



Urban Agriculture



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Address : AME Foundation
No. 204, 100 Feet Ring Road, 3rd Phase,
Banashankari 2nd Block, 3rd Stage,
Bangalore - 560 085, India
Tel: +91-080- 2669 9512, +91-080- 2669 9522
Fax: +91-080- 2669 9410
E-mail: leisaindia@yahoo.co.in

Leisa India

Chief Editor : T.M. Radha
Consultant Editor : K.V.S Prasad
Assistant Editor : B.M. Sanjana

EDITORIAL Team

This issue has been compiled by T.M. Radha and K.V.S. Prasad

ADMINISTRATION

G.G. Rukmini

SUBSCRIPTIONS

Contact: G.G. Rukmini

DESIGN AND LAYOUT

S Jayaraj, Chennai

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COVER PHOTO

Growing vegetables at home is gaining importance among urbanites.

(Photo: MANAGE)

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The editors have taken every care to ensure that the contents of this magazine are as accurate as possible. The authors have ultimate responsibility, however, for the content of individual articles.

The editors encourage readers to photocopy and circulate magazine articles.

Dear Readers

When we first conceived urban agriculture as a potential theme, we were aware of some known initiatives across country both in urban and peri urban areas. However, it was heartening to see the wonderful response - individual efforts; efforts galvanised by State support; social media enthusiasm in scaling up citizen's participation.

Urban agriculture started worldwide in response to a crisis - for example in geographies like Cuba, where every possible space was converted into food productive areas to deal with shortages. In some cities from developed economies it was conscious effort to recognising green spaces. In developing countries embarking on rapid urbanisation as a development approach, the result was spiralling concrete jungles and urban slums. However, few local Governments conscious of green lung spaces pursued suitable landscaping within cities. Similarly, some interventions were designed and implemented - to support rural livelihoods while arresting distress migration to unsustainable and choking cities.

The impetus came from eco conscious citizens movements to pursue growing and eating healthy. The concepts like food miles, healthy organic vegetables appealed to all which gave birth to pursuing hobbies like roof top gardening. etc and optimising use of limited spaces. An attempt has been made in this issue to show case a few examples

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The Editors

LEISA is about Low-External-Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about the optimal use of local resources and natural processes and, if necessary, the safe and efficient use of external inputs. It is about the empowerment of male and female farmers and the communities who seek to build their future on the bases of their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors, to improve agriculture and adapt it to changing needs and conditions. LEISA seeks to combine indigenous and scientific knowledge and to influence policy formulation to create a conducive environment for its further development. LEISA is a concept, an approach and a political message.

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AME Foundation promotes sustainable livelihoods through combining indigenous knowledge and innovative technologies for Low-External-Input natural resource management. Towards this objective, AME Foundation works with small and marginal farmers in the Deccan Plateau region by generating farming alternatives, enriching the knowledge base, training, linking development agencies and sharing experience.

AMEF is working closely with interested groups of farmers in clusters of villages, to enable them to generate and adopt alternative farming practices. These locations with enhanced visibility are utilised as learning situations for practitioners and promoters of eco-farming systems, which includes NGOs and NGO networks. www.amefound.org

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Leveraging the lessons learned

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The health conscious urbanites are moving towards growing their own food. Starting as a hobby, urban farming is evolving as a necessary means to address issues of food security, physical and emotional well being. This calls for improved access to information and intensive knowledge exchange through diverse and emerging media.

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Bringing food security to an educational campus

Deborah Dutta and Amrita B Hazra

Urban spaces can be innovatively used for food production. They can help city dwellers rethink their connection with food ecosystems and land in the process. Educational institutions provide a unique opportunity conducive to integrating food security as part of its curriculum as well as outreach activities. The IIT Gandhinagar organic farm is a testament to the possibilities of community-driven and locally supported farming in urban and peri-urban places.



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Urban Agriculture

With 50% of the Indian population expected to live in cities by 2050, there is a huge challenge of meeting the nutritional security and sanitation needs of the urban dwellers. There is a need to prevent further land use changes, unregulated construction activities, water wastage and pollution. Promoting green spaces through urban and peri-urban initiatives is a way out. At the aggregate level, access to land and water can play a critical role in promoting urban and peri-urban agriculture. However, the health conscious urbanites are moving towards growing their own food in limited spaces available like the rooftops, balconies and terraces. Urban home gardening, presently limited to private residential spaces, has a potential to address issues of food security, physical and emotional well being of citizens, when expanded.

The initiative of co creation of science and technology solutions over the green spaces in peri-urban areas of Gorakhpur city have paved an effective way out to improve food security of people, maintaining green space around the city and enhancing livelihoods for rural poor in urban –rural hinterland areas (Singh and Srivastava, p.15). The practices of climate resilient agricultural have helped in reducing input costs and boosting the net gains. It has also contributed to the enhanced livelihood security of vulnerable groups and ensured food security for the urban poor.

In heavily populated cities, where availability of land is a constraint, innovative approaches may be needed. For example, Mr. Verghese from Kerala set a successful example by practising vertical farming, thus addressing the issue of space constraint. Inspiring innovative structures and deep sense of recycling and reuse set this farmer innovator as a model to emulate for many aspiring urban gardeners (Archana Bhatt et al., p.12). Apart from these vertical gardening structures, Varghese is continuously thriving towards innovation and integration

at his farm. He also prepares bio fertilizers and nutrient amendments like Jeevamrutham, Beejamrutham, Fish Amino, etc

Growing your own food is no more a hobby, it is an integral part of life in ensuring a sustainable city. Urban youth like Mr. Rundan ventured into rooftop gardening, during the lockdown period. Having been successful in growing several types of vegetables, he feels that home gardening serves as a stress buster in cities like Bangalore that are facing increasing population and vehicular traffic, with an alarming increase in pollution. Also, a lot of kitchen waste is being recycled as organic manure, thus addressing the issue of ever increasing garbage in the city.

While urbanites are new to farming, there is hardly any support or extension system to cater to the knowledge needs of these growing urban farmers. Majority of urban farmers gain access to information and exchange knowledge exchange through diverse and emerging media (Vincent A and Saravanan Raj, p.25). Social media is playing a major role in bringing revolution in urban agriculture. A number of urban farmers depend on Youtube channels to gain knowledge on crop cultivation and management. Individual and innovative farmer like Mr. Varghese also started his own YouTube channel where he showcases details of his innovative practices in vegetable gardening (Archana Bhatt et al., p.12). Whatsapp groups are the most popular among the social media for knowledge exchange. Also there are a growing number of agri startups in urban agriculture, providing information and advisory services to urban practitioners in agriculture.

Expanding to community gardens

Urban spaces can be innovatively used for food production. Green urban spaces can help city dwellers too to rethink their connection with food ecosystems and

land in the process. From being in small private spaces, it is time to expand to the community level. Institutions, Gated communities, common places etc., provide a unique opportunity to grow food on a wider scale. (Dutta and Hazra, p.32)

Edible food gardens are hotspots for local biodiversity, and provide an experiential understanding of pollinators, pest-prey relationships, soil ecosystems and the interdependence of plant health and root microbial communities. For example, the IIT Gandhinagar organic farm is a testament to the possibilities of community-driven and locally supported farming in urban and peri-urban places (Dutta and Hazra, p.32). Such urban farm community spaces serve multiple purposes - they provide access to fresh food and the opportunity to children and adults alike to get their hands dirty while also playing a vital role in the first hand understanding of the delicate balances that sustain our ecosystem. From seed to farm to table, how food reaches us today is a nuanced lesson integrating the natural sciences, social sciences, economics, and business. Thus, finding ways to include urban farms as part of our community spaces and educational curricula is a worthwhile pursuit.

Supported by governmental intervention urban home gardening initiative has a potential to expand to address

the urban food supply chain. Both central and state governments have initiated a few interventions to create a favourable ecosystem for urban agriculture. For example, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aims to reuse the treated municipal wastewater for peri-urban agriculture and attract greater private investment in precision irrigation systems (Vincent A and Saravanan Raj, p.25). Similarly, Kerala government has initiated a vegetable development programme to involve their citizens to grow their foods by supplying grow bags, vegetable seedlings, etc at subsidised rates, enabling beneficiaries to set up an urban home garden at a cost as low as Rs.500 on the roof tops and balconies. (Anita Pinherio, p.6)

Urban agriculture has multiple benefits as seen from the various cases presented in this issue. It has scope to expand further, with better support of suitable and appropriate policies. Opportunities for promoting local food through training, value addition and better markets, and integrating urban agriculture in urban planning will go a long way in creating the required green spaces in urban areas.



Urban home gardening movement in Kerala

Role of social media collectives

Anita Pinheiro

Urban home gardening, limited to private residential spaces, has a potential to address the urban food supply chain, when expanded. In Kerala, urban home gardening, supported by governmental intervention and people's social media-based initiative has become a wider societal movement.

Light weight designed grow bags are used for rooftop garden



Kerala, a state with rural-urban continuum, is overcoming its geographical and spatial limitations in agricultural expansion through extending vegetable production from farms to home gardens in rural and urban areas. Since 2012, the state government of Kerala has made a huge hike in budget allocation for vegetable production in the state through ‘Vegetable Development Program’ (VDP). Urban home gardening received a vital place through allocation of nearly 10 percent of the total annual allocation for VDP. One of the key strategies was to extend vegetable production into otherwise unused spaces - households, schools, and other government and private institutions.

The support included subsidized (75% subsidy) distribution of grow bags planted with different vegetable seedlings, enabling beneficiaries to set up an urban home garden at a cost as low as Rs.500 on the roof tops and balconies. The light weight design of grow bags and use of coir pith in the potting mixture have contributed to reducing the weight of containers, thereby reducing fear of damage to the home roof structure. The government subsidy (ranging from 50%-75%) also supports various ecofriendly inputs like biocontrol agents and organic pesticides, water-saving technologies such as wick and drip irrigation, and domestic waste management units (pipe composts, portable biogas plants etc.) enabling recycling of the household wastes. The subsidized inputs were complemented by support of suitable institutional mechanisms - government research organizations for development of space-saving and resource-efficient cultivation methods; extension services by *Krishi Bhavans*; training programmes and establishment of urban agro-service centres for easy and affordable access of gardening inputs and technologies. Home garden vegetable production was also given a cultural dimension by linking it with the traditional festivals of *Onam* and *Vishu*.

Government provided subsidized eco-friendly inputs and created institutional mechanisms to support initiatives

People's response to the government interventions

The following observations are based on the review of various government documents, news reports, a household survey conducted in Thiruvananthapuram Corporation, and a questionnaire survey conducted among participants of a physical meet up organized in Thrissur by HOPE foundation across various FB-agriculture groups of Kerala.

