

## Agriculture in Urban Culture: A Review on Terrace Farming

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### Abstract

Planting an own garden may provide people both joy and riches. However, in this concrete jungle known as cities, finding a location to expand your garden might be tough. There are concrete structures, highways, and marketplaces everywhere, and we plant lovers in cities can no longer develop our gardens. This difficulty may be overcome with the help of Terrace gardening. It is also called a roof gardening in which vegetables, fruits or flowers are grown on terraces, balconies or roofs of buildings due to constraints of space. In this article, we'll discuss about how to construct a terrace garden, which is often overlooked in urban places. Maximum useful use of the smallest amount of space available, as well as a cost-effective technique of balancing green space with the uncontrolled development of cements structures in metropolitan environments.

**Keywords:** Terrace gardening; Urban; Wind Barriers; Invert roof system; Geotextile; Insulation

### Introduction

A terrace garden is a garden that is grown on a terrace, roof, or patio, usually in a home with limited gardening space. In urban areas, terrace gardens are highly popular. The study's goal was to find out how private gardens contribute to urban biodiversity and how urban planning, garden design, and management affect it [1].

Terrace gardens are frequently developed at many levels, which are :

- On a building's rooftop.
- Porches, window boxes, porticos, balconies, and other similar structures.
- Above-ground floors protruding from the skyscraper block level.
- On the podium, around the base, or on the roof of basements that are huge.

### Materials and Methods

#### The Fundamentals of Rooftop Gardening are

Make a drawing or blueprint of your terrace garden and collect data.

Gather the necessary equipment or tools

Construction of Roof System

what to grow

Soil Preparation

Wind Barriers

Care & Maintenance

Insects & Pests management

Heat Proofing Terrace Garden

Harvesting

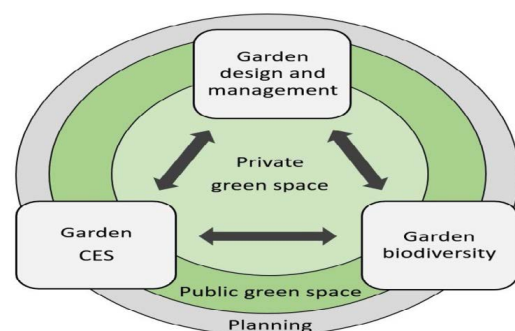
**Make a drawing or blueprint of your terrace garden and collect data**

To begin, gather facts such as how much sunlight or shade our terrace receives, how much wind may affect the region and the type

of water supply our terrace naturally receives, the climatic pattern and temperature of the area, which vegetables we want to plant, and so on. Make a rough sketch of the roof top garden and decide how and where we want to grow plants. We can grow plants in different methods like Raised Beds methods, vertical garden growing up the wall, Planting In Pots, Planting in polystyrene boxes, Planting in Grow bags etc. (Figure 1) [2].

#### Gather the necessary equipment or tools

- Trowel
- Hose Pipe Or Watering Can
- Shovel
- Gardening Rake
- Pruning Scissor
- Grow Bags/ polystyrene boxes



1. Garden biodiversity 2. Perceived garden CES 3. Garden design and Management 4. Private Green space 5. Public green space and 6. Urban planning

**Figure 1:** The garden 'human-nature' nexus framework with its six components.

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- Soil Mixture
- Nutrient Mixtures
- Seeds/Plants
- Shade nets
- Shelterbelts
- Trellises
- Fences/Hedges

### Construction of Roof System

Roof garden construction may be done in 3 ways: The first way is to build a container garden on a terrace, while the second is to build a large number of raised beds to grow plants, which may be made of concrete or wood [3]. The third is to convert your entire roof, or a section of it, into a vegetation ground, comparable to a conventional garden (Figure 2).

#### Invert Roof system

This system is built by assembling a few basic components into a complete system, with the waterproofing positioned behind thermal insulation. This design safeguards the roof waterproofing from mechanical damage as well as the direct influence of external factors (temperature, UV radiation, wind suction forces etc.). Furthermore, regardless of the weather, the temperature on the waterproofed surface remains constant. The components contain the following layers.

**Waterproofing layer:** Waterproofing is probably highly recommended need for a green roof. Because the fundamental function of a roof is to keep the building dry, this layer serves as an important barrier against rainwater entry into the building. The roof must be waterproofed, durable, and frost resistant, and it should be the first stage in the construction of a terrace garden. Waterproofing covers the whole surface of the roof, especially the areas where plants will be planted and it should be root and rot resistant.

