



Cultivating Hope

Exploring food growing possibilities in Indian cities



Edited by Deborah Dutta and Amrita Hazra

Foreword

The pandemic, apart from exposing people to the virus, also laid bare the broken food system held together only by excessive dependence on fossil fuels and skewed market forces. However, as the supply chains became dysfunctional, communities also saw a surge in kitchen garden initiatives. ‘Lockdown’ edible gardens in urban areas started gaining popularity, as people were driven by various motivations to experiment with growing food. The practice offers potentially revolutionary ways of reimagining the structure and function of cities. Far from being a novelty, growing food in small spaces were the mainstay of many residential areas, until modern city-planning created physical and structural barriers to utilise areas for growing food.

In recent years, the practice has become increasingly popular in recent years for a variety of reasons ranging from concerns of food security, urban biodiversity, recreational spaces and so on. As urbanisation continues to grow at a rapid pace, urban farming can become a crucial tool in re-imagining our relationship with the immediate environment. On the other hand, increasingly erratic weather patterns, combined with excessive dependence on fossil fuels to grow and transport food over thousands of kilometres has made an average farmer's work extremely challenging. With the loss of traditional farming knowledge, and support of local community, they are forced to buy seeds, pesticides, and fertilizers, often falling into vicious cycles of debt when crops fail due to weather. The indiscriminate use of pesticides on large monocultures decreases the fertility of the soil, thereby requiring even more chemical input. The actual situation is more complicated due to influence of short-sighted policies, market forces and local politics. The result is a massive loss to local biodiversity, and negatively impacts the health of living beings.

Apart from easing the pressure on rural land and resources, urban farming practices offer a promising way to rebuild our connection to food, though local production and consumption. We can bring back the traditional farming knowledge, while exploring creative methods in smaller spaces. Farming can be a way to bring communities closer. Through food gardens, we can enrich the local biodiversity, and more importantly appreciate the joy and reciprocity of tending to the soil. Cities are conventionally seen as a source of numerous environmental issues. We can change that narrative, and it can all start with a handful of soil.

The stories and themes shared in this handbook illustrate ways to start your own food garden, no matter where you are, and offers a guide to involve the local community as well. We hope these ideas and thoughts inspire you to begin your journey of building equitable and regenerative cities where both present and future generations can flourish.

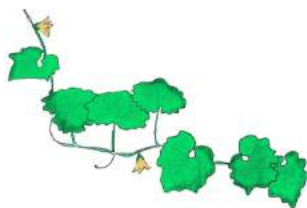


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Sustainable Food Systems- An Introduction

Deborah Dutta

Every time you bite into a morsel of food, you are most probably enjoying the literal fruits of thousands of years of experimentation and knowledge. Think about it, how do you know that bitter melon is edible, or some yams need to be boiled to remove their itchiness, or some foods can be eaten raw while others need to be cooked in specific ways? Think a bit more about your last meal, and answer the following:

- What did you eat?
- Did you buy the food?
- If you cooked it, where did you buy the raw ingredients from?
- Have you grown or know how to grow any of the ingredients used?

Answering these questions, you'll realise that most of us know very little about the steps required to produce, process, transport, and prepare the food we eat.

On the other hand, we are living in through unprecedented moments in human history, characterized by ecological, economic, and socio-cultural crises. Ecological and climate crises, environmental degradation, growing inequality, poverty, hunger, and obesity are interconnected, with the food and agriculture system being central to all of them. The convergence of crises is particularly visible in food systems, which is reeling under multiple pressures of decreasing soil fertility, depleting groundwater levels, loss of livelihoods, adverse impacts on health, and dependence on chemical inputs amongst others. The food and agriculture system refers to all the artefacts and activities related to the production, processing, packaging, and consumption of food, along with their socio-economic and ecological outcomes. Transitioning towards sustainable and equitable food systems requires systematic shifts in collective values, public policies, markets and knowledge systems.

Recognising the fundamental ways in which food impacts the planet and our wellbeing, UN held a food systems summit in 2021, and the opening address said the following –

“Rich or poor, young or old — every person in the world needs to eat. Safe and nutritious food provides not only life and health, but hope. Every day, billions of people harvest, process and transport food to market and to our homes. Consumers make choices of what to eat, based on what is available and accessible. This daily activity touches us all, and underpins our cultures, our economies and our relationship with the natural world.”

– UN Food Systems 2021

Given this deteriorating ecological situation, many efforts to reclaim a positive relationship with the immediate environment have begun by reverting to the traditional

practices of farming. Attesting to the embodied values of farming, Norman Wirzba, in the book ,‘The essential agrarian reader’ argues that,

“Attention and responsible action can occur most readily as we directly/practically see and feel our connections with each other and the land... If we can see how our living practices directly affect air and water quality, soil retention and health, species contentment and diversity, communal cohesion, and other markers of environmental health, and then learn to appreciate how nature's services enrich our personal and social lives, we will be much more inclined to change our practices in ways that benefit rather than bring harm to others. The assumption is that we are less likely to misuse or abuse the memberships we see benefiting us directly.” (2003, p.8)

As an activity, farming naturally provides a space to raise questions, and develop an integrated understanding about weather, food, nutrition, the economics of food production, water, and local geography. The connection between environmental actions and the act of farming is succinctly captured by farmer and author, Wendell Berry's statement “Eating is an agricultural act” (Berry 1992). Linking the act of consuming food to the conditions under which food is grown and brought to our plates requires a systemic way of thinking about human-nature relationship. Nurturing pro-environmental values amongst urban communities, which face a physical and psychological disconnect from various aspects of nature is a challenging task. Yet, as author Michael Pollan notes, “Eating and drinking especially implicate us in the natural world in ways that the industrial economy, with its long and illegible supply chain, would have us forget” (Pollan 2013, 408).



Consequently, the potential of local urban food systems in promoting socio-cultural and ecological sustainability is a growing field of research. A food garden, by virtue of its

elements and their relationships, embeds many action possibilities, to understand principles (such as interdependence) and ideas (such as recycling) related to the environment. When done as a community, farming and harvesting food from the garden allows for many related discussions and motivations to come to fore, as would the regular tending and care of the living space. Community based urban farming requires constant dialogue between participants to partake the knowledge and skills involved in various tasks. The dialogue and sharing of tasks in turn strengthens feelings of community belonging, as people exchange ideas and thoughts on a variety of related topics. Furthermore, the physical activity of farming has a positive impact on the health of people involved, as they become aware of better diet in terms of fresh and local food. Several studies show that exposure to the natural environment helps in reducing stress¹. The experience of growing food also allows participants to understand various cycles in nature and be more attentive to their needs, while respecting the interdependence in nature. Urban farms can also serve as hot-spots of biodiversity, and contribute to better air quality as well as micro-climate². The benefits of urban farming, from the nutrition and food security perspectives, have also been well studied. A flagship initiative by the Food and Agriculture Organisation (FAO), called the ‘Urban Food Agenda’ aims to enhance sustainable development, food security and nutrition in urban and peri-urban areas, and nearby rural spaces.



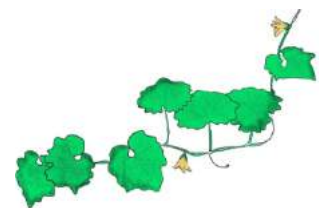
Exploring the possibilities of foodscapes in cities

¹ See for instance, Yao, W., Zhang, X., & Gong, Q. (2021). The effect of exposure to the natural environment on stress reduction: A meta-analysis. *Urban Forestry & Urban Greening*, 57, 126932.

² See Tresch, S., Moretti, M., Le Bayon, R. C., Mäder, P., Zanetta, A., Frey, D., & Fliessbach, A. (2018). A gardener's influence on urban soil quality. *Frontiers in Environmental Science*, 6, 25.

However, it is also important to note that the concept of urban farming in India is not new, as immigrants from rural areas have engaged in various forms of farming for local consumption or market produce. As Cook et al. (2015) comment, “Less traditional, but not necessarily less prevalent forms of urban agriculture include open-space production of high-value products on undeveloped land that is public or private land located along roads, railway lines, streams, and river valleys, and in industrial areas and around airports. Rather than speaking of ‘urban agriculture’ in general, more research is necessary to understand the particularities of each of these forms in specific contexts” (p. 267). In India, the spatial constraint, and population density in urban areas throw up unique challenges to pursue urban farming; yet, these problems have also inspired innovative approaches and initiatives. Several startups have facilitated the nascent interest in growing food by offering a host of services and materials to grow rooftop farms. Examples include iKheti, Edible Routes, Homecrop, and Squarefoot farmers. States like Kerala have seen civic bodies initiate sustainable practices by providing kits and services to grow up to 30 vegetable varieties locally. This trend is accompanied by a revival of, and search for, ecologically sound methods of farming that were embedded in traditional practices. Urban home gardening has enormous potential in creating edible cities and towns in India. With adequate planning and support systems, urban home gardens can become sites of integrated production (vegetables, fruits, poultry, and small livestock-- depending upon the specific context). Urban home gardening can also reduce the issue of urban waste by integrating vegetable production with household waste management. Therefore, creating edible urban areas through the wide popularisation of urban home gardening practice in India can considerably reduce waste at the source while bridging the urban systems with food production and reducing its dependency upon the rural areas.

Urban agriculture in India, especially in metropolitan cities, also encompasses technology-aided, capital-intensive entrepreneurial initiatives such as hydroponics, vertical farming, and aquaponics. However, they need to have scrutiny. The mere practice of urban agriculture does not ensure sustainability outcomes. Although such enterprises contribute to short urban food supply chains, their promotion should be based on a holistic and nuanced understanding of their functioning in intensive production methods and external dependence on inputs. The potential of local urban food systems in promoting socio-cultural and ecological sustainability needs to be researched from various perspectives, along with clear directives for urban local bodies to support such grassroots endeavours. As our lives get more intertwined through various ecological, social and economic processes, it is clear that a transition to regenerative agrifood systems cannot take place without the development of regenerative cities, education and livelihood aspirations.



Part 1

Journeys in growing food

“Action on behalf of life transforms. Because the relationship between self and the world is reciprocal, it is not a question of first getting enlightened or saved and then acting. As we work to heal the earth, the earth heals us.”

— Robin Wall Kimmerer, *Braiding Sweetgrass*



Homegrown harvests: Bringing food security to an educational campus

Deborah Dutta and Amrita Hazra

Urban spaces can be innovatively used for food production, and 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.

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.

'Like these are kohlrabi (ganth gobi) vegetables, these are fenugreek, in between there is spinach, coriander. Look these are red carrots. Those are turnips. Those are beetroots...'

We had been introduced to Shantu over email as someone growing edibles inside the IIT Gandhinagar campus and was 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.



Ms Shantu Pindoriya next to rows of purple cabbages, tender garlic, and other plants

Modest beginnings backed by the love for gardening

Ms Shantu Pindoriya did not have any formal educational experience in farming. The wife 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 they asked to try something in a small scale and see. So, it all started in a small space of 30 feet by 30 feet.'

Shantu began by 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, while also visiting 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, so she also relied on reading and seeking advice from expert practitioners and trainers from other states. Finally, the institute hired a few helpers from local nurseries to help her with various activities of tilling, sowing, transplanting, weeding, and harvesting and started the farm in 2016. The institute additionally supported her by providing the initial funding to clear construction debris, level the land, and prepare the soil. In the first six months or so, they spent ~Rs 40000 for starting up the project, and sold vegetables worth Rs 3000-4000 to the staff members on campus.

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 controls. Mostly we use Jivamrut³, Dasaparni⁴, we also make Beejamrut⁵ here only. There is liquid from waste compost. We make that as well. Mainly we spray these liquids... 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'.

³ 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.

⁴ Dasaparni is an organic pesticide made by fermenting 10 types of leaves such as Neem, papaya, chilli, tobacco etc in cow urine

⁵ Bijamrut is a treatment for plants, seedlings or any planting material. It is made in a manner similar to Jeevamrut.