The primary survey conducted in Thiruvananthapuram Corporation indicated that the government interventions have been instrumental for many urban residents to start home gardening. Besides reviving the traditional practice, with subsidy support, it was easier for the people to quickly adopt vegetable gardening in their households with low financial investment. Another major reason that sparked people's interest in home grown vegetables has been health concerns with regard to awareness on dangerous levels of harmful pesticide residues in commercially available vegetables including those sold as ‘organic’. The results brought out by Kerala Agriculture University since 2013 in the print and visual news media helped in building awareness. Memories of the endosulfan pesticide tragedy, increasing incidence of cancer rate alarmed the people to think about alternative options. In this context, home garden vegetable production adopting organic and agroecological approach seemed to be the best option.

Social media, particularly Facebook groups created in the vernacular language, Malayalam, have become a platform for popularisation of these home gardening practices in Kerala. Soon, home gardening in rural and urban areas became a social movement

Thus, in Kerala, the home garden movement picked up with awareness on agroecological options supported by government's Organic Agriculture Policy (2010) and supportive interventions for self-reliant vegetable production and adoption.

Building social media networks

Social media platform Facebook was used widely to create networks of interested people. Among the active Facebook (FB) based agriculture groups in Malayalam, more than ten focus primarily on home garden cultivation. While specific objectives of these collectives vary, most of these collectives share a common ground - building

Table1: List of FB agriculture groups with membership over 1 lakh

FB-group	Membership as on 31st January 2022	Year of formation
Krishi (Agriculture)	454743	2014
Nammude adukkalathottam (Our kitchen garden)	409613	2014
Krishibhoomi (Farmland)	391139	2014
Karshika vipani (Online Organic Agricultural Market)	153532	2014
Adukkalathottam (Kitchen garden)	137333	2016

a healthy eating practice through agroecology-based home garden cultivation of vegetables and fruits. Many of these collectives extend their support to both rural and urban home gardens, while being largely beneficial to the urban residents with space and resource constraints. However, there are also some FB groups that intend to cater primarily to the urban home gardeners. Some collectives focus primarily on providing a marketing space for sales by the gardeners themselves of home-grown surpluses. Until the onset of COVID-19 pandemic, many of these groups have organized annual in-person meet-ups to further strengthen the networks.

Learning from each other

One of the challenges many people faced, in the initial phase of starting home gardens was, lack of a support system that can rapidly respond to their gardening-related queries. Facebook groups evolved as a convenient option for many of them, as it did not affect their work hours. Another advantage is the availability of a multitude of experts, both trained agricultural personnel including scientists and expert home gardeners, to respond to their queries. These collectives quickly became a platform for learning from each other's knowledge and experience.

Queries related to almost all aspects of home gardening are posted on these groups and people get rapid response. Common discussions include agroecological methods, development of home-based remedies for crop management and innovative space-and resource saving methods of cultivation. Use of photos and videos of crops or gardening methods helped to get a better grasp of the topic. Field visits to well-established urban home gardeners have helped in learning innovative gardening practices and technologies. These collectives help newcomers immensely in gathering basics of gardening, less dependence on external inputs, adoption of less

expensive gardening and effective utilization of available space.

The upsurge of home gardening movement in urban areas triggered a platform for development of innovative technologies of practices for space-resource efficient home gardening. Many people who developed these technologies and practices freely shared their ideas through FB groups while others have found potential buyers of their technologies from these groups.

Fostering competitiveness and recognition

Before onset of COVID pandemic, many of the FB collectives were highly active in organizing competitions and challenges to encourage home gardening. These initiatives were varied. They all focused on fostering the momentum on encouraging innovative home garden practices maximizing cultivation of diverse vegetable varieties organically in limited spaces available. During the competition/challenge period, participants upload photos with description of vegetable cultivation from day one to final harvest. For some of the competitions, recognitions and awards were distributed during physical meet-ups.

To give it a festive fervor, these initiatives were held coinciding with the traditional festivals of Kerala especially, during *Onam*, the harvest festival of Kerala, so that people can have a safe-to-eat feast. Some of these competitions are named after the cultural connections of the state such as *sambar challenge*, *Onathinu oru muram pachakkari* (A Winnowful of Vegetables for *Onam*). These initiatives were either organized by the specific FB groups or across the FB agriculture groups by the interested parties.

One of the FB-based home gardening challenge named *Onathinu oru muram pachakkari* led by P.C. Harikumar in 2016, an agricultural officer with the state government, was later incorporated as the mainstream intervention. Being a rooftop gardener himself for over a decade, Harikumar realized the importance of boosting home garden production across Kerala. Accordingly, he prepared a proposal to the Government and successfully got it mainstreamed. The proposal was soon accepted and incorporated into the government interventions. (See Box 1)

Box 1: Onathinu oru muram pachakkari

Onathinu oru muram pachakkari challenge, organised across various FB agriculture groups, is the brainchild of P.C. Harikumar a.k.a Harikumar Mavelikkara. He encouraged people to plan for festive season ahead in order to be able to produce sufficient quantities of vegetables from their home garden.

In 2015, Harikumar posted this challenge *Onathinu oru muram pachakkari* on FB group, one month before the scheduled start of planting the seedlings. The plan was to start planting seedlings approximately 85-90 days before Onam so that adequate quantities of vegetables can be produced for the entire period of Onam celebrations. Once the challenge started, every week he posted tips and techniques of gardening, how to take care of vegetables etc. Throughout the period of cultivation, from planting to harvest, interested people shared photos of progress of their garden on a daily or weekly basis. In 2015, approximately 15000 families participated in this challenge, as Harikumar recalls. The challenge

was continued for three consecutive years across various FB platforms and in some years, similar challenge was taken up to meet extra vegetable requirements for Vishu festival season as well.

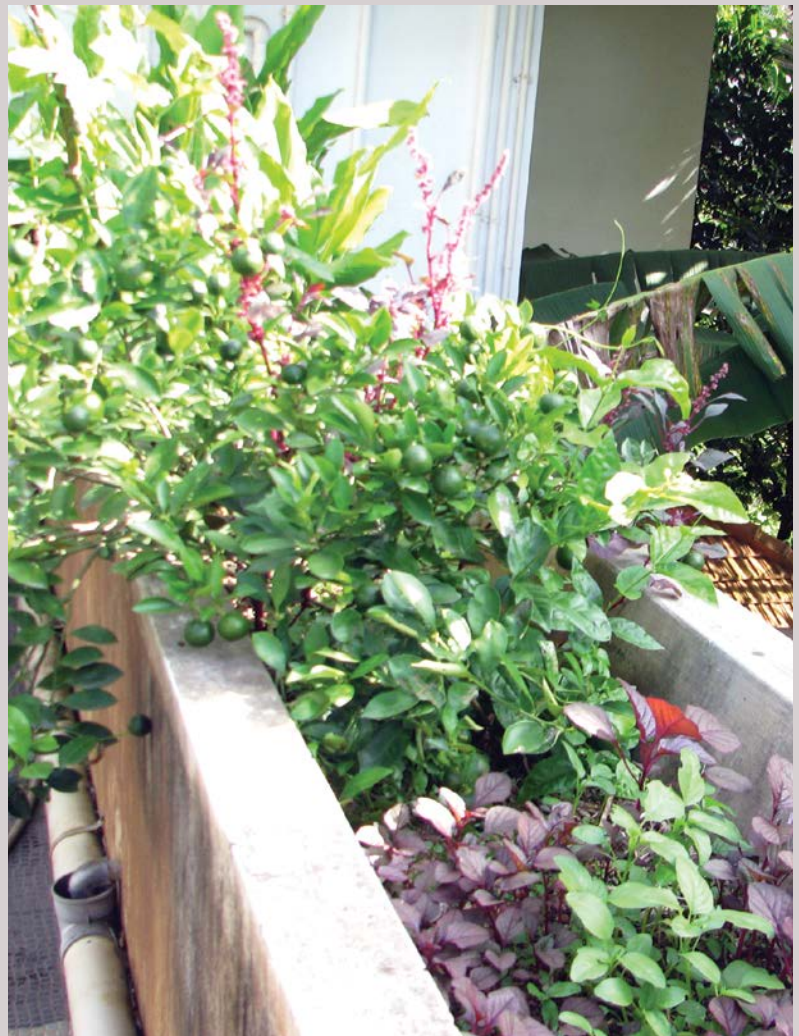
In 2016, to expand the challenge beyond social media, Harikumar prepared a proposal and discussed the idea with the minister at the FB meet-up in Thirssur. Later, in 2017, the state government introduced *Onathinu oru muram pachakkari* component under VDP, as a means of promotion of home garden vegetable production targeted at Onam festival season. In this special drive, assorted seed kits were distributed freely to school-going children, farmers, households, through media etc. Apart from seed kits, vegetable seedlings were also distributed at subsidised rates to households through Krishi Bhavans. The *Onathinu oru muram pachakkari* component is an ongoing component under VDP.

Source: <https://keralaagriculture.gov.in/wp-content/uploads/021/06/Final-VDP-2021-22-Working-Instructions.pdf>

Low cost vegetable gardens in urban households

Sharing and exchanging inputs

The FB collectives also fostered a culture of sharing and exchanging of gardening inputs, primarily seeds and seedlings. Many gardeners prefer traditional and local vegetable varieties that are not commonly available in the markets. The FB collectives facilitate preservation and dissemination of seeds of these varieties. Exchange and free distribution of seeds takes place throughout the year using the postal services. People with surplus seeds mention the list of available seeds on the FB groups and if someone wants the seeds, they send a stamped envelope within another envelope mentioning the name of seeds they need. This way, the person distributing the seeds does not incur any additional cost. Some of the collectives also maintain 'seed banks' so that people with surplus seeds can send it to the seed bank. Free exchange of seedlings and other inputs takes place mainly during the physical meet-ups. Many friendships developed owing to active interaction in these FB groups. The physical meet-ups create a great opportunity for strengthening the bonds and friendships through gifting and exchange.



FB based markets linking farmers and consumers

What if the home-gardeners want to sell their surplus harvest? In the early years of home gardening movement, especially when everyone was more interested in gifting the surplus, this question seemed to be a surprise to many, if not strange. The admins of the FB group named “കാർഷിക വിപണി Online Organic Agricultural Market” pursued this idea in Thrissur municipal corporation. A weekly Sunday market was started in a school premises in Thrissur city so that farmers, mostly home gardeners, can sell their products directly to the customers avoiding middlemen. Later on, they shifted the venue to a nearby club and the details of the available products with the respective farmers were posted on the FB group, every Saturday.

Nattuchantha - a niche market of organic produce was established. The weekly market called ‘*nattuchantha*’ entrusts upon selling completely organically grown produce from urban and peri-urban home gardens, while enabling ‘knowing the address of the farmer’.

The *nattuchantha* is organised by the FB group ‘Karshika Vipani Online Agriculture Market’ and the interested farmers contact the admins of this FB group to be able to sell their products through Sunday market/*nattuchantha*. If they succeed in passing the scrutiny process, they inform the group admins/organisers what products they will be bringing each time. The FB group admins cum organisers of *nattuchantha* display the details of vegetables/other products and respective farmers’ names every Saturday evening (except when Sunday market do not function due to COVID related restrictions) on the page of FB group ‘Karshika Vipani Online Agriculture Market’. This helps the interested members of the FB group in the locality to visit the Sunday market/*nattuchantha* for purchase.

