

Urban Farming: Growing a Green Future

Rashmi Paramesh

Abstract: *Urban Farming, the practice of growing food inside a city, can play a significant role in a cities food system. Food is one of the 3 necessities for human life: air, water, food. As the population continue to grow rapidly and move into the cities. This increasing urban population demands energy, water, resources and food that are produced and transported from rural areas in unsustainable ways. We are losing our agricultural landscapes worldwide due to urban sprawl and industries. Urban farming has become a means to increase grown food and a way of reintroducing the public to the many aspects of food that we has been lost as a culture. What food grows regionally and seasonally are all important lessons and make a better informed urban consumer. Urban farming reduces the distance the organic food has to travel before reaching the mouth of the urbanite. A large portion of urban and household organic waste is converted to wealth, prevents contaminated vegetables and fruits getting into human body.*

Keywords: Urban agriculture, Urban food production, Food security, Future generations

1. Introduction

In Bengaluru, not very long before, when houses were independent with space all around, people used to grow vegetables in kitchen gardens at the back and ornamental/landscaped gardens at the front yard. As the so called development progressed, the land value increased, the land around the house disappeared and every inch is used for one or the other constructions. At present no place is there for the gardens. In the guise of development, agricultural land in and around the cities were compromised for industries. Large amount of peri-urban land is lost for industrial development. Bengaluru is just an example, but this is happening in almost all metros (cities) around the globe. [1] The vegetated roofs/ urban farming are gaining popularity as a tool to mitigate many of the negative environmental effects caused by urbanization. Urban farming can be described as any form of food and non-food growing or processing of produce that is sold to consumers both within and on the margins of an urban area. Urban agriculture takes many forms though and exists as backyard gardens supplying one or more families, community gardens, small-scale commercial growing on vacant allotments, commercial hydroponic vegetable or flower operations on a large scale, or aquaculture and livestock raising, common in less developed countries, and many more. With such a wide variety of activities the term 'urban agriculture' is simply an umbrella term describing a wide range of agricultural activities of such diversity that a survey commissioned by the United. [2]

Small-scale enterprises face challenges from larger enterprises when trying to compete in the conventional market.

The best opportunity for small enterprises is to serve market niches that offer price premiums.

The rise of farmers markets and the embodied local foods sentiments encapsulated with these markets are a positive influence on the development of urban agriculture.

As too are the influences of rising fuel costs and the pressures of urbanization. Production closer to markets will have a production cost

advantage if energy prices continue to climb and remain high.

Urban agriculture may also help ameliorate the effects of urbanization by helping to go some way towards 'closing the nutrient loop' that is significantly disrupted by urban infrastructure and processes. [3] As urbanization and density increases in India, the views of green landscapes are vanishing. Modern day urban landscape includes acres of rooftop which are either neglected or forgotten. But the same roof top buildings at the ground level are vibrant with activities, people and plants, but at the roof level they are lifeless. Increased urbanization is creating harsher rooftops that are affecting people and environment. As globalization brings in more development to cities consequently decreasing green landscape, the interest in green roof is growing in today's world.

A commonly-used definition of urban agriculture is "the practice of food production within a city boundary or on the immediate periphery of a city," including the cultivation of crops, vegetables, herbs, fruit, flowers, orchards, parks, forestry, fuel wood, livestock, aquaculture, and bee-keeping. While the idea of farming within a big city's limits may seem novel as it recently gained popularity, urban farming has been in practice since the dawn of cities and agriculture itself. [4]

2. History of Urban Farming

The viability of urban agriculture particularly after World War II began to diminish due increasingly to land pressures in burgeoning cities. In virtually every industrially advanced country, food growing in urban areas made way for housing, community facilities or industry, and the associated rising wages after World War II meant there was less incentive to grow food in the city.

While a similar path to industrial development is being sought in less developed countries, many countries particularly in Africa have embarked upon urban agriculture as a response to crisis. Many African cities suffer from inadequate or unreliable access to fresh food; and inadequate opportunities for employment due to issues ranging from

deteriorating national economies, urbanisation pressures or natural disasters and conflict.

Research into urban and peri urban agriculture in African societies began in a small way in the 1970s and 1980s, and did not receive academic acceptance until the 1990s when the research and extension activities focussed on economic activities. Ellis and Sumberg summarized the reasons for urban agriculture in Africa as: a means of survival; a personal strategy of women in times of economic uncertainty; food security; as a substitute for cash allowing bartering; as a means of income supplementation; and as a commercial activity taking advantage of growing markets for high value produce. African cities have turned to urban agriculture for a number of reasons, but most notably as a survival mechanism by urban residents. [5]

3. Current manifestations

In more developed countries urban agriculture often takes the form of a community garden or 'city farm'.