A view of farm

Growing food, creating communities

Since its inception in 2015 and its humble beginnings, the farm in 2022 now spans nearly eight acres. And now, the farm produce earns Rs 25- 30,000 per month. Shantu works with seven helpers to cultivate and maintain the land. Four acres are devoted to vegetables and medicinal plants, while the rest is being used to grow fruiting trees. She describes,

'We have mangoes, custard apple, purple berries, naseberry (chiku), sweet lime (mausambi), orange, black plum (jamun), dragon fruit, berries, lemon, avocado, all these trees we have planted. Total we have all most 1400 trees of fruits.'

Shantu follows multi-level cropping to use the space optimally, with spaces between trees to grow short-duration plants, along with mixed cropping techniques. 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. 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.



Amla candy kept for drying under the Sun

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 creeper 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 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 supposed 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.



Many sunbirds flock the flowering moringa trees. The space has turned into a haven for birds

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 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.
- *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.

Learning as living – Life lessons from my journey of growing food

Samira Mukherjee

Samira Mukherjee, 53, has recently retired from her job as a school teacher and now works with children to focus on their language development. She also develops activities to create awareness amongst people about sustainability by practicing waste management and urban farming. In this article, she shares her journey and lessons in growing edibles.



Samira at her balcony garden

Joining the dots between personal ideas and professional commitments

Using my balcony and open areas of the building terrace and growing food had been my long-time dream. I had read about the effects of the Green Revolution in terms of the increased use of chemical inputs and pesticides and its adverse impact on farmers, fields, animals and consumers. I thought that growing some food, even in small quantities, could help better understand the connections between food, soil and health.

While I was enthusiastic, I had no idea where to begin. I had seen my grandmother growing various types of vegetables and fruits in the backyard of her house. My mother used to collect kitchen waste and make compost. She would use them to grow flowering plants and leafy greens in our balcony.

Yet, there is a difference between mere observation, attention and actual practice. Mistakes and trials are inevitable when starting something on your own. For example, I had no idea about the growing seasons of plants and companion planting. All I had was the willingness to learn from my own mistakes as well as those of others.

I remember when I started working as a school teacher in 1997, we had only a few indoor plants to beautify the living room of my home. I had not begun segregating my waste then and had hardly any idea about sustainable living. Teaching, in fact, opened up a new arena of learning for me. Through teaching lessons as part of the environmental science course, I realised doing justice to my teaching profession entailed practicing what I preached. However, when I started managing my kitchen waste to be reduced into compost, it wasn't easy. There have been days when I missed saving all the peels from my kitchen, either because I forgot or they were innocently thrown in the bin by some other family member, as a regular practice. Then, I started speaking to everyone about the importance of managing our waste. This was a reminder to me to keep going, come what may.



Using mulch and innovative, low-cost watering technique based on osmosis

Learning through trial and error

Initially, when I began, I did not know that adding a catalyst to my compost could hasten the entire process. I remember carrying the half-done compost to school to build a terrace farm as I couldn't see any scope of making good use of it at my place.

Eventually, as I got more interested in methods for growing food, I discovered stalwarts such as Subhash Palekar, whose practices and philosophy of 'zero-budget natural farming'

appealed to me. I picked the idea of making *Jeevamrit* or *Amritjal* from his workshop, which I attended at Vashi, Navi Mumbai, with my school gardener, in 2016. A terrace farming project being implemented at the school by external resource persons further bolstered my experience and skills, as now I could learn from the school activities as well.^[1]

Amritjal is a fermented mixture (biocultural liquid) of cow dung, cow urine, flour of pulses, jaggery and a fistful of soil with rich microbial content.

As the fermentation progresses, the microbes begin to multiply and require a timely supply of oxygen. Hence, the mixture is stirred twice a day at regular intervals. The fermentation process is completed within 48 to 50 hours.

Amritjal also known as *Jeevamrut* is an organic biofertiliser and pesticide that promotes microbial activities in the soil and increases its nutritional composition. The fermentation process is clearly visible in the form of a thick layer formed on the top of the liquid. It also helps in preventing pests and diseases.

I began making this bio fertiliser at home in 2016. The biggest hurdle in his process has been sourcing cow dung and urine from cows of Indian origin. I have observed that a weekly application of this liquid gives good results. It helps decompose the materials in the compost pile speedily and, in the process, also helps keep unwanted pests away.



gunny bags full of dry leaves and crates being used as compost bins

Other alternatives

Sour buttermilk is also an effective ingredient I often use on my farm. Diluted sour buttermilk works very well in preventing pests. A spoonful of rock salt mixed with 5 litres of sour buttermilk, fermented for a few days, make an excellent fertiliser for fruit-bearing plants.

In my native place in West Bengal, people use mustard oil cake as a fertiliser. Bengalis use mustard oil for daily cooking, and the waste from the local oil mills is recycled. I have also effectively tried this waste (mustard cake) liquid on my plants.

Biodiversity and pests

Millipedes and earthworms can usually be spotted in the soil. Snails and slugs are familiar visitors too. However, they typically eat the tender leaves, and I just remove them manually. Birds like bulbuls, sparrows, sunbirds and fantail flycatcher are frequent visitors to the garden. They usually visit in search of worms and insects. Butterflies often lay their eggs on curry leaves and lemon leaves. Squirrels drop in at times in search of brinjals. I remember once a monkey visiting the mango tree adjacent to our terrace. It picked the only ripe tomato on one of the tomato plants. Rodents are very difficult to remove from a farm like this unless cats frequent the place. Otherwise, seedlings need to be protected and kept indoors at night.

Polyculture

My experience of growing various herbs in shallow containers has been amazing. The lowest layer of the container is sand followed by a rich mixture of compost (leaf mould+ cow dung compost +goat manure + neem cake + mustard cake+ biochar). The topmost layer is typical garden soil for best anchoring. I have tried coriander, mint, amaranth and spinach. Shallots and radish greens also grow well together. The polyculture method works very well in bright sunlight. Regular feed of liquid mustard cake and *Jeevamrit* helps them grow well.

Bio enzymes

I have tried several methods of making liquid fertilisers for plants. One of them is bio enzymes. I remember the meaning of enzymes, as explained in the chemistry class in school. They are molecules present in the cells of all living things. They are amino acids (proteins) that speed up chemical reactions within cells.

Making bio enzymes at home is relatively simple.

The ingredients required are:

One part of jaggery, three parts of peels of fruits or vegetables and ten parts of water, ie for one litre water ,300gms of fruit or vegetable peels and 100gms of jaggery. The mixture needs to be stored in a 1.5 to 2 litre bottle to allow some empty space for collection of the gas it produces.

If the proportion is correct, the chemical reaction takes place quickly. This reaction produces gases that need to be released once, daily for about a month. After a month, the gas can be removed occasionally and kept aside for three months. After three months the organic matter settles down with a clear liquid floating on the upper part of the air-tight container. Usually, a thick plastic container works well for this process.

I have experimented with petals of marigold flowers, limes and oranges with excellent results. These materials produce bio enzymes with a sweet natural fragrance. Other than these, I have tried making bio enzymes with cooked rice and with banana peels too. I have observed that it's a good idea to water plants regularly with a small portion of bio enzymes in it to keep it well nourished.

Wet waste management

As I have mentioned earlier about my composting experience, which has gradually improved through years of trial and error, I find myself learning every day.

The basic composting process involves four components:

i.e. Organic matter, moisture, oxygen and bacteria.

The proportion is what matters the most. Organic matter also is of two types, browns and greens. Greens are materials that are rich in nitrogen or protein. They are also the items that tend to heat a compost pile because they help the microorganisms grow and multiply quickly, whereas browns are carbon rich materials.

Any plant waste which is dry, fibrous, and hard is generally recognised as brown. This is because browns are more resistant to decay. It can be considered as the materials that are food sources for all of the lovely soil-dwelling organisms that will work with the microbes to break down the contents in the compost pile.

The greens and brown materials with favourable proportions of carbon and nitrogen (C:N) (25:1) offer the microorganisms a "complete meal ". This helps the breakdown of the compost. So, collecting dry leaves and other browns for composting is in itself, a task that becomes essential.

Without enough brown matter for compost, the wet and nitrogen-rich green matter for compost becomes slimy, attracts insects, and seems slow to change. Bins without enough carbon-rich material also don't produce much volume.

Another important observation I have made is that the smaller the pieces of scrap(peels), the faster the composting process. The use of a catalyst helps in the bio-composting process. For example, sour buttermilk or liquid molasses work well. However, jeevamrit decomposes organic matter much faster than any other material.

Nowadays, I follow the general rule for composting: 3 – 4" layers alternating Green (high nitrogen) and Brown (high carbon) materials. I water each layer as I build it, so the material is moist, not wet, like a wrung sponge. I end with a Brown layer on top to keep flies and other insects away. Thin layers help prevent anaerobic (smelly) pockets from developing and allow microbes to access both Green and Brown food sources.

Successful composting has been a long journey. A strong desire to keep my wet waste at home, preventing it from ending up in some landfill somewhere, has kept me going. I feel 'at source' segregation is the easiest to manage and allows us to be more mindful of our consumption patterns.

Following the Sun

Commonly, we all know that the Sun rises in the east and sets in the west. But sunlight doesn't stay confined to these two directions. During the short winter days, the Sun does not rise exactly in the east but instead **rises just south of east and it sets south of west**

I eventually discovered this as I started growing food on my shaded terrace in 2014. There is an area on my building terrace that receives good sunlight during winter. After Dussehra, the area begins to light up slowly. It stays sunlit till the end of February. As March approaches, the Sun appears to move its position, and the entire area gets into the shade again. This is the south-facing wall of the building. My plants require attention at this stage and so I move them to the east-facing parapet. This had been a dangerous place to grow food when I started

shifting my pots to this well-lit area at the end of winter. It did not have a grill for protection. My husband noticed that it could be perilous and installed a railing for safety. Since then, I have grown sweet potato, ginger, turmeric and ivy gourd or pumpkin vines in this area. The pumpkin and Ivy gourd vines grow well on the **bamboo trellis** we have constructed on the railing of this area to ensure that maximum sunlight could be harvested by plants.



Ivy gourd vine and the harvest

My foray into growing medicinal plants

I also have a collection of medicinal plants. One of them is the *thankuni* leaves, as called in Bengali. It is scientifically known as call *Centella Asiatica*. It is commonly also referred to as *Gotu kola*, *kodavan* or Asiatic pennywort. Traditional Bengalis are used to eating chutney made from the leaves of this plant in the beginning of a meal. It is known for improving overall health and well-being.

Lemon grass or *Gavti chaha* is another easy plant to grow. Formally known as *Cymbopogon Citratusm*, it is a tall, aromatic grass consisting of antibacterial and antifungal properties. I like adding it to my tea and recipes like Thai curry.

Turmeric or *Haldi* also grows relatively easily. I use the leaves of this plant for steamed sweets. The leaves of ginger plants can be used to flavour tea too. Both turmeric and ginger being shade-tolerant plants, grow well in minimal amounts of sunlight. I have also grown microgreens of mustard, chia, Bengal gram, green peas, amaranth, fenugreek and wheat. Recently, I collected the cuttings of a rare medicinal plant from the forest of Yeour hills. It is known as *kulekhara* in Bengali and the scientific name is *hydrophilia auriculata*. It is beneficial in treating anaemia. This plant is also commonly seen in a Traditional Bengali kitchen. I often use the medicinal plants I grow to treat minor ailments at home or prevent certain diseases like the common cold and stomach ailments.

My plant teachers

My garden gives me hope. Being able to exist and develop without depleting natural resources might seem to be overwhelming, yet I am always in awe of nature's abundance. My journey in urban farming has been exciting, but several setbacks need to be overcome. Pest management seems to be the biggest hurdle right now. The farm is frequented by rodents who often gobble up most of the seedlings. Hence the growth of microgreens and seedlings requires prolonged effort in terms of protection.