The scrutiny process is however, stringent. Through discussions and field visits, the organisers of ‘*nattuchantha*’ make sure that only organic inputs are used for cultivation and no chemical pesticides are used along with organic inputs, as has been observed in some

Recycled cans for growing plants



instances. The products are considered reliable and can be tracked. In most instances, the producer, preferring to call themselves as farmers, sell their produce themselves enabling the customers to make a direct relation with the farmer. The '*nattuchantha*' provides an opportunity to earn extra income while creating and strengthening social bonding between the farmers and customers. Many of the farmers in this '*nattuchantha*' come from the borders or outskirts of the administrative city limits and therefore have relatively larger cultivation area than those from the core urban area. However, farmers can bring even small quantities of surplus produce, even 200 grams as has been witnessed by the author, a few years ago. When organic products are in huge demand and its reliability becomes a major concern, the Thrissur urban '*nattuchantha*' organized by the FB collective provides a platform that functions on the basis of trust, that can be verified. The major take-away from this initiative is its attempt to bring the independent initiatives of urban and peri-urban production into the larger fabric of urban food systems. Over the years, similar initiatives have been started in a few other district centers by other FB collectives. However, only a few of them have been successful to keep up the emphasis on complete organic production and 'know the customer' aspect.

Mathrubhumi daily, one of the oldest and most popular Malayalam daily has reported about the *nattuchantha* organised by the FB group Karshika Vipani Organic Agriculture Market in Thrissur. This created further momentum.

After the onset of pandemic, the number of farmers selling their products in this *nattuchantha* has been drastically reduced, from 15-20 farmers before COVID to 6-8, after it restarted after the lockdown. Although many farmers are expressing their interest to be part of the *nattuchantha*, many of these interested farmers are not able to pass the stringent scrutiny to ensure complete organic production methods. Moreover, the Sunday market organized by the FB group 'Karshika Vipani Online Agriculture Market' is an additional source of income and not a primary source of income for these farmers. This Sunday market/*nattuchantha* is still functioning at Banerjee memorial club, one of the oldest clubs of Thrissur. The only time(s) the Sunday market could not function was during lockdown period. However, during these periods, the farmers of

nattuchantha arranged home deliveries to a limited extent.

Only *nattuchantha* of the Facebook initiative functions on the principles of 'know your farmer' and complete organic production methods. Otherwise, many FB groups including 'Karshika Vipani Online Agriculture Market' permit the members to find customers (across India) through the posting in FB groups and admins do not take responsibility to ensure the quality of the products.

Challenges faced

Like any other arena, the involvement of FB collectives in urban home gardening was also affected by the Covid pandemic. Physical meet-ups came to an end, competitions and challenges have been halted, seed bank and seed sharing activities drastically reduced, and the '*nattuchantha*' has been stopped for over a year. Despite these challenges, the involvement of FB collectives reiterates the potential of social media in contributing to transition to sustainable agri-food systems while reviving traditional home garden practices.

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Anita Pinheiro

Adjunct Faculty, School of Global Affairs,
Dr. B.R Ambedkar University Delhi.
E-mail: anitapadiyoor@gmail.com
apinheiro@aud.ac.in

Creating new avenues in Vertical Gardening

Archana Bhatt, Vipindas P and Abdulla Habeeb

Inspiring innovative structures and deep sense of recycling and reuse set this farmer innovator as a model to emulate for many aspiring urban gardeners

Renowned Agricultural scientist, Dr. Rattan Lal in one of his talks, talked about how South Asia is considered as one of the hot spots of food insecurity as reported by various studies. It has also been reported that 57% or more of South Asian population cannot afford healthy diets. With an ever increasing population, the burden of food insecurity is rising every day, especially with the cities brimming with packed spaces. There is a dire need to adopt more resilient food systems, improve urban food supply chains, promote home gardening and urban agriculture. Urban home gardens offer a better microenvironment around the home besides providing healthy vegetables for home consumption. They can be grown by effectively utilizing limited spaces.

Mr. Varghese is a popular figure in the small town of Pulpally, Wayanad in Kerala. He has pioneered in the area of vertical gardening with his curious and enthusiastic mindset. Mr. Varghese, at the age of 60, besides being an innovative farmer is also a very humble human being. By utilizing the front and back yard of his house, he has successfully created unique functional models. He started experimenting in farming since twenty years after quitting his service as a radio mechanic. Currently, he is cultivating diverse crops like carrots, cabbage, potato, tapioca, fennel, strawberry, chilies, sweet potato through vertical gardening and other innovations. Mr. Varghese, initially had grown some ornamentals in his front yard. Having realized that they cannot provide food for his family, he decided to grow vegetables. He decided to develop systems which can be aesthetic, effective in space utilization, promote crop

Eco friendly low cost structures using betel nut wood



diversity, use wastes such as kitchen waste, dried leaves and paddy straw along with manure and soil for planting.

Vertical gardening structures

Mr. Varghese developed several innovative vertical gardening structures.

The GI net and PVC pipe structure system: This structure is primarily used to cultivate wide varieties of vegetables including carrots, cabbage, chillies, capsicum, brinjal, sweet potato and also strawberry in his front yard. Around 24 plants can be accommodated in one structure. The system is a cylindrical tower like a structure. It uses a fine sturdy fibre/cloth or shade net which is further covered by the GI net (2 inch gaps). This cylindrical structure is then layered and filled with plant growing media. At the bottom, either paddy straw waste or dried leaves are put to avoid water leakage. This is followed by putting kitchen waste with some soil and manure. Every layer is shoveled down to pack it tightly so that it remains compact. The structure also has a thin cylindrical pipe in the centre to supply water for irrigation purpose with holes at 3.5 inch distance. At present, Mr. Varghese is supplying water through drip irrigation at the top of various structures. Some zip ties are also attached for opening and closing the structure, so that it can be used for around 10-15 years.

Small PVC pipes are fitted at appropriate spacing to plant the vegetable seedlings. Extra pipe setting is provided for support later as the plants grow in size. Pipes are filled with a mixture of soil and organic manure (cow dung) along with neem cake. The mixture helps in easy absorption of water and nutrients to the plants.

One can even cultivate strawberry in this system efficiently, without attaching the PVC pipe. It is done by creating holes at adequate spacing and propagating the runner throughout the structure.

Mr. Varghese proudly affirms that the system allows effective utilization of space and also reduces the pest and disease incidence due to adequate spacing while weed management is also not required in this system since the system has optimum spacing for the crop only.

The betel nut wood structure system: Similar to the previous model, this system is an eco-friendly alternative and is also inexpensive. The cloth and GI net is replaced by betel nut (areca nut) wood and dried leaves. The

structure is developed through narrow wooden planks that are tied together to form a cylindrical shape which is then filled with straw, dried plant leaves on the side. Then in a similar manner, kitchen waste along with soil and organic manure, neem cake, etc., is filled inside. After the system is complete, holes are made on the surface where potato eyes (around 120 eyes can be planted in 10 towers) are planted for sprouting. This system allows good harvest of potato through lot of plants being accommodated in a single structure. On a timely basis, he also supplies the plants with organic manure, Jeevamrutham and neem cake for additional nutrition. Interestingly, Mr. Varghese also tried out integrating chillies and tomato in the same tower at different levels, successfully. He reflects that the good harvest of all the crops and the individual yields were not affected.

The PVC pipe structure system: A common structure of vertical gardening used by Mr. Varghese for growing crops like carrots, fennel, chillies, etc. is through the use of PVC pipes. A PVC pipe of 6 inch diameter is utilized for cultivation, cuts are made at appropriate spacing for sowing or planting. Cuts are pushed back or holes are made through a heated iron rod for making space for sowing or planting. Around 16 to 20 plants can be accommodated in the system. Extra support is provided through pipes as the plants grow in size. A central pipe (with multiple small outlets) is attached in the structure for irrigation either manually or through drip irrigation.

Mr. Varghese has been working on the PVC and GI system of vertical gardening for a while now. With the support of a welder, he recycles old PVC pipes and GI net as and when necessary. Based on the need, he also purchases new PVC pipes or GI net to construct the vertical gardening structure.

A praiseworthy point in all these systems is that the filling inside the structures can be reused for planting again by mixing it with vermi compost. The enriched filling can also be filled in *grow bags* and further crops can be cultivated. Thus, Mr. Varghese is efficiently operationalizing the principle of “Reduce-Reuse-Recycle” on his farm.

Bio-inputs preparation and future plans: Apart from these vertical gardening structures, Mr. Varghese is continuously thriving towards innovation and integration at his farm. He also prepares bio fertilizers and nutrient



Wide varieties of vegetables grown in vertically stacked layers

Innovative method to cultivate Tapioca

Apart from the general vertical gardening, Mr. Varghese has developed an innovative method to cultivate tapioca which allows him to harvest good quality tapioca with high productivity. His creative method gives tapioca tubers from three areas from a single plant. In this method, two additional soil layers are created apart from the ground root zone by placing grow bags on the layers and the main stem is allowed to pass through both the layers. In advance, small incisions are made on the stem part in contact with the soil in grow bags to facilitate rooting and tuber formation. Mr. Varghese proudly affirms that he gets good shaped tapioca tubers worth 25 kg from a single plant at three zones through this method. He is also innovatively cultivating vanilla in shade net and mint in plastic bottles.

amendments like Jeevamrutham, Beejamrutham, Fish Amino, etc. He is planning to set up a nursery near his house to sell seedlings at a remunerative price where he plans to sell vegetable surpluses, harvested from his vertical gardening structures. The nursery shed is already constructed and will be ready to go into business in the coming months. In the coming year, along with his family, Mr. Varghese plans to open his own nursery to provide various vegetable seedlings and planting material at a cheaper price to the farmers.

Sharing with others: He is part of various farmer groups and Whats App groups where he shares his knowledge and wisdom. He also serves as a resource person for training activity. With the help of his son, he has also started his own YouTube channel (<https://www.youtube.com/c/VARGHESEPULPALLY>) where he showcases details of his innovative practices in vegetable gardening. He told that he was not able to share his knowledge efficiently with everyone through calls and Whats App and that led him to make his own YouTube channel. Even at this age, Mr. Varghese is very passionate about farming and keenly learning new techniques serving as a big inspiration for fellow farmers and youth. He acknowledges the various media platforms that helped him being recognized, gain recognition and thrives to upscale his innovations and share with fellow farmers. He has many ideas to upscale his innovation but on account of fund constraints, he is unable to refine further his gardening system. He strongly believes that this vertical gardening system when up scaled can be a cost effective model for city dwellers.



Archana Bhatt

Scientist

Vipindas P

Development Coordinator

Abdulla Habeeb

Development Associate

MSSRF-Community Agrobiodiversity Centre

Wayanad, Kerala

E-mail: archanabhatt1991@gmail.com

Food and livelihood security in urban-rural hinterlands

Ajay Kumar Singh and Archana Srivastava

Peri-urban areas are not 'waiting rooms' for entry into urban areas. A fundamental change in mindsets is needed, to prevent further land-use changes and unregulated construction activities. The situation can be better managed by promoting and maintaining multifunctional green spaces and also peri-urban agriculture. The initiative of co-creation of science and technology solutions over the green spaces in peri-urban areas of Gorakhpur city has paved an effective way to improve food security of people, maintaining green spaces around the city and enhancing livelihoods for rural poor in urban-rural hinterland areas.