There are several waterproofing techniques available including:

- Bitumen/asphalt roofing felt and bituminized textiles.
- SEBS polymer modified bitumen and coal tar pitch/polyester built-up systems using SBS modified, bituminous membrane sheets.
- Fluid applied membranes.
- Concrete admixture.

**Insulation Layer:** The insulation layer (Protection Layer) protects

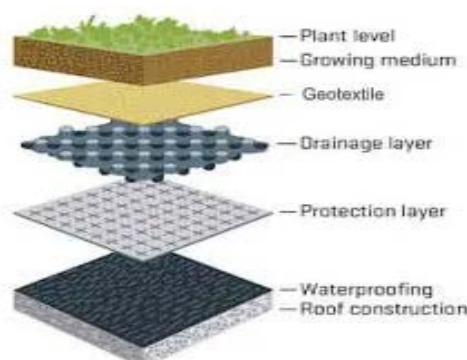


Figure 2: Invert Roof system.

the terrace garden from moisture and temperature fluctuations while also providing mechanical strength. It's generally built of XPS extruded polystyrene boards, PIR panels, or polyurethane foam. PIR panels are ideal for use as an insulating layer on the roof garden because they include specific grooves and machined edge connectors that allow rainwater to readily transfer to drainage systems. If the drainage layer is made of a basic granular mix, the application of protection layers is critical [4].

**Drainage Layer:** The drainage layer's principal function is to remove surplus water or underflow as quickly as possible in order to avoid protracted saturation. Drainage materials are classified into three types

- Granular materials include gravel, stone chips, broken clay tiles, clinker, scoria (lava rock), pumice, expanded shale, and LECA.
- Mats with pores (made from recycled materials such as clothing and car seats and behaving much like sponges.)
- Drainage modules constructed of lightweight plastic or polystyrene (made of high-density polyethylene.)

A typical proprietary water storage reservoir is built of moulded expanded polystyrene and may hold up to 32 litres of water per square metre.

**Geotextile:** A geotextile fabric layer separates the drainage layer from the plants growing in the soil. It keeps dirt and other tiny particles from clogging the drainage system. It also counteracts the quick loss of water from the plant layer by circulating moisture. Geotextiles must be waterproof and vapour permeable, as well as chemical and biologically resistant and mechanically durable.

**Vegetative layer:** The vegetative layer is the growing medium on which plants grow (soil). It should be permeable to water and have sufficient aeration. Soil preparation is done in accordance with the type of plants selected. Plants, in general, require rich, slightly acidic soil, which may be made by combining garden soil, humus, farm manure or compost, and organic materials.

#### What to grow?

Ornamental plants, seasonal flowers, blooming plants, foliage shrubs, small to medium shrubs/herbs, succulents, and other plants can be cultivated.

Hours of sunshine, irrigation, soil PH level, and temperature needs are all crucial things to consider when selecting seeds to put in your rooftop garden (Tables 1 and 2).

#### Soil Preparation

Properly nourished and conditioned soil is essential for growing healthy plants. Adding organic matter to soil is the most effective technique to make it more loam-like and enhance its structure. As a result, in an equal proportion to red sand and coco peat, mix the soil with organic matter such as composted yard waste, manure, and fallen leaves. The soil should have a balanced texture and crumbliness that allows it to retain moisture. Mix well and let the soil to settle for a week before planting or seeding. Chemical fertilisers, in general, should be avoided since they kill beneficial bacteria and microorganisms in the soil, instead, use less-concentrated organic fertilizers and slow-release formulas. Plant your selected plants after preparing the soil and providing nutrients as needed. Mulching practice increases the structure and health of your soil. During the summer, it lowers evaporation and

Table 1: India's Vegetable Growing Calendar.