Also, the availability of local seeds (non-hybrid) seeds is rare. I try to save different seeds but have had limited success. I request all nature lovers to form communities and start organic farming in cities. Any such attempt would not only provide people with healthy food but also add value to the lives of the children who witness the process. The children at school thoroughly enjoyed the process of growing their terrace garden while learning to care for the plants and watch them grow. A school farm is a living classroom offering everyone valuable life lessons in care, attention and reciprocity.

They say it takes a village to raise a child. Similarly, I think it takes a community to sustain green spaces. I am thankful to my neighbours who allowed me to use the common walls of the terrace to manage my waste and grow food on it.

Being able to manage my waste and procure high-quality nutrients from it gives me an immense sense of satisfaction. I have also sold my compost to two of my acquaintances on request. However, the process of sieving the material is a tough job which is inevitable if one has to sell the product. Normally, I avoid the sieving process and use compost as mulch, which works well.

Nowadays, I also propagate saplings and distribute them as gifts to my gardener friends. Some people have also bought *jeevamrit* from me to improve the quality of their soil. I look forward to lifelong learning and growth in finding ways to live sustainably.



End notes

[1] See 'Pedagogy of dirty hands: Reflections from an urban terrace farm'
<https://publications.azimpremjiuniversity.edu.in/2106/>

From resistance to resilience: The journey of connecting girls' education to food sovereignty

Most tribal residential schools in India struggle with poor infrastructure and a range of social and administrative issues. However, the story of Telangana Social Welfare Residential Junior College for Girls in the Adilabad district has been different. With single-minded determination, Suvarna, the school principal since 2014, has been traversing the uphill battle of transforming the neglected educational space into a vibrant learning community. With a focus on critical place-based education, Suvarna saw the potential of the campus land to grow nutritious food for the students, with the activities creating a sense of ownership and agency amongst the students and staff. With each harvest season, the once dilapidated infrastructure and general sense of demotivation experienced by students gave way to renewed feelings of achievement and empowerment. Today, nearly 5 acres of land is used as a food forest, and the nutritional security experienced by the girls is reflected in their academic performance. With a bounty of local food and young voices, the school is an inspiration for creating sustainable and equitable transformative landscapes.



Students proud of the food grown in their school garden

Beginning with a barren landscape

Talking to Ms Suvarna Latha is like taking a brisk walk in the morning. Her energy is infectious, and it is was easy to infer that Suvarna is not an armchair administrator. Instead, for the entire duration we spoke over zoom, she gave me a virtual tour of the campus kitchen gardens, multitasking an interview, administrative work and brief meetings with teachers, all with a ready smile on her face. The smile is accompanied with an equally loud and confident voice that makes it clear that she isn't someone who would take 'No' for an answer. It is this potent combination of optimism and sheer stubbornness that has led the Telangana Social Welfare Residential Junior College (TSWRJC) for Girls in the Adilabad district on its current trajectory.

Suvarna Latha joined TSWRJC as a principal in November 2014. An experienced educator, having worked with various educational institutions for more than two decades, Suvarna had no illusions about the difficulties of managing the space. Unsurprisingly, the Junior College was struggling with a range of administrative, academic and infrastructural issues that had grown over years of neglect and mismanagement. The state of the facilities, and poor nutrition through sub-standard school meals had impacted students' academic performance. Suvarna instinctively knew of the fundamental connections between a healthy body and an active mind, and carved out the task of procuring nutritious food for the students. However, budgetary restrictions meant that she could not buy large amounts of quality produce.

It was then that she noticed that the school had nearly five acres of vacant land lying idle. The entire 18-acre campus was also devoid of trees and other green spaces apart from some neglected mango trees. Making use of state government initiatives on tree-planting such as 'Haritha Haram', Suvarna was able to source more than 1500 saplings, and ensured that the trees were looked after. Her efforts began to bear fruits, literally, as they began to harvest mangoes a couple of years later.



Setting up a composting unit

Building communities through creative collaborations

Raising resources for farming was a challenge for the school, so Suvarna reached out to the families of the students, many of whom depend on agriculture as a source of livelihood. The land mainly comprised of barren black soil which could be used for cotton cultivation. So she formed an arrangement with farmers such that they could use the land for growing cotton and share some of the profits with the school. They cultivated cotton for two years and raised funds to start a school kitchen garden. The resources were used to construct vermicompost pits and buy fertilisers, seeds and pesticides. The remaining land was used to grow a variety of grains, vegetables, millets and cereals. Students and staff worked regularly at the kitchen garden and their efforts drew the attention of the state government.



Getting advice and training for organic farming practices (Ms Suvarna at the centre)

Transitioning to organic farming

Suvarna recalls that they started out with no guidance on sustainable ways of farming since most farmers in the vicinity also practice chemical agriculture. However, in 2019 they received a grant and technical support from the Centre for Sustainable Agriculture (CSA) through the Earth School Program. CSA and Synergy India Foundation (SIF) partnered with Telangana Social Welfare Residential Educational Institutions Society (TSWREIS) to establish Organic Farms using Staggered Production of Fruits and Vegetables, under Project Cornucopia. Suvarna eagerly worked with them to switch to organic practices, and soon the students were exposed to ways of making organic fertilisers, pest repellents and design mixed

cropping systems. CSA helped them make raised beds, use organic matter as mulch, monitor the plants and create farm-based enterprises for the school alumni as well. Over a year, students grew more than 30 varieties of local, seasonal vegetables, totalling a yield of nearly 860 kgs.

The students felt the difference in the taste and quality of the produce and were proud to be responsible for growing food for the entire campus. During the pandemic induced lockdown, they were also able to distribute excess produce to migrant labourers returning to the villages. The collective motivation to grown food on the campus helped them overcome issues such as waterlogging, pest attacks etc by working with villagers to devise solutions. Through saving money on the mid-day meal rations provided by the state government, Suvarna is able to use the funds to procure fruits that are not grown in the are such as grapes and apples for the students. The access to a wholesome diet has improved attendance in school and motivated better academic performance. Suvarna firmly believes that farming played a crucial role in bringing students and teachers together as they began thinking in terms of possibilities rather than failures.



Growing food during the pandemic

The way forward

Though the school no longer receives support from CSA, Suvarna is determined to keep the kitchen garden going. She enjoys whole-hearted support of the students and school staff who feel that the food garden has become an integral part of TSWRJC's identity. That being said, Suvarna is aware that sustained support and funding play a role when such projects encounter obstacles which are bound to arise due to erratic weather, water supply, seed quality etc. Currently, the school produces 50 kgs of food per month on an average, and they hope to inspire many other educational institutions area around the country to nurture sustainable food systems on the campus.

Gardens as community learning spaces

Christopher Pareira, 63, wants his garden to be a fertile learning space for people of all ages to connect with each other and nature. He also runs a company to help people design sustainable living initiatives through growing edibles using compost generated from wet waste.

63-year-old Christopher Pareira is an engineer by profession, and a nature enthusiast by heart. His ancestral home in Bandra is a flourishing nursery cum training centre, and is hard to miss amidst the concrete jungle. His interest in gardening led him to start a recycling and composting centre in 2008, where he slowly started maintaining a plant nursery as well. His shop called D-ERT ('The Earth Shop') hosts a wide variety of edible and ornamental plants, mostly maintained by young volunteers and interns who work there to get some hands-on experience. Christopher has also hosted many workshops over the years to train people in composting and gardening. He has also helped many others install composting units like tumblers and rotating bins. Over 2000 sq feet of his home is dedicated to growing nearly 160 species of edible and ornamental plants. On the other side of his house, Pareira has the three tumblers that can process up to 150 kilograms of wet waste. About 5 to 6 kilograms of garden waste goes back to the garden after being composted in his backyard.



Low-cost innovations and upcycling experiments

Christopher's home has a huge vertical hydroponic installation made of pipes. The installation uses bathroom water and the contaminants in the water get deposited at the bottom acting as manure. He says, *"my bathroom water is filtered and used in growing plants. What we are using is a natural water filter. In small scale we can take kitchen water and bath water, when we are using organic bath soaps, they act as natural pest controller, so we don't have to use fresh water. The tap water after you wash rice and all is full of nutrients for the plants. That should not go waste."* In the garden, one can also see plants growing in ceramic, clay, plastic and coconuts with green glass bottles acting as barriers between plants. He has also made innovative planters using wastepaper, cocopit and a little cement, such that the planter itself acts as a source of nutrient for the plant. His other inventions include the design of portable shredders to disintegrate biomass without making much noise. He is currently tinkering with ideas of building natural cooling systems by designing walls of indoor ornamental plants. He has also created modular planters for terrace gardens made of packing case wood, steel frames and so there's distance between the planter and the floor surface.



Christopher has also collaborated with organisations such as Safai bank to encourage people to segregate plastic waste. He has set up a collection centre at his home for multi-layered plastic, tetra packs, wet waste and medicine waste. Local households and businesses they get plants from D-ERT when they deposit plastic at his place as an incentive.

Nurturing a love for nature

Christopher believes that school education can happen only when every child has access to some green space. He says, *“Every classroom should have window. We are disconnecting children from nature with all the concrete buildings. Let them spend time outside and then ask questions... We need to create those kinds of schools where children will be close to the environment. What is education -- sharing experiences of people. Listen to their experiences, share your experience, this is how you educate.”* Some schools in the area have sought Christopher’s guidance to teach students composting and gardening, and he hopes that more schools are able to take up such activities in their spaces. He wants the movement to carry on independently. *“How to connect to people, how to connect people with nature...? There should be more schools where children can grow food gardens... See, I could be talking to people and get funded, and associate with NGO, still it will be at one place. The objective of my work is to spread it to hundreds of places.”*



The journey from food to farm to people

Manasa Kambanna, 30, a journalist and public policy professional turned ecopreneur narrates how her food garden at home played an important role in nurturing her vision to start a social enterprise geared towards sustainable food systems. Through her food products, she tries to emanate the importance of growing our own food, processing with no synthetic ingredients, consuming homegrown food and going local.

Following her mother's nostalgia

Manasa traces her interest in growing food to her mother's stories of their village. Her mother would often lament at the lack of fresh and seasonal produce in the cities, and the thought stayed with Manasa. She recalls, *"As a teenager, I thought, everything was possible. It kept me thinking – although it's such a simple thing, why couldn't we grow our own food?" Thus began my interest in food and farming. But at that time, I thought I would do this just as a hobby and for family alone.*" Manasa took to growing plants as a hobby, gradually moving from ornamentals to edible varieties, and realized that the latter actually require less maintenance too – *"it is actually easier to grow and maintain a native edible and medicinal garden than an ornamental garden as most of the latter are exotic varieties which need higher attention and care. With this transformation, my aesthetic sense too evolved and I started appreciating the beauty of an edible garden."*



More than the yield, Manasa found pleasure and wisdom in the act of growing plants. The daily tasks of watering, weeding, raking, preparing manure and observing the minute changes in each plant gave her a lot of satisfaction, and a much-needed break from her day job as a journalist. She grew many varieties of plants, especially local, edible weeds such as Purslane,

varieties of sessile Joyweed, Black nightshade etc. and popular greens such as Malabar spinach, Moringa, Indian Roselle, Indian pennywort and Mint. She also grew leguminous crops such as groundnut and cowpea, and flowering plants such as Mexican sunflower, Jasmine, Hibiscus, Butterfly pea etc. for pollination.



Growing native ridge gourd variety at her home

Becoming an agripreneur

However, Manasa wanted to do more. She realised that farmers needed to have a good customer base who could support sustainable farming practices, and her efforts to build connections between farmers and customers in cities led her to found a social enterprise called ‘Bayaluseeme’. In her words,

“Bayaluseeme is founded to do justice to ourselves, farmers and mother earth. Bayaluseeme, in Kannada means an expanse of dry land/ the plains. As major portion of Karnataka is in the plains where majority of our food is grown, it indirectly refers to local farming and production. Bayaluseeme currently does food processing by procuring from local farmers and harvesting from regional forests and delivering it to people directly in Bangalore through its weekly delivery service. In the coming days, Bayaluseeme intends to grow most of its raw materials on its own naturally.”

