondents growing vegetables. Cent percent of the respondents were growing vegetables whereas only 28 percentage was growing fruits. The reason could be that growing vegetables is easy in terms of watering, maintenance, knowledge and skill can be carried out in pots/containers of any size or material as compared to fruit cultivation.

Data of table 4.11 highlights the reasons for urban farming practice by the respondents. Respondents had indicated more than one reason for this. So the data represents pooled percentage for each reason presented in table 4.11.

Table 4.11: Reasons for urban farming practice by the respondents

Sl. No.	Reasons	Number of respondents	Percentage
1	Interest and passion	3	3
2	Interest	81	81
3	Belongs to agriculture family	3	3
4	Interest and from agriculture family	5	5
5	Interest and health purpose	1	1
6	Interest and govt. subsidy	1	1
7	Inspired by others	1	1
8	To preserve the health by organic farming	3	3
9	To reinstate biodiversity	1	1
10	Newspaper article	1	1
11	Passionate	1	1
12	Organic food and from agriculture family	1	1
13	Interest and to be a role model for the future kids	1	1

**Note: The total percentage cannot be 100 as the reasons stated by the respondents can be more*

The major reason quoted by them was own interest by majority 81% of the respondents. The other reasons quoted by the respondents are their nativity from agriculture family had created interest to adopt urban farming, interest and passion, agriculture family members motivation, to have good health by doing organic farming and consuming chemical free and safe food, interest and health purpose, with interest and to obtain government subsidy, inspired by other fellow members who are practicing, to reinstate biodiversity, from the newspaper articles read and found the information as useful, passionate, in order to grow organic food and their belongingness to agriculture family and interested and to be a role model for the future kids mentioned to varying degree ranging from 5 to 1 percent by the them.

The results indicated that the reasons to do urban farming was their own interest, passion, their roots being from agriculture family and in order to grow organic food for their family as the primary reasons. It can be seen that as majority of the respondents (81%) were doing urban farming out of their own interest, to do any activity or task it is important to have

self-interest which can make things happen was proved once again, as interest is the internal drive to continue with the problems and risks aroused in urban farming.

Table 4.12: Source of motivation for urban farming

S. No.	Source	Number of respondents	Percentage
1	Training	0	0
2	Neighbors	0	0
3	Friends	3	3
4	Relatives	7	7
5	Newspaper	9	9
6	Own interest	88	88

Different sources of motivation to do urban farming was collected from the respondents and presented in table 4.12 and figure 4.14. Majority of the respondents (88%) cited their source of motivation as 'own interest', followed by 9% of them who mentioned information from newspapers, 7% of them from their relatives and 3% from their friends respectively.

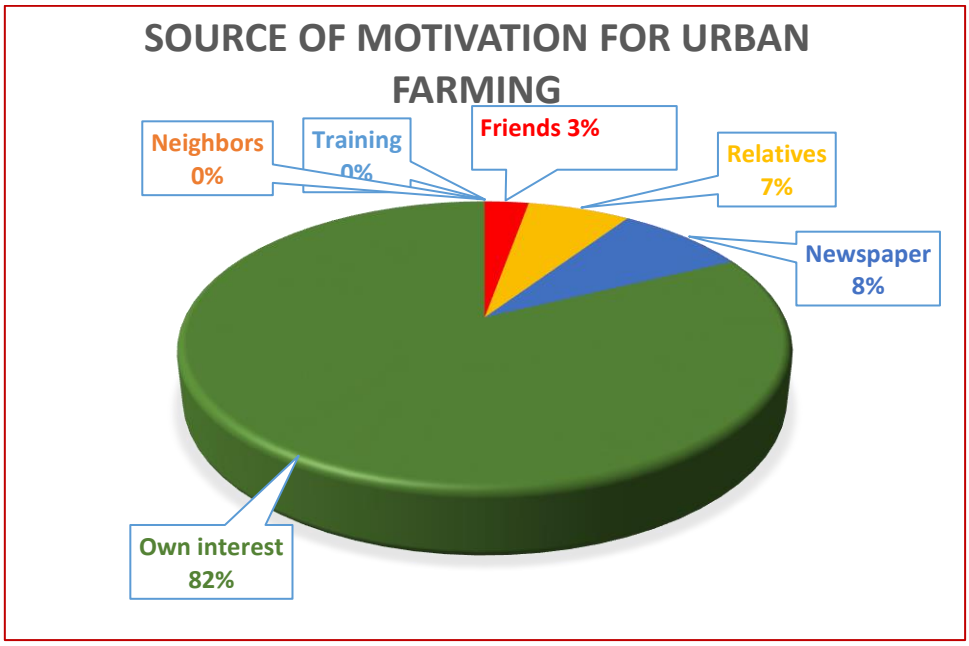

Figure 4.14. Source of motivation for urban farming for the respondents

Table 4.13: Trainings attended on urban farming by the respondents

Trainings attended (n=100)	Yes	Percentage	No	Percentage
	13	13	87	87

Data on training programs attended by the respondents is presented in table 4.13 and figure 4.15. Majority of the respondents (87%) did not attend/receive any training on urban farming whereas only 13 percent of the respondents had attended/received trainings on urban farming. Hence there is a need or scope for organizing more training programs with technical skills and knowledge, so that urbanites get motivated and start practicing urban farming. Those who are already into urban farming will get further advanced scientific know-how about urban farming.

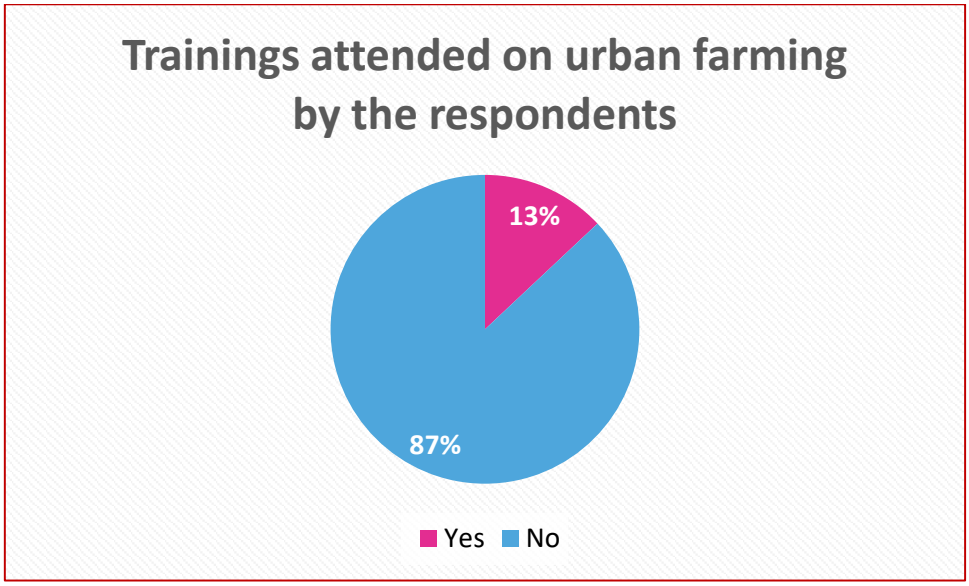

Figure 4.15. Trainings attended on urban farming by respondents

Table 4.14: Urban farming model practiced for fruit and vegetable cultivation

Sl. No.	Urban farming model	N (%)
1	Terrace garden	88
2	Roof top garden	12
3	Vertical garden	1

4	Balcony garden	13
5	Back yard garden	13
6	Front yard garden	37
7	Hanging model	2
8	Window/slit garden	1
9	Stack model	0

Note: Percentage and number are same.

