



**Biotica
Research
Today**
Vol 3:5 386
2021 389

Roof Gardening

Abhay Kumar Yadav^{1*}, Vikash Singh¹,
Prabhakar Yadav² and Ritesh Singh¹

¹Dept. of Horticulture, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh (224 229), India

²Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh (209 217), India

 Open Access

Corresponding Author

Abhay Kumar Yadav
e-mail: bhy.abhay@gmail.com

Keywords

Aeroponics, Extensive, Hydroponics, Intensive

Article History

Received in 24th May 2021

Received in revised form 27th May 2021

Accepted in final form 28th May 2021

E-mail: bioticapublications@gmail.com

How to cite this article?

Yadav *et al.*, 2021. Roof Gardening. *Biotica Research Today* 3(5): 386-389.

Abstract

Urban environments face many challenges related to the health and well-being of the citizens. Environmental qualities in urban areas are getting worse by the minute. Hence, Roof garden can be splendid substitute for natural looking landscaped areas at the ground level. A roof garden is a garden on the roof of a building. Besides the decorative benefit, roof planting may provide food temperature control, hydrological benefits, architectural enhancement, habitats or corridor for wildlife, recreational, opportunities and in large scale it may even have ecological benefits. The practice of cultivation food on the rooftop of building is sometimes referred as rooftop farming roof top farming is usually done using green roof, hydroponics, aeroponics or container garden. In addition with the decorative benefit, roof gardening may provide food, temperature control, hydrological benefits, architectural enhancement, habitats for wildlife, recreational opportunities, and ecological benefits.

Introduction

A roof garden is essentially a garden on the rooftop of building, man-made green spaces on the topmost level of residential and commercial structures. Consisting of different plants, these verdant areas help improve a building's aesthetics. Roof gardening is an art and science of growing plants on the fallow spaces within, surrounding or adjacent to the roof of the residence. Other conventional areas of roof gardening include atrium, balcony and window boxes. It can be also designated as a leisure time activity that involves satisfying the aesthetic needs of the gardener. Roof gardening is usually done using green roof, hydroponics, aeroponics or air-dynaponics systems or container gardens. It is not an easy going activity like conventional gardening as its success largely depends on suitable species selection, appropriate containers, proper cultural methods and sufficient supervision and control. Any roof can be made more energy efficient with the practice of roof gardening.



Figure 1: Green roof + Garden Toronto

Brief History of Roof Gardening

Rooftop gardens have been in existence for a long time now. The people of ancient Mesopotamia have grown trees and shrubs atop ziggurats. Some European

homes in the olden days had roofs made with turf. And the Hanging Gardens of Babylon, one of the Seven Wonders of the Ancient World, are known to have tiered gardens with lots of vegetation.

By the 1970's, the first green roofs were manufactured and installed in homes and commercial establishments. Until the 20th century, having a rooftop garden equated to novelty and wealth.

The first book on roof garden was "Roof Gardens" (1988), by Roland Stifter. Thereafter, many books have been published on this topic. However, the most recent trends in roof gardens are both ecological and practical. These days, the idea of the



Figure 2: The Hanging Gardens of Babylon

roof garden has been transformed into the "green roof."



Figure 3: Types of green roof gardening

Types of Green Roof Gardening

Intensive Green Roof

It is more of a rooftop garden or sky park than anything else. This roof garden design is characterized by deep soils that have a growing medium depth of more than 6 inches. A variety of vegetation can be grown in an intensive roof garden, from small to large plants, shrubs, groundcovers, and even small trees. An intensive green roof offers a great potential for highly creative designs and biodiversity. It can

support vegetable garden, playgrounds, small home gardens, and even full-scale parks. But this rooftop garden type also requires intensive care, with regular professional maintenance and advanced irrigation systems.