She envisions Bayaluseeme as a way to encourage farmers to engage in regenerative agricultural practices, while creating critical awareness amongst customers to know about farmers and farming at a personal level. She firmly believes that customers have an immense role in building local and regenerative food systems. Their choice of buying a locally and sustainably grown food versus the super market food makes a tremendous difference to

human health, soil and climate. In many ways, the simple task of just growing some edible at home can encourage them to reflect more deeply about their food choices. She says, “*Start now, be at any scale. Growing food teaches a lot about food– how to know what kind of food is good, how difficult it is to grow, why growing your own food matters, why should our waste go back into the soil and more.*”



Left: Women employed to make cold, wood-pressed oil; Right: oil cakes that are excellent animal fodder and soil manure.

The journey is the goal

Through her exposure to other farmers and practitioners, Manasa has also been designing two permaculture farms that have water harvesting trenches, bunds, pond, fruit orchard and a Miyawaki style forest to prevent soil erosion in the flood-prone terrain. On a personal front, Manasa and her husband Mahantesh moved to the outskirts of Bangalore, where they have a patch of land to grow some edibles for self-consumption. Through Bayaluseeme, they are also able to consume the processed food prepared by their small team of two women staff. These include edible oils, breakfast mixes and tea. According to Manasa, regular composting, mulching, collecting dry leaves from the streets has become her second nature. Sustaining the social enterprise itself has been far from easy, given the challenges of competition with businesses glibly using terms such as “organic”, “natural”, “herbal” etc. to market their products, and consumers lacking the critical awareness to understand the nuances. To keep prices affordable, they currently don’t have additional staff to manage operations, and do most of the work themselves. Economies of scale also go against their efforts of operating a small business at local level, which often translates into high production costs. Nevertheless, Bayaluseeme is determined to go for the long haul. Even as Manasa slowly builds the enterprise, small joys of being able to provide employment to local women, procuring from farmers directly and encouragement from customers bolster her confidence.



City planning for urban farming

Manasa feels that cities can actively plan for food gardening spaces in urban and peri-urban areas. She argues, *“Just how parking spaces have become a necessity, there should be spaces for edible gardens in apartments at least, as they would have larger common area. City planning should take into account not just civil engineering or architectural aspects but also social, psychological and health aspects of a human being in charting out its plan. City planning board can start with working on public parks, for example, and let local groups interested in growing food to tend to a certain patch of the park. The edibles can then be shared within the group. Big hospitals, schools and universities can also grow their own vegetables as patients and children need the most nutritious food. IT parks must have a growing patch near to their canteen which helps instil growing habit in the young working force.”* According to Manasa, the possibilities are endless, if there is a collective will to reimagine urban areas.



“We all need some bit of wild in us”

Antara Ray, 44, is ex-software professional turned educator and urban farmer. She is a part of various food and farming groups, and a vocal supporter of the food sovereignty movement. With the belief that change must begin at home, Antara shared about her urban terrace farming activities.

Antara lives in the top floor of a six-floored tower in an apartment complex, situated at Kestopur, Saltlake, very close to the Kestopur Bajar in Kolkata. An engineer by training and a former IT sector employee, Antara turned to growing food after a serious illness led her to question many assumptions of work and life in general. Recognising the truth in the famous adage, ‘You are what you eat’, Antara began experimenting with growing food without synthetic chemical inputs. She visited organic farms near Shantiniketan and began to adapt practices suited for urban areas. She began kitchen composting in 2014 and started with growing leafy vegetables such as Amaranth and Spinach, which grow easily. In the meanwhile, she also did courses in agroecology offered by Calcutta University in collaboration with Welthungerhilfe, and continued visiting farms to learn from other practitioners.



Initial learning and reflections

Antara was able to use the terrace space above her apartment on the sixth floor to grow a food garden. The space, approximately 700 square feet in size, provided her with ample area to experiment with a wide variety of plants and planters. Initially, she enthusiastically planted pumpkin, gourds and cucumber, only to realise that she would need to create structure to support the creepers too. She managed to make some bamboo supports, but they were difficult to source in the city and had to be replaced every couple of years. She also tried to pollinate flowers by hand because there weren't any bees, butterflies or other pollinators present in the initial days. She recalls feeling so delighted seeing any seedling sprout, that she

tried to plant everything that grew instead of being selective; *“Initially I tried to make space for every little seedling I had. Now I feel like laughing at my attempts. It took me a while to understand that I should select the healthiest seedling growing to avoid nutritional scarcity due to overcrowding. It is also important to select varieties that are in season, otherwise the plants may not fruit.”*



Innovations and discoveries

Antara experimented with many kind of planters such as growbags, earthen pots and vegetable crates. She found each having some pros and cons, and eventually found vegetable crates to be most suitable and appropriate for her needs. She also discovered that water hyacinth, growing in plenty in the nearby lakes, is a good source of organic biomass. Her search for locally available nutrients has decreased her dependence on commercial inputs such as cocopeat.



Her continued interaction with like-minded farmers and practitioners has helped her source indigenous seeds and saplings. She also observed the interaction amongst plants and insects, and feels that each time, she ends up learning something new; Pointing to some plants in the garden she explained, *“This is called “Betho saag” (Chenopodium greens) it grows always with potato. It is a weed but very nutritious... Because whenever weed comes out, it means soil is deficient of something and weed has come as a succession crop to help the soil. All weeds are full of nutrition, whether for associate plants or for us. One must never uproot weeds. I always allow them to be there.”* Antara also grows many leguminous plants that can fix nitrogen, as well as herbs that also act as pest repellents. She also use the hard biomass generated like broken bamboo pieces, tree stems etc to make biochar. All the activities may look like a mess to an untrained eye, and Antara is aware that her garden is mostly perceived as a ‘wild space’ by the neighbours rather than an urban food forest. As an educator running a small school, she has more hopes from the children.



Left: A pot of biochar; Right: harvesting onions

Way ahead

She regularly encourages children to have their own food gardens and save seeds for different seasons, explaining that such skills should be an integral part of education. *“How disconnected people are from nature, I mean eating and throwing, living for short term pleasure. The mustard, when I tried to peel it I realised how small and fresh it is. I have grown spices like Mustard for my annual consumption. This again I will use for mulching. We have to return to the soil whatever nature has given us, else how soil will give us again. The food is getting transported from village to city, so the soil of the village is becoming less fertile. So they are adding more and more fertilisers from the factories into the soil. Unless you grow your own food you won’t realise the value of food. I compost those carton boards. Some of them I soak in the water and put in the soil as mulching paper and some I will burn. Normally I use for mulching. I burn those which cannot be used otherwise.”* Antara wants to create a seed bank along with her students, so that they learn to save seeds as well. She has also been able to introduce them to the variety of insects, birds and critters in the garden, helping them understand how such spaces can be a home for other living creatures. Antara firmly believes that it is possible to start small, and keep building on skill required to grow food through getting in touch with farmers, practitioners and educators. Apart from being part of the education system, urban gardening should be seen as a collective, civic action

movement to reimagine nourishing city spaces. Though her neighbours are yet to see the importance and potential of her roof garden, Antara is hopeful that times will change.



Note: Recently, following extended complaints by some neighbours who felt that the garden was compromising their common access to the rooftop, Antara had to clear the terrace. This is terribly unfortunate, but common issues faced by many urban gardeners. Infrastructure support, educational interventions, and incentives need to be designed to enable gardening initiatives at community level. It is disheartening to see such spaces vanish even as their importance grows by the day.



Celebrating the anarchy of a garden

J Vimalanathan, known as Vimal by his friends and family, is a retired development professional. At 67 years old, he feels his connection with plants has been a literal life-saving activity during the pandemic. *“I grew up in a farmer’s family, and plants were always a core part of my life. So, even after moving to cities, I always tried to grow something or the other.”* When he began building his home in the mid-nineties, he kept a significant part of the land to plant trees such as chickoo, areca nut, coconut, jackfruit, mango, litchi, badam, allspice, hibiscus and vanilla. Over time, the trees have outgrown the height of the house, and the space is a haven for many birds, insects and smaller reptiles. He grows plants on his 800 sq foot terrace. *“I mostly had ornamental plants on the rooftop because my wife (Mercy) is fond of flowers. However, in 2019, I became interested in growing food after getting introduced to some terrace farming groups in Bangalore.”*



Learning, inventing and discovering

The trees around Vimal’s house provided him with a lot of leaf litter, and he wanted to use it along with the kitchen waste to make compost. He initially bought vermicompost bins but found the maintenance of the worms a hassle. So, he drilled some holes in big, plastic drums and found aerobic composting to be the easiest method to follow. He began sourcing oil cakes and neem powder to add to the compost once it was ready and found that plants responded well to the nutrient-rich medium. *“I use whatever waste is generated in the house, and sometimes make liquid ferments to use as a spray or add to the compost. I think whatever we are regularly using should be easily and locally available. I haven’t found good quality*

cow-dung, so I have developed my own recipes of nutrient mixes. Each plant responds differently, and I am always learning that way.” He strongly feels that anyone interested in growing plants must begin with composting to generate nutrients for their plants. More so, he explains that it offers a deep understanding of ecological processes and cycles, poetically quoting Thich Nhat Than, *“Even while blooming, the flower is already in the compost, and the compost is already in the flower. Flower and compost are not two...”*. Vimal recycles much of the greywater generated in the kitchen and collects discarded drums etc to make various concoctions for the plants.



Pandemic, healing and health

At 67, Vimal feels that his garden has offered him more than just fruits and flowers. *“This space became my refuge during the pandemic, as I could not travel anywhere. I have never hired any help, and pottering around the plants gave me an outlet to feel physically and mentally active. Since I am retired, I spend 2-3 hours in the garden, tending to the compost bins, observing the soil, plants, insects and everything else that happens in the garden. I take care of the plants, and the plants heal me.”* He grows various medicinal plants and herbs in the garden for regular consumption and is increasingly focused on growing perennial rather than seasonal plants. According to him, people must start by growing plants with which they have personal, cultural or culinary connections. He says, *“For people like me, who are not too focused on yield and have limited energy, perennial plants are a good way to ensure regular harvest and keep the space green.”*

‘Green’ is probably an understatement for the seeming riot of plants growing on the terrace, but Vimal likes the ‘wild garden’. He comments with a laugh, *“earlier, when I wanted to grow chillies and tomatoes, I did not have any success. As I became more interested in*

maintaining healthy soil instead, using compost and organic fertilisers, many plants grew from the compost itself. Now chillies are growing in every other pot. I like how the garden takes its own course.” Vimal regularly makes saplings and is always happy to share them with anyone interested in growing plants. He also sources seeds and saplings from various horticultural institutions or NGOs working with farmers. He has also interacted with many pioneers and activists working in the farming sector, owing to his work in the development sector and has found the community to be largely supportive. He is interested in seeing more spaces being used for growing edibles so that individuals can help each other in sourcing seeds, nutrients, exchanging harvest and so on. He says, *“We think we are growing plants, but really, the plants help us grow as human beings. Do we need any other reason to garden?”*



Ground Up: Sourcing, growing and consuming food ethically

Gayatri Desai's restaurant, 'Ground Up' in Viman Nagar, Pune is a cosy space lined with edible plants and herbs for those who are observant. A dozen of large earthen containers and numerous more glass bottles are neatly placed in rows, each of them containing vegetables, fruits or meat at various stages of fermentation. *"I started this space on a very idealistic note of wanting to source each ingredient directly from farmers, but I have realized along the way, that the process is much more complex than initially imagined. Farmers need to be sensitized, customers need to be aware, and the market has to be more amenable to allow small-scale enterprises like Ground-Up to function. These are long-term changes, and I need to be patient."*



Apart from patience, sheer grit and tenacity push Gayatri to clock nearly 14-16 hours of work on most days, to experiment with newer flavours, visit farms personally, document local recipes and run a business at the end of the day. Besides the herbs growing in her restaurant space, Gayatri's balcony houses nearly 10-15 varieties of edible plants, including entangled beanstalks, millets and tall Indian roselles leaning over her petite frame.