The urban farming models adopted by the respondents is shown in table 4.14 and figure 4.16. Majority of the respondents who practiced urban gardening on terrace, followed by 37% who practiced front yard gardening. Another 13 percent each practiced in balcony garden and back yard gardening. Yet another 12% as rooftop garden, 2 percent of them were doing gardening on hanging model, 1 percent practiced window/slit garden and vertical garden. None of the respondents practiced stack model as urban farming practice.

*__Note:__ *The percentage cannot be 100 as the respondents were adopted more than 1 model for their urban farming or gardening.*

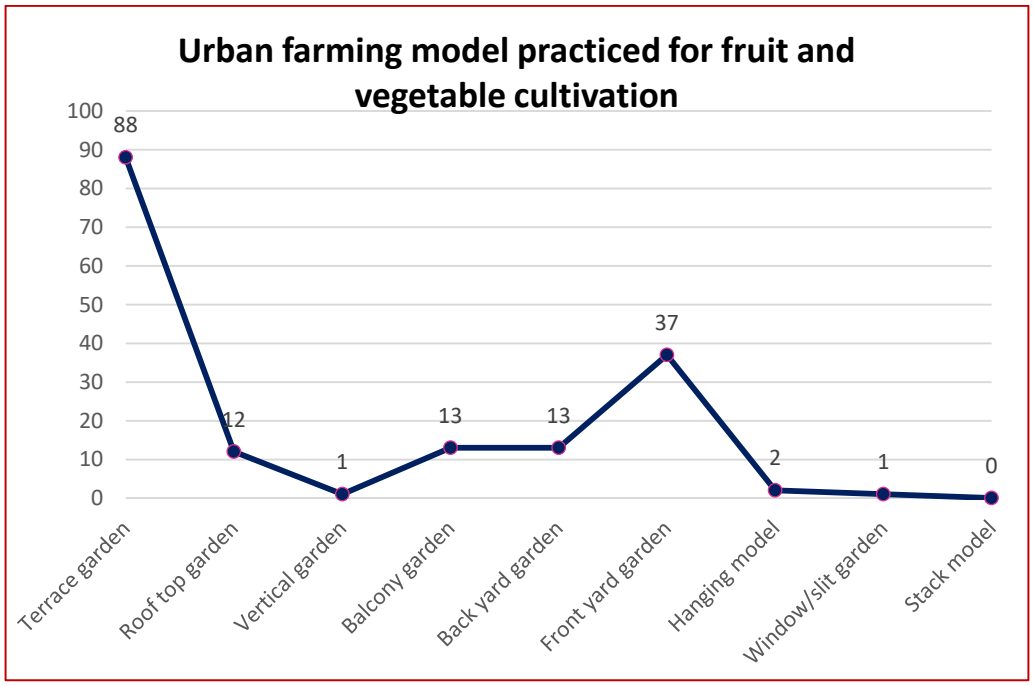

Figure 4.16. Urban farming model practiced for fruit and vegetable cultivation

From the data on urban farming models practice, it was inferred that the most popularly adopted model is terrace garden, since it is very feasible, easy to maintain with ample amount of sun light and without much interference of spatial problems. Another model adopted by the respondents was front yard gardening which will add beauty to their home, can be supervised easily and provide coolness during sunny days and evenings.

The urban farming practice duration, in number of years, was collected from the respondents and is presented in table 4.15 and figure 4.17. Majority of the respondents (67%) were practicing urban farming from 1 to 3 years, while 13 percent of them were continuing this

Table 4.15: Duration of urban farming practice by the respondents

Duration (Years)	Number of respondents	Percentage
<1	12	12
1-3	67	67
3-5	8	8
>5	13	13
Total	**100**	**100**

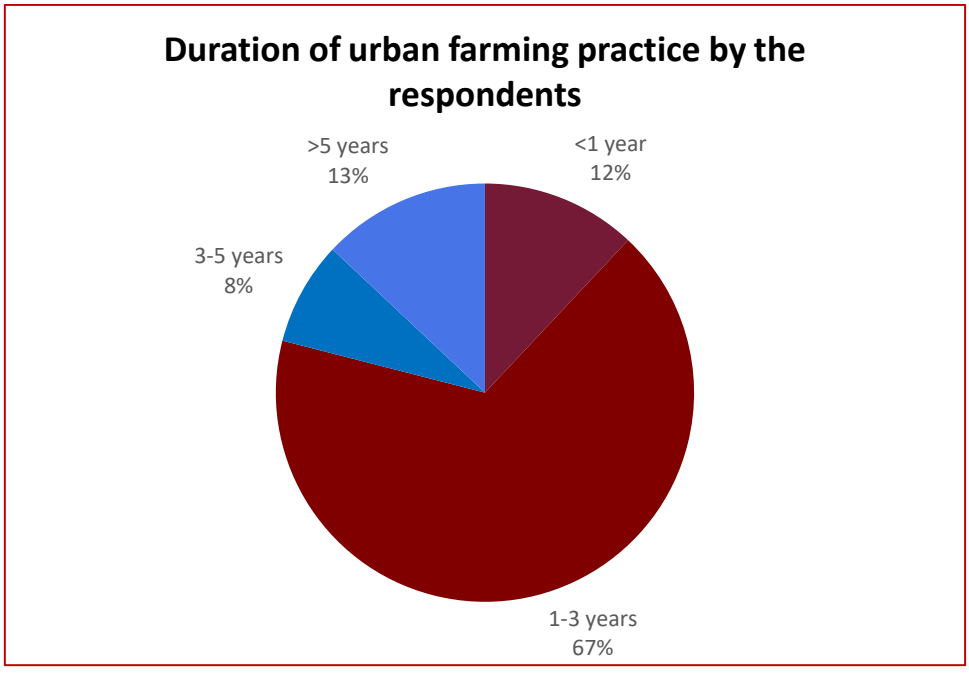

Figure 4.17. Duration of urban farming practice by the respondents

practice since more than 5 years, 12 percent were into urban farming practice since less than 1 year and the remaining 8 percent were practicing urban farming since 3 to 5 years.

From the results it can be seen that majority of them were practicing since 1-3 years, it could be because of the growing popularity for urban farming and the motivation to grow safe green foods.

