Urban Farming: Good Practices and Knowledge Management

Discussion Paper 4

MANAGE-Centre for Agricultural Extension Innovations, Reforms, and Agripreneurship (CAEIRA)

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The research report is based on the research conducted by Mr. Vincent A. as MANAGE Intern under the MANAGE Internship Programme for Post Graduate students of Extension Education.

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Director General's Message

Smt. V. Usha Rani, IAS
Director General, MANAGE

Our Father of Nation, Mahatma Gandhi advocated that every individual should grow for his or her own food. If the habit of growing vegetables at the places of residence is inculcated, valuable resources like petrol, diesel, etc. can be saved avoiding transportation. Transportation of vegetables also reduces nutritional value. Urbanization is a growing phenomena in our country and the vegetables that are available in the urban areas are not only costly but at many instances they are grown with water affected by pollutants which is also a cause of concern.

In the above circumstances, the urban agriculture is gaining tremendous importance. In India, though it is a new concept, it is picking up in some cities like Chennai, Pune, etc. Many Residents of Hyderabad are involved in Urban Agriculture and adopting various techniques. Let me appreciate Mr. A. Vincent for bringing out this comprehensive paper on Agriculture. Let me also appreciate Dr. Saravanan Raj, Director (Agricultural Extension) for guiding Mr. A. Vincent successfully. The paper helps the training institutes, policy makers who need to focus more on Urban Agriculture for better human health and better environment.

09.04.2018

(V.Usha Rani)

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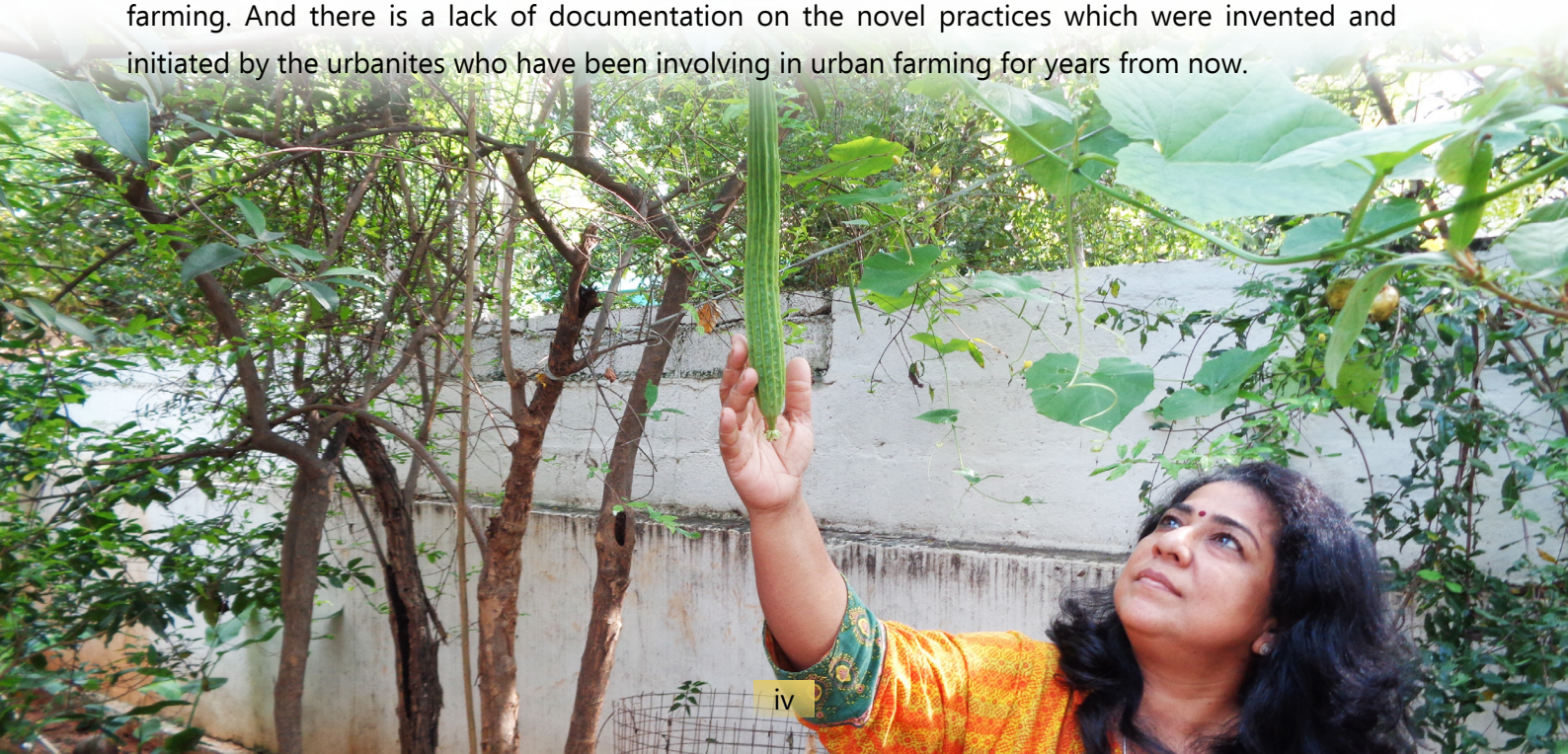
Abstract

Urban population has outnumbered the rural with 54.29 per cent (3.9 billion) share globally in 2016. Urbanisation is one of the crucial drivers of the transformation in the world, be it educational development, economic growth, employment creation, development of service sectors and so forth. However, the unprecedented paradigm shift in population from rural to urban has led to a concern as to how to ensure the food and nutritional security and food availability of the booming urban inhabitants. Besides, the unplanned developmental undertakings in urban areas have jeopardized the cityscape and ruined the urban ecosystem owing to inevitable growth of industries, factories and a lot of chemical plants in and around the cityscape. In this backdrop, with the intention of restoring the ruining urban environ, there are several ambitious programmes such as planting of trees, promotion of green parks, carbon emission control measures etc., have been implemented by the government, Non-Governmental Organization (NGOs), different organizations and institutions across the cities. Of these programmes urban farming has also been seen as the saviour of urban future. Urban farming is a novel initiative which has been encouraged across urban areas so as to re-create urban areas as clean, green and sustainable in the near future. According to the FAO report, urban garden lands are 15 times more productive than the rural holdings and further, the study noted that one square meter of urban farm is capable of producing 36 heads of lettuce every 60 days, 10 cabbages every 90 days and 100 onions every 120 days. Moreover, urban farming is capable of bolstering more social and political inclusion, sustainability in environment, economic progress, and unified water and land policies. Urban farming also paves a way to nutritional security of the population and assures the access to daily sustenance. Another report of FAO articulates that, of the 54.29 per cent of the urban population, 10.66 per cent of (0.8 billion) of the population is found to be involved in urban farming and believed to have produced one-fifth (1/5th) of the world food production. In this context, numerous research studies have been carried out across the urban areas to explore as to how the farming in urban areas meets the food and nutritional security along with its impact on urban ecosystem and cityscape. However, there have been a dearth of information on good practices and approaches followed in urban farming. And there is a lack of documentation on the novel practices which were invented and initiated by the urbanites who have been involving in urban farming for years from now.



Executive summery

A majority of the urbanites have been practicing urban farming, be it roof top gardening, backyard gardening, kitchen gardening, gardening on exclusive land areas within the urban areas, or on the lands in the city outskirts. There has been nascent documentation regarding good practices and information on approaches followed by the urbanites who have been involved in urban farming. In this backdrop, the study has brought to light, the good practices and information on approaches followed in urban farming in the twin cities of Hyderabad and Secunderabad. Notwithstanding the good practices 'starting from seeds to grains' being different from one urbanite to another regarding farming, this study has encompassed the most replicable practice and viable practices. The growth media and growth culture are essential parts of farming and these two, in urban farming are entirely different from farming in rural areas. Most sustainable growth media and growth culture included in urban farming are curd buckets and Compost of Coco Peat (CCP) and local cultivars from different parts of the country are most sought after seeds, be it vegetable or greens or fruit seeds. Moreover, compost and vermicompost made from household organic waste are been served as essential manure for the production of crops rather than using chemical/ synthetic fertilisers. Meanwhile, neem oil, bio-liquid and bio-liquid extracts prepared in the households are used as natural pesticides against pests and as a control measure against diseases, rather than use of chemical pesticides as the urban farming is essentially a thrust to organic farming. Besides, recycling of water and wastes are the two sides of a coin in urban farming, where even filters are used to recycle water. On the other hand, urban farming is also coupled with rain water harvesting, as the harvested rainwater is used in production of crops. As far as harvest and market is concerned, the produce is harvested mostly for own household consumption rather for marketing, as urban farming is generally in a small scale basis. However, farming in urban areas has reduced the money spent on purchase of vegetables, greens and to some extent, fruits.

Hence, the urban farming has brought a greater impact on the nutritional security of the urban farming urbanites as they cultivate almost all vegetables including those like broccoli, cauliflower, etc., which are essentially good nutritious sources for human diet. On the whole, the information sources that the urban farming urbanites tap into are unique, for they use different approaches to learn and share farming information. At the same time, trainings, seminars, exhibitions and expos, organized by the Urban Farming Division, Horticulture department, have served as one of the most important information source for the urbanites. However, several social media platforms like Facebook, WhatsApp, etc., are used in urban farming in order to get immediate information on farming, particularly on urban farming. On the other hand, the urban farmers have also started their own groups using social media to share and get information. For example, a WhatsApp Sainikpuri Garden Club is the liveliest group which began to share information covering all aspects of urban farming. Moreover, YouTube channels like Nature's voice, gardens of abundance, kitchen garden are also used to source information and to understand the practical ways of farming in urban areas. On the whole, although urban farming is in its nascent stage, the urbanites involved in urban farming have been refining newer, innovative and practically applicable practices. Moreover,

these practices can easily be made by anyone in a short span of time, thereby increasing the feasibility of urban farming. On the other hand, awareness and mass scaling up of these practices are impending. Therefore, the government has to take a lot more initiatives to create awareness and share knowledge widely on the novel practices which have been successfully followed in urban farming. It may possibly pave a way to transform the urban concrete jungles into green and clean cities. It would also restore the urban ecosystem that has been ruining by industrialization and urbanization, to give a different perspective to the cityscape.

Introduction

Urban population has outnumbered the rural with the share 54.29 per cent (3.9 billion) globally (2016). In India as well, the urban population escalated to 33 per cent in 2016 from a miniscule 18 per cent in 1960 (Batty, 2015; World Bank, 2017). Besides, the population of the urban areas is expected to grow to nearly 60 and 40 per cent in the world and India respectively by 2030 (First Post, 2014). Notwithstanding that, urbanization is one of the crucial drivers of the transformation in the world, be it educational development, economic growth, employment creation, development of service sectors and so forth, it gave rise to increased living cost, non-availability of spatial areas, increased burden on resource accessibility, etc.

Moreover, the unprecedented shift in population from rural to urban areas has led to a concern as to how to ensure the food and nutritional security and food availability of the booming urban inhabitants. Besides, the unplanned developmental undertakings in urban areas have jeopardised the cityscape and ruined the urban ecosystem owing to inevitable growth of industries, factories and a lot of chemical plants in and around the cityscape. In this backdrop, with the intention of restoring the ruining urban environ, there are several ambitious programmes such as planting of trees, promotion of green parks, carbon emission control measures etc., implemented by the government, Non-Governmental Organization (NGOs), different organizations and institutions across cities. Of these programmes, urban farming is also seen as the saviour of urban future.

On the whole, urban farming is a novel initiative which have been encouraged across the urban areas so as to re-create clean, green and sustainable urban areas in the near future. According to FAO report, urban garden lands are 15 times more productive than rural holdings. The study further noted that one square meter of urban farming is capable of producing 36 heads of lettuce every 60 days, 10 cabbages every 90 days and 100 onions every 120 days. Moreover, urban farming is capable of bolstering more social and political inclusion, sustainability in environment, economic progress and unified water and land policies (Cabannes, 2012 and Nugent, 2000). On the other hand, urban farming paves a way to nutritional security of the population and assures access to daily sustenance.

Another FAO report titled FAO's Role in Urban Agriculture articulates that, of the 54.29 per cent urban population, 10.66 per cent (0.8 billion) is found to be involved in urban farming and believed to have produced one-fifth (15-20 %) of the world's food. Similarly, more than two-thirds (2/3rd) of the urban and peri-urban population in developing countries are involved in agriculture/farming. FAO in its report entitled "*Growing greener cities: Cities of despair or opportunity*" ascertained that, 130 and 230 million urban residents of Africa and Latin America practice agriculture, mainly horticulture, to meet their own food needs and to a certain extent, earn income from its sale. In this context, numerous research studies have been carried out across the urban areas to explore as to how farming in urban areas meets the food and nutritional security along with its impact on urban ecosystem and cityscape. However, there have been a dearth of information on good practices and information approaches followed in urban farming.

And, there is lack of documentation of novel practices which were invented and initiated by urbanites who have been involving in urban farming for years from now. Therefore, to explore and elucidate the good practices and information approaches respectively, followed among the urbanites pertinent to urban farming the study entitled "Urban Farming: Good Practices and Knowledge Management" has been embarked upon with the following objectives:

1. To understand the location of urban farming
2. To elucidate and document the good practices followed in urban farming
3. To discern the information approaches followed in urban farming
4. To study the crops included in urban farming along with the nutritional security of urban households involved in urban farming
5. To explicate the perceivable impact of urban farming concerning urban regions
6. To make suitable recommendations to the policy makers

Besides, the study has made a document on preparation procedures of these good practices, based on feasibility and practical applicability so as to replicate them in various cities where urban farming is in its nascent stage of development.

Review of literature

While roots of urban farming are traced back to 4000 years, the urban farming has its shoots only after the 20th century, as wartime relief to the battalions who were starved in the First World War. Besides, in Germany and Paris, the city dwellers were motivated to grow their own foods as wartime food security (Deelstra and Girardet, 2000). In Great Britain too, urban farming was established under the banner of British Allotment Act (Ashebir, 2007). Although, urban farming came to being as the warfare relief, of late it has emerged as a developmental entity for food and nutritional security, a saviour of city ecosystem, source of income/extra income, mode of recreation, way for fresh foods, etc. (Drakakis Smith , 1995; Veenhuizen, 2006). In this context, much efforts were undertaken to document who involves in urban farming; how it contributes to the food and nutritional security of the growing urban population and how urban practitioners have the access to inputs, resources (land, water, etc.), how the information is sourced and utilised, still there is a dearth of information with regard of urban farming (Devenish, 2006; Veenhuizen, 2006; and Drakakis et al, 1995).