S. No.	Vegetable Name	Growing Season - North India	Growing Season - South India	Germination Temp. (in °C)	Sowing Method	Sowing Depth (inches)	Sowing Distance (inches/feet)	Days to Maturity	Links
1	Apple Gourd	Feb-Mar Jun-Jul	Feb-Mar Jun-Jul	20-30	Direct	1	Between Seeds - 12" Between rows - 12"	70-80 days	Apple Gourd Seeds
2	Beetroot	Oct-Nov	Aug-Nov	Oct-30	Direct	1	Between Seeds - 4" Between Rows - 18"	80-90 days	Beetroot Seeds
3	Bitter Gourd	Feb-Mar Jun-Jul	Nov-Dec Dec-Jan Jun-Jul	20-30	Direct	0.5	Between Seeds - 1 ft Between Rows - 4 ft	55-60 days	Bitter Gourd Seeds
4	Bottle Gourd	Feb-Mar Jun-Jul	Nov-Dec Dec-Jan Jun-Jul	20-30	Direct		Between Seeds - 1 ft Between Rows - 4 ft	55-60 days	Bottle Gourd Seeds
5	Broccoli	Aug-Sept	Aug-Sept	21-23	Transplant	1.5	Between Seeds - 1 ft Between Rows - 1.5 ft	90-100 days	Broccoli Seeds
6	Cabbage	Sept-Oct	Jun-Jul Oct-Nov	Oct-20	Transplant	0.25	Between Seeds - 1 ft Between Rows - 1.5 ft	90-100 days	Cabbage Seeds
7	Capsicum	Nov-Jan May-Jun	Jan-Feb May-Jun Oct-Nov	15-25	Transplant	0.25-0.5	Between Seeds - 1.5 ft. Between Rows - 1.5 ft.	95-100 days	Green Capsicum Seeds
8	Carrot	Aug-Sept-Oct	Aug-Nov	Oct-30	Direct	0.25	Between Seeds - 2" Between Rows - 1.5 ft	75-80 days	Carrot Seeds
9	Cucumber	Feb-Mar Jun Jul	Jun-Jul Sept-Oct Dec-Jan	16-32	Direct	0.5	Between Rows - 12"	50-70 days	Cucumber Seeds
10	Beans	Feb-Mar	-	16-30	Direct	1-1.5	Between Seeds - 8" Between Rows - 18"	45-50 days	Beans Seeds
11	Lettuce	Sept-Oct	Oct-Dec	Jul-27	Direct/ Transplant	Surface Sow, cover lightly with soil	Between Rows - 8"-12"	45-55 days	Lettuce Seeds
12	Okra	Feb-Mar Jun-Jul	Jan-Feb May-Jun Oct-Dec	20-32	Direct	0.5	Between Seeds - 12" Between Rows - 18"	45-50 days	Okra Seeds
13	Onion	May-Jun	Mar-Apr May-Jun Sept-Oct	Oct-32	Transplant	0.25	Between Seeds - 4 ft. Between Rows - 6 ft	150-160 days	White Onion Seeds
14	Peas	Sept-Oct-Nov	Sept-Oct-Nov	Oct-22	Direct	1	Between Seeds - 4" Between Rows - 12"	55-60 days	Pea Seeds
15	Radish	Aug-Jan	-depends-	10-30	Direct	0.5	Between Seeds - 2"-3" Between Rows - 12"	40-45 days	Red Radish Seeds
16	Spinach	Sept-Nov Feb	Sept-Oct-Nov	Oct-22	Direct	0.5	Between Seeds - 3" Between Rows - 9"	60 days	Green Spinach Seeds
17	Tomato	Jun-Aug Nov-Dec	Jan-Feb Jun-Jul Oct-Nov	20-30	Transplant	0.25	Between Seeds - 1 ft Between Rows - 2.5 ft	110-115 days	Cherry Tomato Seeds
18	Turnip	Oct-Nov	Oct-Nov	15-35	Direct	0.5	Between Seeds - 4" Between Rows - 1.5 ft	40-50 days	Red Turnip Seeds
19	Cauliflower (Early)	Mid-June	Jun-Jul Aug-Sept	25-27	Transplant	0.5	Between Seeds - 2 ft Between Rows - 2 ft	120-125 days	Cauliflower Seeds
20	Cauliflower (Late)	Aug-Sept-Oct	Jun-Jul	16-20	Transplant	0.5	Between Seeds - 2 ft Between Rows - 2 ft	120-125 days	Cauliflower Seeds
21	Cauliflower (Mid-season)	Sept-Oct	Jun-Jul Aug-Sept	<16	Transplant	0.5	Between Seeds - 2 ft Between Rows - 2 ft	120-125 days	Cauliflower Seeds
22	Potato	Oct-Dec	Oct-Dec	4	Direct	4	Between Rows - 12"-18"	70-120 days	-
23	Pumpkin	Jan-Mar	Jun-Jul	20-35	Direct	1	Between Seeds - 24"-48"	70-75 days	Pumpkin Seeds

		Sept-Dec	Dec-Jan						
		May-Jun							
24	<b>Corn</b>	Oct-Nov	Sept-Oct	10	Direct	1-1.5	Between Seeds - 4"-6"	60-100 days	Corn Microgreen Seeds
							Between Rows - 30"-36"		
25	<b>Melon</b>	Feb-Mar	Jan-Feb	22-32	Direct	1	Between Rows - 18"-24"	70-85 days	Yellow Melon Seeds
		Jun-Jul	Mar-Jun						
			Oct-Dec						