The type of containers used for urban agriculture by the respondents is given in table 4.16 and figure 4.18. Majority (91%) of the respondents used mud pots, followed by 84 percent who used grow bags, 29 percent grows on ground, 23 percent used plastic drums, 16 percent used plastic buckets that were used at home, 14 percent each grow plants in water bottles and paint buckets, while each of the 9 percent each used old tyres and broken pipes, another 3 percent were used thermocol boxes and the remaining 2 percent of them grow small plants in coconut shells that were used in the kitchen and temples.

Table 4.16: Type of containers used for urban farming by the respondents

Sl. No.	Containers Used	N (%)
1	Mud pot	91
2	Plastic drums	23
3	Tyres	9
4	Grow bags	84
5	Pipes	9
6	On ground	29
7	Water bottles	14
8	Paint bucket	14
9	Plastic bucket	16
10	Coconut shell	2
11	Thermocol box	3

Note: Percentage and number are same.

From the results it was inferred that majority of the respondents were using mud pots and grow bags which was easily available in nurseries and through the subsidy kits. Most of the respondents were using containers that had broken at home or from their vehicles, with their creative ideas respondents were making the waste and broken things into re-usable and add aesthetic element to beautify their garden which was also a cost effective method.

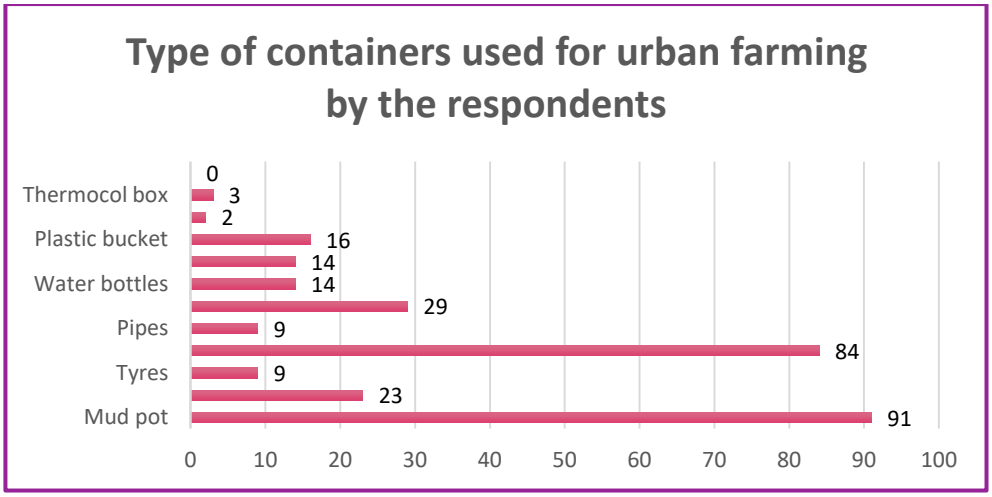

Figure 4.18. Type of containers used for urban farming by the respondents

3. Food security through urban farming

This section discusses about the food security that was met out through urban farming for the selected respondents which includes information on percentage contribution of urban agriculture in meeting our food security, consumption, percentage of different foods, food consumption scores and food group's intake.

Table 4.17: Percentage food security of different foods met out through urban farming

Sl. No.	Food groups	Percentage contribution from urban farming			Total
		<25%	25-50%	>50%	
1	Vegetables	7	12	81	100
2	Fruits	85	5	10	100
3	Milk and milk products	-	1	-	1
4	Meat and meat products	-	-	1	1
5	Egg and poultry	-	-	-	0
6	Fish and other sea foods	-	-	-	0
7	Mushroom	-	-	-	0

To ascertain percentage contribution of urban agriculture in meeting food security of the practicing respondents, the respondents were asked to indicate quantity of different foods grown through urban agriculture and the quantity purchased on monthly basis. Accordingly percentage was calculated and the percentages were categorized as <25%, 25 -50% and >50% for the seven food groups presented in table 4.17 and figure 4.19.

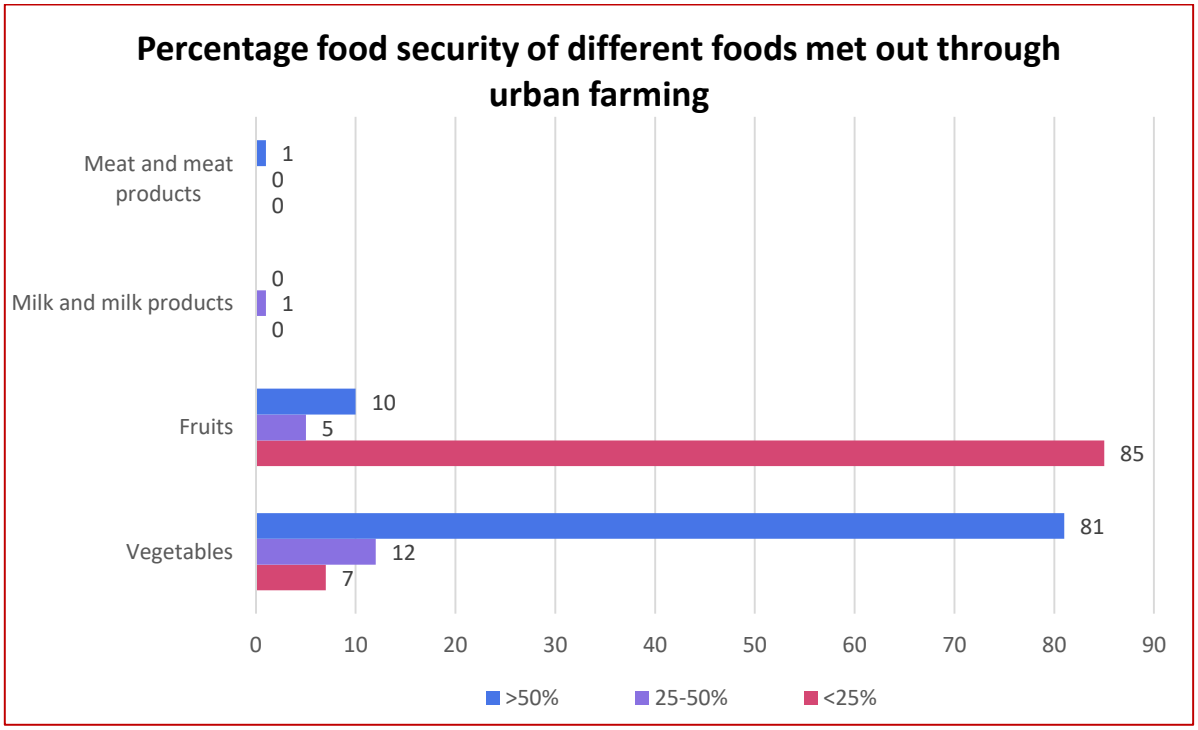

Figure 4.19. Percentage food security of different foods met out through urban farming

It was noticed from the data table 4.17 that percentage food security through urban agriculture was highest for vegetables (81%) with >50% of the requirement of different vegetables were met out from their own farm, whereas for 12 percent of the respondents, vegetables requirement was met out to the extent of 25-50% and 7 percent of the respondents vegetables requirement met out to the extent of <25% from their own gardens. It was noticed that majority of the respondents (85%) fruit requirement, calculated on a monthly basis, was met out only <25% through urban farming/own kitchen garden, followed by 10% of the respondents who could meet >50 percent of the fruits requirement from their own gardens while, another 5 percent of them could meet 25 to 50 percent of the fruits requirement that were grown by them at home. Out of 100 respondents i.e. only 1 percent was able to meet 25 to 50 percent of the milk from their own livestock. Likewise only 1% of the respondent was able to meet >50% of the total meat and meat products consumption through his own poultry.