Peri-urban agriculture in Gorakhpur city of India represents a practical mechanism for diversifying urban livelihoods, particularly those of poor and marginalized communities, ensuring the availability of local food supplies, particularly vegetables and fruits and maintaining open areas that can serve as flood buffers. The land use pattern and ecosystem services in these areas are maintained to promote climate resilient peri-urban agriculture with innovative methods. This has resulted in securing livelihoods of small and marginal farmers, enhancing agricultural productivity and ensuring urban food security.

Unplanned urbanization and climate variability are two major impediments for sustainable development

of cities. The shrinking open space in urban areas and growing demand for shelter is creating pressure on the existing agricultural land, it is jeopardizing green spaces, interrupted the supply chain of vital food items to cities and affecting the traditional livelihood pattern of rural areas.

The present paper is an attempt to disseminate the innovative initiatives taken by the Gorakhpur Environmental Action Group (GEAG) under the project supported by the Core Support Project of the Department of Science and Technology, Government of India. In this project, GEAG seeks to mitigate flood and water logging risk of Gorakhpur city through maintaining green by strengthening peri-urban agriculture. The process also

demonstrates the importance of ecosystem services through resilient agriculture practice for addressing climate change impacts on the city.

Peri urban areas of Gorakhpur are densely populated. Intensive smallholder agriculture is the dominant norm. Marginal local farmers and poor city dwellers as well as, rural migrants live side by side and are engaged in agriculture. The peri-urban areas are important food production centres. That play a crucial role in supplying fresh and affordable food for growing urban populations. For poor peri-urban communities, agriculture is a key livelihood strategy meeting basic food produce and income requirements, as a source of employment e.g. as farm labourers. However, the challenges for producing safe and affordable food that preserves environmental integrity are immense.

Gorakhpur is considered the largest commercial centre in Trans Saryu region, with both retail and wholesale markets of commodities ranging from agricultural products to home based cottage industries. Historically,

The initiative has reduced migration by desperate farmers and has generated hope in farming.

the whole region new to experience low levels of flooding each year, during the summer monsoon (June–September). But during last few decades the haphazard urbanisation process and climatic variability (more rainfall in fewer days) has added new challenge to the existing vulnerabilities, in and around the city. The recent extreme events have raised the intensity and duration of floods and water logging in certain parts of the city.

The Initiative

GEAG is promoting innovative climate resilient agriculture practices in two villages of Jungle Koudiya Block, Gorakhpur, across 170 hectares of land in the peri



Box 1: Diversification: a less risky option

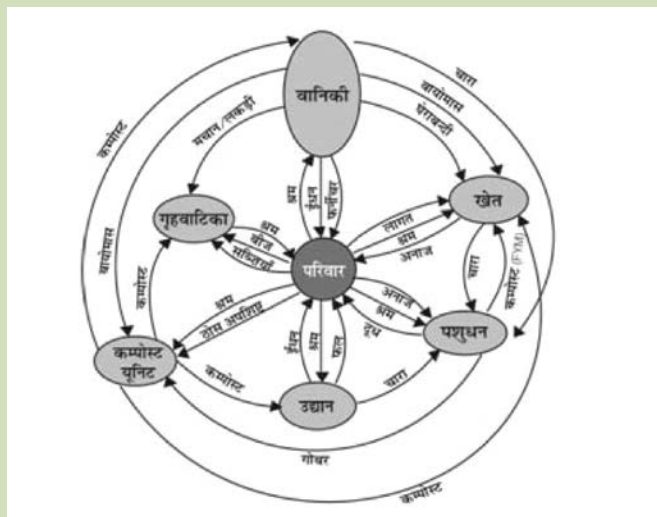
50 year old Sugreev Prasad, a farmer from Jindapur village, Block- Jungle Kaudia, Distt.- Gorakhpur, who traditionally grew only few types of crops on his one acre land. In 2019, he attended a training program on various agriculture related soft technologies and decided to change his approach to farming.

Today, Sugreev has moved beyond those few crops. His winter crop vegetables include peas, cauliflower, cabbage, radish, carrot, coriander, garlic, onion, spinach, potato, wheat, tomato, while the monsoon palette has beans, gourd, lady's finger and paddy. He prepared C.P.P and vermi compost, which combined with cattle manure gives him his own supply of organic manure. Besides this he makes chemical free pesticides for his crops and has developed a system for irrigation; all of which makes him self-sufficient. Sugreev is happy to experiment now and uses innovative techniques.

He explains, 'More income means, lesser loans taken. There is more to eat for the family.' Again he says, "With these efforts and linkages with technologies, I reduce the 42% market costs due to minimal external inputs. Before the linkages with project, we got net annual profit Rs. 10000-12000, but now our net annual profit is Rs. 65000. Today, his experience has enabled many others to adopt multiple vegetable farming techniques and almost 25% farmers in the vicinity have embraced these techniques on their own farms.

Growing diverse vegetables using farm organic manure creates self sufficiency

Fig. 1: Integration of diverse systems on the farm



urban parts of Jungle kodiya town, especially with small, marginal and woman farmers. The intervention under the Strengthening, Upscaling & Nurturing Innovations for Livelihood (SUNIL) programme, supported by the Department of Science and Technology, Government of India has co-created a process of enhancing net gains in farming for small and marginal farmers by evolving customised technologies in specific contexts of waterlogged area, silted area, upland area (with drought uncertainties), flood plains - catchment area, and peri urban areas.

Under the SUNIL Programme, GEAG has been promoting resilient agriculture in the peri urban areas since last three years (2018-2021). The initiative started with 2 small and marginal model farmers – Sugriv (Box 1) and Ramchandar (Box 2). It has now spread to 117 farmers who are following the model farmers.

The initiative represents a practical way of diversifying livelihoods for poor and marginalised communities, ensuring local food supplies, particularly vegetables and fruits and conserving open areas that serve as flood buffers. The process has helped the farming communities to become more robust and flood-resilient by minimizing the chances of losses. The farmers have also adopted recycling processes in farm sub systems, reducing the need for external inputs. Farmers use a range of practices including reducing external bio-inputs, growing appropriate crop varieties, employing space and time management, seed banking, land shaping and potable nursery systems.

The Initiative is based on the principle of integration of agriculture-horticulture-livestock system to enhance the diversity-complexity and recycling processes in the farming systems (fig.1). This is an established and adapted model of GEAG developed over the last three decades with the people. The unique feature of this model is its sustainability. It is designed on the basis of local conditions. The regions are prone to high floods. Hence, the farmers are regularly updated with short and medium term weather forecast through Mobile SMS.

Along with technical support in farming systems, the strategy is also to create a demand for climate resilient peri urban farming system among the vulnerable groups. While promoting an environmental policy to preserve the agricultural land of peri urban areas. In this process, emphasis has also been laid to institutionalize the community through model farmers and agro service centres. Together with jungle kaudia clusters, 16 model farmers and 4 agro service centers have been established.

Key components of peri urban farming

1. Establishing and disseminating resilient farming systems: The program established and disseminated resilient farming system with the underlying idea of “seeing is believing.”

2. Institution building The implementation of the bio inputs and climate resilient practices described above were further supported by the farmer field schools, Self help group agro-service centers, and farmer producer groups. The farmer field schools facilitated exchange of information among farmers and increased their confidence in implementing the newly learned practices. The agro-service centers provided agricultural equipment, such as diesel-powered water pumps, irrigation pipes, and materials for preparing nurseries and constructing poly houses, on a rental basis. These organizations have been crucial in supporting and facilitating both model and link farmers in the implementation of the climate-resilient production practices.

3. Establishment of linkages and networking with knowledge institutions: The project facilitated the establishment of linkages and connections between farmers and experts from different knowledge institutions like KVK, NABARD, IIT Kanpur and start-up companies. These linkages enable farmers to access to information from experts, subsidy schemes from

Box 2: Low Tunnel Poly House technology

Ram Chander, from village Jindapur, was not a farmer in true sense. He did grow wheat on his 0.6 acre field, but got very low returns, since the land was low lying and subject to water logging. His income came from a small shop that served as a means of livelihood for him and his family. He attended the monthly Agro Service Centre committee's meeting and other awareness meetings, but did not actively participate in its activities nor showed any interest until almost a year after the training.

What caught his interest was the Low Tunnel Poly House technology, particularly beneficial for low-lying area. This is based on a greenhouse technology that lets in light and sun, and prevents heat from escaping. However instead of glass these structures are made from a cheaper alternative, polythene or plastic. He builds such low tunnels on the higher reaches of his fields (bunds), with transparent coverings fixed over vegetable rows to help plant growth. Not only did he raise saplings for out of season vegetables but also reduced plant mortality. Today Ram Chandar has a vegetable nursery and sells seedlings and saplings to neighboring farmers. He has also

taught this technology to others farmers and helped twelve farmers set up these structures.

Ram Chandar says proudly, "Farmers come to me for a range of information relating to agriculture." Improved monetary benefits have enhanced his and his family's lives. From a very reluctant farmer, Ram Chandar has now become a proponent of LEISA, particularly the low tunnel poly house technology. He further says ' "After linkages with project, our net profit was Rs. 3500.00 per season, but now, we got annual output income is Rs. 6000.00." He believes that vegetable cultivation gives him more profit and better nutrition for his family, compared to the wheat he was growing earlier, even though the work now is more intensive. Innovative technology and the resulting benefits have reaffirmed Ram Chandar's faith in agriculture. He does not want to lose his land to urbanization and hopes that this will not happen at least in his or his children's lifetime. Now, more than 50 farmers adopted this technology for nursery growing and timely vegetable harvesting.

government and line departments. Farmers recognizing the importance of these linkages felt they felt better able to solve their own problems.

Programme impacts: Broadly the programme has achieved the following.

- Conserving agricultural land in peri-urban areas and paved model to enhance flood buffering capacity of the city.
- Establishing sustainable and climate-resilient models for agriculture-horticulture-livestock systems in marginal land holdings in peri-urban areas by promoting bio input support practices.
- Ensured food security of poor households and reduced distress migration.
- Reduced input use and enhanced net gains for smallholder and women farmers.
- Enhanced livelihood security of vulnerable groups in peri-urban areas and the food security of urban poor.

Conclusion

The Gorakhpur case has been a successful attempt to reduce migration by desperate farmers and has generated new hope in farming. The practices of climate resilient

agriculture has helped in reducing input costs and boosting the net gains. It has also contributed in enhanced livelihood security of vulnerable groups and ensured food security for the urban poor. There no doubt that if villagers are helped to improve farming, horticulture and animal husbandry in systematic way, the possibility of selling their valuable lands to builders will reduce open spaces and water bodies will be protected in their area.