However, Gayatri has no illusions regarding the difficulty of growing and sourcing indigenous varieties of crops. She comments, *"I try to source non-hybrid, indigenous varieties of grains. It is tough to source indigenous varieties of vegetables, though, and there are immense logistical issues of having to source separate ingredients from different farmers because most of them are not growing multiple crops. In my case, because I am not into*

mass-production of cooked food, I have even tried contacting urban home gardeners to sell any excess they have. For instance, there is this person from whom I source sesame seeds."

Through repeated interactions with farmers, she has also explored wild variants of vegetables and herbs, thus also stimulating their interest and memory regarding wild edibles. She says, *"This elderly farmer told me that he has mohar, a wild vegetable, and I immediately asked him to sell it to me. I keep asking them what is seasonal, what grows easily etc, and then try to create my menu based on what is available rather than the other way round."*



Gayatri's menu mostly consists of food which has undergone some process of fermentation. Her fascination and expertise in the process embeds the idea of enhancing taste through microbial cultures rather than energy intensive cooking procedures. She reflects, *"Fermentation allows me to amplify, transform and preserve the taste of an ingredient. Fermentation broke all rules of that I learnt in cooking school. I had never grown fungus on rice before and slowly saw it turn into delicious miso!"* She also sees it as an excellent way to add value to things that are otherwise wasted or thrown. She believes that greater awareness and acceptance of fermented food takes us one step closer to appreciating symbiotic relationships between our gut and the land. She says, *"Fermentation is that sense the antithesis of the fast food culture, because the flavours are a direct result of the time taken by the bacteria to work on the food. Being aware of these processes shows the violence we do to our bodies and, by extension, the land, when we value 'faster, bigger' etc."*

Amongst the many challenges, Gayatri feels that she struggles with creating an impact because her current mode of operation has created a group of loyal customers but is unable to break the price and class barrier. There is a need for wider and more popular narratives that

can bolster more interest and encourage wider uptake of similar initiatives. Gayatri is aware of the trade-offs involved in economies of scale and therefore wants to be deliberate about she would like to take her initiative forward. *“I imagine my efforts in scaling to be more integrative rather than expansive. This could include increasing what I grow in my kitchen garden, building a bigger network of consumers, farmers and chefs.”*



The idea of local need not be restrictive. Gayatri’s garden consists of coriander and ginger gifted to her from a collaborator in Nagaland, and they seem to have adjusted to the Pune weather. Gayatri says, *“I also try to grow newer varieties because many things which existed earlier are not available here anymore. We need to be resourceful, innovative and mindful in our relationship with food.”*



A paradise called a garden

Madhuri Somalwar, 52 a resident of Baner, Pune, talks about how she started her 340 sq ft garden. Along the way she learnt how to make the most of the space and resources, one pot at a time.

“It is important to start with whatever you have. Even if it is just one plant, it will make a difference to your life,” says Madhuri, showing visitors the immense variety of plants growing in her balcony. She adopts a utility-based approach to deciding which seeds to plant; most of her potted plants are edible, ranging from fruits like strawberries to medicinal plants and spices used in everyday cooking such as turmeric and ginger.



Madhuri's gardening adventures go far back to when she first planted black mustard (*mohri*). Encouraged by the fast growth of the plants and easy availability of black mustard seeds, she decided to continue gardening, and planted pumpkin seeds in 1998. After harvesting a number of pumpkins, she went on to grow more plants that she could use in her everyday cooking. Now, the diversity of species in her garden includes cherry tomato, green chillies, garlic, lemon, golden apple (*bael*), gooseberries (*amla*), and curry leaves, amongst others. She has also planted pigeon pea (*toor dal*) and uses it to make lentil soup. She also maintains a basil plant (*tulsi*) and marigold flowers to use in religious ceremonies, along with ornamental plants like rose, champak, and gardenia (*ananta*). She also regularly saves seeds for the next planting season.

The garden is a miniature ecosystem: coconut shells are hung on tall plants to serve as nests for birds, sunflowers function as a food source for pollinators such as parrots, sunbirds, pigeons, and bees, and Madhuri has adapted a variety of unique and innovative practices to ensure that her plants stay disease-free and live longer. Every few months, she makes compost from leftover fruit peels and kitchen waste. Planting Indian lilac (*neem*) alongside green chiretta (*kalmegh*) is said to prevent infections, especially of the root and leaves. She is

enthusiastic about trying out new ways to improve her garden's health, and shares a few tips: human hair can be used as a source of nitrogen when added to soil, wastewater from washing meat or rice can be used to water plants, burnt coal and vinegar can be added to soil mixtures to increase fertility, and bricks can be placed at the bottom of planters to absorb excess water from pots. She also adds ant killer powder during the process of making vermicompost to avoid infestations and decline in worm populations.



“Money is usually not a hindrance when you are starting out. Earlier I used to utilize broken or old cooking utensils, paint cans, and buckets as planters. You can also use cold drink bottles with cocopeat powder to grow saplings.” She recommends planting leftover seeds from vegetables obtained from the market as the most efficient and cost-effective way to grow multiple plants at once. Some of her vegetable plants have been borrowed from her friends. Madhuri's gardening endeavours serve as an inspiration to her friends and family, and she strives to be more connected to nature and encourages urban residents to discover their green thumb using sustainable methods.



Growing a community

Vidula Mhaiskar's terrace garden has a green and cool feel as I visit her on a early summer afternoon in Pune with a dry heat starting to take over the city. A 30 ft x 20 ft space, the terrace garden located a floor above their apartment was a labour of love of her father and is 25 years old, she informs me. She started the garden with very minimal resources, but a lot of interest and enthusiasm. The apartment building members are all like a family, so there has been a lot of support and interest in the initiative over the years, and has survived the test of time. Now, Vidula, her husband and her daughter take care of the space and continue experimenting with the plants there



A toy maker and educationist by profession, Vidula brings a deep sense of curiosity, wonder, and careful hands-on care for the diverse life that thrives on her terrace. The space hosts an impressive variety of tree species along with herbs and other small edibles. There's drumstick, lemon, banana, gooseberry, sitafal, sonchafa, chikoo, kadipatta, pomegranate, and champa trees along the edges of the space, planted in soil laid out directly on the terrace floor, held by a foot-high brick bund. Lemongrass, colocasia, spring onions, and chillies take up the remaining empty spots along the edges. The soil is covered neatly with leaves and feels moist and looks really healthy. Vidula and her husband explain that the leaves, byproducts of the trees, are reused in the same space to enrich the soil and to prevent water loss. This process is called mulching, and is an elegant and efficient way to recycle organic matter and nutrients.

Other than the beds along the edge, there exist four beds in the center of the terrace, each with an interesting trellis pattern. Some are custom-designed and fabricated at a local manufacturer, and the others are home-designed with locally available waste material. These

host a variety of beans, ivy gourd, ridge gourd, and other seasonal creepers. On the bed floor are bunches of basil and spinach plants, and herbs such as coriander and fenugreek. A cluster of sorghum catches my eye – planted on one of the central beds, they stand tall and the sorghum pod is just starting to develop. Vidula informs me that they have noticed a much higher frequency of birds when they have some millets on the terrace. So they often have small clusters of finger millet, pearl millet or sorghum dot the beds that invite a variety of seasonal and migratory birds that stop by for a bite and a sip of water. The pots that surround the beds and the open edges of the terrace host a large variety of flowers – colorful ones, fragrant ones, seasonal ones. These are a great way to get bees, butterflies and other pollinating insects to the space. The family has documented bird and butterfly varieties over the years, and have an impressive list which include a handful of rare migratory ones.



Glimpses of the garden with a map of the space

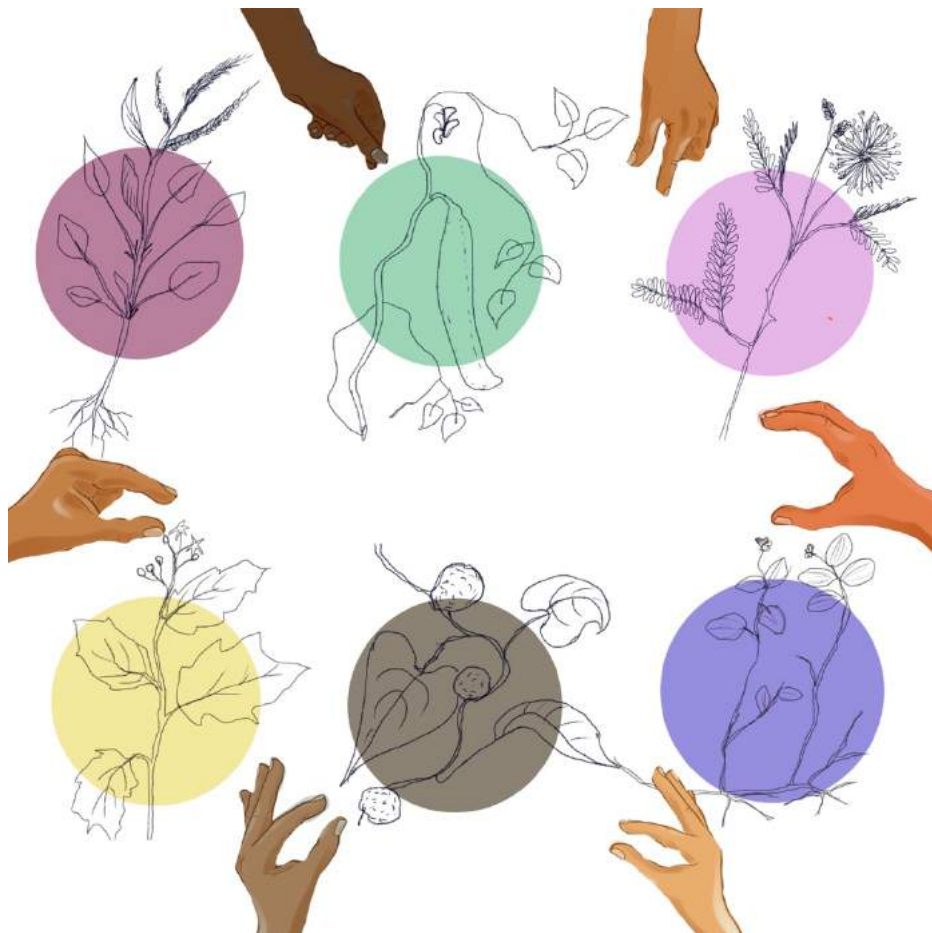
Other than the greenery, there is a short kadappa bench nestled under the drumstick tree under which are stored the humble tools required to tend to the space. Two watering cans, a pair of clippers, pruning shears, a shovel, some small buckets, pots, and some seed boxes. Near the entrance to the garden, four metal chairs, a table, and an umbrella create a beautiful space for just sitting down and reflecting or some quiet reading. We sit there and chat a bit more about the inspiration to keep this going. This space is integral to Vidula's family and their lifestyle – during the pandemic, this space served as a hands-on workspace as well as office space for all the family members. It also provided respite from the redundancy that had set in, as the garden always had something new to offer. There are always a couple of ingredients from the terrace in each meal they eat. It serves as a reminder of the energy and enthusiasm of Vidula's father who set it up. And it serves as a common ground for many of the apartment residents who not only benefit from the occasional bumper harvest of various produce, but also from seeing their terrace flourish as a green space. As we walk down to Vidula's apartment, it is clear to me that this terrace garden serves a purpose way beyond just the harvest of produce – it is a living, growing, and ever-evolving part of the family and community.

