
Transforming Urban Agriculture for Sustainable Living by Vertical Gardening

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Published on: January 31, 2024

ABSTRACT

Due to overpopulation in cities, excessive use of chemicals on crops poses health risks. To combat this, urban residents are turning to establish and maintain small home gardens, even utilizing limited spaces like balconies. Recognizing the significance of home gardens, people are exploring alternatives like terrace gardening and vertical gardening when space is scarce. A model vertical system namely Arka Vegetable Garden Structure for growing vegetables, flowers, and herbs in small urban spaces, was developed by Indian Institute of Horticultural Research located at Bengaluru.

INTRODUCTION

Due to the rising issue of overpopulation in urban areas, the excessive use of chemicals on crops is becoming a major concern due to its associated health risks. In response to this challenge, city dwellers are increasingly embracing the concept of small home gardens, making use of even the most limited spaces such as balconies.

Recognizing the pivotal role of home gardens, individuals are exploring alternative approaches like terrace and vertical gardening, particularly when dealing with constraints in available space. A notable initiative in this direction comes from the Indian Institute of Horticultural Research, Bengaluru which has developed a vertical gardening system tailored for cultivating vegetables, flowers, and herbs in small urban areas.



DESIGN AND USE OF VERTICAL GARDEN STRUCTURE

This innovative vertical system is specifically designed for apartment-style houses, creating a balcony-like environment for the purpose of cultivating plants. It consists of three essential components: a sturdy base, a middle frame designed to hold pots, and a structured placement for the water tank. Importantly, the system is crafted with mobility in mind, ensuring easy adjustments according to the user's preferences.

The vertical garden system not only provides a solution for limited space but also offers flexibility in terms of plant placement. Plants are grown in bags or bins with dimensions customized to support their growth,



accommodating a diverse range of vegetables, greens, and herbs.

PLANTS SUITABLE FOR VERTICAL GARDEN

The vertical garden's distinct tiers enable the cultivation of various plants at different levels. The top tier proves ideal for flowers like marigolds and China aster, while the lower tiers are well-suited for growing vegetables, greens, flowers, ornamentals and herbs of varying heights. The selection of plants is based on the preference of the consumers.

IRRIGATION SYSTEM FOR VERTICAL GARDEN

To address the essential need for irrigation, a 25-liter tank is strategically positioned at the top of the vertical system, with a network of pipes efficiently distributing water to all levels through drip irrigation system. Remarkably, the entire system, including plants and the growing medium, weighs only 40 kg, showcasing its efficiency and suitability for cultivation in limited urban spaces.

SPECIAL CHARACTERS OF ARKA VERTICAL GARDEN STRUCTURE

Vertical gardening is indeed an efficient way to utilize limited space for growing a variety of plants, including vegetables, medicinal herbs, and flowers. By utilizing vertical structures such as trellises, wall-mounted planters, or specially designed vertical garden systems, the available sunlight and space can be maximized.

SOME KEY BENEFITS AND CONSIDERATIONS OF VERTICAL GARDENING

Space Efficiency: Vertical gardens make the most of vertical space, which is especially valuable in urban environments or homes with limited outdoor space like balconies or terraces.

Accessibility: With plants grown vertically, it's easier to access and maintain them, reducing the need for bending or kneeling, which can be beneficial for people with physical limitations.



Diverse Plant Options: Vertical gardens can accommodate various types of plants, including vegetables, herbs, and flowers. This diversity allows for the creation of aesthetically pleasing and functional arrangements.

Soil Options: Traditional soil or soilless growing mediums like cocopeat can be used as growing media, depending on the preference and the specific needs of the plants. Soilless mediums offer advantages such as better water retention and reduced risk of soil-borne diseases.

Watering and Drainage: Proper watering and drainage are crucial for vertical gardens. Consider the watering needs of different plants and ensure that excess water can drain effectively to prevent waterlogging, which can lead to root rot.

Support Structures: Depending on the weight of the plants and the chosen structure, sturdy support is to provide, to ensure the stability and safety of vertical garden. Trellises, stakes, or wall-mounted brackets can be used for this purpose.

Light Requirements: Since vertical gardens utilize vertical space, ensure that the chosen location receives adequate sunlight for the plants to grow. Factors such as the orientation of the space and any potential shading from nearby structures or trees may be considered.

Maintenance: Regular maintenance is essential for the health and productivity of your vertical garden. This includes tasks such as pruning, fertilizing, and monitoring for pests and diseases. By carefully planning and maintaining vertical garden, we can create a beautiful and productive space for growing a wide range of plants, even in limited areas. Vertical gardening offers an accessible and rewarding way to cultivate fresh produce, herbs, and ornamental plants.

SIZE OF CONTAINERS FOR DIFFERENT CROPS IN VERTICAL GARDEN

Plant Selection and Placement: A wide range of plants including vegetables like tomatoes, chili, brinjal, French beans, peas, as well as leafy vegetables and medicinal herbs can be chosen. Placing plants with larger pot sizes and height requirements at the base makes sense to provide stability and support, while smaller plants are positioned on upper levels.



Pot Sizes: Different pot sizes are allocated based on the specific needs of the plants, ensuring they have adequate space for root development and growth. Larger pots are used for plants like tomatoes, while smaller pots are used for leafy greens and medicinal herbs.

Vertical Structure: The vertical garden structure is designed to accommodate plants at various levels, optimizing space and sunlight exposure. This setup allows for efficient use of vertical space in sunlit areas such as balconies or terraces.



Watering System: A 25-liter plastic container positioned at the top of the structure, equipped with drip laterals, microtubes, and drippers, provides a systematic watering system for the plants. This ensures consistent moisture levels and efficient water distribution throughout the vertical garden.



Yield: Depending on the crop, crop yield of 2 kg to 5 kg of produce per crop cycle can be harvested as fresh economic produce. This estimated yield reflects the productivity potential of the vertical garden and allows for planning and management of harvests.

Cost: The approximate cost of the vertical garden structure is Rs. 22,000, which includes materials for the structure, pots, watering system components, and any additional accessories or tools required for installation and maintenance.



CONCLUSION

Vertical garden is a better concept for effective utilization of available places for growing crop plants preferred by the growers or consumers of urban area. It can provide not only pesticide free vegetables but also giving satisfaction of growing plants even in urban area as well as refreshing stressful minds of urban dwellers by horticulture therapy.