Urban farmers belong to all age categories and all walks of life (women, men wealthy, poor, locals and immigrants), and many are from low income households (FAO, 2014; Robertson, 2013). As far as location is concerned, it is either in the midst of the city or alongside or periphery of the city or intra-urban or inter-urban (van Veenhuizen and Danso 2007; Lynch et al, 2001; Ashebir et al, 2007; and De Zeeuw et al, 2011). However, urban farming at micro farming level is practiced in a range of places at the households or apartments, i.e., field plots, vacant land, in gardens, on rooftops, in barns and cellars (Devenish, 2006; De Zeeuw et al, 2011).

According to a FAO report (2001), in Nairobi, Kenya, urban agriculture is mainly centered around horticulture and the preferred locations are private residential land (32 %), road side lands (29 %), along river banks (16 %) and public lands (16 %). In Dodoma city, 34.30, 23.10 and 21.30 per cent of the farmers carry out their urban farming activities in residential, rented and governmental plots respectively (Namwata et al, 2015). However, in Cape Town (South Africa) the gardens are located in school grounds (49 %) and municipal land (32 %) (Robertson, 2013). In terms of ownership of the plots, in Dodoma city, Tanzania, 55.70 per cent of them owns the plots for urban farming and holds an average plot of 2 acres per head (Namwata et al, 2015). In cities like Havana (Cuba), Lima (Peru), Bulawayo (Zimbabwe), Rosario (Argentina) and Governador Valadares (Brazil), they have city ordinance plans, that pan regulates the use of municipal land by organised farmers for urban agriculture Cities such as Colombo (Sri Lanka), Rosario (Argentina), Kampala (Uganda) and Dar es Salaam (Tanzania), have included establishment of community gardening in new public house projects and slum upgrading schemes, so as to promote urban farming sustainably (https://goo.gl/dTDCYN).

Moreover, when it comes to growth media and culture, Namwata et al, (2015) argued that 59.70 per cent of the farmers were in need of extra land for urban farming and they have been seeking to get it from government and relatives and 8.90 per cent of the urbanites do not have adequate information source for access to land. Therefore, soil is predominantly used as the growth culture and growth media in rural farming.

As far as crops included in urban farming are concerned, the urban farmers practice urban farming essentially to meet their own food requirement (Devenish, 2006; Veenhuizen and Danso, 2006). Therefore, the produce of urban farming is usually non-traditional vegetables like lettuce, cabbage and spring onions in open spaces, with water access throughout the year (Keratia et al, 2002). In Dakar (Senegal, Africa), urban farmers mostly grow lettuce, tomatoes, onions and jaxatu (a type of eggplant) (Niang et al, 2002). In many cities, urban agriculture provides a substantial part of the urban demand for vegetables (especially fresh green vegetables: often 0·90 or more), fresh milk (often 0·60– 0·70), poultry and eggs (0·50–0·70), and to a lesser extent, pigs, fruits and freshwater fish (0·15–0·50) (Veenhuizen, 2006). Many of the urban cities have family farm that includes production of foods for self-consumption and sale of the surplus to the markets for some income (Moustier and Danso, 2006). The Mexico City has produced on an annual average, 15,000 tonnes of vegetables from 22,800 ha land. In Lima, 5,000 ha of irrigated land is utilised for short-cycle vegetable crops that are sold in city markets. Whereas, the urban dwellers of the Hyderabad, India, cultivate mostly para grass accounting for 65 per cent of the urban produce, followed by leafy vegetables and one per cent of fruits, crosandra and jasmine flowers (Buechler and Devi, 2002). Contrariwise, the urban dwellers of Faisalabad, India, grow wheat as it is the staple food of the residents of the city (Ali, 2002).

This also helps the producers save significant amount of money (Hagey, 2012). Urban farming enabled Mr. V. Anand, Mrs R. Sharadha and Ms Purnima from Hyderabad, save up to 25 per cent, INR 50 weekly on vegetable expenditure alone (Devenish, 2006). In this way, urban households involved

in farming have increased access to healthy foods, revitalises the societal and community health or gardening, are more food secure, have a better and more diverse diet eat more vegetables than non-farming households and lessen their expenditure pattern on foods. It is cited that in Dar es Salaam (Tanzania), urban practitioners are able to save around 10 per cent of their weekly income by means of growing their own foods. (Hagey, 2012; Zezza; Tasciotti, 2008; Vanhuizen, 2006; and Howorth, 2001).

Production of food by poor urban households can supply 20-60 per cent of their total food consumption especially in green vegetables, medicinal and aromatic herbs, eggs, milk and meat from small animals (Smit et al, 1996). In the city of Havana, those with their own farms are able to meet 30 per cent of their own food demand (Novo and Murphy, n.d.).

Involvement in urban farming may also lead to better mitigation of diseases (better nutrition, home-grown medicinal plants), more physical exercise, less dependency on gifts and food aid and enhanced self-esteem (Lock et al, 2001). It does not only meet the food need of the households involved in farming, but also meets 30-40 per cent of the food need of the urban community. Besides, it produces affordable, fresh, healthy food for the expanding urban population, in addition to the sale of surplus in the market. (Vanhuizen, 2006; Hagey, 2012). In addition to enhanced food security and nutrition of the urban producers themselves, urban farming had a share of 15-20 per cent to the world's food production in 2011 (Armar-Klemesu, 2000). Besides, urban farming can contribute to enhancing urban food security and healthy nutrition of the urban poor, while on the other hand, it provides employment opportunity, trainings, incubating and capacity building services to a multitude of population who are interested in farming. Self-production of food produce by urban households can meet 20-60 per cent of the food demand of the family, can be fresher than that bought in shops, markets, etc., and household which practices urban farming are more food secure than others (http://documents.worldbank.org). In Nakuru, Kenya, 8 per cent, in Dakar, Senegal, 10 per cent, Lusaka 33 per cent and in Hanoi, Vietnam 44 per cent of the food requirement were met by urban farming (Foeken and Owuor 2006; Mubarik et al, 2005; Hovorka et al, 2001; and Mbaye and Moustier, 2000).

As far as good management practices and conservation of resource is concerned, urban farming diverts organic waste from city landfills, converting them into a useful resource for the production of food for urban citizens. However, most of the usage of urban resources in urban farming are strongly influenced by urban conditions i.e., urban policies and regulations, high competition for land, urban markets, prices, etc. (Mougeot, 2000; Hagey, 2012). In this context, 59 per cent of the urban farmers in Dodoma city were found to not have used any input for urban farming and 52.20 per cent of the farmers use only farm yard manures as input, as it is available readily, inexpensively and increases the fertility of the soil too (Namwata et al, 2015). On the contrary, urban farmers in Cape Town use manure to fertilise their gardens and the Department of Agriculture is the main source for acquiring manures, but some prepare their own composts and worm farm and few get the manures from the Urban Foundation, in case of Cape Town, South Africa (Robertson, 2013). The urban farmers depend on a variety of source for the other production/input resources like seeds/seedlings, tool/equipment,

land, shelter (container and building), windbreaks and bushes. These sources include NGOs (Non-Governmental Organisation), CBOs (community Based Organisation) i.e., Abalimi Bezekhaya, Urban Foundation, Quaker Peace Project, H.A.T., and Sidra and the government departments like Department of Agriculture, City of Cape Town, City Park, Department of Social Services, Violence Prevention through Urban Upgrading (VUPPA), and the foreign sources like HEART (Sweden) and Adcorp, are the sources of urban farming in Cape Town, South Africa (Robertson, 2013). Moreover, urban farming can make use of urban waste as productive resources and for irrigation, wastewater from cities can be used (Vanhuizen, 2006) and, in most cases, urban water source determines the method of lifting water and method of irrigation (Keratia et al, 2002). Since it is evident from the literature that about 70-80 per cent of water leaving the city is considered to be wastewater, (Buechler and Devi 2002; Buechler and Scott, 2006), it may help in sustaining the urban ecosystem. Kossodo, Africa, is a large farming area that uses untreated wastewater from an industrial zone, with most water coming from a brewery and a leather tannery (Keratia et al, 2002). Similarly, in Bulawayo, Africa, 62 per cent of the urban farmers were found to have used wastewater for farming albeit they have boreholes (Mubvami and Toriro 2008). In Kamboinse, Africa, there are vegetable plots which have been fed by water from channels dug from the lake into the fields, while urban farmers in Boulmiougou, Africa, use water from wells to irrigate the strawberry crops (Keratia et al, 2002). In Dodma, Tanzania, 68.10 per cent of the urbanites use tap water to irrigate their urban farms and they make use of water from the streams, wells and deep wells for irrigation but to a limited extent (Namwata et al, 2015).

What is more, in the Indian city of Hyderabad, approximately 250 households live around the banks of Musi river and use this river water for farming their 100 ha of land (Buechler and Devi, 2002). On the other hand, urban farmers in Faisalabad city, Pakistan, use canals, both the sewage domestic water (channel 3) and industries 'waste water (channel 4) for irrigating the crops (Ali, 2002). Therefore, recycling, reusing and reinvigoration of urban organic waste and industrial effluent/grey water/black water would be a good practice in increasing the productivity and production of urban farming, as it is found to have essential nutrients needed by the crops (Rutkowski et al, 2007; Mutengu et al, 2007 and; Ensink et al, 2002).

Moreover, in terms of impact on cityscape, usage of wastewater in urban farming restores urban ecosystem that has been polluted by the booming industries, chemical plants, etc., amid increasing paucity of fresh water. It also enhances the vegetation cover of the urban area and results in reducing the heat and evapotranspiration. Besides, urban farming can make use of the runoff effectively (Molden, 2007 and Acharya, 2011). Besides, it is estimated that about 0.3 m ha in the cities relay on wastewater for irrigating the farms (Rutkowski et al, 2007). In Ghana and Togo, urbanites use buckets to carry and irrigate the crops. Importantly, women and children are long been involved in carrying water from the source to field (Keratia et al, 2002). However, 54.50 per cent of the urbanites/ farmers have not received reliable water supply for urban farming in Dodoma city of Tanzania (Africa). Moreover, there is need for more water for household purposes, since there is vivid regulation in use of water for agricultural activities (Namwata et al, 2015).

Proximity to the consumers and availability of cheap resources (e.g. organic wastes and wastewater) creates comparative advantages for urban food production (Mougeot, 2000). Besides, the destination of urban farming produce is the household itself (Nugent, 2000).

As far as information source for urban farming is concerned, 88 per cent of the vegetable farmers in the urban part of Accra, Ghana, have radio as a source of information, followed by friends (64 %), extension agents (52 %), agro-chemical shops (45 %), television (37 %) and others (27 %) regarding farming and 68 per cent of the urban vegetable farmers use information on application of fertilisers followed by 63, 62, 56, 32, 31 and 30 per cent of them use information on organic farming, weedicides, soil improvement, pest management, market price and pesticides, respectively (Osei, 2017). Social media is also used as one of the viable options to source information regarding urban farming. It is evident that in case of urban farming, Oota from Your Thota (OFYT) provides voluminous information needed by the urban farmers who are interested/practicing gardening. On the other hand, 77.20 per cent of the livestock keepers of Kinondoni and Morogoro urban areas of Tanzania, depend mostly on veterinary shop for their information contact and almost 63.80 per cent of them access extension officers for their information source followed by 40.20, 39.80, 29.10 and 12.60 per cent of the livestock keepers access information from fellow livestock keepers, print media, agricultural exhibition and meetings/seminar, respectively (Angello, 2016).

Research Methodology

Of the six metropolitan cities (New Delhi, Mumbai, Kolkata, Chennai, Bengaluru and Hyderabad & Secunderabad) in India, the twin cities of Hyderabad and Secunderabad were chosen, a sample size of 25 urbanites practicing urban farming was selected using simple random sampling method. Qualitative and quantitative data were collected by means of semi-structured interview schedule.

An in-depth information and underlying reasons why urban farming is practiced and the good practices and information approaches followed in urban farming were documented and prepared as modules and models. Besides, direct observation was considered for the study, to make notes on the scenario of urban farming. And, focus group discussion were conducted for this study. In order to quantify the data, the per cent analysis shall be used with the help of Microsoft Excel. Besides, with the help of SPSS and frequency of the distribution of the urbanites based on various practices and information approaches. All the practices were documented in order to make the study more effective and comprehensive. Likewise, successful case studies were recorded and analysed noting the good practices.

Results and Discussions

This part describes the good practices and information approaches followed by the urbanites who have been involving in urban farming for years now. Besides, this part illustrates the good practices with models and preparation procedures for the same. In addition, the study has brought into light as to how the information is accessed and utilised pertaining to the practices followed in urban farming.

Location of Urban Farming

Any farm activity needs a considerable area so as to cultivate crops. It is also much more important to understand the location/area in which the urbanites grow their crops in as much as the confined area. It is observed that most of the urbanites (36 %) preferred to cultivate crops on the rooftops of their houses owing to the non-availability of space in the city. Besides, closely spaced households nearer to each other has coerced them to choose rooftops as an undisputable location for farming. Backyard gardening has also been a preferred choice of the urbanites as they have got considerable amount of space between each of their house on account of outskirt location of the houses. In addition, each of the house is 30-50 years old, hence built long before urbanisation of Hyderabad city (Table 1).

Table 1. Location of urban farming

S.No.	Location	Number
1.	Roof-top	9
2.	Backyard	9
3.	Household surrounding	3
4.	Exclusive land area outside of house	2
5.	Balcony	1
6.	Terrace	1
	Total	25

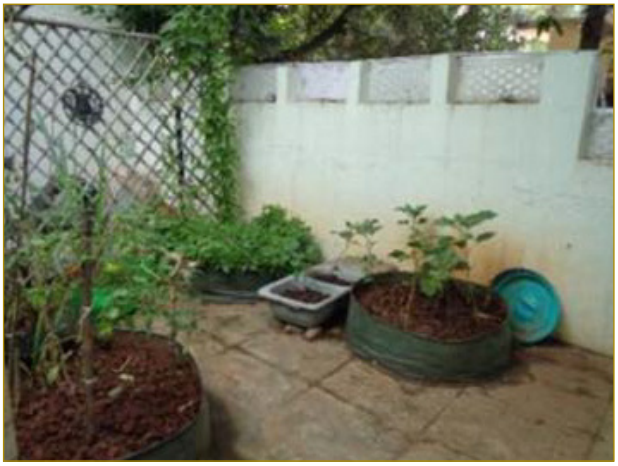
Rooftop of Mr. Subba Rao at L.B.Nagar at Hyderabad

Outskirt of city- Urban commercial farm at Rampally, Hyderabad (Ranga Reddy)

Terrace garden of Mrs. Vasunbhara at Banjara Hills, Hyderabad

Exclusive urban farming garden of Mrs. Vasunbhara at Banjara Hills, Hyderabad

Balcony garden of Er. Babu. P. John at Habsiguda, Hyderabad



Backyard garden of Mrs. Deepa Shailendra at Sainikpuri, Secunderabad

Figure 1. Location of urban farming

Growth medium in urban farming

Unlike farming in rural areas, the urban farming has an extensive practice in selection of growth medium whereas, farming in rural areas is done in the lands/fields as a result both the growth medium and the culture is soil predominantly. But the growth medium is a crucial and an essential element in cultivation of crops in urban area. The famous growth media used by the urbanites include mud pots of 10-20 litres size, depending upon the availability of pots in the markets, milk trays, plastic basin, rose pots and cement pots are also a choice of the urbanites who grow vegetables and leafy vegetables (Refer figures 2 and 2.a for visual image of growth media used in urban farming).