Part 2

Growing a green thumb

“To garden is to make whole again what has been shattered: The relationship in which you are both producer and consumers, in which you reap the bounty of the earth directly, in which you understand fully how something came into being. It may not be significant in scale, but even if it’s a windowsill geranium high above a city street, it can be significant in meaning.”

— Rebecca Solnit, *Orwell’s roses*



Gardener's Gold: Compost

Anjali Choudhary

Healthy plants need healthy soils. What if you were told that all your kitchen waste could turn into nutrients for your plants, instead of being thrown as a pile of garbage? Alchemy, you say? Well, then it is time you turned into an Alchemist and discover the gold hiding in your everyday waste. Welcome to composting.

My journey as a gardener didn't start with growing my vegetables; rather, it started with composting⁶ at home. With a lot of compost⁷ being made at home, I was applying it to all the flowering plants in my garden. Gradually, apart from noticeably healthier plants, I also spotted many saplings growing between the flowering plants and in the pots. These were baby papayas with 6-7 sprouting leaves. I had never sowed the papaya seeds or planted in sapling. I realised that these had germinated from the compost. With so many healthy papayas thriving in the garden, I thought of growing other vegetables too. So, it was compost that led me to embark on my gardening journey, as I began growing tomato, chilly, ivy gourd and many other edibles over time. Some initial setbacks included monkeys eating all my tomato harvest, but eventually I managed to get a share. Thereafter I planted brinjal, pumpkins, bottle gourd, sponge gourd and cucumbers. Like all other gardeners, my focus used to be on a healthy feed for my plants. Feeding them with homemade compost, adding vermicompost to the plants, using banana peel fertilizer and spraying other bio cultures was now routine. All the applications introduce lots of nutrients in the soil. As the human body derives energy from food for overall functions and survival, the plants derive their energy from soil. The richness of soil will dictate the nourishment of the plants and hence, gardeners focus on building their soil and provide their plants with essential nutrients. I came across expert gardeners who recommend vermicompost or homemade compost as feed for plants. These composts are a natural way of fertilizing the soil and supplying nutrients to the plants.

⁶ Composting is a natural process where organic matter like (agricultural waste, vegetable and fruit waste, dry leaves) breaks down into valuable fertilizer which can be used to enrich soil for growing healthy plants.

⁷Compost is the end product of the composting process.



Image 1 : Spot the two-papaya tree in the image on image. These are from the papaya seeds which germinated after compost application. I am harvesting the home-grown papayas in the image in right.

Delve deep into to magic of compost

If you are wondering what this compost is like and what benefits does it hold? Have you ever walked in a deciduous forest or an area with a lot of trees? If you observe the forest floor, the first thing you might notice is the thick layer of fallen leaves in various shades ranging from light yellow to grayish-black. Some fruits might have fallen from the trees, releasing the funky smell we associate with over-ripe, sweet food going bad. You might spot some animal dung covered with flies. You are witnessing the process that sustains life – decomposition of organic matter. Underneath the decaying leaves, you might see white threads of fungal and bacterial structures responsible for breaking down the complex organic matter into simpler nutrients that will eventually replenish the soil. Dig around a bit more and you'll see many critters, earthworms and insects in the soil, which itself will be this crumbly, slightly sweet-smelling substance – The stuff of life. Now, what if you were told that you can observe, and even create this magic at home? This mini ecosystem can be created in our homes and gardens using the process of composting. This phenomenon recycles organic matter, such as leaves and food scraps, into a fertilizer for plants.

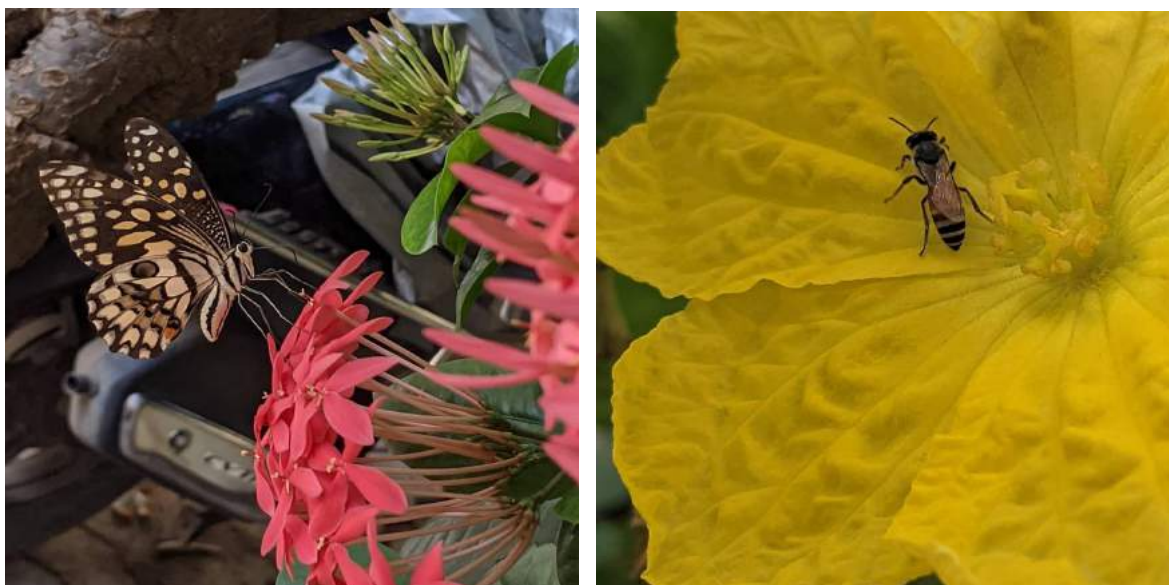


Image 2 : Butterfly and honey bees are attracted to the flowers in the garden.

Compost introduces so many microorganisms and life forms in the soil. It provides further food for these live forms to flourish and thrive, enhancing the quality of soil. With regular application, I have observed life thrive in my garden. Not only healthy flowering plants, but also sightings of earthworms became regular. Earthworms not only aerate the soil but also breakdown the organic matter further in the soil and make it available for plants to absorb. The part of the garden which has earthworms also has this dark and crumbly soil.

Compost has proven to be far better than the artificial and synthetic fertilizers to provide natural and more resilient soils. Unlike artificial fertilizers, compost contains macro and micronutrients, and these are released slowly over time. No wonder, why plants bloom with application of these fertilizers. Composting has not only added to the richness of the soil and growth of the plants⁸, but it also helps in recycling of kitchen and yard waste.

⁸ With application of compost, acidic and alkaline soil can be neutralized improving pH levels hence providing better nutrient availability to the plants. Soil enriched with compost is able to hold and retain water, nutrients and other fertilizers better by preventing runoff. It loosens the soil and provides a good soil structure with air channels holding up the air, moisture and nutrients. Soil enriched with compost holds diversity in the form of insects, worms, bacteria, fungi and other organisms that burrow through soil. In addition to improving the physico-chemical and biological properties of the soil. It is an excellent source of plant nutrients such as nitrogen (N), phosphorus (P) and potassium (K). It helps plants develop a healthy root system. Compost provides nutrients to the plants preventing any nutrient imbalance. This in turn makes the plant resistant to fight any pest and disease attack as compost retains water, it prevents plants from drying out quickly. A healthier soil is also a carbon sequester.

Types of Compost

As a composting enthusiast, I came across various types of compost and got confused over which one to use. The magical thing about variety of compost is that any of them can be used for the garden. They are natural and good for soil. To talk about a few of these compost, we briefly discuss vermicompost, green manure, farmyard manure, and leaf compost. As a home gardener, not all compost are feasible to prepare at home. Hence it is important to understand the type of compost and requirement before starting the composting process.

Vermicompost: Earthworms are the star player of vermicompost as they eat the waste, digest it and then excrete. Their excreta is known as vermi cast and those are power packed with lot of nutrients⁹. The organic material required for vermicomposting can be crop residues, weed biomass, vegetable waste, leaf litter, food refuse, waste from agro-industries, cow dung, organic portion of urban and rural wastes. The earthworms are introduced depending on the waste compositions and thereafter the process of decomposition starts. The whole process makes compost which improves the soil's water absorbing capacity, increases seed germination and supplies continuous nutrients to all plant life. These fascinating earthworms can transform your garden into a beautiful and blossoming wonderland. Usually, farmers use large quantities of vermicompost as they have easy access to raw material and earthworms. Vermicompost preparation demands more attention and management as the temperatures must be in check for earthworms. Lot of heat generated in the process or lack of moisture can kill the earthworms. This method is recommended after some experience in a simple method of composting.



Image 3 : Earthworms in soil. (<https://pixabay.com/photos/compost-earthworm-worm-7006499/>)

⁹ Castings of earthworms contain higher amounts of nitrogen, potash, and calcium than found in good topsoil. To know more about vermicomposting read:
https://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html

Green Manuring: Using green plants as manure is known as green manuring. For this process, we grow variety of legumes (green gram, chickpea, soybeans, peas), cereals (Sorghum, Maize, Wheat, Pearl millet, oilseeds (groundnut, sesame, mustard, sunflower) and vegetables seeds (fenugreek, spinach, coriander, beetroot etc). The above-mentioned seeds are sown in the soil and after 30-40 days of germination, they are uprooted. These must be chopped finely and mixed into the soil and watered. After 15 days, the soil is turned and left for another 50 days. After a total period of 70 days, the green plants have decayed and converted into nutrients in the soil. Now, you can use this soil to grow your vegetables and plants. To grow crops for green manuring, we need some extra space dedicated to growing these crops. Also, make sure that the plant is uprooted before the flowers set in.

Leaf Compost: This is the easiest form of composting which requires minimum ingredients. Fallen dried leaves are collected and put together along with cow dung slurry. Leaves should be dried and shredded. If you don't have a shredder then they can be crushed by hands or jumping over them. Cow dung slurry is added to provide the nitrogen content and



Image 4: On left, two leaf composter are placed in the garden. On right, I am standing with mesh wire composter

speed up the process of decomposition of carbon rich dried leaves. The leaves require 12 months to decompose and form compost. But you can harvest them after 6 months and use it as leaf mulch for mulching your garden soil. A small mesh wire of 3 to 4ft can be bought and placed in the corner of the garden.

Farmyard Manure: Farmyard manure¹⁰ (FYM) is the decomposed mixture of dung and urine of farm animals (cow, goat, buffalo etc.) along with litter and left-over material from fodder. FYM requires supply of animal excreta and larger decomposition area which makes it unsuitable for home gardens. These can be easily bought from the farmers or cow sheds/dairy farms.

¹⁰ https://agritech.tnau.ac.in/org_farm/orgfarm_manure.html

Home compost: Home compost is another easy option to make at home. The raw materials required for home composting are generated in our kitchen every day. Yes, I am talking about kitchen waste that is fruit peels and vegetables. Organic waste can be decomposed by using two easy composting methods: Aerobic (with oxygen) or Anaerobic¹¹ (without oxygen). Both methods can be used at home for generating compost.

Let's talk about *anaerobic composting* first. This composting can be easily done by using a dustbin with a tight lid and a tap to drain excess water. Some microbes shall be added to the composting bin. These microbes are available in the market. The process happens in two stages

- 1) Fermentation of the waste in the bin: Add the kitchen waste every day in the bin and make sure to press it down to remove any air. Always keep the lid close after adding the waste. The excess water generated in the bin can be removed by opening the tap. This water is known as leachate¹² and is beneficial for plants or can be poured in the drain to clean it. Once the bin is completely full, then keep it aside for 3 weeks and start using the second bin. Stage 2: Decomposition takes place for over a period of 3 weeks. Once harvested, mix the composted material with soil or compost and keep it aside in a container with holes. This will help in air supply and curing of the compost which can then be used for soil application. Few things to remember while doing anaerobic composting: There may be smell only when you open the lid of the bin and the smell will dissipate after closing the bin.