Community gardens are places where food is grown but they also tend to have a social element associated with them.

While fruit, vegetables and often livestock such as chickens and ducks are raised within a community garden they primarily serve to educate urban people about food production, and provide agricultural and environmental awareness and facilitate opportunities for social interaction. Community gardens are numerous worldwide, but appear to be a phenomenon closely associated with countries of higher economic development.

Sommers and Smit (1994) state that New York City has over 1,000 community gardens and Boston has over 400. According to Australian Community Foods (2007), Brisbane has nine community gardens. One of the oldest and most developed in an organizational and educational sense is Northey Street City Farm located in the inner city suburb of Windsor. Community gardens also exist in Europe, but there the more common practice of urban agriculture is within allotments or privately rented plots. [6]

Another urban farmer in Chicago utilizes vacant lots throughout the city to grow tomatoes on waste that has been sourced from restaurants and other food sources throughout the city and specially composted through his recycling facility, thereby using some of the city's waste that would otherwise have been lost from the nutrient cycle. The use of vacant lots means that there is no certainty of tenure, but this use is an example of the innovation required of urban agriculture if it is to be successful. In order to make agriculture, including urban agriculture, more attractive it is necessary to show that it can also be economically viable.

4. Benefits of urban agriculture

4.1 Land regeneration

Another urban farmer in Chicago utilizes vacant lots throughout the city to grow tomatoes on waste that has been sourced from restaurants and other food sources throughout the city and specially composted through his recycling facility, thereby using some of the city's waste that would otherwise have been lost from the nutrient cycle.

The use of vacant lots means that there is no certainty of tenure, but this use is an example of the innovation required of urban agriculture if it is

In order to make agriculture, including urban agriculture, more attractive it is necessary to show that it can also be economically viable. [7]

4.2 Income generation

Many less developed countries have well developed urban agriculture as an integral part of their cities, but as the earlier discussion has suggested, for quite different reasons commercial urban agriculture remains under-developed in "western" cities. This may not be due to economic reason. The issues may be more cultural. For example, Singapore and Hong Kong are two economically advanced and highly urbanized cities in Asia with income levels amongst the highest in the world and yet are estimated to be 30-50% self-reliant in fresh produce provided by urban farmers [8]



Figure 1: New York City-based Gotham Greens produces more than 300 tons per year of herbs and greens in two hydroponic facilities. (Source: <http://ensia.com/features/urban-agriculture-is-booming-but-what-does-it-really-yeild/>)

4.3 Waste recycling

Most developed cities including Brisbane source the majority of their food from the surrounding countryside and more frequently from distant international sources. Effectively the soil nutrients are continuously exported from fields of rural regions to cities where they are converted to wastes and ultimately lost to the system. Urban agriculture could help reduce this lost organic matter by tapping into the urban organic waste stream to use as an input to the farming system in the form of compost and fertilizer additions. Much of the current organic material in cities is lost by being combined with other waste streams in the sewage system or deposited as household rubbish in landfills. Brisbane city has

a partial organic recycling system in place that provides a free green waste curbside pickup and deposit through waste transfer stations that will compost green waste [9]

4.4 Contributions to urban ecology:

Firstly, Farmers may use wastewater for irrigating their farms when they lack access to other sources of water or because of its high price. The use of fresh (untreated) wastewater has the additional advantage for poor urban farmers that it contains a lot of nutrients.

Secondly, urban agriculture may also positively impact upon the greening and cleaning of the city by turning derelict open spaces into green zones and maintaining buffer and reserve zones free of housing, with positive impacts on the micro-climate . [10]

Degraded open spaces and vacant land are often used as informal waste dumpsites and are a source of crime and health problems. When such zones are turned into productive green spaces, not only an unhealthy situation is cleared, but also the neighbours will passively or actively enjoy the green area. Such activities may also enhance community self-esteem in the neighbourhood and stimulate other actions for improving the community's livelihood. [11]

Thirdly, urban agriculture and urban forestry contribute to disaster risk reduction and adaptation to climate change by reducing runoff, keeping flood plains free from construction, reducing urban temperatures, capturing dust and CO₂, while growing fresh food close to consumers reduces energy spent in transport, cooling, processing and packaging, whilst productive reuse of urban organic wastes and wastewater (and the nutrients these contain) reduces methane emissions from landfills and energy use in fertilizer production. [12]

5. Food Security

In open economy like India the rising food demand can be met by imports but natural and political economy constraints limit the proportion of the food that can be imported with putting the food security of huge Indian population under risk. Climate change will increase the vulnerability of Indian agriculture. The domestic agriculture cannot able to provide required food for long term.