Ajay Kumar Singh
Archana Srivastava
Gorakhpur Environmental Action Group
HIG - 1/4, Siddharthpuram
Taramandal Road
Gorakhpur-273 017
E-mail: geagindia@gmail.com

Urban farming for healthy life

Rundan V

Rapid urbanization, industrialization, land ceiling, construction of multi-storeyed buildings, wide roads, offices, markets have resulted in the non-availability of land for gardening work in big cities and towns. Ever-increasing population in cities and increasing vehicles have resulted in an alarming increase in pollution. There is a great need to break the monotony and provide relaxation for the tiring mind. Roof top gardening is an affordable option for the urban dwellers, providing several benefits.

Gardening is an age-old practice to produce healthy horticultural produce. Gardening in the backyard of the home can help to produce healthy and chemical free vegetables for our daily diet. But, in the urban areas where the land is a constraint, it's impossible to establish a garden. However, spaces like rooftops could be used to produce healthy vegetables.

Effective management of kitchen waste is one of the advantages of growing home gardens organically.

Terrace garden is diverse with various vegetable crops



Lockdown during June 2020 triggered the idea of rooftop gardening. Being an agriculture graduate with a passion for growing crops, I started my rooftop garden during the lockdown period. I started utilizing my terrace for cultivating vegetables, on a small scale initially and expanded gradually.

Setting up a rooftop garden

For the establishment of a rooftop garden we considered a number of criteria like the space available, containers to be used, plants to be grown, water availability etc. Defining the space available for terrace gardening is most important, since it helps us to plan the number of pots that can be occupied per unit area. The space was selected in such a way that plants get sufficient sunlight and water.

Next, we had to look upon the media for growing crops on the terrace. Numerous containers are available in the market for terrace gardening but it usually depends upon the type of vegetables grown. We selected UV stabilized LDPE bags that were lightweight with the dimension of 24 cm X 24 cm X 30 cm (LXBXH) and thickness of 150 Micron and 600 gauge. This size is suitable for most of the vegetable crops and can hold up to 18 kg of the potting mixture. This type of material has a life span of 4-5 years and it is also economical.

The pots were filled with soil, coco peat, and compost in a 1:1:1 ratio, to provide essential nutrients. To this, Trichoderma @ 1kg/100kg of mixture was added to help in controlling soil borne diseases. The mixture was filled up to 2/3rd of the bag.

A detailed planning was done during sowing, so as to get diverse vegetables on a regular basis for home consumption. The selection of vegetables was based on the prevailing season which helps to achieve its yield potential. Also it was based on the crops ability to grow quickly so that harvest can be made soon. The seed material was selected from certified companies and government institutes like IIHR, since they supply quality seed material which has a good yielding potential.

Box 1: List of vegetables for various seasons

Seasons	Vegetables
Kharif (June- end Oct.)	Eggplant, Tomato, Chilli, Okra, Dolichos bean, Cluster bean, Methi, Amaranthus, pole bean etc.
Rabi Oct. –March)	Radish, Palak, Dill, Coriander, Knol khol, Potato, Onion, Cabbage, Cauliflower, chenopodium, Beetroot, Peas, Broccoli etc.
Summer	All types of gourds, cucumber, melons, tomatoes, French beans etc.

A number of diverse vegetable varieties were grown in 60 bags. Around 50 – 60 grow bags are sufficient to produce vegetables for a small family of four to five members. Creeper vegetables such as pole beans; gourds

Vegetables produced on roof tops are fresh, nutritious and tastes good



Table 1: The Total Operational Cost of Cultivation and Total Income from Rooftop Gardening during the first year (01st June 2020 to 31st May 2021)

Particulars	Cost		Returns		
	Cost (Rs.)	Quantity	Yield (In Kgs/Cuttings)	Price (Rs.)	Returns
Polybag	1500/-	60	-	-	
Manure	750/-	300	-	-	
Tie	100/-	1	-	-	
Hand sprayer	200/-	1	-	-	
Biofertilizers	200/-	2	-	-	
Red soil	500/-	300	-	-	
Coco pit	900/-	300	-	-	
Irrigation	800/-	2 man-days	-	-	
Weeding	800/-	2 man-days	-	-	
Seeds of all the crop					
1. Beans(pole+ french)	165/-	300gm	30kg	60	1800/-
2. Coriander	30/-	100gm	10 cuttings	25	250/-
3. Palak	100/-	500gm	25 cuttings	15	375/-
4. Amaranthus	150/-	200gm	21cuttings	10	210/-
5. Rajgiri	70/-	100gm	22 cuttings	15	330/-
6. Menthi	60/-	250gm	20 cuttings	20	400/-
7. Tomato	260/-	10gm	20kg	30	600/-
8. Pudina	10/-	10 cuttings	10 cuttings	10	100/-
9. Bendi	48/-	150gm	12kg	45	540/-
10. Dolichos	20/-	100gm	6kg	100	600/-
11. Onion	60/-	25gm	5kg	50	250/-
12. Brinjal	200/-	25gm	15kg	40	600/-
13. Sabaske sopu	200/-	200gm	10 cuttings	15	150/-
14. Radish	50/-	50gm	20*20		400/-
15. Knol khol	50/-	50gm	15*45		675/-
16. Chillies	100/-	25gm	30kg*40		1200/-
Total	5223/-				8480/-

were placed in corners so that they get good support for creeping. Rest of the bags were placed based on the sunshine requirement (full sun, partial shade, and cool place). Inclusion of legume vegetables such as field beans, methi, peas, etc., helps to improve soil fertility through its symbiotic N fixation, besides providing vegetables.

The diverse crops were grown in the following way.

- 15 bags used for green leafy vegetables including Palak, Amaranthus, coriander, Dill, fenugreek, mint, Rajgiri, etc., depending upon the season.

- 20 bags for the cultivation of okra, brinjal, tomato, chili (5 bags each)
- 10 bags for pole beans and French bean
- 2 bags for Dolichos bean (spreading type)
- 8 bags for radish and Knol khol
- 5 bags for onions

Crop care

Every home generates organic waste daily which can be kitchen waste, dried leaves and residues. These wastes can be efficiently recycled. They can be used as feeding

material to worms to produce vermicompost. Also, this kitchen waste can also act as mulch for chilly, eggplant, tomatoes, and okra. Daily waste is dumped as mulch in these crops. After partial decomposition, this waste is filled into a vermicompost bin, above the layer of cow dung slurry, which enhances the performance of worms in composting. The vermi-compost bin should be placed in a shady place where rainwater does not directly enter the bin. After 2-3 months, this bin is emptied and used as vermicast. Also, vermiwash, a kind of liquid manure which is collected from the outlet of the bin is used to spray @ 10% rate which acts as growth promoter apart from supplying nutrients to plants.

Besides vermicompost, FYM and compost can be used after each crop. Wood ash is an excellent source of lime and potash for garden. It is mixed along with compost in small proportion and applied to growing crops.

In terrace garden, we always rely upon organic inputs, so pest and disease is very common. However, owing to plant diversity, there is less incidence of pest and disease damage. For example, leaf curl in chilli, white fly in beans - this problem is solved by using botanicals (Box 2) and natural control of pest and diseases by predators and parasitoids. Timely sowing of vegetables helps to avoid pest attack. We do not use any pesticides.

Harvesting benefits

Planning during sowing ensured a flow of vegetable harvests for a long period of time. My terrace garden is diverse with various vegetable crops for example: all leafy vegetable come to harvest once in 30 days but subsequent cutting come within 15 days. Beans starts bearing after 50 days onwards and harvested in 2-3 days' intervals. Other vegetables come to harvest based on its duration and produce vegetable for at least one month.

The yield level is as good as the field grown crop, owing to intensive care. Also, the vegetables are fresh and nutritious and tastes good, compared to market produce. The vegetables produced are being used for home consumption. Excess vegetables are shared among the neighbours.

The costs and returns have been worked out. The total cost of setting up rooftop garden and producing vegetables on the rooftop over a period of one year, amounted to Rs.5223. This included all the operational

Box 2: Botanicals - Some examples

Neem leaf extract: 250 gm of neem leaf is soaked in a half-liter of water. Cover the mouth with cloth and ferment for 3 days-this can be used after dilution by 10 times helps to control sucking pests.

Sour buttermilk: Spraying sour buttermilk after dilution help in the control of some fungal disease in plants.

Wood ash: Wood ash is dusted to Brinjal, gourds, and for okra to control some of the pests such as armyworm, aphids, cucumber beetle, etc. due to its anti-feeding property.

costs categorized under different headings as given in Table 1. The value of vegetables produced is around Rs. 8480, which proves that growing vegetables on the roof top is a profitable venture.

Rooftop gardening has many other benefits such as minimizing the side effects on health, utilization of leisure time and space and production of healthy food. Effective management of kitchen waste is one of the important advantages of growing home gardens organically. Also it acts as a stress buster for those who work in the urban areas.

Having gained practical experience in roof top gardening, I have started training people in my locality to practise gardening for a healthy life. In future, I plan to start a terrace gardening consultancy in Bangalore.

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Rundan V

Ph.D. Scholar, Department of Agronomy
University of Agricultural Sciences, Dharwad.
E-mail: rundangowda10@gmail.com

Budget 2022: Nirmala Sitharaman announces major impetus for agriculture and farm sector

Finance Minister Nirmala Sitharaman has made significant announcements for the agriculture sector in the Union Budget 2022. Further, she added that Rs 2.37 lakh crores will be the direct payment of Minimum Support Price (MSP) value to their accounts. Further, a completely paperless, e-bill system will be launched by ministries for procurement. Railways will develop new products for small farmers and MSMEs, the Minister added.

Announcing the setting up of a fund with blended capital raised under co-investment model to be facilitated through NABARD to finance start-ups in agriculture and rural enterprises for farm produce value chain, she added that the States will be encouraged to revise syllabi of agricultural universities to meet needs of natural, zero-budget and organic farming, modern-day agriculture.

To drive a wave of technology in the agriculture and farming sector, the Finance Minister said that the government will deploy 'Kisan Drones' for crop assessments, land records and spraying of insecticides and nutrients.

Nourishing cities through urban agriculture

During the Covid-19 lockdown, people from a fortunate section were able to engage in nurturing their home gardens, producing supplies for home and neighbours. These gardens, which are part of the broader concept of 'urban agriculture' (UA), can provide uninterrupted supplies to city dwellers during crisis situations like the pandemic. In urban India, public spaces generally carry ornamental vegetation. There is opportunity to create edible landscapes and green infrastructure.

Professionals such as urban planners and landscape architects need to effectively utilise public spaces and offer citizens an opportunity to enjoy nature's bounty. To begin with, public institutions and work spaces, especially those with residential services, could be encouraged to create green corners in their premises by growing vegetation that are regularly consumed by the residents.

The year 2022-23 has been announced as International Year of Millets, she also announced that a rationalised scheme will be brought in to increase domestic oilseed production will be brought in to cut down imports. Emphasising the Modi government's thrust on modern-day agriculture and organic farming, she added that chemical-free natural farming will be promoted throughout the country with a focus on farmers' land in 5 km wide corridors along the river Ganga, in the first stage.