Rooftop of Mr. Subba Rao at L.B.Nagar at Hyderabad

Outskirt of city- Urban commercial farm at Rampally, Hyderabad (Ranga Reddy)

Plastic basin-Mr. Subba Rao at L.B.Nagar, Hyderabad

Rose pots-Mrs. Sudha Gorthi at Sainikpuri, Secunderabad

Cement pot-Mr. Mallikarjuna at Habsiguda, Hyderabad

Plastic drum-Mr. Ravichandra Kumar at Dilshuknagar, Hyderabad

Figure 2. Growth media used in urban farming

Mineral water can container –Mr. Subba Rao at L.B.Nagar, Hyderabad

Tyres –Mr. Subba Rao at L.B.Nagar, Hyderabad

Silpaulin –Mr. Subba Rao at L.B.Nagar, Hyderabad

Grow bags – Mrs. Sudha Raghuram at Sainikpuri, Secunderabad

Curd Buckets- Mr. Ravichandra Kumar at Dilshuknagar, Hyderabad

Figure 2 a. Growth media used in urban farming

Besides, they use plastic drums, mineral water cane containers used in households as a conservational and reuse practice; similarly, tyres either purchased from the local mechanical shops or the torn tyres of their own cars are used as a growth medium. And, Silpaulin of 40 in diameter and 12 in height and grow bags of 1 cu.ft. are also preferred growth medium for urbanites as these are sold at subsidised cost, thanks to the Urban Farming Kit (UFK) of the Department of Horticulture. It was observed that 76 (19 of 25) per cent of the urbanites have Silpaulin and grow bags along with other growth medium such as pots, mud pots, plastic containers, etc., and they have purchased the vegetable farming kit (grow bags and Silpaulin) either directly from the Urban Farming Division of Horticulture Department located at Nampally public garden, Hyderabad or at the exhibitions conducted by the Horticulture Department, Telangana (Refer figure1 for the visual images of growth media used in urban farming) at various places of the twin cities of Hyderabad and Secunderabad. Moreover, at least twice a year, exhibitions/expos at Nampally, Necklace Road near Dilshuknagar, Nampally, Sainikpuri and People's plaza are conducted.

The advertisements of the exhibitions are widely circulated in newspapers and telecasted and broadcasted through various television channels and radio channels respectively, so as to create mass awareness among the city dwellers. Other growth mediums are either purchased from the markets or reused. Pertaining to the purchase of the growth media, urbanites preferred to purchase them from Hyderguda, Kushaiguda, Musheerabad, L.B. Nagar and Necklace road markets, as these market places have exclusive media for kitchen gardening and rooftop gardening. Interestingly, some urbanites have ordered from online source as well, i.e., www.trustbasket.com, www.ugaoo.com and nurserylive.com.

Besides, nurseries like Sreekanth nursery at Kompally, Hyderabad, is also a famous destination for urbanites who maintain urban farms. Mr. Ravichandra Kumar of Dilshuknagar, Hyderabad uses curd buckets as a source of growth medium as it is a special source of lactic bacterium acid for the growth and development of plants. The curd buckets are available in the markets and can also be purchased from any function hall wherein the celebration like marriage and other functions are held. Each curd bucket costs around 35 INR and the curd buckets can also be bought using online sources like www.indiamart.com and www.sniplastics.com but also from Sri Nishitha Industries, Cherlapally, Hyderabad. Moreover, the curd buckets are available in different quantity such as 5 Kg, 10 Kg and 20 Kg.

Source: Webpage image of the www.sniplastics.com

Courtesy: http://www.sniplastics.com/products.html

However, the second hand/used curd buckets are found to be a source of microorganisms as these curd buckets contain lactic bacterium. Thereby, urbanites have shown interest in purchase of second hand curd buckets from function halls rather from online sources.

Moreover, dearth of information and availability of native cultivars of vegetables, fruits and greens have led to the creation of a WhatsApp group by the colony dwellers at Sainikpuri, Hyderabad. They have created an app for themselves so as to post the information pertinent to the availability of seeds with any one of them in the group. Many of them have also been interested in growing crops of rare cultivars for seed production, be it vegetables or greens or fruits that they have acquired from various parts of the country such as local farmers, nurseries of known places and relatives etc.

This WhatsApp group has 20 members, and the urbanites who have similar interests of having an urban farm, have been joining the group as soon as they come to know about the group. The main admin of the group is Mrs. Deepa (WhatsApp mobile No-9989990845). Though initially the group has concentrated only on the urbanites at Sainikpuri colony, it is now expanding to a wide variety of similar interest urbanite from the twin cities of both Hyderabad and Secunderabad.

Practical way of preparation of the growth culture - Compost of Soil

The growth culture of compost of soil is prepared as follows - add 30 litres of water to 10 Kgs of Coco Peat in a bucket or tank or drum i.e., 2 Coco Peat cake (Each 5Kg) and bring it to 40 Kgs or 40 Litres. To this, add 40 Kgs of compost along with 1 Kgs of neem cake. Stir it thoroughly with the help of a rod or hand, whichever is preferable and to this add 20 Kgs of red soil and once again mix it with the hand or big rod. After thorough mixing, this can be filled in the growth medium, be it bags/ plastic drums/ Silpaulin covers/ grow bags/ tyres/ mud pots/ cemented wrack/ cemented pots and so on.

Take a bucket of same size, be it 10 litres or 5 litres or whatever is available. Take a brick of coco peat (5 Kgs) and put it one of the buckets and add required water and at the same time take compost along with handful of neem cake powder in the other bucket and 50 per cent of the soil in one more bucket, and finally transfer them into the container or tank that can withhold the total amount in all 3 buckets and mix it thoroughly either with hands or rods. Put the mixture in the desired growth medium.

Growth culture in urban farming

Soil is the most common growth culture for any cultivation. Even in urban farming, red soil is predominantly used as culture medium. However, soil is not directly used or it is not a single source of culture for the cultivation. When it comes to preparation of soil, all urbanites (with an exception to two) mix cow dung and compost with red soil and fill the growth media for sowing seeds or for

transplanting of seedlings. However, there are two urbanites who have got their unique growth culture. One is prepared by Mrs. Vijayalaxmi at Sainikpuri, Secunderabad, i.e., mix compost, Coco Peat, soil and neem cake at the ratio of 40:40:20:1 or take 40 Kgs of compost, 10 Kgs of Coco Peat brick cake, add 30 litres of water, 20 Kgs of soil and 1 kg of neem cake for 20 grow bags, 20 litres in size. The composition is capable of producing proliferated roots, more number of branches and high yield. The preparation procedure of these growth cultures (scientifically and practically) are as mentioned in the box above.

Compost, coco peat and neem cake can be bought from the markets of Musheerabad, and Hyderguda, Hyderabad. The red soil can be purchased from the outskirts of Hyderabad or from the lakes of Himayatsagar or Ramanthpur. Besides, the Urban Farming Division, Horticulture Department, Govt. of Telangana have also been supplying red soil mixed with Farm Yard Manure (FYM) at the ratio of 2:1 in 20 bags along with the urban farming kit at subsidised rates. Table 2 shows the cost of preparation of compost of soil (Figure 3).

Table 2. Cost of preparation of Compost of Soil (CoS)

S. No.	Composition	Proportion	Images	Quantity	Cost (INR)
1.	Compost	40 %		40 Kgs	320
2.	Coco Peat	40 %		2 Coco Peat brick cake	400
3.	Red soil*	20 %		1 load of tractor	2000
4.	Neem cake	01 %		1 Kg	10
				Total	**2730**

Source: Personal communication with Mrs. Vijayalaxmi

*In case the red soil is purchased from the horticulture department or available at the house, the cost of preparation of Compost of Soil can be reduced, i.e., if it is available at the house, then the cost of preparation of Compost of Soil is about 730 INR.

The other growth culture was invented by Mr. Ravichandra Kumar. It is called Ravichandra growth culture or Compost of Coco Peat (CCP). It has got its unique composition, but importantly, this medium does not have soil as a component. CCP has a variety advantage and the vigour of this growth culture can last for 5-7 years. Conversely, the soil medium may last only for 2 years, the soil growth culture is said to lose its sustainability and nutrient contents from the second year onwards, as the crops grown in the soil culture exhaust the nutrients available in the culture. However, CCP is

an exclusive growth culture, especially an appropriate model for the urban farming, be it terrace or kitchen or roof top gardening. It is prepared as following -

Mix compost, Coco Peat, cow dung, neem cake and perlite in the ratio of 30:30:30:10:3 in a container required for the aforesaid composition. i.e., 30 Kgs of compost, 30 Kgs of Coco Peat, 30 Kgs of cow dung, 10 Kgs of neem cake and 3 Kgs of perlite. The total quantity after preparation is around 103 Kgs. This quantity is sufficient to fill 15-17 buckets of 10 litre size. If more of the CCP is required, increase the composition proportionately. Table 3 shows the cost and advantage of each medium included in the preparation of CCP (Figure 3a).

Table 3. Cost and advantage of components included in the preparation of Compost of Coco Peat.

S. No.	Composition	Advantage	Proportion	Cost (INR)
1.	Compost	Facilitates the proliferation of roots and cater the mineral requirements of roots	30	300
2.	Coco Peat	Retains the moisture so even in less irrigation condition, the coco Peat is capable of releasing water needed for the roots	30	2000
3.	Cow dung	Contains millions of beneficial microorganisms and activated the nutrients of the mixture	30	100
4.	Neem Cake	Acts as the pesticide in the mixture for the seeds and seedlings	10	100
5.	Perlite	Expedites the aeration of the roots	3	100
			Total	**2600**

All of the compositions included in this growth culture are available at the Hyderguda Market. However, to reduce the cost of preparation, compost and cow dung can locally be prepared or purchased from nearby Goshala.

As far as seeds or seedlings sown or planted in the land, (not in grow bags or special growth media), many of the urbanites practice mixing cow dung/Farm Yard Manure (FYM) onto the surface of the soil or dump near the root portion of the crops. Besides, the cow dung manure/FYM/Coco Peat is incorporated into the soil.

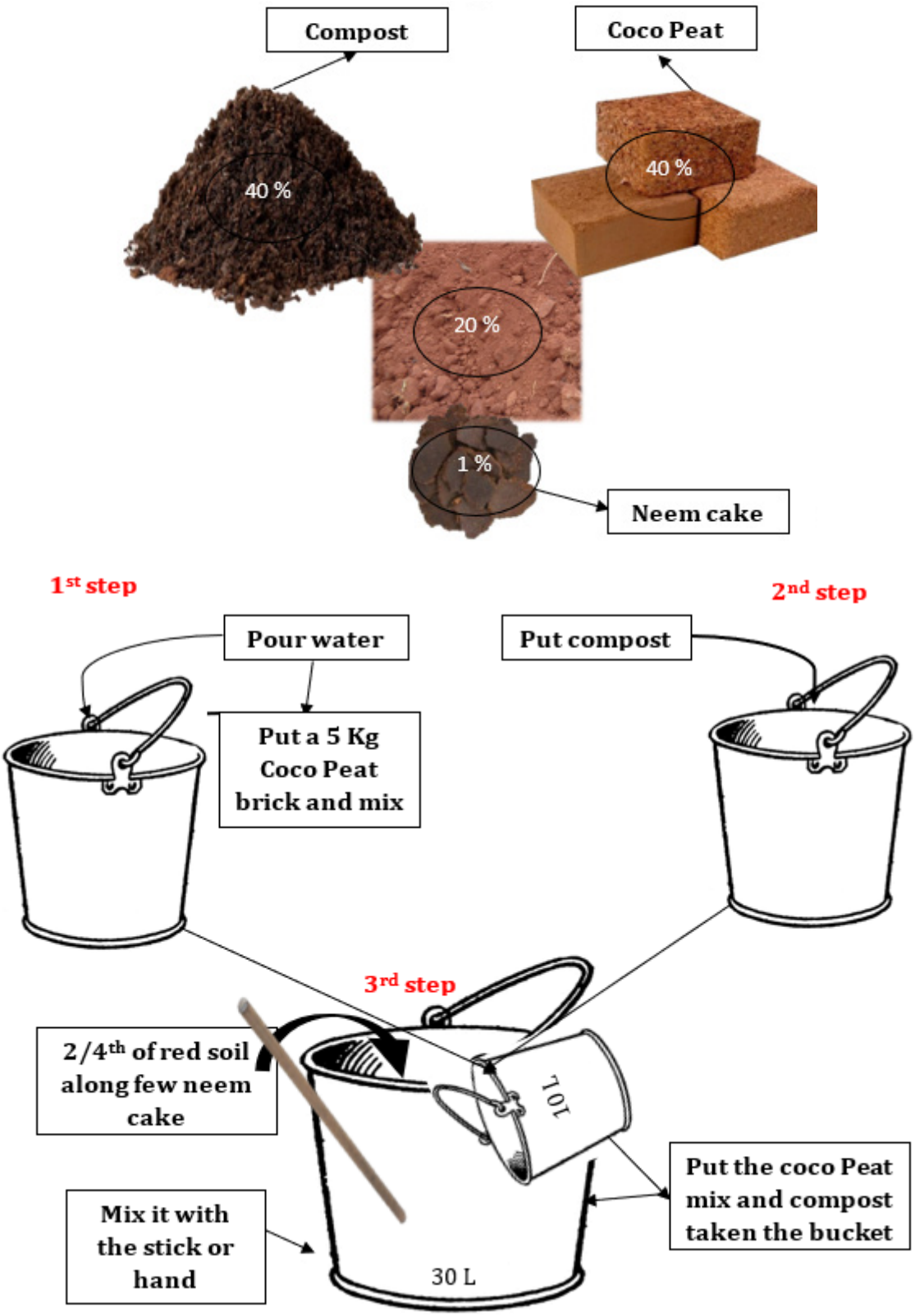


Figure3. Preparation procedure of growth culture Compost of Soil (CoS)

Figure 3 a. Preparation procedure of growth culture Compost of Coco Peat Compost of Coco Peat

Seed and the urban farming

Seed is the soul of cultivation. So far as the availability of seeds and practice of seed treatments are concerned, many of the urbanites have purchased seeds from a variety of areas and local farmers from their respective natives. None of them have used a single source as far the seeds are concerned. However, most of the urbanites (14 of 25) have one thing in common, i.e., seeds are either purchased from the Horticulture Department or exhibitions of Horticulture Department, conducted at the various places across Hyderabad (refer - growth medium) through vegetable/ urban farming kit at subsidised costs (Figure 4).