Semi Intensive Green Roof

It boasts a mix of both the intensive and extensive green roofs. It is characterized by a growing medium depth of around 6 to 12 inches to host a much richer ecology. Greenery in this type of rooftop garden consists of small plants, grasses, herbs, small shrubs, and groundcovers that require occasional irrigation and moderate maintenance. A semi-intensive green roof is able to retain more storm-water than an extensive green roof and, at the same time, provides the potential for a formal roof garden effect. Its design makes it ideal for long-term care facilities, day-care play spaces, and urban picnic areas.

Extensive Green Roof

It is a low-maintenance green roof garden that has a thin, light-weight growing medium. This type of green roof is characterized by its vegetation, which is often limited to sedums, mosses, herbs, small plants and flowers, desert grasses, and succulents. Because it has a growing medium depth of around 3 to 6 inches, an extensive green roof is easier to install and cost-efficient, and generally doesn't require an irrigation system to survive. It is ideal for storm-water management for flat or low-sloped roofs and retrofits.

It's understood that when a building has a rooftop garden, care and maintenance must be done regularly, especially if it is the intensive type. But does that mean that having a roof garden can be costly, or cause leaks and damage to structures?

Debunking Myths about Green Roofs

Here are some common misconceptions about roof gardening.

1. Roof Gardens can Cause Structural Issues

For new buildings, architects and structural engineers already take into account the load requirement of green roofs even during planning. For retrofitted green roofs, however, reinforcements must be built to handle the additional load needed to develop a roof garden, as well as live loads like rainwater and snow. Experts are there to thoroughly evaluate and recommend the best way to install a rooftop garden on an existing structure.

2. Roof Gardens are Prone to Leaks

Unless the roof was haphazardly constructed, there is little evidence linking roof gardens to leaks. Fact is, they are known to protect the waterproof membrane of a building's roof and shield it from UV light that can cause

weathering. In short, if installed properly, rooftop gardens can prolong the life of one's roof.

3. Roof Gardens are Expensive and High-Maintenance

Creating a rooftop garden seems costly if one doesn't know where to start. That's why a consultation from professionals – architects, landscape designers, and structural engineers – is needed. They can offer the best roof garden design ideas and solutions for the short and long term.

With regards to maintenance, take into consideration the types of plants and seasonality to determine the substrate and drainage systems to use. Professionals will most likely recommend thicker substrates that can absorb more water and a drainage system that can store water and release it during warmer weather. This way, the need for irrigation is greatly reduced.

4. Roof Gardens are Only for Aesthetic Purposes

True, rooftop gardens add beauty to a building, but they do more than that. Green roofs alleviate the urban heat island effect by reducing surface temperatures through natural insulation. They also improve the air quality of the surroundings as plants remove the carbon-dioxide in the air and release oxygen. Extensive green roofs can offer habitats for diverse birds and other animals because of the variety of trees and plants present. Moreover, a rooftop garden makes roofs useful as grounds for social activities such as play and picnics, and even for relaxation.

Key Considerations for Establishing Roof Garden

- **Roof Condition:** The most effective time to construct a roof garden is when the roof is newly constructed or being repaired. When working with an existing roof, we must take into account the existing leakages, damage, inability to resist roots and standing water *etc.*
- **Structural capacity of the roof:** Prior to designing and constructing a roof garden, we must determine if the roof can support the additional weight of soil and plants. The structural capacity of the roof mainly determines the type of roof garden that can be built.
- **Access to the roof:** Access to the roof is an important consideration. Typical access includes stairs or fire escapes. However, there should be enough space for transporting materials for construction and maintenance.
- **Weight of garden:** Consideration of weight is the heart of planning for any type of roof garden. Weight of the garden should be determined by licensed architect or structural engineer. It must be assured that the weight of garden does not exceed the structural capacity of the roof.
- **Total Cost:** Before starting a roof garden, all necessary cost analysis should be done. Usually, a green roof costs 50% higher

than conventional roofs. Moreover, an extensive garden is less costly than intensive garden.

- **Roof garden design:** The design of a roof garden may vary with the structural capacity of building, owner's personal choice, purpose of gardening, surrounding scenery *etc.*

- **Irrigation water:** Roof garden plants largely depend on rain water for irrigation. But, during certain period of year, rainfall may be insufficient to fulfil the water requirements. So, harvesting of rain water can be done. Moreover, drip irrigation system, hose-pipe manual watering *etc.* should be arranged to supplement rainfall.