Over the subject of irrigation, the Minister announced various river-linking projects including the implementation of the Ken-Betwa link worth Rs 44,605 crore will be taken up to provide irrigation to over 9 lakh hectares of farmers' land.

Source: <https://www.timesnownews.com/business-economy/budget-2022-nirmala-sitharaman-announces-major-impetus-for-agriculture-and-farm-sector-article-89263832>

The community of small producers exchange ecological knowledge and barter produce making such initiatives successful, to city-raised children such spaces provide avenues for eco-cultural learning. It used to be a practice in government schools in Tamil Nadu where a corner of the school would be used for growing green supplies for children's mid-day meal. However, there is little offered for inclusion of agriculture in city plans, though, UA and vertical farming are mentioned as one of the climate mitigation and adaptation measures. Green India Mission is one of the eight missions under the National Action Plan on Climate Change aiming to increase the forest and tree cover, restore degraded lands and promote agro-forestry in cities.

Other corresponding missions on agriculture, sustainable habitat and water if worked in tandem with the goal of UA, have potential to enhance urban resilience. Although the pandemic has brought disruption and uncertainty,

never before has there been such mass awareness about health, hygiene and building immunity through clean air and water or consuming fresh, organic food.

It is an appropriate time to introspect and transform the way we produce and consume. Apart from governments, citizens and professionals from the field of architecture,

Understanding Peri-Urban Agriculture

A huge number of millions of individuals, 30-40 percent live in urban communities and is expected to increase by around 60% in 2050. Many people migrate to cities in search of economic activity or for pursuing other interests but are unable to do because of high living costs in city areas. The population movement and concentration of population is triggered by economic reasons or by land speculation. This led to the occurrence of changes and increases in peri-urban (or peripheral urban) areas. Peri-urban areas are the dynamic interface between our cities and rural areas. These regions usually comprise a mix of urban and rural uses, such as residential dwellings (often on large 'rural lifestyle' blocks), small-to-medium-scale agriculture, as well as the occasional town center, often concentrated around a transport hub.

The concept of peri-urban agriculture has become prevalent as a result of limitations in the dichotomy between rural and urban areas. Historically, rural and urban land have been viewed as two separate economic systems with few interactions and often these arguments

Promoting roots, tubers for sustainable agriculture and health

A two-day tubers and roots mela was organized with experts underlining their benefits to fortify and build up immunity. Organised by Sahaja Samrudha, an NGO promoting sustainable agriculture, and Rotary Club of Mysuru West, the mela being held was inaugurated by G. Hemantha Kumar, Vice-Chancellor, University of Mysore.

He said, "India was a land of diverse cultures that encapsulated even dietary practices, given the range of cuisines across the country. Tubers and roots constituted an important component of indigenous food and culture and it should regain its pride of place. He also said that the University of Mysore will sign an MoU with the Sahaja Samrudha to conduct at least two melas promoting tubers and roots involving the Department of Botany every year. This will give an impetus to the cultivators and help revive inclusion of tubers and roots in one's diet".

planning, agriculture, social sciences and private developers need to cross-learn and co-create productive green urbanism for a resilient future.

Source: <https://www.thehindubusinessline.com/opinion/nourishing-cities-through-urban-agriculture/article36166592.ece>

refer to the disappearance and urbanization of rural-urban land. Peri-urban farming more often consists of units close to town which operate intensive semi-or fully commercial farms to grow vegetables and other horticulture, raise chickens and other livestock, and produce milk and eggs.

Urban food security is becoming a matter of increasing concern. Urban poverty is reflected in the nutritional status of people. With the emphasis on peri urban agriculture, the positive contribution that production closer to the cities can make has been hardly acknowledged. As the population of our world grows, sustainability is key, and preserving such highly valuable farming areas is a step in that direction. With the steady growth of urbanization, we can increase global sustainability in rural and urban areas to efficiently utilize resources through peri-urban agriculture.

Source: <https://www.dailyexcelsior.com/understanding-peri-urban-agriculture/>

Krishnaprasad of Sahaja Samrudha said "Roots and tubers were naturally available in Western Ghats and areas surrounding Bandipur and Nagarhole and tribals including Soligas and Jenu Kurubas knew their importance. Some of the species grows even in arid conditions and progressive farmers among the tribals were now taking up their extraction and even promotion in a big way.

Jenu Kuruba, Betta Kuruba, Soliga, Irula, and Kunabi tribes are participating in the mela along with their tuber collection while about 20 farmers' groups have displayed a variety of tubers and tuber-based food items after value addition.

Source : <https://www.thehindu.com/news/national/karnataka/promoting-roots-tubers-for-sustainable-agriculture-and-health/article38419202.ece>

Knowledge management for urban agriculture

Leveraging the lessons learned

Vincent A and Saravanan Raj

The health conscious urbanites are moving towards growing their own food. Starting as a hobby, urban farming is evolving as a necessary means to address issues of food security, physical and emotional well being. This calls for improved access to information and intensive knowledge exchange through diverse and emerging media.

Urbanisation is no longer a buzzword. According to the World Bank Report, about 56.15 per cent (4.35 billion) of the people live in urban areas globally in 2020. It is projected to increase by 60% in 2030. Urbanisation is a positive force for change as it creates education, employment and livelihood opportunities. However, the rapid urban growth poses increased challenges in terms of a congested space, pollution, declining supply of good drinking water, urban heat island effect, occurrence of new diseases, increased poverty, malnutrition, high cost of living, raising crimes, rise in environmental crisis, etc. Of all the major challenges, food insecurity is becoming a major concern in urban areas, particularly to the urban poor. Transporting required food items from rural areas to feed the urbanites is becoming another challenge due to declining farm areas, increasing population, increasing risks of climate change, marketing, increased price of essential food items including perishables.

Urban agriculture is proven to contribute to minimising the above challenges. Therefore, there is an urgent need for the urbanites to grow their own food to develop sustainable and responsive cities with enhanced livelihoods.

Retired people in urban areas start growing vegetables as a hobby



Nearly 100–200 million urban farmers worldwide provide the city markets with fresh horticultural goods (Orsini *et al.* 2013). Particularly, growing own food will help in overcoming food supply chain challenges during the situation like lockdown resulting from a pandemic (COVID-19). There is a growing interest among the researchers, academics, policymakers, etc., to explore the information sources that serve as a fulcrum for urbanites to acquire knowledge on urban farming and best urban agricultural practices.

Against this background, a study was conducted to find out the information sources for urbanites to grow their own food crops by the Centre for Agricultural Extension Innovations, Reforms, and Agripreneurship (CAEIRA), National Institute of Agricultural Extension Management (MANAGE). The study has surveyed 25 urban practitioners both in Hyderabad and Secunderabad.

What crops do urbanites grow and how?

Farming is practised in rural areas and farm land is the area where crops are grown. However, in urban areas, the crops are grown on the rooftop using buckets/plastic drums/mineral water canes or gunny bags or any other plastic material filled with soil and other nutrient content. Also, the urbanites with backyards have preferred to grow crops such as vegetables and leafy vegetables in the backyard and the wastewater from the household is used for irrigation. Balcony gardening is also gaining importance among the urbanites in the cities of both Hyderabad and Secunderabad.

Information Providers

The findings of the study show that most of the practitioners were educated and elderly and belonged to the middle and upper-middle classes. Often, the crops are maintained by the womenfolk and retired professionals. Most of these practitioners are who got motivated to practice urban farming mostly as a hobby.

Urbanites have limited access to a formalized extension system for their information needs. They follow a set of principles in growing crops right from method of producing crops, selecting growth media and culture, sourcing seeds, applying manure, managing irrigation and drainage as well as controlling pests and diseases. Therefore, understanding their information sources in practising agriculture is vital.

Extension service support for urban agriculture

Every city is establishing an urban agriculture wing to create awareness and provide Extension Support Services. The Government of Telangana state has established an Urban Farming Division (UFD) in Horticulture Department. This division organises a series of trainings and meetings at various locations of Hyderabad to create awareness on urban agriculture. It also supplies Urban Farming Kit (UFK) containing Silpaulin and bags of 1 cu. ft. with vegetable seeds and nutrients at a subsidised cost. This has motivated several urbanites to grow plants as they have access to information related to cultivation practices. UFD also advertises the importance of UFK through dailies, television channels and the programmes of local radio.

Social Media

a) Youtube channels – A virtual farm experience

Seeing is believing. Though the urban practitioners do not have the luxury of going to farm fields and gaining experience in the cultivation of crops, they view the videos on production management of crops uploaded on YouTube Channels. This has enabled them to get an insight into production management. The YouTube Channels which are popular among the urbanites of Hyderabad and Secunderabad are given in the Table 1.

b) WhatsApp groups

Majority of the practitioners are using WhatsApp for communicating the information related to crop production, pest and disease management. For example, at Sainikpuri in Secunderabad, more than 15 residents are growing vegetables. Though they are all from different professions and cultures, to overcome the information lacuna in growing vegetables, they have created a WhatsApp group (*Sainikpuri Garden Club*) involving all the practitioners. The members of the group shares information on the production practices of various crops of vegetables, greens and fruits. Moreover, they post pictures of the crops affected with pests and diseases in the group and if any of them know the management practices, they respond to it immediately. The Sainikpuri Garden club also shares event information like exhibitions, training, meetings and other similar activities organized on urban agriculture.

Table. 1. YouTube Channels for urban agriculture

Name of the Channels	Why it is important to urban agriculture
eTV Abhiruchi (https://www.youtube.com/c/etvabhiruchi)	It is a famous Telugu YouTube channel and has a subscription base of 701 K. It mostly focuses on the kitchen recipe of different Telangana and Andhra Pradesh cuisines. Besides, it features the best practices of successful kitchen gardens in Hyderabad and Secunderabad. The successful practitioners' urban agriculture is documented and uploaded in the Channel for the benefit of urbanites. Therefore, the urbanites who need information related to urban agriculture can search in the search box provided in the channel and gain knowledge eg., Rooftop gardening.
Nature's voice (https://www.youtube.com/c/NaturesVoice)	It is a Telugu YouTube channel. It has a subscription rate of more than 153k. Several videos on organic farming practices and successful cases of urban agriculture are uploaded.
Gardens of abundance (https://www.youtube.com/c/GardensofAbundance)	It is the English language based YouTube Channel that uploads videos related to urban farms which are based on permaculture. It features the successful urban agriculture models of rooftops, balconies, terraces, backyards and so on. It has 5.32 K subscribers as on February 2022.
Kitchen Gardening (https://www.youtube.com/user/greatizhar6)	It posts videos related to basics on the know-how of soil, compost, pot preparation for urban farming and how to grow and manage vegetable crops. The total subscribers of Kitchen Garden was 1.03 million as on February 2022.