However, markets like Musheerabad and Hyderguda are found to be famous designations for seeds of various vegetables and leafy vegetables. Besides, some nurseries (Sreekanth nursery at Kompally, Hyderabad), friends and neighbours with farms, are also sources for getting seeds, while online shopping are also an exclusive juncture for purchase of seeds. However, when it comes to their preference, the urbanites mostly favoured purchase the seeds, be it vegetables or fruits or leafy vegetables, from local rural farmers, since these seeds are more viable and with assurance of no hybrids. Furthermore, these seeds are found to have good taste, savour and flavour, as cited by many of the urbanites. Table 4 shows the online sites preferred by the urban farmers for seed purchase.

Table 4. Online sites on seed purchase for urban farming

S. No.	Online sites	Images	Available seeds
1.	www.ugaoo.com	UGAOO	Seeds of all vegetables, greens, fruits and flowers available
2.	www.trustbasket.com	TRUST BASKET	All most all varieties of vegetables, fruits sand leafy vegetables are available. However, most of them are hybrids
3.	https://www.facebook.com/intipanta.in/	INTIPANTA	Shares the availability of images and sees pertaining to the urban farming
4.	https://seedbasket.in	Seed Basket	Seeds of all vegetables, greens, fruits and flowers available
5.	www.niamigarden.in	mai Garden	This website hosts the seeds of vegetables, greens and fruits and to some extent flowers of ornamental types. The most noteworthy is that the online shop sells only the open pollinated variety and non-hybrids seeds and local cultivars of years old. Hence, all of these seeds are organically viable and germinal

For the urbanite Mrs. Vijayalaxmi, the seeds for her farming were purchased from various parts of the country, through her friends i.e., seeds of vegetables and leafy vegetables from local farmers

at Pune and Jammu. However, in due course of time, Mrs. Vijayalaxmi has started selling her own seeds, produced from her garden, through the online website www.MyEdibleGarden.in and facebook.com/MyEdibleGardenIndia.

Besides, the sites have made an endeavour to design and make the tools and inputs necessary for the urban farming, on a real time basis. The chief aim of starting the sites is that, every urban dweller has to become a producer rather than just a consumer, for the promotion of a sustainable future.

Therefore, these online sites and novel initiatives have helped the urbanites to be self-sufficient in seeds pre-requisite for crop production. What is more important is that, by now these urban farmers have started producing seeds of their preference and suitability.

Vegetable seeds of Urban Farming Kit-Urban Farming Division, Horticulture Department at Nampally, Hyderabad

Madanapalli tomato cultivar-local cultivar of Madanapalli. Mrs. Susie Tharu, Sainikpuri, Secunderabad

Vegetable seeds of local cultivars of Mr. Ravichandra Kumar at Dilshuknagar, Hyderabad

Figure 4. Seeds and the urban farming

Crops included in urban farming

There are a variety of crops cultivated in urban farming. Mostly vegetables, greens and fruits are essentially the cultivated crops. However, to some extent, cereals are also included in urban farming. Table 5 below shows the crops cultivated under vegetables in urban farming.

Table 5. Vegetables cultivated in urban farming

S. No.	Vegetables	Urbanites	Percentage *
1.	Tomatoes	17	68
2.	Brinjal	16	64
3.	Bhendi	14	56
4.	Chilli	14	56
5.	Bitter gourd	9	36
6.	Bottle gourd	7	28
7.	Ridge gourd	7	28
8.	Snake gourd	5	20
9.	Cluster bean	3	12
10.	Pumpkin	3	12
11.	Kovakkai	3	12
12.	Broadbean	2	8
13.	Lab	1	4

*Multiple response

Table 5 makes it clear that tomatoes, brinjal, bhendi and chillies are the most sought-after vegetables by the urbanites. However, gourds have also been found to be preferred vegetables, since these creepers do not need more space to grow, as a tree or some sticks or wall to spread on is sufficient.

Grain food and urban farming

As much as grains are concerned, 4 of the 25 urbanites have been interested in cultivation of cereals nor millets. Of the 4, 3 urbanites have maize crop of 5-8 numbers, that too used as a feed for birds and animals. Mrs. Kaniza, had 4 maize crops from Thailand, gifted by her friend and one pearl millet crop. The maize had not yet given cobs, but the pearl millet is used as feed for birds which come to the rooftop. As the UF is done in a limited space and available areas around the households, these urbanites have not shown interest in cultivation of cereals and coarse grains.

Root vegetables cultivated in urban farming

As far as the root vegetables are concerned, only one urbanite (Mr. Ravichandra Kumar - Dilshuknagar, Hyderabad) has been growing radish, carrot, onion and beet root. However, most of the urbanites have not cultivated root crops yet as a few (2 of 25) have shown interest in cultivating garlic and two (Mr. Mallikarjuna-Habsiguda, Hyderabad and Mr. Ravichandra Kumar - Dilshuknagar, Hyderabad) have even cultivated turmeric on a small scale and in pots, as a passion. It is because root vegetables require a conditioned temperate climate in most cases, except onion. So, the aforesaid crops have been observed to be few among the urban farmers.

Table 6. Leafy vegetables in urban farming

S. No.	Leafy vegetables	Urbanites	Per cent *
1.	Spinach (Palak)	14	56
2.	Hibiscus (Gongura)	10	40
3.	Fenugreek	8	32
4.	Coriander	7	28
5.	Mint	6	24
6.	Lettuce	5	20
7.	Basil	4	16
8.	Amaranths	4	16
9.	Curry leaf	4	16
10.	Ponnaguni keera	3	12
11.	Chukka	2	8
12.	Batchilgura	2	8
13.	Drum stick	2	8
14.	Turnip	1	4

*Multiple response

It is observed that almost all of them have Amaranths and spinach as their main cultivated crops. However, the greens like fenugreek, coriander, mint lettuce and basil have also been to be preferred crops among the urbanites, since most of these green seeds are supplied by the Horticulture Department through the urban farming kit, motivating them to cultivate these greens inherently. Above all, greens are considered to be a significant diet and essential supplier of nutrients, required for the growth and development of human body. Moreover, it was observed that urbanites who have been cultivating greens, have high access to fresh and nutritious greens and every week they consume any of the aforesaid greens, nearly 4-5 times. On the other hand, many a times, these urbanites give greens as gifts to their neighbours, relatives and friends, when the harvest is in plenty, in particular during peak season. Thereby, cultivation of greens through urban farming enhances the nutrition security of both the households which have been involving in urban farming and the fellow city residents.

Table 7. Fruits included in urban farming

S. No.	Fruits	Urbanites	Per cent *
1.	Mango	9	36
2.	Custard apple	9	36
3.	Sapota	7	28
4.	Coconut	7	28
5.	Pomegranate	6	24
6.	Lime	4	16
7.	Papaya	2	8
8.	Amla	2	8
9.	Guava	2	8
10.	Apple ber	2	8
14.	Turnip	1	4

*Multiple response

As far as growing habit of fruit crops is concerned, the mango has been the favourite fruit crop, with custard apple and sapota also being grown by the urbanites as these crops are grown well in the red soil, since most of the urbanites lands and growth media are said to be red soil. Other crops like papaya, amla and guava are also grown here. Besides, coconut has been a chosen tree and most of these tall growing coconut trees are 30-40 years old, as these trees were planted while building of the house by the urbanites.

However, there is a unique urbanite Mrs. Beyniaz Edulji of Sainikpuri, Secunderabad who has been growing only fruit crops in her household, the fruit crops include 14 varieties of mangoes, sapota, passion fruit, Mosambi (sweet lemon), star fruit, fig, apple, pomegranate, guava, jack fruit, phalsa, jack fruit, barbados cherry and apple. The varieties that are grown by Mrs. Beyniaz Edulji is dealt with under the subhead - varieties of fruits in this document. However, a few urbanites were found to have more than four fruit crops, and they are as followed:

Table 8. Urbanites and their fruit crops

S. No.	Mane of the urbanite	Fruit crops cultivated and number of crops
1.	Pastor Daniel Sainikpuri, Secunderabad	3 varieties of mango, 2 varieties of Sapota and 2 trees of custard apple and 1 coconut
2.	Mrs. Vasunbhara Banjara Hills, Hyderabad	4 Dasheri variety of mango and 1 Benishan variety of mango (totally 5) and 5 custard apples and 2 sapota and 1 coconut tree
3.	Mr. Subba Kumar L.B.Nagar, Hyderabad	3 varieties (2 of Banganapally, 1 of Totapuri and 1 of Jalal) of Mango) and 3 guavas, 1 pomegranate, 1 sweet lime and 1 custard apple.
4.	Mrs. Vijaya Reddy Attapur, Hyderabad	6 banana crops, 2 pomegranates, 1 orange, 1 lime, 1 custard apple and 1 papaya

With respect to the fruit crops grown, with the exception to Mrs. Beyniaz Edulji, others have only a few fruit crops owing to the non-availability of space in and around the households. However, there are few urbanites who have been able to grow more than 4 fruit trees. Of them, Mrs. Vasunbhara has got an exclusive land area outside of her house, and hence she is capable of managing several varieties of mango and custard apple (Refer table 8). Conversely, the other three have also got an extensive area surroundings their houses, which led them to grow more tree crops than the other urbanites. Besides, the three households of Pastor Daniel, Mrs. Subba Rao and Mrs. Vijaya Reddy are independent in nature, thereby the autonomy of the households allowed these urbanites to grow more fruit trees.

Most of the fruit varieties grown by these urbanites have been purchased from local farmers of their respective villages, friends, neighbours, relatives and the seeds thrown on the lands after the consumption of fruits purchased from the market. However, most of these urbanites have spent time to discover the nurseries for preferred fruit crop varieties, i.e., Alphonso in case of Mango variety. When it comes to nursery for seedlings concerning fruit crops again the Sreekanth Nursery of Kompally and Army nursery of Sainikpuri stand out to be first that have got immense respect among the urbanites. Besides, Mrs. Beyniaz Edulji mentioned that the seeds and seedlings of Sreekanth nursery have good germination percentage and yielding capacity.

Varieties included in urban farming

There are different varieties in vegetables, greens and fruits cultivated by the urban farmers. Moreover, the preference and selection of varieties are different for each of the urbanite, be it vegetable varieties or fruit varieties. The following sub heads explain the most preferred varieties included in urban farming.

a. Varieties of vegetables cultivated in urban farming

There are wide types of vegetable varieties cultivated among the urbanites. However, most of them have been cultivating vegetable and green varieties supplied by the Urban Farming Division (UFD), Horticulture Department, Telangana, through the urban farming seed kit. However, urbanites like Ravichandra Kumar, Mrs. Vijayalaxmi and Mrs. Susie Tharu have got a few varieties of local cultivars and the local cultivars cultivated by these urbanites are given in Table 9.

Table 9. Local cultivars in urban farming

S. No.	Crop	Varieties	Name of the urbanite
1.	Brinjal	Purple long, Green long, Ivory long, Ivory round, Milk round	Mr. Ravichandra Kumar (Dilshuknagar, Hyderabad)
2.	Bhendi	Red long and green bold	Mrs. Vijayalaxmi (Sainikpuri, Secunderabad)

3.	Tomato	Madanapalli	Mrs. Susie Tharu (Sainikpuri, Secunderabad)
4.	Bottle gourd	Long and bold	Mr. Subba Rao (L.B.Nagar, Hyderabad)

b. Varieties of fruits grown in urban farming

Fruits are seen as the healthy and nutritious food among the urbanites who cultivate them. There are several fruit crops cultivated by them. Of the fruit crops, mango is the leading crop since most of them, which are readily available to them from various markets of Hyderguda and Musheerabad. Table 10 shows the mango, sapota and apple varieties grown by Mrs. Beyniaz Eduli of Sainikpuri, Secunderabad.

Table 10. Fruit varieties in urban farming (grown by Mrs. Beyniaz Eduli of Sainikpuri, Secunderabad)

S. No.	Fruits	Varieties
1.	Mango	Alphonso, Himayat, Cheruku Rasalu, Chinna Rasalu, Dasheri, senthoora, Banganapally, mallika, Benishan, baramasi, kesar, langra, Totapuri, suvar-narekha
2.	Sapota	Cricket ball and kalapati
3.	Apple	Granny smith

Most varieties grown by Mrs. Beyniaz Edulji were purchased from Sreekanth nursery, Kompally, Hyderabad, as mentioned under Table 8. However, some of the fruit varieties were gifted by friends and relatives. Similarly, the apple variety Granny Smith was gifted by a friend of Mrs. Beyniaz Edulji from New Zealand.

Granny Smith - an apple variety of New Zealand -Mrs. Beyniaz edulji, Sainikpuri, hyderabd

There are some urbanites who have the same mango varieties as mentioned in.

Table 11: Mango varieties grown by urban farmers

S. No.	Mango variety	Name of the urbanite
1.	Benishan	Mrs. Deepa and Mrs. Beyniaz Edulji
2.	Banganapally	Mr. Subba Rao of L.B. Nagar, Hyderabad and Mrs. Sudha Gorthi of Sainikpuri, Secunderabad, and Mrs. Beyniaz Edulji

3.	Dasheri	Mrs. Vasunbhara of Banjara Hills, Hyderabad Mrs. Sudha Gorthi of Sainikpuri, Secunderabad, Mr. Daniel Sainikpuri, Secunderabad (Pastor) and Mrs. Beyniaz Edulji
4.	Totapuri	Mr. Subba Rao of L.B. Nagar, Hyderabad and Mr. Daniel, Sainikpuri, Secunderabad and Mrs. Beyniaz Edulji
5.	Alphonso	Mrs. Sudha Gorthi Sainikpuri, Secunderabad, Mr. Daniel Sainikpuri, Secunderabad and Mrs. Beyniaz Edulji, Sainikpuri, Secunderabad
6.	Mallika	Mr. P. Mallikarjuna Rao of Habsiguda, Hyderabad and Mrs. Beyniaz Edulji, Sainikpuri, Secunderabad.

So, it is clear that with respect to mango varieties, urbanites are greatly aware of which varieties have to be bought and grown, and many of them have shown much interest in more than two varieties of mango. It is because, each of the variety tastes different and have their own distinctive characters. Besides, with respect to the other fruit crops, the urbanites are not aware about the various varieties grown. However, they choose to grow fruit crops which have, over a period of time, given good taste and yield, rather than growing them based on their variety names.