From the above results it is evident that majority of the respondents were able to grow their own fruits (< 25%) of monthly requirement, vegetables (50%) of the monthly requirement and the least was noticed for meat & meat products (>50%) and milk & milk products (25-50%). The reason for the majority of the respondents to meet adequate requirement of fruits and vegetables through urban farming practice could be because of the easy availability of the seeds, narrow rooting system, easy maintenance, low space utilization with high productivity and short duration for the yield. It implies that the urban farming practitioners are able to address food as well as nutritional security through sufficient supply of fresh vegetables and fruits and thus also meeting the micronutrient requirement of vitamins and minerals, which is essential for the optimum health and wellbeing. However there is also a need to encourage urbanites regarding livestock/dairying practices, fish cultivation, mushroom, aquaponics etc. to meet the requirement of macro nutrients such as protein, energy and fat. This will enrich their daily diet and also bring dietary diversity to the family's meal.

Table 4.18: Classification of the respondents based on Food Consumption Score (FCS)

FCS	**Profiles**	**Frequency (n=100)**	**Percentage**
0-21	Poor	0	0
21.5-35	Borderline	0	0
>35	Acceptable	100	100
Total		100	100

Data regarding food consumption score was categorized into 3 categories i.e poor, borderline and acceptable according to the FAO, 2010. Seven days food consumption history of the respondents was recorded and decoded into different food groups, classified and presented in table 18. From the results it can be noticed that all the respondents (100%) fall under acceptable level of food consumption score for IDD index which means that the individual respondents consumed. This implies that there was good diversity in the food basket of the respondents. This could be partly due to the availability of fruits and vegetables from their own home garden or due to the better purchasing capacity of the respondents or due to easy availability of diverse food, by being in cities and town.

Note: The food consumption scores are only qualitative assessment and not quantitative. For example in Indian cooking, addition of spices and condiments is quiet common but their quantities are very less. Similarly coriander leaves and curry leaves are used just for garnishing purpose in food preparation which will be noted as green leafy vegetable consumption but if we look into the quantities of these foods, it will be very less which adds negligible quantity of nutrients into the diet.

Table 4.19: Food groups included in the diet by the respondents daily

Sl. No.	Food Groups	No. of respondents	Percentage
1	Cereals	100	100
2	Pulses and Legumes	91	91
3	Roots and Tubers	64	64
4	Green leafy vegetables	91	91
5	Other vegetables	96	96
6	Vitamin A rich fruits	72	72
7	Other fruits	96	96
8	Milk and milk products	94	94
9	Eggs	37	37
10	Fish	3	3
11	Meat and meat products	2	2

A detailed study about the food group's intake per day is carried out and the data presented in table 4.19 and figure 4.20. It can be seen from the results of this table that cereals intake was cent percent by the respondents followed by other vegetables (96%), other fruits (96%), milk and milk products (94%), Pulses and legumes (91%), green leafy vegetables (91%), vitamin A rich fruits (72%), roots and tubers (64%), eggs (37%), fish (3%) and meat & meat products (2%).

This result on food consumption data reveals that cereals like rice, maize and other millets (ragi, jowar, foxtail etc.) are the staple food for the people of Telangana State and is consumed every day. It is followed by other vegetables as there is daily intake of curry along with cereal based meal. Most of the urbanites can afford to have the fruits which may be the reason for its consumption, milk and milk products was included on a daily basis either in the form of milk, curd, butter milk or tea/coffee. Pulses and legumes also formed an important part of their daily diet in the form of dal/sambar/chutneys which is included as breakfasts meals where in a combination of cereals and pulses is used for example idly, dosa and uttappam etc.

Consumption of green leafy vegetables was also noticed to be high where in many times curry leaves and coriander leaves are added to most of the recipes. A few GLVs like curry leaves, coriander, spinach, gongura, amaranth etc. are vitamin A rich fruits like papaya, mango etc. was consumed less as compared to other fruits and vegetables. Roots and tubers like carrots, potato and beet roots were also consumed by more than half of the respondents (64%). Eggs, fish, meat & meat products were consumed by less number of the respondents which is a major concern as they are good sources of high quality protein and vitamin A.

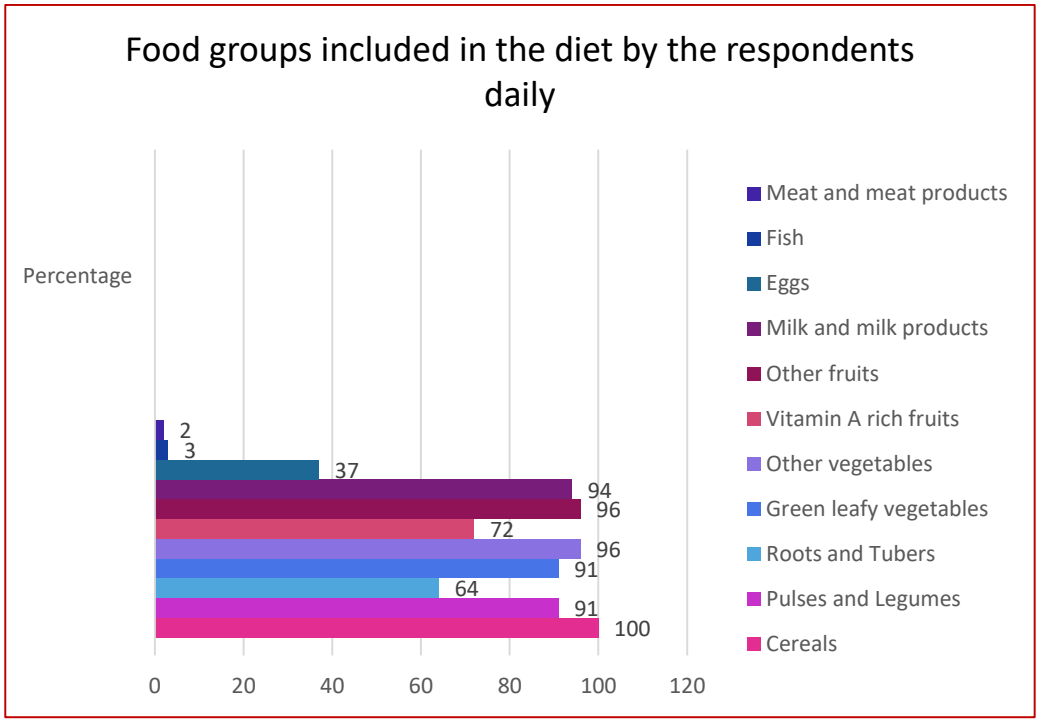

Figure 4.20. Food groups included in the diet by the respondents daily

Table 4.20: Food groups consumed by the respondents

S.no	Food Groups	Respondents Intake(Average)	Percentage Adequacy	RDI*(gms)
1	Cereals	210	77.77	270
2	Pulses	61	101.66	60
3	Vegetable-A	4	4	100
4	Vegetable-B	93	46.5	200
5	Fruits	93	93	100