This can bring revolution to urban agriculture. There are possibilities that there would be more such WhatsApp groups among urban practitioners. There is a need to identify them.

c) Facebook – An unlimited source of knowledge for urban agriculture

Most of the practitioners in Hyderabad and Secunderabad are accessing information from “intipanta – organic kitchen/terrace gardening (<https://goo.gl/dr7qPh>)”, a Facebook-based urban agriculture group. The membership of the Facebook group is over 40,000 and this group shares the information, photos and videos related to organic urban agriculture. Members share the photos of the plants infected with the pest and disease, to get a response on organic control measures from other members. Also, the members share the procedures of preparation of bio and organic pesticides and manures like bio-enzymatic cleansers. Besides, the demonstrations conducted elsewhere are shared on this group, to inform the members who were not able to attend the demonstrations.

Oota from your Thota (<https://www.facebook.com/ofyt.org>) is a Facebook-based page and it serves as a one-stop shop on organic urban agriculture and brings together the organic farming related enterprises onto one platform. More than 15k people follow the page of Oota from your Thota.

Some practitioners have created a page in the Facebook. For example, Mrs. Vijayalaxmi from Sainikpuri, Secunderabd has created her own page in the Facebook i.e. MyediblegardenIndia to share and sell the products for practicing urban agriculture. This page is followed by nearly 1400 people. Mrs. Vijayalaxmi shares the best urban agriculture practices and innovative urban farming models on her page and also shares the related videos of urban agriculture sourced from Internet. The interested urbanites who want to grow vegetables or other nutri crops in their households can be benefited MyediblegardenIndia. More can be seen using the URL <https://www.facebook.com/MyEdibleGardenIndia>

d) Magazines and Websites

Beyond social media, there are several digital magazines and websites devoted to Urban farming which serve as sources of information. For eg., Garden Culture magazine, Urban Agriculture magazine, Urban Farming magazine, Urban Kisan are some of them.

Growing your own food is no more a hobby, it is an integral part of life in ensuring a sustainable city.

Emerging Agri startups on urban agriculture

There are a growing number of agri startups in urban agriculture. They provide information and advisory services to urban practitioners in agriculture. For example, Living Greens Organic Pvt.Ltd., founded by Mr Prateek Tiwari provides information on organic management of vegetables, fruits on the rooftop, backyard, schools and office surroundings and inspire the city dwellers to go grow their food crops on available spaces. Similarly, Mr Sai Krishna Pokuri, co-founder of an urban agricultural start-up namely Home Crops, provides information on edible gardens and cultivation practices. Further, Home Crops supplies seeds, organic fertilisers and pesticides for promoting urban agriculture. The other emerging start-ups on urban agriculture include Growing Greens, a Bangalore based startup found by Ms Hamsa V and Mr Nitin Sagi, Urban Fate Farms (UGF) found by Linesh Pillai, Homecrop, a Hyderabad based startup etc.

Schemes and programmes for promoting urban agriculture

There are no specific schemes for promoting urban agriculture. However, both central and state governments have initiated a few interventions to create a favourable ecosystem for urban agriculture. For example, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aims to reuse the treated municipal wastewater for peri-urban agriculture and attract greater private investment in precision irrigation systems. Vegetable Garden Kit initiative of the Department of Horticulture and Plantation Crops in Tamil Nadu is providing vegetable garden kits at subsidised cost to urban dwellers. This initiative is popularly known as the 'Do It Yourself'(DIY) Kit. Kerala being the consumer state has initiated a vegetable development programme to involve their citizens to grow their foods by supplying grow bags, vegetable seedlings, etc to cultivate vegetables on homestead and terraces. Likewise, most of the states are providing a

Urban growers share their experiences through social media



subsidised urban farming kit to encourage citizens to grow their own foods.

Center for Gender in Agriculture, Nutritional Security and Urban Agriculture

Considering the importance of urban agriculture in ensuring food and nutritional security, MANAGE has established a Center for Gender in Agriculture, Nutritional Security and Urban Agriculture. This centre provides a series of capacity development programmes to the stakeholders who are promoting urban agriculture. Also, it documents the good practices of urban agriculture, innovations and good models and disseminates to the practitioners. The e-book and a discussion paper on Urban farming are good information sources for practitioners. Further, the centre has developed a Model Vegetable Garden (7m X 7m) at MANAGE. It helps the centre to create awareness about the possibility of growing vegetables in urban areas to the trainee visiting MANAGE and the general public from various parts of the country.

Impact and Way forward

Urban agriculture has impacted the lives of urbanites in many ways. As urbanites are health conscious due to changing lifestyles and food habits, they seek information related to organic amendments for the production of vegetables and other food crops. Practising agriculture serves as a stress buster and reduces blood pressure and diabetes at a perceivable level among the practitioners.

The study found that considerable efforts are taken by central and state governments to promote urban agriculture. However, new media, social media and agri startups serve as the most important information sources of urban agriculture.

Considering the importance of practising urban farming, there is a need for promoting community gardens on common lands, wherever possible. For this, the efforts of UFD or the Department of Horticulture have to be complemented by City Corporation, Greater Hyderabad Municipal Corporation (GHMC) in the case of Hyderabad. Inculcating knowledge among school children about practising farming through school gardens will elicit their interest in agriculture.

There is also a need for the identification of farmers who have migrated from villages to cities and utilisation of

their expertise for promoting community gardens. They may be supplied with free urban farming kits along with seeds as part of an urban agriculture initiative. There is also a need for intensification of urban extension advisory services to persuade the city populace towards the importance of growing own food.

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Vincent A

Consultant

Centre for Climate Change and Adaptation (CCA)

National Institute of Agricultural Extension Management (MANAGE)

Rajendranagar, Hyderabad, Telangana, India

E-mail: vincentvinil15@gmail.com

Saravanan Raj

Director (Agricultural Extension)

National Institute of Agricultural Extension Management (MANAGE)

Rajendranagar, Hyderabad, Telangana, India

E-mail: saravanan.raj@manage.gov.in

saravananraj@hotmail.com



Sustainable Agriculture for Food Security: A Global Perspective

Acharya Balkrishna, 2021, *Apple Academic Press Incorporated*, 384 p., ISBN 9781774637562

Sustainable Agriculture for Food Security: A Global Perspective takes an analytical approach to issues related to current agricultural practices. It looks at global geographical data and key statistical reports to aid readers in comparing, understanding, and making agricultural decisions.

The book is divided into chapters with each dealing with a specific problem and its solutions, keeping in mind the context of geographical variations. The book first provides a historical overview of the socioeconomic importance of agriculture around the world along with a discussion on threats and opportunities in the agricultural sector. It goes on to explore the importance of water sources for agriculture, including rain-fed agriculture practices, water harvesting techniques, sustainable irrigation practices, and irrigation water management. Guidance on the usage of agrochemicals and solutions to their detrimental effects from non-standardized consumption is also addressed. The volume also includes a discussion on organic farming methods, certification standards, and key restrictions in crop production.

Phytomicrobiome Interactions and Sustainable Agriculture

Amit Verma, Jitendra Kumar Saini, Harikesh Bahadur Singh, Abd El-Latif Hesham John Wiley & Sons, 2021 - Science - 320 pages

Phytomicrobiome Interactions and Sustainable Agriculture offers an essential guide to the importance of 'Phytomicrobiome' and explores its various components. The authors – noted experts on the topic explore the key benefits of plant development such as nutrient availability, amelioration of stress and defense to plant disease. Throughout the book, the authors introduce and classify the corresponding Phytomicrobiome components and then present a detailed discussion related to its effect on plant development: controlling factors of this biome, its behaviour under the prevailing climate change condition and beneficial effects.

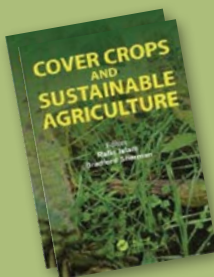
The book covers the newly emerging technical concept of Phytomicrobiome engineering, which is an advanced concept to sustain agricultural productivity in recent climatic scenario. The text is filled with comprehensive, cutting edge data, making it possible to access this ever-growing wealth of information.

Cover Crops and Sustainable Agriculture

Rafiq Islam, Bradford Sherman, 2021 *Routledge.*, ebook £38.24, Hard back-£140.00, ISBN 9781032034409

This book will not serve as the “encyclopedia of cover crop management,” but it’s close. The benefits of a wide range of individual cover crops and blends/mixes for specific agronomic crop rotations and geographic locations are included. Descriptions, photographs, and illustrations show how cover crops look in the field, including plant height, leaf architecture, and rooting patterns. Long term benefits are described for soil health, soil structure, water quality, nutrient contributions, soil biodiversity, air quality and climate change.

Cover crops are an economic input with an expected return on investment, similar to pesticides and fertilizer. As part of a continuous no-till system, cover crops provide long-term biological, chemical and structural benefits. The resulting increase in soil organic matter means the agronomic crop yields benefit from better water infiltration and water holding capacity, greater availability of nitrogen and other nutrients, deeper rooting, and increased soil microbial activity in the root zone.





Urban Horticulture: Necessity of the Future

Shashank Shekhar Solankey Shirin Akhtar Alejandro Isabel Luna Maldonado Humberto Rodriguez-Fuentes, Juan Antonio Vidales Contreras, Julia Mariana Márquez Reyes, 2020, *Intech open*, 180p., ISBN 9781838805128

Urban horticulture is a means of utilizing every little space available in cities amidst buildings and other constructions for growing plants. It utilizes this space to raise gardens that can be economically productive while contributing to environmental greening. It can boost food and ornamental plants production, provide job opportunities, promote green space development, waste recycling, and urban landscaping, and result in improved environment. This book covers a wide array of topics on this subject and constitutes a valuable reference guide for students, professors, researchers, builders, and horticulturists concerned with urban horticulture, city planning, biodiversity, and the sustainable development of horticultural resources.

Achieving Sustainable Urban Agriculture

Johannes S. C. Wiskerke, 2019, *Burleigh Dodds Science Publishing Limited*, 408 p, ISBN 9781786763167

This collection reviews key recent research on developing urban and peri-urban agriculture. Parts 1 and 2 review current research on ways of building urban agriculture, from planning and business models to building social networks to support local supply chains. The third part of the book surveys developments in key technologies for urban agriculture, including rooftop systems and vertical farming. Chapters also assess challenges and improvements in irrigation, waste management, composting/soil nutrition and pest management. The final group of chapters provides a series of case studies on urban farming of particular commodities, including horticultural produce, livestock, aquaculture and forestry. With its distinguished editor and range of expert authors, this will be a standard reference on building and supporting urban agricultural networks.



Urban Agriculture and City Sustainability

Syngellakis.S., Miralles I Garcia, 2019, *WIT press*, 170p., eBook-£77.00, ISBN 978178466365

Selected paper presented at the 1st International Conference on Urban Agriculture and City Sustainability are contained in this book. The research reviews ways in which urban agriculture can contribute to achieve sustainable cities and considers ways of reducing the impact in terms of use of natural resources, waste production and climate change.

The increasing number of people in cities require new strategies to supply the necessary food with limited provision of land and decreasing resources. This will become more challenging unless innovative solutions for growing and distributing food in urban environments are considered.