The fact that in North America the food has to travel approximately 200KM from the point of production to shelf of the stores. The agriculture system is totally depend on transportation which is unsustainable this in turn depend on petroleum industries. The prices of oil are fluctuation so as our agribusiness. The executive director of the generally optimistic international energy agency warned in April 2001 that “the age of cheap energy is over”. The countries like India and china are industrializing and adopting the use of automobiles, the ability to get fossil fuels out of the ground is decreasing. Texas discovered in 1901, oil was found just thousand feet underground today the most promising Tupi fields the oil is found beneath as much as 9000 ft of water, 10000 ft. of rock and 6000ft of salt. The renewable sources of energy like wind and solar has limitations because wind

turbine produce energy only when wind blows, solar panels work only when sun shine nuclear is constrained because of expenses and danger of dealing with its waste. [13]

“Urban agriculture as the— new frontier in public health,” offering two potential health benefits: first, more fresh fruits and vegetables for urbanites, and second, the exercise involved in food. [14].

If the people start observing how the food is grow that will change the attitude towards processed food and create awareness about fresh fruits and vegetables. If the people have more control over where their food comes from, it is critical form mitigating the food gaps that have woven into urban fabric.

6. Various Methods to achieve urban farming

6.1 Roof top agriculture

Rooftop agriculture can be categorized into extensive and intensive roof depending on the depth of planting medium and the amount of maintenance they need. Extensive green roof agriculture incorporates light weight substrates with depths ranging between 5to15cm this can be applied to grow herbs, vegetable with low root system like leafy greens. Intensive green roof agriculture the substrates deeper than 15cm, allowing them to grow much wider variety of edible crops. This type can with stand load between 200/1000kg/m².

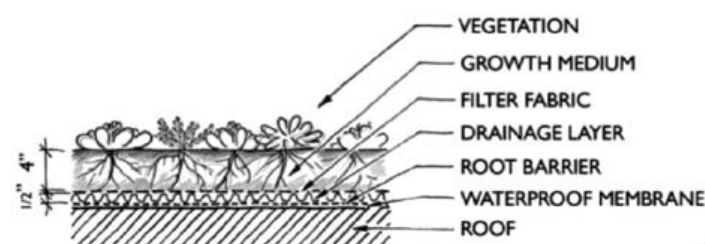


Figure 2: Cross section of an extensive green roof.
(Source: Green roof handbook)

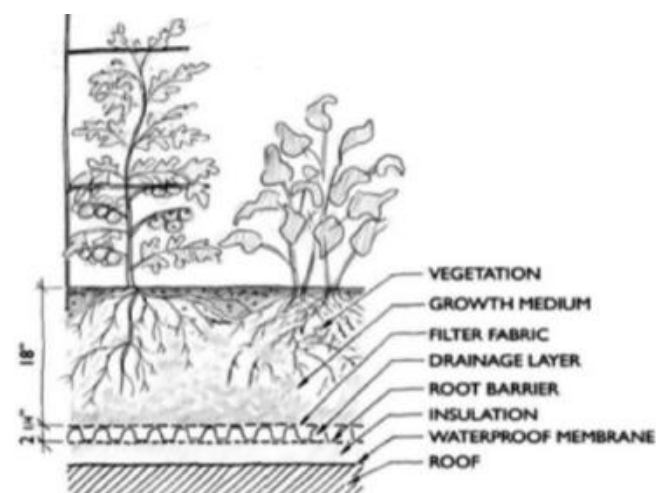


Figure 3: Cross section of an intensive green roof.
(Source: Green roof handbook)

6.2 Roof top Container garden:

Roof top container gardens are best suitable for small scale roof top residential gardens. Here one can choose to grow herbs, vegetables in the containers. It is easy to start initially one can start practicing with one or two containers and gradually can raise the number of containers but containers are vulnerable to temperature changes, soil dry out quickly and often require watering. Containers doesn't have fixed place it can be placed in balconies, steps, concrete sidewalk, or even hang from the roof. Containers is an excellent option where people doesn't want to make changes to the actual structure of the roof.



Figure 4: Containers of different sizes.
(Source: Balconygardenweb.com)

6.3 Roof top Container garden

These are built – in – place or prefabricated low - profile structures filled with soil, which provide more continuous growing space than containers. Raised bed production is ideal for roof top gardens for which a relatively simple installation. Compared to other growing methods, the growing are as are more permanent than a container garden, more light weight than a row farm and can grow almost any crop – including root vegetables like beets and carrots, and invasive perennials like strawberries. Raised beds, on the other hand come with a few restrictions these are heavy structures that requires careful planning and organization.