*Image 5: Trustbin is a brand in India which sells anaerobic composters :
<https://www.trustbasket.com/blogs/composting/anaerobic-composting>*

Now moving on to *Aerobic composting*, I started this at my home in an earthen pot using a 'Do it yourself' method which I describe in detail below:

¹¹ <https://www.trustbasket.com/blogs/composting/anaerobic-composting>

¹² The excess moisture is oozed out in the composting process as a brown/black color liquid. It is known as leachate. Read more about leachate here: <http://www.carryoncomposting.com/441149729>

Requirement for items to start aerobic composting at home:

A bin: For beginners, an earthen pot is the best bin to start with. If earthen pots are not available, use any flowerpot or a plastic dustbin with a lid. The lid should be easy to lift but not too loose. For estimating the size of the bin, consider 1 kg of kitchen waste for a 4-member household. A bin size of 30 litres will take around 30 days to be full. Start using another bin.



Image 6: In sequence from left to right, A plastic bin, Earthen pot, Tripod stand, Rake and stick

A stand to keep the pot/bin: The compost bin (pot/ dustbin/ bucket) should be kept balanced. Using a plastic stand/iron tripod will ensure balancing and hassle-free collection of leachate.

A Container: This will be placed below the compost bin to collect Leachate. It is the brown water percolating through compost. This can later be used for plants (dilute 1 part with 10 parts water) or simply let it go down the drain to unclog!! The size of the container should be small so as to fit inside the stand just below the bottom hole of the compost bin.

A rake and stick: This will be helpful in mixing the compost. Rake is not compulsory but a stick is.

Knowing the waste: In compost, we add our kitchen waste which is known as ‘greens’ or ‘wet’ waste and dry garden waste known as ‘browns’ or ‘dry’ waste. Good composting will happen only when there is a specific blend of green and browns. Brown materials are high in carbon, while green materials are high in nitrogen. Usually, double the quantity of browns is taken than the greens. The below image will give a insight on what to include in both brown and green.

Balancing Greens and Browns

NITROGEN	Wet Waste Greens Discarded vegetables/vegetables peels Food waste/food scraps/leftover food Coffee/tea grounds/ tea bags Stale bread/egg shells/leftover salad cut flowers Prunings/fresh grass clippings Cow manure/poultry manure	Dry waste Browns Dry leaves/garden shrubs Corn stalks (broken) Cocopeat Saw dust/wood chips Shredded paper/shredded card board Newspaper Twigs/small pices of barks Paper napkins/tissue paper Garden Soil	CARBON

Image 7: List of greens and browns to be added in the compost bin

Let's Assemble:

To start the process, we need to set up the required items for hassle free composting experience. The below process takes you to the complete process of composting and its setup:

- Let's drill the holes: Around 10-15 small holes need to be drilled on the compost bin using a driller/screwdriver or nails. Drill a hole at the bottom center of the bin. This is where leachate will escape the pot.

Home Composting from Kitchen Waste

- 1 LETS DRILL THE HOLES**
 Make holes on the wall of the pot/dustbin
- 2 FIND A PLACE & SETUP**
 Place the pot over the tripod and plastic container below the stand.
- 3 START LAYERING**
 Base layer: Browns
 second layer: Greens
 Third layer: Browns
 Fourth layer: Greens and so on
- 4 FINE-TUNE THE MOISTURE**
 If moisture content in pile in high then add dry waste
 If pile looks dry then sprinkle water
- 5 TURN THE PILE**
 Using a stick, turn the pile to increase aeration.
- 6 LET IT COMPOST**
 Once the pot is full, stop adding the waste
 Turn the pile and check moisture content every 4-5 days.




Image 8: Steps to follow for composting and reference image of the setup

- Find a place & Setup: For selecting a location for placing the compost bin, choose a corner of the garden or balcony where it doesn't hinder your movement. Keep the bin

away from direct sunlight. Place the bin over the tripod and plastic container below the stand (Refer to the image above)

3. **Start layering:** Fill the first layer of bin with ample browns say 1/4th bin shall be filled with browns. Start adding your kitchen waste. With every layer of kitchen waste, cover it with a thin layer of browns. The proportions of brown will vary with the type of brown used in layering. If leaves are used then, 2 cups of kitchen waste will require 4 cups of dry leaves. If cocopeat is used in layering then, 2 cups of kitchen waste will require 1 cup of cocopeat. Use equal proportions of brown and kitchen waste when using soil for layering. The process of layering (as in the image below) shall be continued till the bin is full. Make sure to leave some space at the top of the bin.



Image 9: Cross- section of layered browns and greens <https://www.growinggreen.com/get-started-composting/compost-layering/>

4. **Fine-tune your pile's moisture:** the pile inside the bin should be neither too dry nor too wet as both will hamper the decomposition process. Add browns if you feel the pile has high moisture content. Add some water if you find the mixture dry. Easy way to identify it is by squeezing the waste in your palm and if it's like a wrung-out sponge, it's good. And I never tried doing it, rather visualized that it doesn't give out more than a few drops of water when squeezed!
5. **Turn the pile:** Mixing the pile every day helps in aeration. Mix the pile after introducing the wet waste. Also, cover the pile with the browns so the next time while opening the lid only brown is visible.
6. **Let it compost:** Once the compost bin is full, cover it and keep it aside. Once in a week check for the moisture content. It will take 60 -90 days for your pile to turn into compost. In case, you haven't got the time to check the compost bin occasionally, nothing to be scared of. Either the compost will be ready or may show some symptoms of dryness or excess moisture. Repeat step 4 and keep the compost bin aside for a few more days.



Image 10: Freshly harvested compost. The compost is not always fine powder. It has bigger chunks of uncomposted food items e.g. corn cob which takes longer time to decompose. These chunks can be removed and put back in the compost bin

7. Curing: The final compost derived from the above process needs to be cured for another 45 to 60 days. For curing compost, transfer it in another bin which is aerated. The compost shall be kept moist at all times so that further decomposition happens. After this, the compost is ready to be applied to the soil.
8. Sieving: Few people like the compost to be fine textured so they sieve the compost before using. You can do so by simple sieve used for sieving wheat and other grains. I find the whole process very calming and the aroma of the compost lightens up my day.



Image 11: The left side of the image has bigger chunks, and the right side has fine sieved compost.

Add more bins

Once the bin is full and you keep it aside, another bin is required where you can start adding your waste again following the same process as above. You can place the new bin above the old one (as in the image below). This will require less space to keep the bins. Once the second

bin is full, start using the third bin. Meanwhile, check the first bin for the compost process. Number of bins required by a household will depend on the family size and amount of waste generated. It looks complicated before starting but the continuity sets in after initial composting cycles.



Image 12: Compost bins are stacked over one another to save on space

Diagnose your compost

While composting, few problems might occur. But, not to be disheartened, it's better to know how to tackle these issues if they ever come up. here's a quick diagnosis of the situations:


Diagnose your compost		
Foul Smell Happens when too much moisture. Add Dry waste or may be the Kitchen waste lies exposed. Cover it with dry waste	Too many Ants Dry pile attracts ants. Add water, spray turmeric around the pot or apply it on the brim	Too much leachate It indicates high moisture content in pot. The process will slow down. Hence, Add dry waste
White/brown larvae They are soldier fly- good for the compost. Not dangerous. Keep your pile covered with dry waste		

Image 13: Issues which are faced during composting and their solutions

For hassle free composting:

Use of Accelerator: Buttermilk acts as a catalyst for decomposition of the compost pile. Adding some buttermilk every week to the pile will accelerate the process. If the moisture content is high in the compost pile then add curd instead of buttermilk. Within 60-90 days, the pile should transform into compost which will be dry, dark brown, crumbly and smelling of earth.

Items to be added: Composting is a natural process and can't go wrong but there are always questions about what goes in the process and what shall be kept out. Below is the list which can be added to compost bin:

- Discarded vegetables/vegetables peels
- Food waste/food scraps/leftover food
- Coffee/tea grounds/ tea bags
- Stale bread/eggshells/leftover salad
- cut flowers
- Prunings/fresh grass clippings
- Cow manure/poultry manure
- Dry leaves/garden shrubs
- Corn stalks (broken)
- Cocopeat
- Sawdust/wood chips
- Shredded paper
- shredded cardboard
- Twigs/small pieces of barks
- Paper napkins/tissue paper
- Garden Soil

For beginners in composting, we can avoid the below items as they might hamper the composting process. But advanced compost enthusiasts can use their discretion to add the following materials, which are fine when added in small quantities.

- Meat/fish
- Large amount of oil
- cooked food
- Dairy products
- Diseased plants

There are few things in the kitchen which come as food packaging and can end up along with food waste unknowingly. They shall not be added to the list. Be cautious about this list:

- Glossy newspaper print
- Plastic

- Aluminum foils
- vegetable net bags

Always cover your kitchen waste with leaves: If you open your compost bin to add more waste, what would you like to see? A layer of fungus or maggots diggin in your compost pile? Not many are pleased with this view. So, always keep your kitchen waste covered with dried leaves or other browns.



Image 14: On left, the fungus which grew in the food. This is not harmful and can be mixed into the waste. On the right, kitchen waste covered with the dried leaves.

Beautiful brown thing: Identify the compost

A well matured compost is beneficial to the plants and immature compost can lead to various issues. With the preparation of your own compost, it is imperative to know when it is fully prepared. To recognize a fully matured compost, look for the below points.

Colour: At the beginning of the composting process, there will be various colors of brown or yellow leaves, wilted flowers, green grass clippings, white eggshells, colorful vegetable and fruit peels, and many more. During the decomposition process, the colors will be blurred and transition towards brown, black color. The ready compost will have a uniform brown to black color.

Texture: It should be dark in color and look like soil. It should be crumbly and appear like tea leaves after being sieved from tea. If you pick it up, it should fall easily in crumbs or particles from your hand. If you can still see the individual elements of the compost, then the compost needs longer to mature. If there are chunks of vegetables, and fruits then let the compost sit for some more days. Any larger chunks of wood, corn cobs, and peanut shells will take more time and hence can be removed and added to another compost pile.

Moisture: A good compost will have moisture content. It gets drier with maturity. Squeeze a handful of compost in your palms and if it is dripping water then there is too much moisture. Then let it dry for a few days by ensuring proper drainage or mixing the compost regularly.

Smell: Taking a good whiff of your compost will help you determine the readiness of the compost. Usually, compost will not have an offensive smell. If it is too pungent, then there is something wrong with the compost. The decomposition process releases nitrogen gas and hence the stinging smell of ammonia. This indicates that compost has not fixed the nitrogen and will require more time for the compost to get matured.

Heat: Compost is cool when touched. Any kind of heat emitting from the compost indicates leaving the compost as it is for further decomposition and maturity.

Use compost for garden

To use the cured compost in potted plants then remove 1 inch of soil from the pot and put in the compost. If compost is to be applied in the garden then loosen up the soil and spread the compost over the soil.

Hope this process of composting gives you clarity on preparing your compost from waste. My whole journey of composting started with an aim to reduce my waste from the landfill. But as I was reading and experimenting with composting, I came to know that the kitchen waste being thrown away can be so much more useful for gardeners like us. While I was taking care of my kitchen waste and garden waste, I was left with a lot of dry waste. In the dustbin, I could easily peek into my dustbin to clearly identify what is left behind. Most of the objects were segregated easily.

I started segregating my waste thereafter. Plastics were cleaned and stored to be sent to recyclers and same with glass and broken glass. The whole experience of composting and waste



Image 15 On left, washed multi layered plastics are stacked up. On right, broken glass and other glass items are arranged in the box.

segregation has led me to think about all my actions and how they are contributing to the waste scenarios in the country. With one simple step of composting, I am much more aware of my choice and have adopted mindful consumption practices.

Different versions of compost setup:

Composting in window grill and home corners:



I hope this inspires you to start your composting journey, and share your experiences with a growing community. There is no space or quantity too small to start!