6	Milk and milk products	52	17.33	300
7	Meat and meat products	19	19	100
8	Fats and oils	31	155	20
9	Sugars	13	65	20

The average intake of different food groups by the respondents was compared against the Recommended Daily Intake (RDI) given by NIN, 2011 and is presented in table 4.20. From the data of the above table, it is evident that percentage adequacy of different food groups of the respondents was more than the recommended percentage for fats & oils (155%) and at par for pulses (101.66%). The least percentage adequacy was observed in vegetable A (4%) followed by milk & milk products (17.33%) and meat & meat products (19%) only. The percentage adequacy for cereals was still below the recommended intake (77.77%) along with other food groups like sugar (65%) and vegetable B (46.5%). The daily intake of fruits was appreciable (93%).

All though result on food consumption score of table 18 revealed acceptable level of food consumption sure for cent percent of the respondents. Yet quantity of intake was not appreciable where almost all the food groups except for the pulses, fats and oils intake was very low for the respondents as compared with the RDI.

Table 4.21: Nutrient intake by the respondents

	Carbohydrate	Energy	Protein	Fat	Calcium	Iron	Vitamin A (Beta-carotene)	Vitamin C
Respondents Consumption	227±52	1296±320	46±16	22±13	356±159	10±3	818±1059	48±54
RDA	270	1900	55	20	600	21	4800	40
Adequacy (%)	84±19	68±17	84±29	110±65	59±27	48±14	17±22	120±135

The daily intake of different foods by the respondents was converted into nutrient intake percentage. This nutrient intake of the respondents was compared with the Recommended Daily Allowance (RDA) of the NIN and presented in the table 4.21. The nutritional adequacy of the respondents is elaborated in table 4.21. It was noticed except for fat (110±65) and vitamin C (120±135), no other nutrients like carbohydrate, energy, protein, calcium, iron and vitamin A were adequately met. This is because of the evident for that the food quantity intake as highlighted in table 20 is not adequate and so is the nutritional adequacy.

Nutrients like energy, calcium, iron, vitamin A intake was low when compared to RDA. So, if we compare and interpret the findings in table 4.19 and table 4.20, it can be concluded that although the dietary diversity of the respondents as indicated in table 4.19 is fairly good for most of the food groups, but the results of table 4.20, that reflects quantitative intake of different food groups is not appreciable for most of the food groups. Hence it suggests that overall food and nutritional security of the respondents is not met out. Moreover there is excessive intake of vitamin C, the excess and unutilized vitamin C will be excreted from the body, but the intake of high fat is harmful as it gets deposited in the body and causes various cardio-vascular diseases, obesity and related diseases.

4. Constraints In Urban Farming Practice

This section discusses about the constraints faced by the respondents in practicing urban farming.

The constraints faced by the urban respondents is presented in table 4.22 and figure 4.21.

Problems caused by insects, birds and monkeys was felt by majority of the respondents (26%), followed by accessibility of quality seeds in their nearby places as reported by 17 percent of the respondents, another 13 percent of the respondents felt that unavailability of water especially during the summer season is a great problem to continue home farming, 4 percent of them found it difficult to spare/manage time for gardening from their regular routine activities, 2 percent of them felt that due to improper sunlight (either high or low) results in low productivity and the least percentage (1%) expressed that lack of space for gardening is a major concern.

Table 4.22: Constraints faced by the respondents in urban farming

Sl. No.	Constraints	Number of respondents	Percentage
1	Getting good quality seeds	17	17
2	Water availability	13	13
3	Improper sunlight	2	2
4	Insects, birds and monkeys menace	26	26
5	Space	1	1
6	Time	4	4

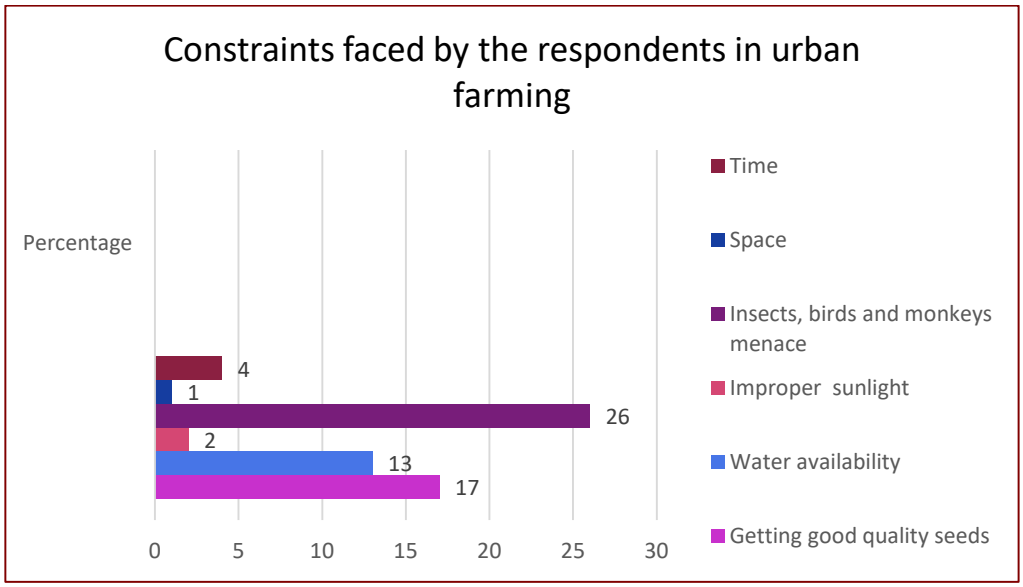

Figure 4.21. Constraints faced by respondents in urban farming

Solutions:

Based on the results of constraints faced in urban farming, it is evident that few of these constraints can be addressed by:

1). **Getting good quality seeds** - The active urban practitioners can form social network to exchange information among themselves and get information about quality inputs suppliers for urban farming.

2).**Water availability** - Now-a-days, many urban farming practitioners are doing rain water harvesting. They are constructing structures that conserve rain water to be used at a later stage. They can also divert kitchen waste water into the urban garden. Alternatively, they can also look at aquaponics as an alternative, where the water will be recycled between plant and fish ecosystem, hence less consumption of water.

3).**Hydroponics** - Now-a-days, technologies like hydroponics etc. at household level are also gaining importance, where water availability is a concern.

4).**Insects, birds and monkeys menace**- To perfect vegetable and fruit plants from the attack of insects, birds and monkeys, net fencing can be done in balconies or protected structures like greenhouse structure/net can be made in the roof top/front/back yard.