Manures and fertilisers used in urban farming

The manuring and fertilization of the crops are more important for the maintenance and production of crops. To the extent that manure and fertilisers are concerned, the urbanites have a variety of sources such as compost from household wastes, vermicompost, either purchased from markets or prepared in the house itself. Besides, cow dung and FYM are purchased from nearby Goshala across Hyderabad and Secunderabad (Refer Figure5 for visual images of manures and fertilisers used in urban farming).

When it comes to practices pertaining to preparation of manure, the urbanites have experimented various practices like preparing compost using the bin or iron mesh bin. The most important practice followed is terracotta composting using terracotta pots. The following sub head explains the preparation procedure of terracotta composting followed by the urbanites.

Terracotta Composting

It is the simplest composting method used by the urbanites for preparing manure by themselves. It is prepared as follows:

Arrange 3 even sized terracotta pots (5-10 litre size) one above another vertically (as shown in figure). Put the kitchen waste, be it vegetable wastes, peels of fruits/ vegetables or rotten fruits and vegetables, in the top terracotta pot and close it. Sprinkle small amount (10-20 ml) of butter milk and 100 grams of vermicompost as a starter, so as to initiate the activities of the microorganism in

the pot containing the wastes. Once the process is started, keep on adding the kitchen wastes into the top terracotta pot. Once the top pot is filled, bring the second terracotta pot to the top and place the top pot in the place where the second pot was i.e., in the middle of the vertical arrangement. Continue putting the waste into the newly placed pot at the top and sprinkle 10-20 ml butter milk and add 100 grams of vermicompost as done for the first pot. Continue the process and after three months, the compost is ready for applying in the growth medium or culture or into the field.

Terracotta composting model at Mrs. Vijayalaxmi house

Once the first (top) pot is filled bring it to the place of second pot and place the second pot at the top and that is filled bring the third pot to the top and the second to the third and the top to the second

As the compost is prepared out of the kitchen wastes, it is full of minerals and nutrition which are essential for the growth and development of plants. Besides, it is a way of recycling the bio-degradable wastes thereby paving the way for clean, green and sustainable ecosystem of the city in a bigger way. Also, it is a low-cost source of manure because, other than the initial investment on purchase of terracotta pots, it does not involve any cost of production.

The second method of making manure followed by the urbanites is the simple composting method, i.e., dumping kitchen waste, paper waste, peels of fruits and rotten vegetables and fruits, into a common bin, placed at any corner of the field or at the convenient place. To make the wastes into manure, earthworms are released onto the top layer of the waste and the worms then eat away the wastes that are put in it. The earthworms release the excreta at the bottom of the bin and every 3 months the enriched manure can be collected and applied in the field. In order to take out

the excreta/manure, a small pit may be made at the bottom just below the bin, in case the bin is a hollowed bin, or if the bin is closed the make a considerable size of hole at the bottom of the bin.

The urbanites have been using both the bin and hollowed mesh bin. However, the hollowed mesh bin is said to be viable and recommended since it has good ventilation. In case the earthworms are not available, the urbanites have even used butter milk, as mentioned in the terracotta composting method, to activate the microorganism.

The third method followed by some of the urbanites (2 of 25) is vermicomposting. It is similar to the second method, but is prepared by putting the wastes in a 1 cubic metre surface of the soil and it can be made in a preferred location. Then cow dung as the second layer of 1 or 2 inches applied and on top of this, a layer of shredded paper, leaf litter, kitchen waste and other household wastes can be applied. Earthworms, either purchased from local source or known source, (for these urbanites, Professor Jayashankar, Telangana Agricultural University, Rajendranagar, Hyderabad, has been the source of earthworms) are released on to the top of the layers and every 4 months, vermicompost is ready for applying in the field.

Two of the urbanites, Mr. Ravichandra Kumar of Dilshuknagar, Hyderabad and Major Vijay Uppal of Sainikpuri, Secunderabad, use fish tank water as the source of manure, along with compost and cow dung. Though the compost and FYM are believed to be the most widely used manure by urbanites who grow vegetables and leafy vegetables, these two urbanites have started using fish tank water as the source of manure for the crops. As far as the Major Vijay Uppal's fish tank water is concerned, it is a simple and non-commercial method. It is water from two fish tanks of 20-25 litre size and is used as manure for crops.

The fish tank contains colour fishes like tails and guppy (*Poecilia reticulate*), and the water is drained from the fish tank using the siphon. The drained water is then directed into the field. The water is also collected in buckets or jugs and carried to the pots/grow bags/ containers where the vegetables and leafy vegetables are grown. As the water drained from the fish tank is enriched with mineral, the plants are capable of yielding much better and give more nutritious produce. More importantly, these food crops, be it vegetables or leafy vegetables, are organically richer than the fruits which are conventionally grown.

Siphon used in draining water from fish tank-Major Vijay Uppal

The other fish water model of Mr. Ravichandra Kumar's is commercial in nature and the edible fishes like Red snapper/snake headed fish (Channa striata) a rare fish in the world, which grows up to 1 metre length (Korameenu in Telugu) is grown and the other fish which he grows is Tilapia

Ravichandra Kumar's Fish tank

(Oreochromis spp) and both these fishes are grown in the fish tank of 200 litre size, placed at a stand. This model has got two advantages - firstly, once in every 4 months, the fishes can be reared for consumption and the other one is the water from the fish tank is released into the crops, through the drip irrigation system connected with the fish tank, morning and evening, on a daily basis. Therefore, the growth and development of the crops are comparatively more than the crops grown with the use of compost, as the water from fish tank is encompassed with quite a lot of nutritive resources required for the crops.

However, it is advisable to choose Tilapia as the fish for urban farming rather Korameenu as the fingerlings conversion ratio is found to be low in Korameenu, about 55-60 per cent only and the feed requirement is also higher, according to Mr. Ravichandra Kumar.

Moreover, most of the urbanites have also been depending on various sources for manure i.e., Goshala for cow dung, and compost, be it vermicompost or compost, are prepared from biodegradable wastes at the household level. In addition, the markets of Hyderguda and Musheerabad of Hyderabad are ideal centres for purchase of compost and neem, be it neem seed powder or neem cake. Moreover, manure is also procured from other sources like neighbours with similar interest and urban farms at the outskirts of Hyderabad. The Horticulture Department's urban faming kit has also been a source of FYM, as red soil given with the kit is mixed with FYM.

Composting iron mesh of Mrs. Sudha Gorthi at Sainikpuri, Secunderabad

Composting iron mesh of Mrs. Susie Tharu at Sainikpuri, Secunderabad

Composting iron mesh of Mrs. Sudha Raghuram at Sainikpuri, Secunderabad

Fish manure from fish tank of Mr. Ravichandra Kumar at Dilshuknagar, Hyderabad

Compost of cow dung and sheep pellet -Major Sam Sundhar, Secunderabad

Organic manure- Mr. Subba Rao, L.B.Nagar, Hyderabad

Figure 5. Manures and fertilisers used in urban farming

Pesticides used in urban farming

All 25 urban farmers have not used chemical pesticides to control pests and diseases. Most of them used neem oil as the organic solution against pests and diseases. It is easily available in the market and the urban farming kit supplied by the Urban Farming Division also has neem oil in it. Hyderguda and Musheerabad market centres are the places for purchase of neem oil. What is more important is that these urbanites use a homemade bio-solution to control the pests and diseases. An urbanite in the outskirts of Hyderabad uses 5 bio-pesticides as organic pesticides against the pest and disease. A few of the urbanites (10 of 25) use bio-liquid extract of garlic, onion and green chillies as a pesticide. And, one of the urbanite uses bio-liquid for the management of pests and diseases. The following sub heads provide the preparation of bio-liquid extract and bio-liquid.

Bio-Liquid Extract Model and its Preparation - Mrs. Vijayalaxmi (Sainikpuri, Secunderabad)

Bio-Liquid extract is a homemade pesticide, against pests and diseases. It is prepared in following way:

Take a few green chillies, garlic and ginger, and grind them either using mixer grinder or pestle and mortar, to form a paste and filter it through a fine filter, so as to separate the fine liquid extract out of the paste. Take a tea spoon of the filtered liquid extract in a jug or mug containing 1 litre of water and stir thoroughly. Pour the mixed solution into the hand sprayer and now the bio-liquid extract is ready for application on the plants. This 1 litre bio-liquid extract is sufficient to apply to 15-20 grow bags, depending on the density and number of crops in the grow bags. It is an effective control measure against pests and diseases. This protects the crops from insects laying eggs on the leaves, as the leaves exposed to the bio-liquid extract are unpleasant to taste (Figure 6).

Bio-Liquid and its preparation Major Vijay Uppal (Sainikpuri, Secunderabad)

There is another bio-liquid model invented by Major Vijay Uppal, a retired army officer from the Indian Army, living in Sainikpuri, Secunderabad. It is prepared as following:

Fill 3/4th water in the 500-litre drum / container and put kitchen wastes like vegetable and fruit peels and put the paste of raw garlic and ginger in the drum. Besides, add neem leaves along with the twigs. Leave this for 30 days and after that sieve the water and collect it alone into an available bucket or container of convenient size and put the trapped solids like decayed neem twigs and other wastes into the root of trees or crops. Now, the sieved water can be filled in a sprayer to apply into the crops to protect the crops from pest attack and diseases (Refer figure7 for preparation of Bio-Liquid).

This bio-liquid is a very effective measure against pests and diseases. Moreover, it drives under the conceptual framework of clean and green city as the bio-liquid is prepared from kitchen wastes and available culinary ingredients. So, it is an experimented method and can be replicated elsewhere across the country.

Amirthapani and its preparation by Mrs. Vijayalaxmi

Another organic pesticide experimented by Mrs. Vijayalaxmi of Sainikpuri, Secunderabad is Amirthapani. The Amirthapani is prepared from 1 Kg cow dung, 1 Kg cow urine, 1 Kg pulse flour (red gram, green gram, black gram, horse gram etc.) and 100 grams of jaggery preferably black jaggery. These components are to be put into 10 litres water taken in a bucket/ mud pot/ tank/ container, whichever is available. The most important thing in the preparation of Amirthapani, it should not be mixed and the container encompassing the components should be placed in a corner and the mouth of the container closed with a gunny bag/sack, in order to prevent the entry of mosquitoes into the container and to avoid mosquitoes from laying eggs in it. It can be used after 7-10 days (Refer figure 8 for preparation procedure of Amirthapani).

Amirthapani and its application method

Take out required quantity of liquid extract of these mixtures and fill the hand sprayer and apply to the field. It is the most effective measure against pest and disease.

Step 1. Take a few amounts of green chillies, ginger and garlic

Step 2. Put the green chillies, ginger and garlic into the mortar

Step 3. Grind them into fine paste using the pestle & needed sprinkle slight water

Step 4. Filter the paste to get the fine extract of liquid

Filtered extract of bio-liquid

Step 5. Take out a tea spoon of filtered liquid extract into litre of water

Water with the bio-liquid extract

Step 6. Fill the hand sprayer of 1 litre and spray into the crops

Sprayer filled with bio-liquid extract

Figure 6. Preparation procedure of Bio-Liquid Extract

Step 1. Take 3/4th of water in the drum

Step 2. Put kitchen wastes and peels of fruits along the garlic, onion, green chillies

Step 3. Put the neem leaves and twigs into the same plastic drum

Step 4. Leave the drum for the period of 30 days

Step 5. After 30th day, remove the debris from the drum and filter down the liquid extract into the other container

Step 6. Fill the bio-liquid in the hand sprayer

Step 7. Apply into the crops

Figure7. Preparation procedure of Bio-Liquid

Step 1. Take cow dung (1 Kg), cow urine (1 Kg), pulse flour (1 Kg) and jaggery (100 gram)

Step 2. Put the taken ingredients into the bucket containing 10 litres of water and don't not mix.

Step 3. Keep the bucket for 7-10 days of period

Step 4. Now take the liquid extract by filtering and fill the sprayer

Step 5. Spray into the crops

Figure 8. Preparation procedure of Amirthapani

Irrigation of crops in urban farming

Irrigation of crops plays a pivotal role in urban farming as water is a limiting resource and groundwater is also deepening owing to the growing population and industries around the city. In this backdrop, the urbanites who grow crops have greatly been differing in terms of use of water for the crops and Table 12 gives a glimpse over the sources of water and how it is used.

Table 12. Distribution of the urbanites based on water source for irrigation

S. No.	Water resource	Conveyance pattern	Number of urbanites	Per cent
1.	Ground water	Pipes	15	60
2.	Municipal water*	Pipes	6	24
3.	Municipal water+ground water	Pipes	2	8
4.	Rainwater alone	Pipes	1	4
5.	Municipal and rain water	Pipes	1	4
		Total	**25**	**100**

*Manjira river water as Municipal water

When it comes to irrigation of the crops, ground water has been the most used irrigation water i.e. 60 per cent of the urbanites have been using groundwater through bore wells and conveyed through pipes as irrigation water. 8 per cent of the urbanites have also been using both municipal and ground water as source of irrigation. Besides, one of the urbanites (Pastor Daniel) has been using rainwater alone as an irrigation source, by collecting rainwater in a rainwater harvesting pit, cemented & built in the ground to contain the rainwater for prolong period, even in the summer days.

The rainwater harvesting pit is capable of holding up to 20 thousand litres of water and built in such a way that pipes from the terrace and rooftops bring rainwater directly to the pit without any wastage. There is another urbanite, whose crops are irrigated by rainwater collected in the rainwater pit as mentioned above during all seasons, except summer, when groundwater compensates for rainwater. As the conservation of water is one of the focus of urban farming, most of the urbanites have begun to build rainwater harvesting pits and reuse water used for the other household purposes (Table 13).

Table 13. Distribution of urbanites based on reuse of water

S. No.	Reuse of water	Urbanites	Per cent
1.	Domestic water (grey water)	9	36
2.	Recycling of water through filter	1	4
3.	No reuse	15	60
	Total	**25**	**100**

The reuse of water is an indispensable part of urban farming as wastewater can be used effectively for the growth and development of crops. Accordingly, 36 per cent of the urbanites (9 of 25) used wastewater (grey water) from their bathroom and kitchen. The outlets from these rooms are directly connected to the field, so as to irrigate the crops. Likewise, an urbanite (Mr. Ravichandra Kumar) uses filters for recycling the water for irrigation of crops. However, the reuse of water is possible only when the house is independent and self-owned rather than a housing complex or colony, as it is evident that all of these 10 houses are independent from each other and self-owned houses. In this state of affairs, the reuse of water is capable of reducing the water going down the drain, indirectly helping to improve the urban ecosystem and improve the city landscape.

Thus, it is advisable that the government should encourage wastewater treatment plants as obligatory to constructors responsible to build multi-storeyed buildings and housing complexes in the city. And, fillip would be given to urbanites to reuse treated wastewater/grey water for cultivation of crops as a way for sustainable city and cleaner urban ecosystem.