In the last few years there has been a rapid expansion in initiatives and projects exploring innovative methods and processes for sustainable food production. The majority of these projects are focused on providing alternative models that shift the power back from the global food system to communities and farmers improving social cohesion, health and wellbeing. It is therefore not surprising that more people are looking towards urban farming initiatives as a potential solution.

These initiatives have demonstrated that urban agriculture has the potential to transform our living environment towards ecologically sustainable and healthy cities. Urban agriculture can also contribute to energy, natural resources, land and water savings, ecological diversity and urban management cost reductions.



Homegrown harvests

Bringing food security to an educational campus

Deborah Dutta and Amrita B Hazra

Urban spaces can be innovatively used for food production. They can help city dwellers rethink their connection with food ecosystems and land in the process. Educational institutions provide a unique opportunity conducive to integrating food security as part of its curriculum as well as outreach activities. The IIT Gandhinagar organic farm is a testament to the possibilities of community-driven and locally supported farming in urban and peri-urban places.

Helpers and volunteers played a major role in growing vegetables on the farm



“These are kohlrabi (ganth gobi) vegetables, these are fenugreek, in between there is spinach, coriander. Look these are red carrots, those are turnips and those are beetroots...” went on Shantu Pindoriya while walking across the farm. To say that Shantu Pindoriya knows every plant on the farm, would not be an exaggeration. I was walking behind her as she went around the space, describing everything that was growing in the area.

We were introduced to Shantu over an email, as someone growing edibles inside the IIT Gandhinagar campus. We were curious to see the space. Reaching there on a sunny Saturday winter morning, where most of the natural, roadside foliage has turned brown, I was astounded to see rows of green, leafy vegetables interspersed between fruit trees and flowering shrubs. The Moringa trees were loaded with tender drumsticks, with the bees and birds, buzzing amidst its flowers. I wanted to know how this organic farm began.

Modest beginnings

Ms Shantu Pindoriya did not have any formal educational experience in farming. As a spouse of a faculty member at IIT Gandhinagar, she was always interested in social ventures and outdoor activities. In 2016, when the campus was being built, the erstwhile Director was keen on having some garden space with edible plants on campus. A number of informal discussions ensued, and eventually she was requested to take up the initiative on a small scale.

‘It was a casual talk... some of the faculty members knew that I am passionate about kitchen gardening, flowering plants etc., and asked me to try something in a small scale and see if it worked. So, it all started in a small space of 30 feet by 30 feet.’ says Shantu Pindoriya.

Shantu initially started growing plants such as brinjal, chillies, and tomatoes that could tolerate the local semi-arid and relatively hot climate. She referred to many videos and tutorials available online. She also visited local Krishi melas (farmer fairs) to learn about farming techniques, organic inputs, seed quality and other such logistics, which she had not considered before. She recalled that very few farmers in the nearby areas practiced organic farming. Therefore, she relied on reading and seeking advice from expert practitioners and trainers from other states.

The farm in the institute was started in 2016. The institute supported her by providing the initial funding to clear construction debris, level the land, and prepare the soil. The institute also hired a few helpers from local nurseries to help her with various activities like tilling, sowing, transplanting, weeding, and harvesting.

Shantu wanted to make the farm as sustainable as possible. So, she decided to prepare most inputs from materials available on the farm itself. She explained, *‘.....we are using plants from this locality and make medicines for pest control. Mostly, we use Jivamrut and Dasaparni. We also make Beejamrut (See Box 1). There is liquid from waste compost. We use that as well for spraying. We use Jivamrut for nutrition and proteins for the plants, to ward off insects we use Dasaparni, for fungal we use buttermilk. For flowering, we spray mixture of milk and jaggery... once in three years, we add a layer of dried cow dung to the land. That is the only major expense’.*

In the first six months or so, they spent around Rs 40000 for various activities on the farm. Vegetables worth Rs 3000-4000 were sold to the staff members on campus.

Growing food, creating communities

With its humble beginnings, the farm in 2022 now spans nearly eight acres. Four acres are devoted to vegetables and medicinal plants, while the rest is being used to grow fruiting trees. Shantu works with seven helpers to cultivate and maintain the land.

Shantu follows multi-level cropping to use the space optimally, with spaces between trees to grow short-duration plants, along with mixed cropping techniques. She describes, *‘We have mangoes, custard apple, purple*

Box 1: Organic inputs

Jeevamrut is a liquid microbial fertilizer. It is made by mixing water, dung and urine from cows, some soil and jaggery to accelerate the growth of microbes.

Dasaparni is an organic pesticide made by fermenting 10 types of leaves such as Neem, papaya, chilli, tobacco etc in cow urine.

Bijamrut is a treatment for plants, seedlings or any planting material. It is made in a manner similar to Jeevamrut.

berries, naseberry (chiku), sweet lime (mausambi), orange, black plum (jamun), dragon fruit, berries, lemon, avocado, all these trees we have planted. Totally, we have around 1400 fruit trees.'

The harvest is sold within the campus through a stall that operates three days a week. They also sell some value-added products such as pickles and fruit candy from fruits obtained from older trees on the campus to supplement their income during lean months. Presently, the farm produce earns Rs 25,000 - 30,000 per month.

According to her, the farm has shaped up as a community-supported space with many people informally volunteering along with younger children. The institution has also made use of the space by allotting it as part of awareness sessions and community-service for students in their first year. This has also helped students gain exposure to the farm, learn a little about where their food comes from, and enjoy some of the fresh harvest.

A pandemic-ridden opportunity

Shantu's initiatives spurred a lot of interest among other residents, some of whom started with composting and planting a few edibles at their home. However, Shantu felt the value of being able to grow edibles at home was really felt during the initial pandemic lockdown.

'When I started one of my friends asked me the method of making the compost, how to grow, from where to get good seeds etc. Few of my friends started growing creepers like bottle gourd (lauki) and green gourd (turai), and a few other vegetables. They began making their own kitchen compost. This way, there are almost 90 smaller kitchen gardens on the campus. During the lockdown, we distributed seeds and manure, and

almost every patch with soil had something growing, and someone tending to it. I did not have any helpers at that time, and many people pitched in as volunteers. The effort was appreciated, as our target was to become self-sufficient as far as vegetables were concerned. Everyone got together and learnt to grow something'

Many common spaces in the campus have edibles growing in it, and the produce is shared among the volunteers working in those areas. The appreciation and understanding of consuming seasonal edibles in the community has grown through direct experience and sustained interaction with the farm spaces.

Learning something everyday

There have been many challenges along the way, especially from monkeys, wild pigs and rodents destroying the crops, but Shantu and her team have learnt to manage and accept these issues through digging trenches and keeping a close eye on the farm. *'This land belonged to forest department earlier, so I suppose the animals also deserve a share of the harvests'*, explains Shantu with a laugh, while shooing away a langur that had been feasting on some tomatoes while we talked. She continues, *'Every day, I experience or discover something new on the farm, either an insect or fruiting, pest, flowering... farming is all about observation and patience, I feel.'* Shantu has plans of expanding the farm space and aims to be able to supply fresh harvest to the IIT Gandhinagar student mess eventually.

Experiencing interdependence at the farm

Such thriving ecosystems can be part of living classrooms for the immediate community, ones which provide valuable lessons in systemic thinking while nourishing their bodies. Edible food gardens are hotspots for local biodiversity, and provide an experiential understanding of pollinators, pest-prey relationships, soil ecosystems and the interdependence of plant health and root microbial communities. As if on cue, Shantu plucked a cabbage head and showed me the vigorous roots that supported the plant. *'Taste and health are not separate'* she says, *'eating these vegetables reminds me of my childhood when everything was grown through organic farming. You don't get that taste from the market vegetables now. I want my children to experience and remember this taste.'* Many children on the campus are regular visitors to the farm, and according to Shantu, have become very

The appreciation and understanding of consuming seasonal edibles in the community has grown through direct experience and sustained interaction with the farm spaces.

conscious about not wasting food after seeing first hand, the time and efforts that go into growing it. They are also curious to try everything that they have seen growing on the farm, and this has led to occasional cooking sessions too.

Drawing lessons for kickstarting similar initiatives

The IIT Gandhinagar organic farm is a testament to the possibilities of community-driven and locally supported farming in urban and peri-urban places. Educational institutions are uniquely suited to act as outreach hubs and experimental spaces to grow food gardens owing to availability of safe space, access to water, and a ready customer base. It can provide a much-needed space for building stewardship and affinity towards the land, and help people develop skills to grow food in their immediate environment. The farm space itself can become a hotspot

for biodiversity and contribute to the well-being of the larger ecosystem. Listening to Shantu's experience, we found the following points worth reflecting on –

- *The need for administrative support:* Such an idea required the explicit support of institutional authorities. Once this was provided, it facilitated mobilising initial funds and fulfilling administrative requirements to start creating the space.
- *Starting small, and building on results:* The idea of starting in a limited space allowed her to show some initial tangible results in terms of harvest and gain the skills required to expand. Starting in a bigger area immediately with limited resources at hand may have been intimidating and difficult for her, and an abstract concept for the community members.

Shantu's farm is a sustainable model where most of the inputs are prepared on the farm



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- *Planning for financial sustenance:* Selling the produce at a fair price by understanding the preferences of local customers helped in covering the costs of running the farm. Except the salaries of the workers which are paid as per central government scale, all other costs of maintaining the farm are covered by the sale of produce.
- *Carving out some space for experimentation:* Every year, new crops, variations in methods, farming inputs, etc. have helped her in gaining new knowledge while customising for local weather, geographical conditions and adequate sales to achieve business sustainability.
- *Building collective ownership:* Opening the space for volunteering allowed residents to actively connect with the space and support the initiative in various ways. The campus residents are not just passive customers but have a stake in the initiative through supporting the sale of harvest, providing feedback, bringing seeds from other states, assisting with smaller tasks on the farm and so on.

- *Iterative learning and feedback:* The growth of the farm is a result of continuous cycles of learning and feedback, through close observation of the plants and the conditions that contribute to their growth. Understanding that this is a continuous process is an important part of sustaining such initiatives.

Such urban farm community spaces serve multiple purposes - they provide access to fresh food and the opportunity to children and adults alike to get their hands dirty while also playing a vital role in the first-hand understanding of the delicate balances that sustain our ecosystem. From seed to farm to table, how food reaches us today is a nuanced lesson integrating the natural sciences, social sciences, economics, and business. Thus, finding ways to include urban farms as part of our community spaces and educational curricula is a worthwhile pursuit.

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Deborah Dutta

Senior Research Fellow
Living Farm Incomes Project
Institute of Rural Management Anand-388001
Gujarat, India
E-mail: deborah@irma.ac.in

Amrita B Hazra

Assistant Professor
Department of Chemistry, Biology
Affiliate Faculty, Center for Water Research
Indian Institute of Science Education and
Research Pune, Dr. Homi Bhabha Road, Pune - 411008
Maharashtra, India
E-mail: amrita@iiserpune.ac.in