- **Drainage of extra water:** The drainage system is an essential consideration of any roof garden. Typical drainage systems include gutters, downspouts, drains and barriers to prevent growing media erosion and drainage system clogging. Poor drainage may result in root rot and diseases of plants as well as significant weight beyond the roof capacity.

- **Plants and growing media selection:** Rooftops can be hostile environments for plants due to the effects of wind, heat, rain and shadows. So, drought tolerant plants of native varieties are suitable and attractive option for roof gardening. Usually, light weight growing media consisting of high-quality compost and recycled materials are used.

- **Maintenance:** Roof gardens must be maintained just like any garden such as watering, weeding *etc.* the amount of maintenance will depend on the types of plants used and the garden design. Larger plants, shrubs, and trees must be pruned to ensure safety during windy conditions. Drains and gutters must be inspected and cleared more frequently in comparison to the conventional naked rooftop.

Benefits of having Roof Garden

- **It provides a personal nook for me-times.** When one needs some time out from anything that causes stress, a trip to the green roof would be beneficial. It's been proven that green is a relaxing color that brings about positive impacts on mental and psychological well-being. Surrounding oneself in verdant surroundings can ease tension and anxiety.
- **Green spaces can help people recover from sickness faster.** Long-term care facilities have rooftop gardens where patients can while away their time while on rehabilitation. The color green has a healing and soothing effect, and just being around it can help with recovery and renewed energy.
- **Roof gardens help create wonderful memories with friends and family.** Whether for a picnic or a stroll, rooftop gardens are ideal spaces to spend quality time with other people. The greenery provides a lush backdrop for photos and videos to remember one's day.
- **Green roofs can cultivate one's green thumb.** Semi-intensive and intensive green roofs make great spaces to grow different plants. One can even create a rooftop vegetable garden here to plant herbs and leafy greens that can be used for cooking.

- **Rooftop gardens offer breathtaking views.** Just imagine being 30 feet high above the ground but still be wrapped in beautiful scenery. That's exactly what a rooftop garden can offer. Green roofs also complement the city skyline and make vistas all the more amazing.

- **Green roofs give bragging rights to a resident or building owner.** People love green spaces, and a rooftop garden that's well taken care of will leave them in awe. They will also love the idea that the structure is environmentally friendly and offers biodiversity. Also, since they are able to reduce heat, green roofs help lower energy costs spent on air-conditioning. And because green roofs protect the actual roof's surface, there's little need for much maintenance.

Conclusion

Agriculture means production of goods by growing plants, animals and other life forms. In fact, one of the human activities is agriculture and it should continue in the urban environment and region. Overall, agriculture is the creation of natural produce and growing plant, and owing to urban agriculture a substantial number of plants are growing in the cities. Roof garden means growing many

plants in medium soil on top of the roofing system with flat or sloped rooftop design with vegetation. Also, it includes five or six layers on top of the building where each layer contains a waterproof membrane, a protective layer, the growing medium vegetation materials and irrigation system. Roof garden includes two forms *i.e.* extensive and intensive. Moreover, roof garden has more benefit for cities and people. For example, this technology can reduce heat flux and runoff and can provide better water quality. Other positive effect of roof garden includes noise reduction.

References

- A Brief History of Roof Gardens. Available at: www.heathershimmin.com/a-brief-history-of-roof-gardens. Accessed on 14.05.2021.
- Rooftop Garden. Available at: <http://www.agrnewsbd.com/doc/read/961/rooftop-garden>. Accessed on 14.05.2021.
- Yazid, M., Yunos, M., Jafari, N., Utaberta, N., Ismail, N.A., Ismail, S., Jafari, N., 2015. The Preference of High-Rise Buildings' Residents toward Rooftop Garden to Promote Urban Agriculture: A Case Study of Malaysia. *Advances in Environmental Biology* 9(95), 400-403.