**Table 2:** Vegetables grow in sunny and shady places.

Full sun(6-8hrs)	Partial sun(4-6hrs)	Fully shade
Herbs	Onions	Deep shades are not ideal place for plants to grow
Squashes	Broccoli	--
Okra	Lettuce	--
Peppers	Cauliflower	--
Brinjals	Peas	--
Tomato's	Spinach	--
Guards	Kale	--
Cucumber	Leeks	--
--	Carrots	--
--	Beets	--
--	Radish	--
--	Cabbage	--



**Figure 3:** Wind Barriers.

keeps the soil cooler. It also inhibits weed development and improves soil aeration. [5]

**Wind Barriers**

Wind barriers can help to minimise wind pressure and give cover for your plants. Windbreaks can be created by trellises, hedges, fences, or shelterbelts. Make sure that the new wind barrier you build reduces wind pressure while still allowing optimum air circulation for your plants (Figure 3).

**Care & Maintenance**

- **Soil care** - The soil is not particularly deep in a terrace garden because it is constructed on concrete. As a result, replacement and compost addition are necessary on a regular basis. This will keep the soil's oxygen content high, which is essential for plant growth.
- **Watering the plants** - The most crucial aspect is to maintain the plants well-watered. Because water is required for photosynthesis, watering first thing in the morning is the best choice. Because terrace garden soil dries up quickly owing to its shallowness, it's important to water it regularly.

- **Trimming, Pruning and weeding** - Weeds grow fast and consume important nutrients in plants. As a result, weeding is essential on a regular basis to maintain good plant health. Certain plants must also be pruned and trimmed on a regular basis [6].
- **Sunshine management** - Some plants grow best in direct sunlight, while others grow in the shade. While planting, meet the demands of the diverse plants.
- **Drainage system:** A detailed drainage study is required for a terrace garden. Checking on a regular basis will help keep obstructions at bay, resulting in a healthy and attractive landscape.

**Insects & Pests management**

Insects and pests management can be done by cultural and mechanical methods such as

- Weeds in your garden should be eliminated on a regular basis since they attract additional pests and illnesses, and crop rotation is important for minimising pest populations.
- Make sure the soil is kept at the right moisture level by using well-decomposed farm yard manure and compost, as there are numerous soil-borne grubs and pathogens.
- Leave enough space between plants.
- You can avoid soil-borne fungal, bacterial, or viral infections by exposing soil to sun rays in the summer.
- Remove caterpillars, borers, eggs, larvae, slugs, snails, and other pests from the garden by hand. As needed, trim or remove afflicted branches, shoots, leaves, or flowers.
- Remove infected plants to prevent disease transmission from one plant to another.
- Remove old and basal leaves as they promote the growth of pests and diseases.
- Take out the cotyledon leaves.
- Use a pressurised water spray to kill sucking insects without harming the plant.

**Advantages and Disadvantages**

The creation of fresh and organic goods, which can also enhance the amount of oxygen in the air, is the primary advantage. It primarily aids in the reduction of interior temperatures by 6 to 8 degrees, cutting air conditioning expenditures. It reduces overall heat absorption and insulates structures from both heat and cold. It also helps to minimise noise pollution in congested areas and provides a safe haven for city-weary birds [7]. When it comes to drawbacks, the most significant disadvantage of maintaining a terrace garden is that it necessitates a great deal of attention. Many individuals will not pick this since they do not have time to care for and maintain plants in their hectic life.

Another problem is that precipitation soaks the earth. Rainwater is trapped on the ground and absorbed in this circumstance, resulting in roof damage, mudslides, soil erosion, and other issues. In some areas, terracing has also been related to reduce soil quality due to the leaching of important nutrients from the soil.

### Cost of Terrace Gardening

It will cost roughly Rs. 20,000 to build a terrace garden. You'll need to spend for seeds, saplings, containers, tools, and soil bed/manure if you wish to start terrace gardening. Starting with tiny monthly investments and using recycled containers, costs may be reduced. The returns are highly healthy if the entire process is seen as a productive investment. Cleaner air, a better location to exercise, increased health, and cheaper air conditioning costs may all be gained in the long run after an initial commitment of energy and time [8].

### Conclusion

In this concrete jungle, terrace gardening is not only a profitable hobby, but it is also beneficial in terms of physical fitness, better use of space and time, environmental cleanliness, household trash recycling, and so on. Terrace gardens are beneficial for minimising the amount of

heat generated on the terrace. In reality, no prior agricultural knowledge is necessary to start a roof garden, and once the garden has created, no more training is required. An hour a day is more than enough to keep the garden in good shape in today's fast-paced environment.

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