5).**Space**- Urban farming is gaining significance in cities and towns because it makes judicious use of the available space. Hence, where space is a concern innovative models like vertical garden, stock model, stair-case models, hanging models can be effective in growing more plants per sqft.

Chapter-V

Summary and Conclusions

The research study entitled "**Household analysis of urban Farming: Alternative Strategy for food and nutritional security"** was carried out in Hyderabad district of Telangana, India. The aim of the study was to assess the extent of urban farming technologies practice by the respondents and its impact on food and nutritional security at household level. Hundred respondents were selected and surveyed. The conceptual frame work and semi structured interview schedule was developed to ascertain the proposed objectives; the evidences obtained through objective research procedures were analyzed using appropriate statistical tests.

The major findings of the project are:

- From the demographic profile of the respondents it was revealed that the majority of the respondents were observed in the old age group and married living as a nuclear family. It was also found that majority of the respondents had a family size of < 4 members.
- Level of education of the respondents shown that majority were post graduate qualified and very few of the respondents had low level of education.
- Occupational details shown that majority of the respondents were either retired or home makers, followed by private job holders, government job employees and businessman. Similarly from the respondent's spouse occupation it was observed that majority of them in the category of either a home maker or retired.
- The average income of the respondents was 49,152 Rs and majority of the respondents was earning income range of 12545 to 85759 Rs and belongs to medium level income group.
- Majority of the respondents were spending their income on food, followed by health and education. Though spending high amount on food is a good indication but almost half of them spent high amount on health, is a major concern. The respondents need to modify their food habits, rather than spending on unhealthy foods and visiting hospitals, they should inculcate healthy habits.

- The percentage expenditure on food was 24.66% of their income for the respondents, whereas on non-food sources such as travel, education, hospital, shopping and miscellaneous items it was about 46.14% of their total income. The results indicate that the expenditure on non-food items was high when compared to the food expenditure among the respondents.

- Majority of the respondents were growing 3 to 4 varieties of food groups such as fruits, green leafy vegetables, vegetables and medicinal plants and very less percentage of the respondents were growing more diverse types of foods.

- High percentage of them were growing at least 1 to 5 types of fruits and vegetables at their home, followed by 40% of them who were growing 5 to 10 types of fruits and vegetables and 15% of them with more than 10 number of fruit and vegetable varieties growing in their home garden respectively.

- Majority of the respondents used 500 to 1000 sqft for the vegetable cultivation whereas for fruits cultivation area was less than 500 sqft. The area under of vegetables cultivation was high when compared with fruits cultivation, in terms of both area and number of respondents growing vegetables. Cent percent of the respondents were growing vegetables whereas only 28 percentage was growing fruits.

- The results indicated that the reasons to do urban farming was their own interest, passion, their roots being from agriculture family and in order to grow organic food for their family as the primary reasons. Majority of the respondents cited their source of motivation as 'own interest', followed by of them who mentioned information from newspapers, relatives and friends respectively.

- Majority of the respondents did not attend/receive any training on urban farming. However with the limited knowledge on urban farming, majority of the respondents who practiced urban gardening on terrace, followed by front yard gardening.

- From the data on urban farming models practice, it was inferred that the most popularly adopted model is terrace garden, since it is very feasible, easy to maintain with ample amount of sun light and without much interference of spatial problems.

- From the results it can be seen that majority of them were practicing since 1-3 years, it could be because of the growing popularity for urban farming and the motivation to

grow safe green foods. Most of them were using mud pots and grow bags which was easily available in nurseries and through the subsidy kits.

- It was evident that majority of the respondents were able to grow their own fruits (< 25%) of monthly requirement, vegetables (50%) of the monthly requirement and the least was noticed for meat & meat products (>50%) and milk & milk products (25-50%).

- From the results it can be noticed that all the respondents (100%) fall under acceptable level of food consumption score for IDD index which means that the individual respondents consumed. This implies that there was good diversity in the food basket of the respondents.

- Although the dietary diversity of the respondents as indicated is fairly good for most of the food groups, but the results of quantitative intake reflects of different food groups is not met with RDI. Hence it suggests that overall food and nutritional security of the respondents is not met out. Moreover there is excessive intake of vitamin C, the excess and unutilized vitamin C will be excreted from the body, but the intake of high fat is harmful as it gets deposited in the body and causes various cardio-vascular diseases, obesity and related diseases.

- Problems caused by insects, birds and monkeys was felt by majority of the respondents, followed by accessibility of quality seeds in their nearby places, unavailability of water especially during the summer season is a great problem to continue home farming, difficulty in sparing time for gardening from their regular routine activities, improper sunlight (either high or low) results in low productivity and lack of space for gardening expressed as major concerns for practicing urban farming.

Based on the results of constraints faced in urban farming, it is evident that few of these constraints can be addressed by these suggestions:

- ✓ The active urban practitioners can form social network to exchange information among themselves and get information about quality inputs suppliers for urban farming

- ✓ Urban farming practitioners can also divert kitchen waste water into the urban garden. Alternatively, they can also look at aquaponics as an alternative, where the water will be recycled between plant and fish ecosystem, hence less consumption of water.

- ✓ Now-a-days, technologies like hydroponics etc. at household level are also gaining importance, where water availability is a concern.
- ✓ To perfect vegetable and fruit plants from the attack of insects, birds and monkeys, net fencing can be done in balconies or protected structures like greenhouse structure/net can be made in the roof top/front/back yard.
- ✓ Where space is a concern innovative models like vertical garden, stock model, stair-case models, and hanging models can be effective in growing more plants per sqft.

SUCCESS STORIES

Together we can make it Big

Mrs. Usha Rani working as an Assistant Director in the Department of Agriculture, has trained thousands of farmers. She was shocked to know the amount of pesticides they were using for cultivation of fruits and vegetables. She was very upset with the unhealthy food that everyone is getting from the markets. Being an agricultural graduate, she was exploring other ways of farming herself. One day while watching YouTube videos of T. Raghothama Reddy on terrace farming, she got inspired to start terrace gardening at her home. Her husband Yalamandha was very cooperative and helped her to find about the Horticulture department's subsidy kit. Their amazing journey started with a small kit, but now they have expanded it to 4 different floors, each with ornamental flowers, vegetables, fruits and vine varieties. She is growing nearly 600 varieties of fruits and vegetables all together. Since then she is not buying any vegetables and fruits from outside. She only uses kitchen wastage and bio fertilizers. She believes in ancient ways of farming, especially organic farming.

Vegetable and fruit plants on terrace of Mrs. Usha Rani Yalamandha, an Urban Garden Practitioner

Her success stories were published in various newspapers and YouTube channels. Her journey did not end up there. She started giving trainings on urban farming to others and allowing all the visitors interested in urban farming to visit her home terrace garden. When asked about the motivating factor, she smiled and said "to provide nutritional and healthy food for our family and community". She inspired many and continues to do so with the same enthusiasm.