Besides, the method of irrigation is different for each of the urbanite. Table 14 explains the distribution of urbanites with respect to the method of irrigation of crops.

Table 14. Method of irrigation in urban farming

S. No.	Method of irrigation	Urbanites	Per cent
1.	Hose watering	13	52
2.	Bucket watering	4	16
3.	Drip irrigation	3	12
4.	Rose cane watering	1	4
5.	Hose watering + Bucket watering	2	8
6.	Hose watering + Rose cane watering	2	8
	Total	**25**	**100**

High tech irrigation like drip irrigation is yet to be popularised among the urbanites who have farms, as only three of twenty-five urbanites have been irrigating their crops using drip irrigation. They are Mr. Ravichandra Kumar, Dilshuknagar, Hyderabad, Mrs. Vijayalaxmi, Sainikpuri, Secunderabad and Er. Babu.P. John, Habsiguda, Hyderabad. Mr. Ravichandra Kumar and Mrs. Vijayalaxmi use physical means of opening the valve to irrigate the crops, both in the morning and evening, depending on the water requirement.

Automatic drip irrigation system of Er. Babu P. John, Habsiguda, Hyderabad

However, Er. Babu P. John uses automatic drip irrigation system, which is operated by the drip metre positioned on the wall, which automatically reads the soil moisture level in the growth medium, be it pots or containers or grow bags or Silpaulin and so on and it automatically releases the valve on the tap and irrigates the crops and stops once the growth culture attains the required moisture/saturation level. However, hose watering followed by watering by buckets are mostly found among the urbanites (68 %) as these two methods are easy to do and inexpensive.

Besides, the jugs have been used by urbanites in case of bucket watering of crops i.e., jugs are used to fetch water from the buckets to water the crops. There are also a few urbanites who use two different methods such as hose and bucket watering; hose and rose cane watering while there is only one urbanite who uses rose cane watering alone.

However, in order to facilitate the use of water effectively and to improve water conservation, the promotion of drip irrigation is an indispensable part of urban farming. In urban farming, reuse of domestic waste water is encouraged and hence installation of drip irrigation the wastewater treatment plants are the need of the hour. The automatic drip mediated system followed by Er. Babu P. John is an efficient conservation method of water, therefore this method of irrigation has to be promoted among the urbanites who have effectively and passionately been involved in urban farming. Besides, the government may take necessary steps to replicate the Babu P. John model of irrigating the crops through the subsidised distribution of drip kit to urban farming urbanites besides making awareness the importance of automated drip irrigation system. On the other hand, the automated drip irrigation system is more valuable i.e., as it could be in a position to irrigate the crops and make sure the growth and development of crops does not suffer in the absence of residents.

As far as water drainage from pots/containers/plastic drums/cement pots is concerned, residual water other than the water used by the crops and lost through evaporation, is drained through the holes provided at the bottom of the growth medium, as mentioned above. On the contrary, crops in the land have no problem with respect to the water drainage as the water is seeped or gets drained into the subsoil through the natural process of infiltration and percolation. However, there is only one urbanite Mr. Ravichandra Kumar, who has a unique model as far the drainage of irrigated water is concerned. He uses PVC pipes connected with the bottom holes of the growth media be it curd buckets or cement racks or containers or mud pots.

The growth media is arranged on a stand of bricks horizontally at a leaning angle from one end to the other end, and thereby the water is drained from the holes of the growth media to the PVC pipes, which runs parallel to the horizontally arranged growth media (curd buckets and half cut 500 litre drums in case of Mr. Ravichandra Kumar). This process of drainage is facilitated by the gravitational force. Besides, the PVC pipe' outlet has been set at the open mouth of the tank/drum, so as to collect the drained water in the drum.

The collected water is filtered through five filters namely, sand, mud, compost, activated carbon and ammonia filters, thereby the chemical impurities and heavy metals are filtered in the process (Annexure 2). Therefore, the water is purified and nitrified in the ammonia filter process and then the purified water is lifted up into the fish tank with the use of electric motor and used again for the plants through drip irrigation. It is an effective method and works under the conceptual framework of recycling of water and it is one of finest recycling process and does not involve much cost for the instalment of the drainage pipes and filtering tanks.

So, the very concept of urban farming can be accomplished with the reuse and recycling of the wastes and water and this is observed in the model of Mr. Ravichandra Kumar as his model is solely based on conservation of the dwindling water resource (Refer annexure 3 for drainage water filter model and annexure 4 for cost of establishment of rooftop garden along the instalment of drips and filtering unit).

Irrigation and participation

It is more important to understand as to who is responsible to irrigate the crops and who participates in irrigation. Table 15 shows details of who has been involved in crop irrigation.

Table 15. Participation of urbanites in irrigation of crops

S. No.	Particulars	Distribution	Per cent
1.	Women	6	24
2.	Men	7	28
3.	Labour	3	12
4.	Women + Men	4	16
5.	Women + Labourer	4	16
6.	Men + Labourer	1	4
	Total	**25**	**100**

With respect to irrigation of crops, men are slightly more involved in it, over women, with the per cent of 28. However, this is not much since women shared about 24 per cent in irrigating the crops. Moreover, in some cases, labourer was entrusted to irrigate the crops, mostly the housemaid or the workers who are working in the households.

Combined involvement in irrigation of crops is by women and men; women and labourer; and men and labourer were also recorded. It is because, in some households both men and women are working and so they engage a house maid or a worker of the house to irrigate the crops. Since most of these households are only elderly and two-member families, they can't entrust the crops irrigation to their children, and in other cases, the children are married and settled elsewhere or studying in other states/ abroad.

Tools and implements used in the production of crops in urban farming

Most of the tools used in urban farming are supplied and sold by the Horticulture Department, through the subsidised Urban Farming Kit, either at the Urban Farming Division, Nampally, Hyderabad or the exhibitions and Agri-Horti Expo's conducted by the respective Departments at various places like People's Plaza, Tank Bund Necklace road and so on. The implements and tools included in the Urban Farming Kit are Kurpi, Secateurs, small sprayer, shower and cloth bags.

Hand sprayer, Shower, Kurpi (Hand hoe) and Secateurs (left to right)

However, most of the urbanites have purchased some of the tools like hand hoe, iron rod, spade, axe, crow bar, hand fork, hand trowel, neem oil pressure sprayer and garden weeder from the Hyderguda and Musheerabad markets. Strikingly, there is an urbanite Major Vijay Uppal, who unlike other, has made use of his torn iron whipper to invert the soil and hoe the unwanted crops in the field. It is done by means of whetting the one end of the iron whipper into a wedge shape, so as to facilitate the upturn of soil without difficulty. As a result, the weeding is done without bending, as the iron whipper is around 4 feet long and 1.5 inches of thickness and light in weight, thereby even the elderly with joint problem (arthritis) find it useful for other garden works as well, like mixing soil, weeding, etc. Moreover, some of the tools needed for urban farming are also available in the following online sites, they are www.trustbasket.com and www.amazon.in. (Figure 9).

Hand hoe

Iron rod of Major Vijay Uppal, Sainikpuri Uppal for inverting soil

Hand trowel

Figure 9. Tools and implements used in urban farming

Urban farming mini working table of Major Vijay Uppal, Sainikpuri, Secunderabad

Urban farming mini working table Mr. V.S. Moorthy, Sainikpuri, Secunderabad

Technologies and innovation in the urban farming

As far as technologies are concerned, most of them are the innovative practices discussed in the respective sub heads, yet two urbanites have experimented the following technologies in their urban farms of backyard garden and rooftop garden respectively. One is the solar insect catcher used by Mrs. Vijayalaxmi, Sainikpuri, Secunderabad for the management of pest and diseases and the yellow sticky trap that is being used as insect catcher by Mr. Rajeswar Reddy of Kapra, Secunderabad in his rooftop farm.

Yellow sticky trap - Mr. Rajeswar Reddy, Kapra, Secunderabad.

Yield of crops

Yield is the economic part of the farming. And, it is indeed said to be significant in urban farming. Tables 16, 16.a and 17 gives an insight of the average yield of vegetables and greens on a weekly basis.

Table 16. Yield of vegetables

n=25

S. No.	Vegetable	Number of urbanites grow the crop	Average number of crops	Average yield of crop per week* (Kg/week)	Total yield of the crop (Kg/week)
1.	Brinjal	12	10-15	2.23	26.75
2.	Tomato	15	12-15	1.14	17.10
3.	Bhendi	11	15-20	0.94	10.30
4.	Chilli	7	8-12	0.72	5.05
5.	Cluster bean	3	4-6	0.8	2.40
6.	Lab	1	4-6	0.5	0.5
	Total vegetables			**1.05**	**62.10**

Table 16.a) Yield of gourds

II	Gourds	Number of urbanites grow the crop	Avg number of creepers	Avg yield of crop per week* (Number /week)	Total yield of the crop (numbers/week)
7.	Ribbed gourd	5	2-3	5 Nos	22
8.	Bottle gourd	6	2-3	3.5 Nos	21
9.	Bitter gourd	7	2-3	2.5 Nos	18
10.	Snake gourd	4	2-3	4 Nos	15
	Total vegetables			**3.75 Nos**	**76**

* Responses are multiple

(*the average yield means the yield of the crop in a particular season, that does not mean that throughout the year, the urbanites are harvesting the crops, since during summer days, the average yield of the crops is subject to change and most of the urbanites have fewer crops so as to manage the crops effectively in summer days. However, there are few exceptional urbanites like Mr. Ravichandra Kumar who gets the yield throughout the year owing to his unique model of urban farming).

As far as the yield of vegetable crops is concerned, it is about more than 1 kg every week, as shown in Table 16. Besides, among the vegetables, the brinjal crops have yielded more, with an average yield of 2.23 Kgs every week among 12 urbanites from 10-15 crops of. About 12-15 crops of Tomato yielded about 1.14 Kgs every week among 15 urbanites who grow tomato as a major crop. Crops like bhendi, chilli and cluster have also been yielded more. In terms of gourds' yield, the yields of about 3-4 number of gourds on an average every week from 2-3 creepers.

Yield of these crops reduced in summer seasons, (March to June) and the yield is said to be precarious (as said by the urbanites [100%]). The urbanites who grow vegetables, be it fruits, vegetables or gourds, have reduced purchase from the markets (mainly vegetables) to 1-2 times a month. However, before cultivation of the crops or establishing urban farming, the same urbanites purchased vegetables about 3-4 times a week or one bulk purchase from the markets. Moreover, the cultivation of crops in their households has assurance of freshness, taste, cleanliness and organic nature, as unanimously recognized by all 25 urbanites involved in urban farming, at least for two years till now.

Moreover, the total vegetable yield is about 62.10 Kgs every week, among the 25 urbanites, except in the summer season (March to June). Otherwise, the urbanites who have been practicing urban farming gets vegetables throughout the year. It is believed and observed that only a small per cent of urban households have the habit of cultivating crops and many households have vacant space that are not used productively (based on personal observation during survey). If it is encouraged at a mass level, whole of Hyderabad and Secunderabad can generate and meet their own food demand, particularly that of vegetables and greens. Besides, many of the vacant public and private space can to be brought under the cultivation of greens and vegetables through community gardening model. In this context, the government may put forth a model concept as to how to establish community gardens involving city residents.

The community urban farming will not only make the environment fresh and eco-friendly, but also have the greater impact on food and nutrition security of the population of Hyderabad and Secunderabad, especially the urban deprived.

Moreover, in relation to the yield of gourds, from the creepers of 2-3 the urbanites get 3-4 gourds every week. It is easily grown as it does not need more area to catch on as the area with the walls or other tree branches are sufficient to support the creepers. In order to make urban farming more fruitful, the Greater Hyderabad Metropolitan Corporation (GHMC) should adopt the "urban farming model" of Mr. Ravichandra Kumar of Dilshuknagar, Hyderabad, and they should motivate the urbanites to make a visit to the rooftop urban farming of Mr. Ravichandra Kumar since the model itself is a motivation and an encouragement to the onlookers.

Table 17. Yield of greens

S. No.	Crop	Number of urbanites grow the crop	Average number of crops	Average yield of crop per week* (Kg/week)	Total yield (Kg/week)
1.	Spinach	13	Multiples	0.74	9.65
2.	Gongura	9	Multiples	0.74	6.72
3.	Mint	7	Multiples	0.71	5.00
4.	Basil	5	Multiples	0.99	4.95
5.	Coriander	7	Multiples	0.57	4.00
6.	Fenugreek	6	Multiples	0.6	3.6
7.	Amaranth	4	Multiples	0.76	3.05
8.	Ponnagani	4	Multiples	0.60	2.40
9.	Chukka	1	Multiples	1.00	1.00
10.	Curry leaf	3	Multiples	0.2	0.6
			Total average	**0.69**	**40.97**

*Multiple: each grow bag/container/bucket/raised beds/ or whatever growth media, on an average 50-75 greens are cultivated. As in vegetables, greens yield is reduced in summer or totally nil based on the conversation with urbanites who cultivate greens.

The greens yield about 0.69 Kgs on an average every week and it has been observed that, the greens have the total yield of 40.97 Kgs every week. Of the greens, spinach has been the most sought green crop of the urbanites who grow greens. Of the 25 urbanites, 13 preferred to cultivate spinach as the seeds are easily available and ideal for the salad preparation and other culinary purposes. Moreover, the subsidised Urban Faming Kit sold by the Horticulture Department has spinach seed as one of the 12 varieties of vegetable seeds included.

After spinach, gongura is the most cultivated greens among the urbanites it is revered as the Mathai by the Hyderabad population and it is the famous greens of both Telangana and Andhra Pradesh. Besides, the Gongura is used as leafy vegetables in Telangana cuisine. It is also used for making pickles and thokku by the people of Telangana. Moreover, the cultivation of mint, coriander and Fenugreek have also been seen among the 7, 7 and 6 of 25 urbanites (multiple responses). As these are the added culinary green leafy vegetables of Telangana cuisine.

Besides, the urbanites who have been cultivating the greens have stated that, they have completely stopped buying the leafy vegetables from the markets and they have also gifted leafy vegetables to relatives and neighbours at times of plenty harvest. On the whole, the urbanites claim that,

the consumption of their own leafy vegetables gave them much more energy, is easily digestible while it reduces the risks of health problems. Mr. Ravichandra Kumar has claimed that eating the vegetables and leafy vegetables from his own garden, has reduced his blood pressure and increased the immune power as all of these crops are grown organically and with the use of the local cultivars of the farmers from east Godavari district. Mr. Ravichandra Kumar's statement with respect to the urban farming as follows:

> "I had been using the Thyronorm (levothyroxine) tablet 225 mcg daily for my thyroid disorder before the cultivation of crops by my own. But after the start-up of urban farming on my rooftops, I have produced sufficient vegetables and leafy vegetables for my own consumption. As a result, the uptake of Thyronorm tablet has been reduced to 25 mcg daily". Because, I have not been using any synthetic fertilisers to my crops all of them are grown organically".
>
> **- Mr. Ravichandra Kumar**

Yield of fruits

As far as fruits are concerned, many urbanites who grow a few of the fruit crops like mango, guava, sapota, pomegranate, mostly on lands and but Mr. Subba Rao and Mr. Ravichandra Kumar of 25 have fruit crops in the drum. Mr. Subba Rao grows pomegranate in the drum filled with the mixture of soil and cow dung at the ratio of 2:1 and Mr. Ravichandra Kumar grows sapota in the drum filled with the Compost of Coco Peat/Ravichandra growth culture. Moreover, when it comes to yield, one of the urbanites Mrs. Deepa of Sainikpuri noted that a mango variety, Banishan, yields about 500 Kgs every season. The details of fruit verities have been given in the Tables 7 and 8.

