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Urban Container Gardening; Small Spaces, Big Returns

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Abstract—*Supply of continuous food is the most challenging task for agricultural sciences. Due to substantial increase in population; environmental stress (climate change), shortage of water and land resources are major constraints haunting this task. In recent past, production and productivity of crops have increased along with the increase in fertilizer and chemical consumption. At the same time these trends have created a concern for environment, biodiversity and soil quality. Urban container gardening can accommodate the demands of increasing world population and environmental issues also. Container farming can be defined as a micro model of farming where a family unit or household is producing fruits and vegetables in special containers for personal consumption to help improve the income, health and well-being of its family members. It is an inexpensive way of growing food anywhere in a house using recyclable container and soil mixed with compost made from household waste. For optimum nutrition vegetables should be fresh when consumed. Where refrigeration is limited, production of vegetables near the places they are consumed is an advantage. Biodegradable waste can be reused as fertilizer and contribute to overall urban environmental management. Home vegetable production can decrease household expenditures on food and also bring in extra income for the family. It has been found that 30 square-meter container garden's average production capacity is 60 kilograms of vegetables a month. The family diet has improved with the addition of home-grown vegetables to meals. Urban container gardening can be a means for personal accomplishment, improved income, and good health, and source of national pride in managing waste for a cleaner, more sustainable environment.*

Keywords*: Container gardening, food, environment, waste recycle.*

1. INTRODUCTION:

Supply of continuous food is the most challenging task for agricultural sciences. Due to substantial increase in population; environmental stress (climate change), shortage of water and land resources are major constraints haunting this task. In recent past, production and productivity of crops have increased along with the increase in fertilizer and chemical consumption. At the same time these trends have created a concern for environment, biodiversity and soil quality. The National Institute of Nutrition (2011)[2] recommended average daily consumption of 300 g for vegetables and 100 g of fruits. The vegetables include (green leafy vegetables = 50 gm, other vegetables = 200 gm, roots and tubers = 50 gm). But annual consumption (kg/person/annum) of fruits was 9.6 (rural), 15.6 (urban) and 11.8 (India) while it was 74.3 (rural), 79.1 (urban), 76.1 (India) for vegetables [4].

Magadoff and Tokar (2009)[3] concluded that 12% of global population approximately 36 biillion people suffer from hunger and live without secure of plenty of food. For most of countries, population growth is approximately 2-3% a year, which should translate to annual increase of 3-5% in agriculture production levels. As the production continues at slow rate, per capita food availability is declining day by day. This has given rise so many urban problem like slum, garbage, malnutrition, social alienation, poverty and food insecurity.

The concept of "Grow your own food" can satisfy the hunger of rising population. Due to rapid urbanization there is hardly any space available in the city. Container gardening is an effective way of increasing food production in urban situations. Container gardening is an excellent option for gardeners who have poor soil, or not enough space or time for a larger garden.

2. CONTAINER GARDENING:

Deveza and Holmer (2002) [1] defined Container farming as a micro model of farming where a family unit or household is producing fruits and vegetables in special containers for personal consumption to help improve the income, health and well-being of its family members. Practically any container can be used for growing vegetables. Other than clay pots, cement pots and plastic pots, plastic buckets and trays, wooden boxes and barrels and trash containers, crates, drums can be recycled well as planter. All containers must have drainage holes in the bottom so excess water can drain out. Porous containers such as clay and wood will have to be watered more often than plastic and metal.

3. ADVANTAGES OF CONTAINER GARDENING:

3.1 Resource utilization:

With proper planning and design food can be produced both in vertical and horizontal space. container gardening is an inexpensive way of growing food anywhere in a house using recyclable container and soil mixed with compost made from household waste The containers can easily be placed on the terrace, window boxes, balcony and veranda where plenty of sunlight is available for the plants. Fruits and vegetables can be grown in a right container with right growing media. It has been observed that a 30 square-meter container garden's average production capacity is 60 kilograms of vegetables in a month.

3.2 Nutritional security:

For optimum nutrition vegetables should be fresh when consumed. Apartment and condominium dwellers can enjoy growing and eating fresh vegetables at home too. The family diet will be improved with the addition of home-grown vegetables to meals. Picking the vegetables just before to cook tastes better and have better nutritional contents. The container gardening can provide a wider selection of nutritious, fresh produce to enjoy, and peace of mind from knowing the food was grown without harsh chemical pesticides.