From Waste to Health

Energy can be neither created nor destroyed. However, *energy* can change its forms and can flow from one place to another. Here struck the mind of Mr. Sambha Shivudu and got an idea of converting kitchen wastage into manure which can do miracles in urban farming. His initiative brought health and happiness to his home.

Mr. Sambha Shivudu got retired and working as a consultant at Railtel Corporation. Being a resident of Hyderabad for 40 years, he wants to bring change in the community through terrace gardening, as an active participant in social forest revolution and to reinstate bio diversity. He started terrace gardening at his own house in an area of 1650 sft. Growing vegetables like tomato, brinjal, cabbage, ladies finger, radish etc. He grows nearly 30 varieties of vegetables and ornamental plants. From the past 2 years he has started growing medicinal plants too. Instead of coffee and tea, they are drinking medicinal decoctions, which makes them healthier.

Vegetable terrace garden of Mr.Sambha Shivudu, an Urban Practitioner

He uses kitchen wastage and leaves for vermi compost and vermi wash preparation to prevent plants from insects and nutrient's deficiencies. He changes the crop at every 3 months duration according to the season. He delivers speech on terrace gardening and preparation of vermi compost from kitchen wastage through social media and news channels. With a concern about environment, he is converting kitchen waste rather into wealth, thereby turning problem (waste disposal) into a solution (Vermi compost).

From Passion to Urban Farming

Mr. Venkat Krishna Emani is 45 years old and residing at Mehdipatnam, Hyderabad. Being an MBA holder, though he had chosen a career as Consultant, his mind was inclined towards farming. In big cities like Hyderabad, getting an agricultural land is very difficult. Even though he was motivated for farming, he was not able to do so. His passion and parents' guidance facilitated him to start urban farming. He started terrace gardening on an area of 1200 sft. with the objective of producing healthy, nutritious and safe food for the family. Initially he started with vegetables like brinjal, tomato, spinach, curry leaves, banana, guava, lime and papaya. But now he has expanded it and growing many other varieties of vegetables.

He somehow makes out 2 hours of time daily from his daily schedule for terrace gardening. It helps him relieve stress, gives satisfaction and provides healthy food for his family. It's been 10 years now, that he is practicing terrace gardening and providing motivation and guidance to the nearby people. In a week he is producing 30-40 kgs of vegetables, which is enough to meet the requirement of his family. Agriculture is the backbone of the nation's economy. Concept of urban farming is growing gradually. We appreciate the initiative of Mr. Venkat Krishna Emani for staring urban farming and popularizing it among his fellow neighbors, friends and relatives.

Vegetable Terrace Garden and Harvested Vegetables of Mr. Venkat Krishna Emani, an Urban Practitioner

US to UA

Mr. Sundeep Motamari, is a resident of Mehdipatnam, Hyderabad. Many Indian citizens moved out of the country either in search of jobs or to fulfill their passion. Mr. Sundeep is also one such individual. After completing Graduation study, he went overseas to join software job. After sometime in 2005, he returned to India. Since then his journey of urban gardening had started.

His father is a retired government official and mother was a home maker. They never had agricultural land nor practiced farming. But he was having a keen interest towards growing his own vegetables and fruits at home. Even when he was in US, his love and passion for farming did not subside. When he returned to India, he was shocked and worried to see the rampant usage of pesticides and chemicals in vegetable cultivation. Hence to avoid these harmful chemicals and pesticides filled vegetables and to lead a healthy life, he decided to grow his own vegetables at home.

Since 2005 he is growing different vegetables and fruits on his terrace. Initially started in an area of 1200 sft. , planted 4-5 varieties of vegetables namely ladies finger, tomato, brinjal, green chilies and ridge gourd. After reaping fruitful results, he later expanded it. He is using kitchen waste for vermi compost making for the plants. To enhance aesthetic look of the garden, he added some of ornamental plants too. Around 20-30 varieties of fruits and vegetables are grown on his terrace. His family members also lends a helping hand in the maintenance of garden. Daily they spent about 2 hours for watering, plantation keep up and other things.

He is not only practicing himself but also influencing and attracting others to learn and practice at their available space. He is always in search for organic and new methods of gardening from different sources like friends, social media, and YouTube and news channels. With a noble intention to share the knowledge on urban farming, he and his other friends created “Intipanta organic kitchen gardeners” facebook group. He was one of the admin member and active participant, who posts various information on urban gardening and addresses various doubts of neo- urban garden practitioners.

Recently he has also started growing several medicinal plants, especially insulin plant which helps in curing diabetes and other ailments. They also use some of the medicinal leaves in preparation of tea decoction. He grows enough vegetables for his family members. One must

not forget his roots from where he grows, this was proved in case of Mr. Sundeep and his unforgettable love and passion towards the roots of agriculture.

Terrace Garden of Mr. Sundeep Motamari, an Urban Garden Practitioner

A cherished retirement relaxation-Urban farming

At 65 years of age, Mr. Chandra Shekhar Sastry retired from Electrical Department. Since 10 years he is practicing urban farming at home. He was fascinated towards farming but due to scarcity of space could not pursue his passion. He searched through different sources of information like friends, relatives, newspapers and channels etc. One day he read an article in newspaper on terrace gardening practice. It caught his attention of growing fruits and vegetables within the limited available space in cities and towns.

Very soon he adopted and implemented the idea of urban gardening. He started growing vegetables initially in an area of 820 sft growing sweet potato, roselle, kale, ladies finger, red ladies finger, onion, tomato, brinjal and bottle gourd. He also started growing fruits like raspberry, pomegranate, mango and papaya. He is getting a good harvest, nearly 40-50 kgs of vegetables from his terrace garden every month, which is sufficient to meet the needs of his family.

He expanded his urban garden to balcony also. He is using mud pots, plastic drums, grow bags, pipes and plastic water bottles for planting fruits and vegetables. For the purpose of manure, uses kitchen waste, dry leaves and vermi compost. He shares information on urban farming with his friends and relatives. Some of them whom he guided have also started urban gardening at their homes.

He says that urban farming has many advantages- money saving as there is no need to buy fruits and vegetables from markets; is a stress reliever, very soothing and gives relaxation; safe food, hence no need to think before consumption as there is no pesticides; efficient use of available space, seasonal availability and can grow as per their likings, preference t and requirements of the family.

When he thought about his after- retirement life, felt much stressed but urban gardening practice has made his days brighter and happier. He spends 4-6 hrs of time in garden maintenance by doing different activities there. He also included some of the medicinal plants. He and his wife have their evening tea in the soothing ambience of their garden every day. He finds it a very relaxing and stress-free activity. His both sons are following his footsteps and get involved in it whenever they find time. He buys new variety of plants whenever comes to know about it or stops at a nursery. So urban farming has made his after- retirement life colorful, relaxing and meaningful.

Terrace garden of Mr. Chandra Shekhar Sastry, an urban garden practitioner

Treat with food rather than medicine

Mr. Amarendra Yellala is a doctor by profession and resides in Hyderabad. At 63 years of age, he still looks very active and healthy. He believes in the concept of "Let food be thy medicine and medicine be thy food". Consumption of healthy and nutritious food is a great idea rather than having medicines.