Harvest and marketing in urban farming

When it comes to harvesting of the crops, the participation in harvesting is differing. The following table makes it clear as to who have the responsibility of harvesting the crops.

Table 18. Participation in harvesting of crops in urban farming

S. No.	Particulars	Distribution	Per cent
1.	Women	8	32
2.	Men	5	20
3.	Women and Men	6	24
4.	Women and Labourer	3	12
5.	Men and labourer	1	04
6.	Men + Women + Labourer	1	04
	Total	**25**	**100**

As the Table 18 makes it discernible, women are predominantly involved in harvesting of the crops, and as women are the home maker, they pluck the produce from the crops, be it vegetables or leafy vegetables, for immediate use. Moreover, women and men have also participated in harvesting crops, depending on the availability of the produce in the crops. Besides, women and labourer have been responsible for harvesting of crops to some extent.

As far as the harvest and marketing of the urban farming produces, other than Mrs. Vijayalaxmi none of the urbanites have been interested in commercialising the urban farm produce. Moreover, the extra yield is shared with the relatives, neighbours and friends rather than selling it in the markets. In case of Mr. Ravichandra Kumar, although he gets the bumper yield i.e., 6 Kgs from 15 crops of Brinjal alone every week, he never sells it in the market, nor to the vendors. However, Mr. Vijayalaxmi has slightly commercialised her backyard farm, where most of the produces are sold in the market under the banner of urban organic food crops. Her selling includes vegetables of tomatoes, brinjal, bhendi and all gourd types and leafy vegetables.

Information approaches on production of crops

The production of crops like method of sowing, time of sowing and use of technologies for the cultivation of crops are different in case of urban farming. Each of the urbanite has his or her own method of production of crops as mentioned and discussed under the sub heads of growth media, growth culture, selection of seeds, fertilisers and manure, irrigation and drainage, and pesticides and management of pests and diseases. However, urbanites have searched for information with respect to crop production when it comes to urban farming. Moreover, personal experience and the crops production aspects of neighbours have been the major source of information. Besides, exhibitions and mela on horticulture and agriculture, television channels, social media and magazines have been serving information source. Table 19 gives the glimpse of all sources of information that the urbanites have searched and used as a trustable source of information in urban farming.

Table 19. Source of information for urban farming

S. No.	Sources	Remarks
I	**YouTube channel**	There are a variety of YouTube channels which have served as the source of information for crop production in urban farming.
1.	eTV Abhiruchi (https://goo.gl/oH8Z-fu)	It is the famous Telugu YouTube channels with the subscription base of 80 K and mostly focussing on the kitchen recipe of different Telangana and Andhra Pradesh cuisines. Besides, it features successful kitchen gardening of Hyderabad and Secunderabad and their good practices. Therefore, many of the urbanites who are in need of information in urban farming can view related information by searching in the search box provided in the channel e.g., Rooftop gardening.

2	Nature's voice (https://goo.gl/Y14rE7)	It has a subscription rate of more than 11 000 and it brings out the organic farming practices with nature. It covers the farmers who have been successful in natural farming. Importantly, it covers the urban farming so as to help the urbanites who are interested or practicing farming at their terrace, garden, backyard, etc..
3.	Gardens of abundance (https://goo.gl/FkiE2K)	It posts videos related to urban farms which are under permaculture. It covers farming done in rooftops, balcony, terrace, backyards and so on.
4.	Kitchen Garden (https://goo.gl/PGthVz)	It posts the videos related to basics on know-how of soil, compost, pot preparation for urban farming and how to prepare gardening and how to grow and take care of the crops.
II	**Facebook groups**	There are some urbanites whose source of information on urban farming are through following Facebook groups
5.	intipanta - organic kitchen/terrace gardening (https://goo.gl/dr7qPh)	The membership of the Facebook group is about 34 K and this group shares the information, photos and videos related to organic urban farming. Members of the group update the site with the produce they cultivate, the pest and disease attacked plants so as to get response on organic control measures from other members in the group; the procedures of preparation of bio and organic pesticides and manures like bio-enzymatic cleansers, articles on urban organic farming and related posts released elsewhere, is made available on the sites by any of the group members. Besides, the demo conducted elsewhere are made available on this group so as to intimate and inform other members of this group, if they were not able to attend the demonstrations.
6.	MyediblegardenIndia (https://goo.gl/wNvJZD)	It is the website created by Mrs. Vijayalaxmi. It deals with the day to day garden practices and posts information related to crop production and seeds and materials needed for the urban farming. It uploads news and events related to urban farming.
III	**Newspapers**	Most of the time, information and articles about the successful urbanites in urban farming have been given in newspapers.
7.	Sakshi	Some articles related to urban farming is circulated often in these newspapers
8.	e-nadu	

Impact of urban farming

Impact of urban farming is mostly pronounced on environment, social and community development, food and nutritional security and monetary savings on purchase of vegetables and green and to some extent fruits. In order to comprehend as to how urban farming is capable of nurturing the cityscape's nature, the point is discussed under the following sub heads.

Impact of urban farming on environment of the cityscape

Environment is largely encompassed with the natural resources for human beings to thrive in the mundane life. Nature itself is a nurture of both biotic and abiotic components and their habitants. However, in the course of time, the natural resources like soil, birds, animals, air, water have been ruined on account of anthropocentric activities like over-exploitation of natural resources for the development of various industries, factories, chemical plants, pharmaceutical industries. Moreover, the increasing population has led to inevitable burden on both the availability and use of water, food and shelter. The water has become scarcer and food availability has turned out to be uneven and the spatial area for shelter has been hampered. All of the aforesaid are more pronounced in urban areas as urbanisation is at its peak across the globe. In this backdrop, to what extent is urban farming capable of restoring the ruining environment and the endangered natural resource, is the central subject.

As far as the impact of urban farm is concerned, most of the practices included in the urban farming are done in close proximity with nature. Similarly, several of those practices even offsetting the ruined nature. In a way, urban farming is a way for sustainable city environ, as it thrives under the conceptual framework of cultivation by conservation. Starting from location of the urban farm to harvesting of crops, the urban farming encompasses innumerable good practices for instance, the location for establishing urban farms is mostly rooftops, backyards, terraces, balcony and the exclusive land area which are vacant and unused. Therefore, it makes use of the vacant area of the concrete jungle.

Thereby, it transforms the cityscape into farms of greenery. The advantages of establishing rooftop and terrace gardens are two folds, firstly it is able to prevent the penetration of scorching sunlight into the house directly and the other one is the crops which grown in the rooftops/terrace are able to absorb and use the sunlight effectively for their metabolism. For effective metabolism, the direct sunlight is a vital factor in plants. Moreover, when it comes to soil, the predominant soil used is red soil and it is generally taken from the lakes and ponds available in the city, (in this case the lakes of Ramanthpur and Himayatsagar) thereby it deepens the lakes so as to hold more water during rainy season. However, one of the urbanite has even invented the other method of growing crops, - the Compost of Coco Peat (CCP/Ravichandra's Growth Culture). It has even reduced the exploitation of the soil medium as this growth culture has replaced the need of the soil for crop production.

More importantly, most of the growing medium are available at household levels, such as, waste buckets, containers, mud pots, waste tyres, torn aluminium vessels and so on, as observed in all the 25 urbanites who have used one or the other growing medium mentioned above. Thereby, urban farming is an effective measure of reusing the plastic and other petrochemical materials used in the households which are otherwise dumped in waste bin of the Municipal or thrown away in the lanes of city. So, it is making the city clean from the dumping of these materials and helping nature revive and revamp itself.

Similarly, for the production of crops, urban farming does not use chemical fertilisers as is evident from the 25 urbanites, who use mostly home prepared fertilisers like compost and vermicompost or the Coco Peat and cow dung from the Goshala. Again, in the preparation of the fertilizers, like compost and vermicompost, these urbanites make use of all the kitchen wastes, peels of fruits, rotten vegetables and fruits, leaf litters fallen on the grounds, waste papers and so on. Therefore, almost all of the household's wastes are converted into manure, through composting (the preparation method is discussed in detail under the sub head of manures and fertilisers in the good practices and information approaches). Therefore, it is yet another way of scrubbing the cityscape and conserving the environment from the human mediated extermination.

Urban farming follows organic farming method. In this way, urban farming has never taken synthetic pesticides into account. The pests and diseases are mostly controlled by using home-made pesticides or neem oil or other natural pesticides purchased from the markets. It is also evident from the urban farming models of Mr. Vijay Uppal, Mrs. Vijayalaxmi, Mrs. Deepa, Mrs. Lalitha Iyar, Mr. V.S. Murthy, Mrs. Susie Tharu, Mrs. Beyniaz Edulji of Sainikpuri, Secunderabad and Mr. Ravichandra Kumar of Dilshuknagar, Hyderabad, Mr. Subba Rao of L.B.Nagar that they have got their unique ideas behind the preparation of bio-liquid pesticides and bio-liquid extract.

These bio/organic pesticides are also prepared using materials mostly available at household level and kitchen wastes (details of the preparation of these pesticides are provided under the sub head of pesticides). Therefore, it is not only effective against the pests and diseases of the crops but also protects the environment in particular, the lands and air from the waves of chemical pesticides and pollution.

Impact of the urban farming on dwindling water resource and increasing power consumption

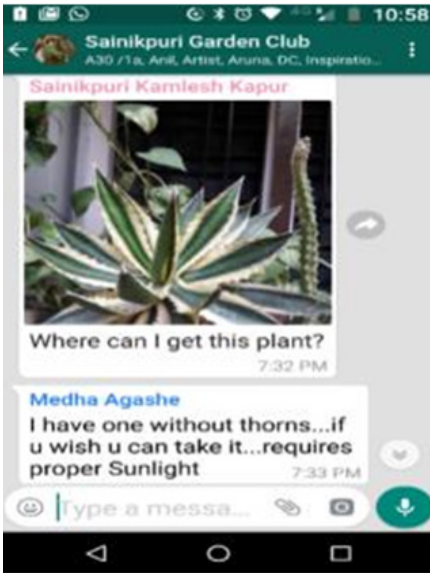
The urban farming is a unique farming model in the 21st century. It functions against the odd rule of exploitation of the nature but for conservation and sustaining the nature. As it is evident from the urbanites practicing urban farming, in particular from the case of Mr. Daniel and Mrs. Vijayalaxmi of Sainikpuri, Secunderabad, and Mr. Ravichandra Kumar of Dilshuknagar, Hyderabad. In the case of Mr. Daniel, it is more unique as his backyard gardening is irrigated only with rainwater harvested during rainy days in a specialised cement tank (for details of the tank built by Mr. Daniel, refer to sub head of irrigation). Mrs. Vijayalaxmi has also been irrigating the crops with the rainwater harvested in the tank.

The most unique model in the conservation of water is the practice of Mr. Ravichandra Kumar of Dilshuknagar and it is indeed a breath-taking practice. Though the water source is the municipal water, he recycles the water for more than 6 months. It is done by the following way; the water is lifted to the fish tank placed at the corner of rooftops on the stand and the water is carried to the crops through the PVC pipes connected with the fish tank. The valve is used for opening and closing the release of water from the fish tank. The water is drained from the holes at the bottom

of every growth medium through the pipes connected with the hole in each growth medium and gets collected in a common pool. The water is then filtered using filters. The filtered water is again carried to the fish tank and the cycle continues for about 6 months period as mentioned above. Thus, these practices are not only effective in conserving water but also in recharging the groundwater.

However, most households are not involved in rainwater harvesting and the water is being wasted as runoff and eroding the good mineral soil along with it. The government must take necessary efforts to make rainwater harvesting pits compulsory in every house with the special priority to houses successful in urban farming. Besides, the government and other organisations which involve in protecting the nature and city landscape may perhaps encourage the urban households to adopt and practice recycling of water. It may possibly foster the Mother Nature for the generations to come. Moreover, the noble practices followed in urban farming increases the visits by birds into the household and helps the avian community to sprawl up in the city more than before.

Impact on social inclusion



The urban farming facilitates people of all classes, castes, creed, education and occupation to unite together under one umbrella of urban farming. It is evident from a WhatsApp group of Sainikpuri garden club. It was established among the urbanites who maintain either backyard garden or rooftop garden or kitchen garden and the group has merely one year old as of now. It is one of the effective WhatsApp group as claimed by the admin of the group, Mrs. Deepa Shailendra.

This group has been kept on the rise since its inception and the members of the group share information on production practice of various crops of vegetables, greens and fruits. On the other hand, this group's members post pictures of the crops affected with pests and disease to identify it and to recommend precautionary measures to surmount those pests and diseases on a daily basis. It is extremely supportive at the time of severe plight in the crops owing to sudden burst of pests and diseases.

The members of the group respond to the queries as soon as they see the posts on their WhatsApp. The Sainikpuri Garden club also shares information like exhibitions, trainings, meetings and other similar activities related to urban farming. As the members (Mrs. Sudha Gorthi, Mrs. Vijayalaxmi and Mr. V.S. Moorthy) of this group claimed, many a times they have come to know about exhibitions, meetings pertaining to urban farming through this group. Above all, this group shares information like availability of seeds of various vegetables, fruits and greens with them along the images of the seeds and, whosoever is in need of seeds can approach the concerned member

who have the seeds since, most of the members are in the same area which has made it easier for them to mobilise and approach each other.

Whenever there is a bulk yield of crops, it is shared in the WhatsApp group and if anybody needs certain vegetables or greens, they can then get it. Similarly, information related to upcoming workshops, seminars on importance matters of both urban farming and organic growing of crops is shared in the group, and the elucidation of such seminars and workshops are also shared among the members through the WhatsApp group. So, this ICT tool WhatsApp, is immensely helpful to these members of Sainikpuri colony who have been practicing urban farming for some time now.
Besides, urban farming facilitates people of similar interest to discuss various practices and methods related to urban farming. It is evident from Habsiguda urban farming, wherein the urbanites like Er. Babu. P. John, Mr. Hemanth V. Mulay, Mr. Mallikarjuna Rao, Dr. K. Sudhakar Reddy and Mr. K. Bhaskar, have united on the common grounds of urban farming, irrespective of the fact that, they belong to different category of society and live in different locations in Habsiguda, Hyderabad. Moreover, they have been planning to take urban farming to the next level and are discussing various innovation practices and technologies that can be employed in urban farming, in order to make urban farming more viable and in harmony with the natural surroundings. Therefore, it is observed that urban farming has paved the way to these urbanites to have a common forum of discussion and conversation.