3.3 Environment friendly:

Apart from savings of money, container gardening provide 'green' to the cities and reduces the air pollution. It can prevent irresponsible disposal of discarded container and reduce the volume of garbage by recycling. Biodegradable waste can be reused as fertilizer and contribute to overall urban environmental management. Like peels of vegetables and kitchen scraps, waste food and anything that decays may be processed into compost. Recently Government of India has emphasised on installation of compost machine in cities to reduce the pollution. This will beautify the city since waste products are transformed into reusable container and media.

3.4 Economical:

It has been studied that the average Filipino household spends more than 40% of its income for food, while poorest Filipinos have to allocate more than 60% of their available budget to feed their families [5]. Every vegetable that is produced by container gardening can reduce the amount of money spent for buying it from outsides. Home vegetable production can decrease household expenditures on food and also bring in extra income for the family.

3.5 Personal growth and development:

Any person who pursues gardening will be spiritually and emotionally invigorated. It will foster a calmer nature and will give the grower a sense of purpose. Urban container gardening can be a means for personal accomplishment, improved income, and good health, and source of national pride in managing waste for a cleaner, more sustainable environment.

4. SUITABLE FRUITS AND VEGETABLES FOR CONTAINER GARDENING:

All fruits and vegetables are not suitable for container gardening. For example, the dwarf and grafted fruits plants are only suitable for container gardening. Proper selection of fruits and vegetables and the planter size is most important. Other than fruits and vegetables some medicinal herbs and spices can also be grown as a nutritional supplement. The suitable variety and crops, sowing times is given in the Table 1.

4.1 Fruits:

It is very easy to grow a mini-orchard of fruit in patio containers if anyone willing to water and feed regularly. Grafted and dwarf varieties of fruits like, mango, papaya, guava, oranges, limes and lemons, water apple, pomegranate, ber, aonla, strawberry can easily grow in containers. A regular pruning and trimming of fruits plants is essential to maintain the plant growth and height.

4.2 Vegetables:

All the leafy vegetables and root vegetables are very easy to grow in a container. Other vegetables like tomato, eggplant, bell pepper, chilli, beans, squash, cole crops can also be grown. A place received at least six hours of direct sunlight is suitable for vegetables. As a general rule, all vegetables, except leafy vegetables, need plenty of sunlight, rich soil and continuous feeding. Almost all of them are grown as annuals, so you have to start with new seeds or seedlings every year.

4.3 Herbs and spices:

Herbs are one of the most rewarding container crops. Most are also easy to grow. Some seed grown culinary herbs like mint, basil, lemon grass, celery, parsley, sage, thyme can be in container.

Black pepper can easily be grown in a pot by planting bush pepper. Some seed spices like coriander, fenugreek can also meet the purpose of spice and greens.

5. COMPOST FROM KITCHEN WASTE:

Composting kitchen food waste is easy and requires little time, effort or space, depending on which system you use. The compost is invaluable for the soil in garden or potted plants: It's a complete and natural food for the soil, helping to improve its structure, water-retaining abilities and overall health. The urban Indian citizen generates nearly 700 grams of solid waste per person per day which is nearly 250 kg in a year [6]. Easy steps to compost kitchen waste:

1. Separate edible kitchen waste (vegetables peels, fruits peels, cooked food).

2. Collect dry organic matter (dried leaves).
3. Take a small amount of cocopeat.
4. Take a large earthen pot or bucket and make wholes around the container at different levels to let air inside.
5. Line bottom with layer of cocopeat.
6. Add food waste in alternating layer with cocopeat.
7. Now commercial compost decomposing mixture available in market that can be used in layers to enhance decomposing.
8. The container has to cover to retain moisture and heat.

Every few days, the raking is to be done by piling a quick turn to provide aeration. If the pile is too dry, water should be sprinkle some water to keep it moist. Within two-three months pile should start forming compost that is dry, dark brown and crumbly and smelling of earth. With time and patience composting will become second nature to us.

6. PLANTING, CARE AND MAINTENANCE:

6.1 Sowing and planting:

Most of vegetables and herbs are raised by sowing their seeds directly in the containers. The seedlings of eggplant, chilli, tomato, bell pepper, cole crops, are transplanted in containers. A single healthy seedling may be transplanted in each container. Two to four seeds can be sown according to size of the container. A numbers of plants can be raised of leafy vegetables and root crops (radish, turnip and carrot). Generally a single plant is planted for the fruits crops.

6.2 Watering:

The soil dries out quickly in containers. If the vegetables wilt from lack of water, they may never fully recover. It is essential to water frequently depending on the season, kind of crop and size of the container. Plants need extra water in hot summer; watering should be done twice a day (morning and evening). In rainy proper drainage is essential.

