

ROLE OF TERRACE GARDEN IN SUSTAINABILITY AND ENVIRONMENT

(A CASE STUDY)

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ABSTRACT

As the world is heading towards the depletion of natural resources and the loss of forest/garden area due to urbanization, there is a dire need of terrace gardens. Due to the population explosion with a house for every citizen in the country, all the open areas are eaten away by concrete buildings. This has created the ecological imbalance, which can cause tremendous harm to our future generations. When we cannot avoid utilizing open spaces on the ground for the construction of buildings and other utilities, then at least the open spaces available above these buildings can be utilized for plantations and gardens to minimize the ecological imbalance, if not eliminate it altogether. There are many benefits of these terrace gardens, such as waste recycling, ecological benefits, energy conservation, water conservation, decorative enhancement of buildings, occupant's health benefits and attracting birds and insects. The list can be much longer. In this paper, a case study is considered highlighting the benefits of terrace garden and its significant role in sustainability and environment. The paper is based on the author's own experience in self-cultivated terrace garden.

KEYWORDS: Terrace Garden, Utilizing the Available Open Space, Sustainability, Energy Efficiency, Environment and Health

INTRODUCTION

Due to the urbanization and growing population, there is a big threat to sustainability. There are many ways and means of maintaining this sustainability to some extent by the citizens. One of the measures would be to have a terrace garden to utilize the available open space in a productive way. It serves many purposes. But one important purpose definitely served would be for those who have a passion for gardening. Apart from that, it has many other benefits like ecological benefits, water conservation, energy conservation, decorative enhancement and attraction to birds and insects. Terrace gardens also contribute tremendously towards the health betterment of the occupants of the building. There are many people who are passionate of gardening but often are disappointed, as they may not be fortunate enough to have open spaces for the same. The author of this paper is one amongst them. Passion is important for a strong motivation to have a terrace garden, because it is not very easy to have and maintain a terrace garden as the one on the ground. There are many obstacles like the quality of construction, proper water-proofing of the terrace, strength of the building to withstand additional weight, the watering facility available, the drainage facility available and proper maintenance of the garden. Hence it calls for some investments and expenditure as well.

BENEFITS OF TERRACE GARDEN IN SUSTAINABILITY

Energy Conservation

Till the water-proofing level or membrane insulation level, both the conventional roof top and the one with the garden are similar from the heat transfer point of view. The elements of conventional roofs absorb the solar radiation during the day when the temperature of air is hotter than the roof and radiates this heat back to the surrounding air during the night when air temperature is less than that of roof top. Due this radiation of heat back to the environment from the roof tops, the urban areas experience warmer nights and hence there is a need for the coolers in the rooms below the roofs during thenight, especially in the summer months.

Whereas the buildings with terrace gardens, this thermal profile changes since there is a direct shading of the roof [Green roofs-EPA] due to the garden and hence the roof top temperatures are always lower than the atmospheric temperature around and hence heat is continuously absorbed from the air around to keep the environment cooler. Also when the terrace gardens are watered in the late evenings, the roof tops are cooled further. Hence the room temperatures with the terrace gardens will be at least 3 to 4 [Scholars research library-2012] degrees lower than that of conventional roofs without gardens. This reduces the cooling load [Green roof –Wikipedia] on air conditioners in the summer, since the set temperature of thermostat can be 4 to 5 degrees higher or it may even eliminate the need for air conditioners altogether depending on the region.

Case Study

Comparison of Energy spent for air conditioners in the room without and room with terrace gardens is given below.

Energy consumption of air conditioner is based on several diverse factors [BijliBachao Team-2015] like area of the room, climatic conditions based on the region(cold, hot, humid), interior of room color-dark/light (wall, floor, curtains, furnishings), finishing-rough/smooth, number of people in the room (residential, office room, class room), type and color of light bulbs in the room (on/off), any other electrical/electronic gadget present in the room, number of solid objects in the room and the thermostat setting for temperature, because all these factors contribute for absorption of heat inside the room. Higher absorption of heat by these elements slowdown the cooling process in the room by air conditioners and hence more energy needs to be drawn by the air conditioners.

Therefore, in our case study, all the above conditions are considered as moderate while comparing the energy consumed. The Table below shows the comparison for a temperature difference of 4 degrees in room temperatures only due to the terrace garden.

Table 1: Comparison of Energy Consumption in Room With/Without Terrace Garden

Features for Comparison	Room without Terrace Garden	Room with Terrace Garden
The total area of the roof top considered for the case study	15 ft x 30 ft	15 ft x 30 ft
The recommended air conditioner size for the area of the room below	1.5 ton	1.5 ton
The type of air conditioner	Split	Split
Thermostat setting	20 degrees	24 degrees
Energy consumed for 1 hour (approx.)	1.2units	1 unit (considered 4% lesser for every degree of

		temperature increase in thermostat setting)
Energy consumed for 6 hours	7.2 units	6 units
Energy consumed for 5 months in a year (being residential load)*	1080 units	900 units
Total units saved	180 units	

**Energy comparison is done for the room in the coastal region with a minimum usage of the air conditioner for 3 months in summer (March, April and May) and 2 months in post-monsoon period (October and November).*

ROLE OF TERRACE GARDEN IN IMPROVING ENVIRONMENT

Improving the Air Quality

Presence of any greenery around always improves the air quality because, in addition to photosynthesis, they are able to absorb dust and other airborne toxins and during rainy seasons they wash them away into the drains. Hence the plants act as natural filters of dust and other toxins. Therefore plants clean the air in around the garden.



Figure 1: Aerial Partial View of Roof Garden (l); Recycling of Wet Kitchen Waste (r)

Improving Occupants’ Health

The organic yields obtained from one’s own garden are free of chemical fertilizers and pesticides (if garden is maintained accordingly). The special herbs, vegetables and fruits which have medicinal values can also be grown and consumed to improve the occupant’s health and hence improve their productivity.

Improves Ecological Balance

Terrace gardens contribute towards ecological balance by providing shelters for other inhabitants in nature like birds, earthworms and butterflies.

Easy Recycling of the Wet Waste

The wet waste generated in the kitchen can be easily recycled by pouring it in to the terrace garden. This way, cost of additional manure required for the garden can be saved. This helps in garbage disposal in a productive way.

CONCLUSIONS

Terrace gardens should be considered as a boon for maintaining sustainability and Environment as they provide Energy savings for air conditioners [Patric Dixon] apart from many other benefits. The diminishing open areas for private/public gardens in the cities are being compensated. The case study discussed indicates the energy savings of just one room in one house hold. When the same is applied for other rooms and buildings, the energy conservation is quite

substantial and contributes towards reduction in carbon emission.

REFERENCES

1. The author's own terrace garden as shown in the pictures.
2. Green Roofs-United States EPA
3. Scholars Research Library-2012
4. Green Roofs-Wikipedia
5. *BijliBachao* Team-2015
6. Roof Garden Impact on Energy Savings -Patric Dixon