Figure 5: Raised beds, of old scaffold boards, to support A variety of vegetables (Source: <http://jardindesign.org/2013/09/07/Grass-roots-revolution>)

6.4 Row farming

Row farming are done in continuous beds which is fairly similar to conventional agriculture practices and is suitable for almost every climate. Row farming is applicable for large-scale crop production and mitigates high storm water management. This type of agriculture is more flexible where bed layouts can be rearranged when necessary and support most types of crop. The continuous beds allow water and microbial activity to move continuously without interruption. Crop rotation is also possible because of continuous beds where different types of crops are grown on the same row which builds up the soil over time.



Figure 6: Green roof row beds in full production.
(Source: The Spruce)

6.5 Hydroponics

The method of growing crops without the use of soil, but by use of an inert medium, such as gravel, sand, peat, vermiculite, pumice, or sawdust, to which is added a nutrient solution. The purest form of hydroponics is water culture, in which a plant's crown is supported by a thin layer of substrate, while its roots are immersed in a nutrient solution. This method well-suited to rooftops, since the containers used in hydroponics can be lighter-weight than soil-filled containers.

Plants require light, nutrients, carbon dioxide, water, heat, and fresh air. Soil typically provides plants with their necessary nutrients. As every landscape architect knows, nitrogen phosphorous and potassium (NPK) are the main limiting factors for plant growth . Although soil-based nutrients are often not in forms that are usable to plants.

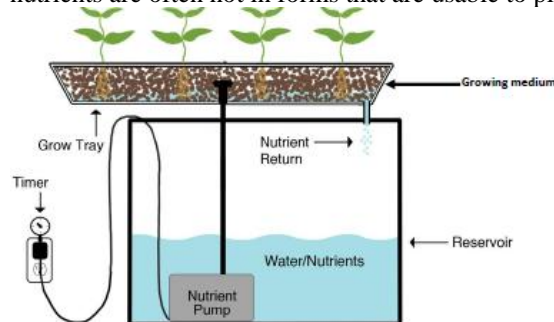


Figure 7: Flood-and-drain (ebb-and-flow) hydroponic growing system. (Source: <http://www.Syndicate-home-garden.com>)

7. Inference

The objective of the paper is to use a minimum of material. The materials of the tower favor the use of ecological,

recycled products or which can easily be recycled. The agricultural greenhouses act like a green lung in the heart of the tower. They favour the control of the solar contributions and the thermal regulation between north and south.

In winter, heat is stored in the solid elements of the concrete core. In summer, interior volumes are controlled hygrometry by the evaporation of the water contained in the plants. Black water produced by the tower is recycled and purified in order to feed and to fertilize the agricultural production of the greenhouses.

Greening and agriculture play an important role in building sustainable cities. It brings about many benefits to our environment. Although there are constraints and some limitations in growing food on roof tops, the benefits are much larger than the city food supply.

opted member for ISOLA Bangalore chapter managing committee team (2019-2021).

References

- [1] Dr.B.N.Viswanath Why urban farming . (journal style)
- [2] United Nations Development Programme (UNDP) 1996(annual report)
- [3] Urban Agriculture, common wealth organization, June 09 2008.
- [4] Evan George, The Urban Agriculture Movement: History and Current Trends, 2013.
- [5] Frank Ellis & James Sumberg, Food production, urban areas and policy responses, 1998.
- [6] Alternative urban futures: Planning for Sustainable future. 1994 (published Paper)
- [7] Al. Viljoen and Bohn, Continuous Productive Urban Landscape, 2005 (published Paper)
- [8] Sommers & Smit, Food production, urban areas and Policy responses 1998 (published Paper)
- [9] Brisbane City Council, High focus on food security and ensuring its residents (annual report)
- [10] E.D Dana, Soledas Vivas & J.F.M Poveda , Urban vegetation of Almería City —a contribution to urban ecology. 2002 (published Paper)
- [11] Cecil Konijnend &Michelle Gauthier, Food Urban Forestry for Multifunctional Urban Land Use. 2002 (published Paper)
- [12] THE RUAF FOUNDATION, Urban agriculture: what & why. (technical paper)
- [13] Austin troy, .The very hungry city urban energy efficiency and the economics fate of cities. (book)
- [14] Wayne Roberts, Toronto Food Policy Council. (annual report)
- [15] Cecil Konijnendijk
- [16] Michelle Gauthier ecology Cecil Konijnendijk Michelle Gauthie

Author Profile



Rashmi Paramesh received her B.Arch. and M Arch. Degrees from U.V.C.E in 2013 and School of planning and Architecture, New Delhi in 2016 respectively. She has been practicing as Landscape Architect since 2016. She is also a visiting faculty at U.V.C.E, Bangalore. She is a member of COA and ISOLA. She is also a Co-