6.3 Aftercare:

Hand hoeing and weeding should be done periodically to remove weeds. Hoeing encourage maximum air flow in the soil which encourage better growth.

Stalking can be done for some crops like tomato, beans and fruits etc. Stalking will help to carry the weight of fruits and branches. For strawberry straw or poly mulching is essential to reduce the fruit rot.

6.4 Feeding of crops:

Container grown vegetables require more feeding because nutrients are washed out through bottom of the pot during watering. The container may be top dressed with homemade well decomposed compost. Alternatively, rice washing and water used for washing meat and fish can also be used. The residue after making tea is also a good source of nutrients. Egg shell dust can also be used for reduce calcium deficiency.

6.5 Pest and disease control:

Increasing biodiversity container gardening is already a way reduce the occurrence of pest and diseases. If in case attacked by various pest and diseases biological and botanical control is most preferable. Use of neem oil, garlic extract, tobacco extract can prevent some sucking type insects. In severe case chemical control measure may be used.

7. HARVESTING OF CROPS:

For optimum nutrition vegetables should be fresh when consumed. Where refrigeration is limited, production of vegetables near the places they are consumed is an advantage. For getting the best texture and flavour, harvest vegetables at their peak of maturity. Like Tomatoes should be firm, snap beans should be thin, medium length, and not contain any big seeds. Pea pods should be filled out and the peas should taste sweet and fresh. Leafy vegetables and herbs should be picked frequently when they are most succulent and tender. Root vegetables should be pulled out still tender as a few days delay makes them pithy and unfit for consumption. Fruits should be harvest at the fully mature stage. Fruits ripened in tree tastes greater.

8. CONCLUSION:

By segregating, recycling and composting, a family of 4 can reduce their waste from 1000 kg to less than 100 kg every year. Imagine 90% of garbage of in India will vanished overnight and a clean green city with fresh fruits and vegetables will help to start a healthy journey.

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Table 1: Fruit and vegetables recommended for growing in container

Crops	Varieties	Sowing/Planting time	Comments
Amaranthus	Pusa Kirti, Pusa Kiran	Feb-Aug	Harvest before flowering.
Beetroot	Crimson globe, Detroit Dark Red	Oct-Dec	Withstands light frost. Tolerates light shade.
Brinjal	Pusa Purple Long, Pusa Purple Cluster,Pusa Kranti	Feb-March and July	Bigger plant required deep pot.
Chilli	Pusa Jwala, Pusa Sadabahar	Feb-March and July	Upright plants, Needs to be staked.
Cluster bean	Pusa sadabahar, Pusa Navbahar	Feb-March and July	May require vertical support. Withstands light frost. Space plants 4” apart.
French bean	Pusa Parvati, Contender	Jan-Feb and Sep	Sunny, warm location
Carrot	Nantes, Baby Orange	Sep-Oct	Freshly manured soil causes carrots to split or fork as they grow. Tolerate partial shade.
Cucumber	Poinsette, Pusa Sanyog	Feb-March and July	Full sun; short rooted varieties best for containers
Radish	White Icicle, Rapid red White Tipped	Oct-Dec	Plant alone in rows 6” apart, or between other vegetables like carrots. Some varieties tend to bolt. Withstands light frost. Require lots of water.
Palak	Pusa Bharati, All Green, Pusa Jyoti	Almost round the year	Withstands light frost, bolts during long days. Harvest before flowering.
Cabbage	Early Acre, Rare Ball	Sep-Oct	Withstands some frost.
Cauliflower	Early Kunwari, Pusa Deepali	Sep-Oct	Withstands light frost. To Prevent sunlight from discoloring, pinch outer leaves together with a clothes pinch once small heads are teacup sized.
Tomato	Pusa Early Dwarf, Pusa Gaurav	Jan-Feb Sep-Oct	Upright plants, Needs to be staked. Great for windowsills.
Mango	Amrapalli, Mallika	July-Aug	Dwarf, precocious, tend to bear regularly
Guava	L-49, Arka Mridula	July-Aug	Dwarf, High yielding
Papaya	Pusa Nanha, Ranchi, Honey Dew	July-Aug	Dwarf, tend to bear at lower height
Apple	Wijick Mc Intosh, Nugget Golden Delicious	Jan-Feb	Bear in small stem and yield more
Cherry	Compact Lambert, Meteor, North Star	Jan-Feb	Dwarf, high yielding, self fruitful
Peach	Red Heaven	Jan-Feb	Dwarf, high yielding