Whenever he visits villages, he gets fresh vegetables and fruits but it is cumbersome to travel all the way. He sought the advice of his sister-in-law regarding urban gardening. He also watched many YouTube videos on urban farming. With great interest and enthusiasm he started front yard gardening initially, by planting fruit varieties. Since 7 years he is growing fruits such as sapota, pineapple, pomegranate, coconut and banana. One year back he started with growing vegetables such as brinjal, tomato, green chilies and green leafy vegetables also.

He is growing vegetables in an area of 500 sft and fruits in an area of 300 sft. He uses plastic drums, plastic buckets, and water bottles and grow bags for plantation. For manure he is using kitchen waste, dry leaves and vermicompost. He is able to harvest sufficient vegetables and fruits for his family's consumption. His wife is also very active and equally contributes to terrace farming.

Seeing the results of terrace farming his neighbors also started practicing it. He said "being a doctor I should practice healthy habits, so that I can help my patients to adopt good habits too. Now-a-days getting nutritious, safe and healthy food is a major concern. Hence everyone is advised to grow their own food with the available limited space".

Terrace garden of Mr. Amarendra Yellala, an urban garden practitioner

His motivation has no ends. During patient's visit also he spreads the message to grow their own fruits and vegetables at home. He feels gardening as a means of relaxation, after his hectic schedule. He feels that it is the need of the time for addressing food & nutritional security of the people. The efforts and insights of Mr. Amarendra Yellala should be appreciated

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Appendix-A

Interview Schedule

A. Profile of respondent:

1. Name of respondent:

2. Age:

Household Analysis of Urban Farming: Alternative Strategy for Food & Nutritional Security

3. Address:

4. Educational qualification:

5. Marital status:

6. Occupation of respondent:

7. Occupation of spouse:

8. Family type:

Nuclear ( ) Joint ( )

9. Family size:

Small (4 members)

Medium (6 members

Large (more than 6 members)

10. Family member details:

Sl. No.	Gender	Age	Relationship
1.			
2.			
3.			
4.			
5.			
6.			

11. Annual income of family:

Primary source: _____

Secondary source: _____

Tertiary source: _____

B. Practice of urban farming among the respondent:

1. Which of this urban practice are you engaged into?

Sl no.	**Food Groups**	**Yes**	**No**	**If yes, Specify**
1.	Vegetables			
2.	Fruits			
3.	Cattle			
4.	Poultry			
5.	Fishery			
6.	Mushroom			
7.	Bee keeping			

2. What is the area utilization under these practice?

Sl. no.	**Products**	**Area**
1.	Vegetables	
2.	Fruits	
3.	Cattle	
4.	Poultry	
5.	fishery	
6.	Bee keeping	
7.	Mushroom	

3. Mention reasons for practicing urban garden:

1.	
2.	
3.	
4.	
5.	
6.	

4. Mention the source of motivation for urban farming:

Training

Neighbor

Friends

Relatives

Newspaper

Own interest

Any other (specify)

5. Benefits of urban farming:

Sl. No.	**Benefits**	**Yes**	**No**
1.	Money saving		
2.	Release stress		
3.	High food safety and quality		
4.	Efficient use of land/Space		
5.	Learning opportunity to grow food		
6.	Quality of food		
7.	Prevent food insecurity		
8.	All season availability		
9.	Less packaging required		
10.	Less food waste		
11.	Air purification		
12.	Prevent illness		
13.	Can cultivate choice of food		

6. Have you attained any training on urban farming earlier?

Yes ( ) No ( )

If yes,

a. Name of program/organization:

b. Duration:

7. Which urban garden model do you practice for fruit and vegetable cultivation?

Terrace garden

Roof top garden

Vertical garden

Balcony garden

Back yard garden

Front yard garden

Hanging model

Window/silt garden

Stack model

Any other (specify)

8. Do you sell the food you produce?

Yes ( ) No ( )

If yes, where do you sell the produce?

9. How long have you been practicing urban farming?

10. Mention the types of containers used for urban farming:

Mud pot

Plastic drums

Tyres

Grow bags

Pipes

On ground

Water bottles

Paint bucket

Plastic bucket

Coconut shell

Thermocol box

Gunny bags

Any other (specify)

C. Food security meet out through urban farming:

1. Consumption of different foods mentioned below:

Sl. No.	**Food Groups**	**Category**	**Own garden (Kg)**	**Frequency**	**Market (Kg)**	**Frequency**
1.	vegetables	Green leafy vegetables				
		Roots and Tubers				
		gourds				
		Other vegetables				
2.	Fruits	Citrus fruits				
		Berries				
		Other fruits				
3.	Milk and milk products	Milk				

4.	Meat & meat products	Meat				
5.	Egg & poultry	Egg				
		Chicken				
6.	Fish and other sea foods	Fish				
		Prawn				
7.	Mushroom	Button mushroom				
		Oyster mushroom				
		Milky white mushroom				

2**.** Expenditure pattern:

Sr.no	**Month**	**Item**	**Amount spent**	**%**
1.	**November 2018**			
2.	**December 2018**			

3.	**January 2019**			

3. Individual Dietary Diversity Score (IDDS) method:

Sr. no	**Food Groups**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
1.	Cereals							
2.	Legumes & Nuts							
3.	Roots & tubers							
4.	Green leafy vegetables							
5.	Other vegetables							
6.	Vitamin A rich fruits							
7.	Other fruits							
8.	Milk & milk products							
9.	Eggs							
10.	Fish							

11.	Meat & meat products							

D. Nutritional security meet out through urban farming:

1. How much money do you spend on food?

Sl. No.	Food Groups	Expenditure on food/month(Kg)
1.	Vegetables	
	1.	
	2.	
	3.	
	4.	
2.	Fruits	
	1.	
	2.	
	3.	
	4.	
3.	Milk and milk products	
	1.	
	2.	
4.	Meat & meat products	
	1.	
	2.	
5.	Egg & poultry	
	1.	
	2.	
6.	Fish & other sea foods	
	1.	
	2.	
7.	Mushroom	

	1.	
	2.	
8.	Cereal & cereal products	
	1.	
	2.	
	3.	
9.	Pulses & Legumes	
	1.	
	2.	
10.	Oils & fats	
	1.	
	2.	
11.	Sweets	
	1.	
	2.	

2. 24-Hours recall method-

Sl. No.	Time	Food Item	Ingredient	Quantity
1.	**Breakfast**			
2.	**Mid snack**			
3.	**Lunch**			

4.	**Evening Snack**			
5.	**Dinner**			

E. Constraints in adopting practice:

1. Mention the constraints faced in urban farming:

Sl. No.	**Constraints**	
1.	Time	1.
		2.
2.	Money	1.
		2.
3.	Physical presence	1.
		2.
4.	Labor	1.
		2.
5.	Space	1.
		2.
6.	Seeds	1.
		2.
7.	Water supply	1.
		2.
8.	climate	1.
		2.
9.	Insects & birds	1.
		2.

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