However, many of the urbanites have no access to these groups nor heard about the existence of WhatsApp group and others groups on Facebook like www.facebook/intipanta/. www.facebook/ Grow your own food/. Therefore, the Urban Farming Division of Horticulture Department, Hyderabad, Telangana, may have to involve themselves to make others awareness on these groups, either through mass publication in newspapers like e-nadu and Sakshi besides, wide advertisement in national newspapers such as Hindu, Deccan Chronical etc. The groups' activities may be telecasted and broadcasted through television and radio respectively. Also, awareness on these social media sites initiated by the urban farming urbanites may be displayed at the exhibitions of horticulture and agriculture along the technologies and innovation pertaining to the urban farming and gardening practices.

As these groups are effective in spreading knowledge and hands on experience, successful urbanite in urban farming and the unique practices followed by such urbanite on production of crops in an urban setup. Similarly, the Urban Farming Division of Horticulture Department, may also start a Facebook page, WhatsApp group and You Tube channels on Urban Faming, so as to make available every good practices and information related to urban farming anytime, anywhere and to the concerned urbanites. The act of creation of these social media group would not only help the government to share and get feedback of urbanites of similar interest but also help the government to get the real time problems faced by the urbanites in regard to the practices and management of crop production. Thereby, ICT and good governance could stand out to be the first of its kind in the modern era pertaining to urban farming in the twin cities of Hyderabad and Secunderabad and eventually serve as a model platform to the other cities to follow.

Impact on health

Eating broccoli cuts risk of arthritis, heart disease

GETTY IMAGES

You may need to include broccoli, cauliflower and sprouts in your diet daily, as it can help in prevention from arthritis to heart disease by keeping the gut healthy, suggests a recent study.According to researchers, when mice ate broccoli with their regular diet, they were better able to tolerate digestive issues similar to symptoms of leaky gut and colitis than mice that were not placed on a broccoli-supplemented diet. Study author Gary Perdew from Penn State University, U.S. said: "There are a lot of reasons we want to explore helping with gastrointestinal health and one reason is if you have problems such as a leaky gut, and start to suffer inflammation, that may then lead to other conditions, like arthritis and heart disease." According to Dr. Perdew, the key to the process may be a receptor in the gut called Aryl hydrocarbon receptor, or AHR. The receptor helps the body regulate its reaction to certain environmental contaminants, as well as triggers other responses to toxin exposure. The research appears in the journal, *Functional Foods*. — ANI

Source: The Hindu, Science and Tech, October 15, 2017

Urban farming is another way of improving and stabilizing health. It is evident that, all 25 urbanites perceived that after eating the produce from their own garden/farm, their asthma, blood pressure and thyroid have reduced and it is because, these urbanites have been cultivating their crops organically and did not use synthetic pesticides to control pests and diseases. As a result, these organic produces are greater in taste, flavour and savour as an accepted saying by the urbanites who have experienced with it. Then again, these produces which are home grown have more digestibility and cooked easily rather than food produce purchased from the markets or supermarkets be it vegetables and greens. After all, the greater advantage of urban farming is that, it improved the access to fresh and green vegetables. Most of the urbanites cultivate even Cole vegetables like cabbage, broccoli etc., as a result it serves as the natural medicines to arthritis and diabetes. It is also evident from research that, these Cole vegetables cut the risks of arthritis and heart disease (refer The Hindu article).

On health impacts, Mrs. Deepa Shailendra of Sainikpuri, Secunderabad, spoke about it as, "it gives exercise to human body as farming requires a fair amount of practical activity that is to be done in order to maintain the farm; besides, urban farming is a stress buster, controls the blood pressure and diabetes at perceivable level.

Impact on monetary savings

One matter observed about urban farming is the monetary savings. The study results show the impact made by urban farming on reduced purchase of vegetables, greens and fruits, and the savings thereof. The following table gives the illustration about savings on reduced purchase of vegetables from the markets (Table 20).

Impact on savings of vegetables

Urban farming enables urbanites to reduce their spending on purchase of vegetable crops, as they are essential part of urban farming. At the same time, proper management of vegetables gives yield throughout the year (Table 20).

Table 20. Impact of urban farming on monetary savings of vegetables

n=24*

S. No.	Savings on vegetable purchase expenditure (INR/month)	Urbanite	Per cent	Yearly saving (INR)
1.	About 200	11	45.84	26,400
2.	400	6	25.00	28,800
3.	600	2	8.34	14,400
4.	800	1	4.16	9,600
5.	1000	2	8.34	12,000
6.	2000	1	4.16	24,000
7.	50	1	4.16	600
	Total average	**24**	**100.00**	**115,800**

*As one of the urbanites (Mrs. Beyniaz Edulji of Sainikpuri, Secunderabad) interviewed do not have any vegetable but have only fruit crops.

It is noted that, 45.84 per cent (11 of 25) urbanites have been able to save about 200 INR every month on purchase of vegetables. On an average, these 11 urbanites are able to save about 26,400 every year. Similarly, 25 per cent (6 of 25) urbanites saved about 400 INR every month on vegetable purchase and that is about 28,800 INR every year. Another 2 urbanites saved 600 INR on an average every month on vegetable purchase and 2 of them saved about 1,000 INR every month on vegetable purchase. One urbanite saved about 2,000 INR every month.

Put together, all of these 25 urbanites together saved about 115,800 INR every year. It is a huge saving since, it takes only the saving pattern on vegetables into account. Therefore, the government should take serious efforts to promote urban farming across the city, citing the importance of savings on vegetable purchase alone, in addition to the impact of urban farming on human health, environment and cityscape.

If urban farming is taken at a mass level with proper guidance and motivation, given to urbanites, then it would certainly bring about huge savings in the urban conglomeration, and it could assure the food and nutritional security of the mounting urban population in a large scale.

Impact on savings on greens

Greens are the major nutritious source of human diet. Greens have long been considered to be the supplier of energy and fillip to metabolism of human body. Moreover, greens are always a part of Indian cuisine. In this backdrop, the survey result encompassed the savings that the urbanites were able to enumerate out of cultivation of greens under urban farming (Table 21).

Table 21. Impact of urban farming on monetary savings of greens

n=24*

S. No.	Savings on expenditure on greens purchase (INR/month)	Urbanite	Per cent	Yearly saving (INR)
1.	About 100	15	62.49	18,000
2.	200	5	20.83	12,000
3.	300	0	00.00	-
4.	400	1	4.17	4,800
5.	500	1	4.17	6,000
6.	25	1	4.17	300
7.	50	1	4.17	600
	Total average	**24**	**100.00**	**41,700**

*Mrs. Beyniaz Edulji has not been taken onto account since she has no greens.

The present seed kit supplied by the Urban Farming Division, Hyderabad, Telangana

It is noteworthy that, growing of greens have led to considerable savings that the 62.49 (15 of 24) per cent of the urbanites saved about 100 INR every month on greens purchase. In total these 15 urbanites saved about 18,000 INR every year. On the other hand, 5 of 25 urbanites saved 300 INR every month on greens purchase i.e., they have saved about 12,000 INR every year. One of the urbanites saved about 400 INR, another saved 500 INR on the purchase of greens every month, while a minimum of 25 and 50 INR had been saved by the respective urbanite who have been cultivating greens on a small scale. Put together, these urbanites who have been growing greens have saved up to 41,700 INR every year.

The government and Metropolitan Development Authorities of the twin cities of Hyderabad and Secunderabad are to take more steps towards establishing urban farms in all households. Also, urbanites who have no interest in urban farming should be encouraged to cultivate at least greens in small scale, since this growth of greens does not involve much crop production practices.

Urban Farming Division, Hyderabad, Telangana

Moreover, the Department of Horticulture and Agriculture, especially the Urban Farming Division, Commissioner of Horticulture, are to supply exclusive kit on greens cultivation along with the greens' seeds which thrive better under Hyderabad

and Secunderabad climatic condition. Urbanites should also be motivated by the urbanites who have successfully established urban farming and also get exposure to the good practices of urban farming followed by different successful urbanites mentioned in this report. Videos of these urbanites and their good practices/ information/ approaches for the production of crops, be it vegetables or greens, may be recorded and telecasted to the urbanites of the twin cities, through famous channels of Telangana and Andhra Pradesh. Wide circulation in other cities of the country will help the interested urbanites across the country to follow the practices experimented by these progressive urbanites in the field of urban farming.

Impact on savings on fruits

When it comes to savings on fruit purchase, all urbanites have not been able to make monetary savings as have been made with respect to vegetables and greens. However, Mrs. Beyniaz Edulji does not depend on the market for fruits, as fruit crops grown in her household is sufficient to meet her household demand and saves about 2,000-2,500 INR on a monthly basis.

Impact of urban farming on the avian activities of the twin cities

As forest and greenery regions of the country like Western and Eastern Ghats, Himalayas, North Eastern States of India have long been the hot spots of flora and fauna. Moreover, birds are likely to have their presence across the country be it rural areas or urban area.
However, modern urban conglomeration and unplanned developmental activities have halted the presence and mobilisation of birds to the greater degree. In this backdrop, the urban farming is considered to be a fillip to the birds to revamp their activities in the urban areas. As it was observed that birds like pigeon, activities are more in the households where urban farming has been practiced. As a result of the urban farming, these birds come to the plants and search for foods from the crops grown either on the rooftops or terrace or the backyards or an exclusive lands area. Besides, all of these urbanites have water dip for the visiting birds to quench their thirsts. Exclusively, Mrs. Kaniza Yosaf Garari of Sainikpuri, Secunderabad, grows one pearl millet exclusively for the birds visiting the terrace farm. Major Vijay Uppal of Sainikpuri, Secunderabad, has water fetch and provision for the birds to build their nests in his backyard and surrounding garden in the house. Similarly, Mr. Mallikarjuna Rao of Habsiguda, Hyderabad has water fetches at his roof top urban garden which serves as the water feed of the birds come to the terrace.

Mrs. Deepa Shailendra had built shelters for birds to nest and rest after seeing the birds' movements have greatly increased on account of urban farming.

Therefore, the urban farming has become not only beneficial to the human beings but also has become an abode of shelter to the birds. The government must take necessary steps to bring more urban farming in the city so as to enhance both the welfare of city dwellers and nature, including birds. Besides, urban farming has increased the activities of several butterflies as put forward by the urban farming urbanites.

Recommendation

There are several novel practices, information and approaches followed in urban farming. However, many of these are not widely known, even among the urbanites who have been practicing farming. Though practices are similar to each other, there is a distinctive variation in preparation procedure and the composition included in them. Therefore, a mass awareness on the innovative practices followed in urban farming, needs to be created among the city residents by the government, especially the Urban Farming Division of Horticulture Department, Hyderabad (Telangana). Also, Non-Governmental Organisation (NGOs), institutions involved in urban farming can concentrate on spreading awareness and knowledge on the practices followed in urban farming and it would possibly bring a change in the behaviour of city residents. Modern day social media such as Facebook, WhatsApp, YouTube channels can be made as an instrument to spread these practices. Moreover, programmes on urban farming, telecast through television channels may be strengthened and oriented toward good practices followed in urban farming. In this way, people interested in household farming may make use of these practices and follow up.

- It was widely noticed that, scientific information on how these practices are carried out is not known. Thereby, efforts would be taken by the government, State Agricultural Universities (SAUs), to document the preparation procedure and application methods followed in urban farming.
- On the other hand, government, both the central and state, should include promotion of urban farming as one of the mandatory activities of Krishi Vigyan Kendra(KVKs)/ Agriculture Technology Management Agency (ATMA), in particular those located near the city sphere or within the radius of city or urban or sub-urban areas. The government may possibly allot funds to the KVKs to document and validate the novel practices followed in urban farming by various urbanites and conduct various training programmes to diffuse the knowledge of the same to other urbanites who are in need of good practices for establishing urban farm.
- In the same way, the agricultural and horticultural universities and other institutes which are closely working in agriculture, may take up projects and research on urban farming practices, information and approaches across other cities of the country. It would also bring into light more unseen and unexplored practices and approaches followed in urban farming.
- Video modules and models of good practices, information and approaches are to be shot and drawn respectively. These videos and modules uploaded under a common domain of Urban Farming, either by Urban Farming Divisions or Department of Horticulture would be useful. Moreover, an exclusive website, Facebook page, YouTube channel may be created to host all materials so as to make urban farming more viable and practically applicable in the coming days. For this purpose, the Sainikpuri Garden club WhatsApp group approach in urban farming may be used as a model for creating ICT based groups in the near future.
- The state and central government may take more steps toward implementing urban farming in schools, located in both urban and sub urban areas of all cities in the country. It may not only help school students understand the importance of urban farming but also kindle the knowledge about nutritive value of crops right from the beginning.

- On the whole, the premier institute in agricultural extension i.e., National Institute of Agricultural Extension Management (MANAGE) may roll out several projects and research in the field of urban farming, to bring efficiency in both curricula and practical application of urban farming.
- Importantly, UFD, Horticulture Department, Hyderabad could develop urban farming models for demonstration to the city residents based on the concept of Mr. Ravichandra Kumar's urban farming. It may serve as an encouragement to the urbanites who are interested in urban farming.

Conclusions

It is evinced from the study that there are many good practices, information and approaches followed by the urban farming urbanites, be it practices associated with the preparation of growth media or the procedure and epitome followed in making of growth culture (Compost of Coco Peat and Compost of Soil) or the preparation of home-made manure (Kitchen compost, vermicompost, etc.,) and pesticides (Bio-Liquid Extract and Bio-Liquid) for the production and protection crops respectively. Each of these practices has a unique method of preparation and its own composition while the constituents included in all of these practices are locally available and organically made. The practical applicability and feasibility of these practices are noteworthy and are capable of giving 100 per cent result in terms of production and productivity of crops.

As these practices encompass mostly kitchen wastes, household wastes, garden wastes, etc., it is duly capable of bringing cleanness and greenery to the cityscape. Urban farming practices followed among the urbanites can bring about a sustainable city in the near future, if not immediately, and would bring different connotation among the people about life in urban areas. Moreover, urban farmers have their own way of sharing and receiving information pertinent to these practices which include social media like Facebook, YouTube channels and WhatsApp groups that have been serving as an effective way of getting and sharing information effectively among themselves. Therefore, urban farming is all set to make the cityscape green and clean henceforth.

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