Guardians of biodiversity – a seed saving journey

Diipti Jhangiani

This chapter features a story on what is perhaps Nature's most cutting-edge technology - the seed. The article describes the importance and process of seed saving as a vital cultural and survival skill for protecting the biodiversity of food species on earth.

Origin of The Seed Saving Story

Take a seed pod in the palm of your hand. Crush it, squish it or crack it open. Emerging from a single seed pod, you'll find the promise of a forest. Thousands of plants, just waiting to emerge. And the journey of this proverbial forest starts from a single seed - the epicenter of one of Nature's most cutting-edge technology.

Ancient forests and grasslands are prime examples of the role seeds play in regeneration. They make for the perfect living labs to study and observe the journey of a seed as it germinates, creates a plant, then regenerates itself, and through this process, ultimately gives birth to a biodiversity.

Living Lab Experiments

Even if you live in a city and do not have access to forests, head over to the nearest garden, and around the park bench you sit on, you can observe the workings of little shrubs around your feet. You'll witness pioneers (what most of us call weeds) of green species such as varieties of grass, several varieties of wild edible like purslane, dandelion, mustard, stinging nettle and more. And if you extend this experiment of observation beyond seasons, you'll notice the unique life-cycle of these plants – they will germinate into seedlings at the onset of monsoons, reach their prime and thrive throughout heavy downpours, and put out pretty flowers to attract pollinators such as bees, ants, spiders, birds and bat. And then, when winter comes, they'd get happily plump in their old age, holding pods of wisdom. These pods are full of seeds, imprinted with all the information needed for the next generation to grow and thrive. Pods that will fall into the same cracks in between tiles of the garden or be carried by the wind, just to repeat the same cycle over and over again.

In fact, our forefathers, the early humans, might have conducted the same observational experiments over time and deciphered how they could cultivate and consume plants and add them to their diet. And from this living lab emerged what we know of today as the unique agrobiodiversity of vegetables, fruits, roots and tubers, grains and pulses and legumes that are such a vital part of the food culture of our country.

A Few Elephant Tusk Seeds

At the end of 2017, I received a few seeds of a variety of bhindi (okra) called Elephant Tusk that were sown, grown, and saved at a permaculture farm in Telangana. I came back home to Mumbai and sowed the seeds in June of the next year. The seeds that I sowed in my garden in Mumbai located in western India in a warm, moist climate had their ancestry based in the dry and hot climate of southern India. I was apprehensive, would they germinate in this drastically different environment? Would they flourish or get stressed and perish? But when after just 7 days, I witnessed the seeds germinating and over the next few months experienced bountiful harvests, my worries were put to rest. And today, in the five years that I have seasonally sowed and saved elephant tusk seeds, I am mesmerized as to how a seed is able to not just survive but also thrive and multiply in diverse regions.

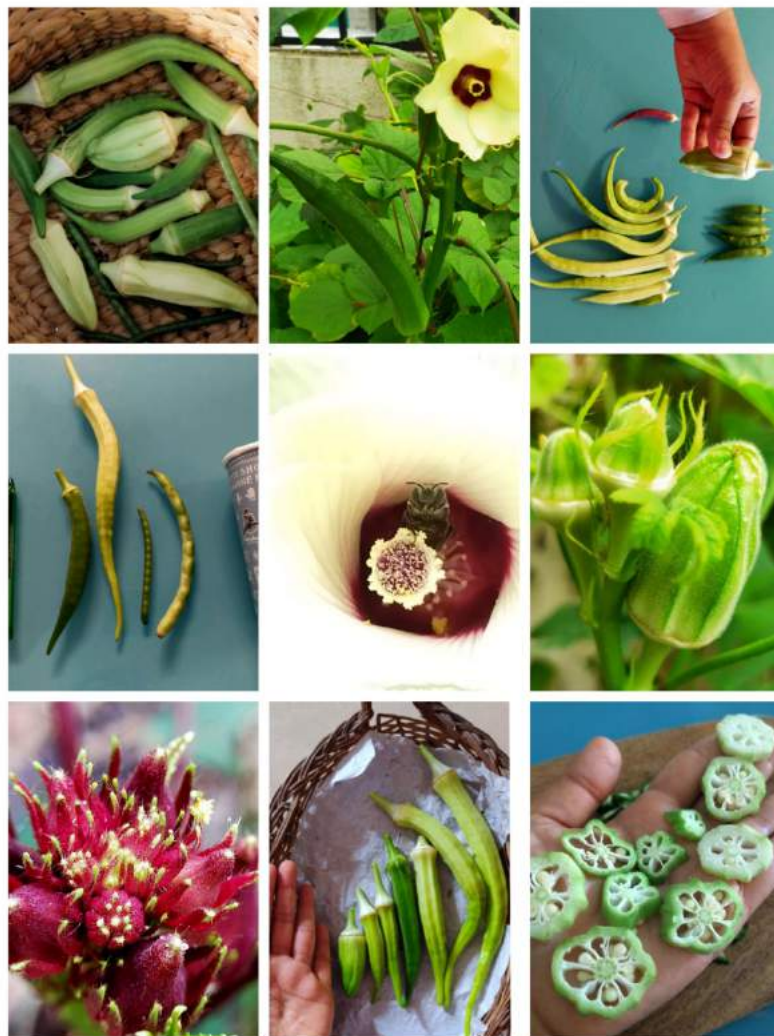


Image 1: Varieties of Okra

United Colours of Bhindi

How does a vegetable exist in so many varieties, beyond the singular green bhindi or white radish, or orange carrot we are used to seeing in our delivery baskets or in the markets?

As I write this piece, nearby in my kitchen, I hear the sizzle of candle fire okra, my favorite variety of bhindi, in a pan garnished with some freshly desiccated coconut. It is one of the many varieties of okra I have grown in my urban garden over the years. It is bright red in colour, has a subtle fragrance, and is not as gooey as the green okra you see in vegetable markets. Each variety of okra has its unique fragrance, taste and texture. Take for example, the elephant tusk okra, which, as the name suggests, can grow beyond 12 inches in length in its tender stage to yield a light-green okra. Then there is the Clemson spineless variety, which is another shade of green and very robust in shape with prominent ridges. In fact, in the many cuisines of India, the variety of vegetable used calls for a unique preparation that showcases its unique flavour. Different varieties of colocasia for example, are used in different varieties of cuisine and prepared differently too - the one shaped like a heart is used to make alu vadi, a traditional Indian snack made using spiced chickpea flour, oiled and steamed in the colocasia leaves, whereas the variety that has oval-shaped leaves must be boiled with a souring agent like tamarind (to neutralise the itchy oxalate crystals) before processing further into a lentil gravy with tempered seasoning. These subtleties, a combination of nature's flavor palate and the rich human culture around preparing and eating food, is a treasure trove worth conserving and protecting, and the journey begins by conserving seeds.



Image 2: Saving Okra varieties

Seasons of Seeds

I am a fan of stuffed brinjal (eggplant) in a peanut and chilli-garlic gravy. This recipe is almost always prepared in the winters as it demands a specific variety of brinjal - the small, oval type that is seasonally available. Some of the more common varieties of brinjal that we see year round are the white eggplant (from where it gets the name), the long purple, big purple brinjal, and the round green variety. Each of these have their unique cycle of life as per different seasons. In my garden, I've closely observed a few varieties - the striped and

thorny variety of brinjal germinates at the peak of summer and gives bountiful harvests during the monsoon season, whereas the big meaty brinjal that we use to make the traditional brinjal bharta (roasted eggplant dip), stays dormant in the monsoons and comes back to producing fruit at the end of the monsoon season.

And if, like me, you are a lover of brinjal, then you'd want some variety or the other available throughout the year, right? Nature has a plan for us – there's a special brinjal or two for each season. The ability of a seed from the same family to germinate in a season that is ideal for its unique genetic makeup and its ability to stay dormant or thrive in a specific season is truly nature's way of giving us the opportunity of a bountiful and biodiverse harvest all year round. And it is in our hands, the unique seeds of each variety which we can save and sow again and again in the right season for many generations and enjoy the fruits of our labor.

Saving, Storing, and Celebrating the Seed

Now that we realize many superpowers of seeds - their several varieties, the role they play in food sovereignty, how they can give birth to a biodiverse forest – the natural next question is - how do we save seeds? It is really very simple. Identify a patch of land around you - it could be in the balcony or terrace of your urban home in containers or a farm patch - and start growing. Start your very own observational living lab. Choose individual varieties of plants that are easier to grow – some examples are basil, beans, and tomatoes. Nurture these plants with the appropriate sunlight, moisture, and compost. Observe the journey of these plants in a journal: variety of seed, date of sowing, date of germination, first few leaves, flowers, fruits, pest attacks if any, and so on. And when the plants begin to give you their first round of harvests, let a couple of the fruits remain on the plant. Let them plump up, let them dry out and then, only then, harvest them for their seeds. In this simple living lab observation, you will have witnessed the seed-to-seed journey - from a single seed sown in your container garden or farm, to a seed pod that's full of seeds for you to save for the next season.

Some plants like beans and okra, amaranth and radish have the ability to naturally dry out their seeds within the seed pods itself, after which the pods burst open to release the seeds. And then there are other plants like cucumber, tomato, snake gourd that are full of juices and quite mushy when their seeds have ripened, and hence we lend a helping hand in the process of seed saving. I've experimented with and successfully managed to save seeds of plants using a method of fermentation for tomatoes and cucumbers and you can follow the same for various other fruits and vegetables as well. Here's how - strain out the flesh and most of the juices of the vegetable or fruit. Then transfer the seeds (which might still have a light coating of juice and flesh) to a shallow bowl or plate and add water to the mix. Store this concoction in an undisturbed space, away from birds or any insects for about 2-3 days. After the first day itself, you will begin to see a thin veil of a white fungus develop over the liquid. This is a wild fungus from the air or the seeds themselves that helps to consume the sugars in the solution i.e the layers of flesh and juices around the seeds. By the second or third day, you can rinse off the fungal layer to find the hard-shelled seeds, ready for the next stage of seed saving - sun drying. Transfer the seeds into an open plate or tray and dry the seeds in an area

with good airflow like a balcony ledge or open courtyard. On a sunny day, your seeds should be all dried out and ready to store within 24 hours or so. If it is a humid or rainy day, try to dry the seeds indoors under the heat and light of a bulb so as to avoid any of the outdoor humidity from getting to the seeds. And once the seeds are sun-dried thoroughly, transfer them to a container (you can reuse a glass or plastic jar from your kitchen) and store them in a cool, dry and dark place.



Image 3 Stages of saving tomato seeds

Once you've witnessed this magical seed to seed journey, the world of seed saving, communities across the country that have dedicated their lives to seed saving, will open up to your horizon. Head over to social media communities started by individuals for seed swaps or visit some of the seed saving collectives of our country. There are some beautiful communities in India and abroad, working towards saving the biodiversity of seeds. The HOOGA Seed Keeper's Collective - a farmer collective for seed saving, Sahaja Seeds - a women self-help group, Navdhanya - seed saving initiatives managed by the community farm are just some examples of the seed-saving communities that have been working for years to save India's traditional agro-biodiversity.

Seed swap meets in cities and peri-urban areas are becoming hotspots for hobby gardeners and urban farmers to exchange seeds, saplings, cuttings of plants, tubers of flowers and rhizomes of edibles like different varieties of turmeric, ginger yam and potatoes too. Look out for seed swap meet-ups in your city or head over to some of the popular seed exchange and plant meet-ups in India such as Oota from Your Thoota based in Bangalore.

Districts and states across the country host annual seed festivals around the time of Makar Sankranti in January, where farmers from across the country come to display with pride the seeds that they have saved over the years. Closer to home in Maharashtra, the Mahalaxmi Saras Festival is one such celebration of indigenous seeds, local crafts and folk music. Seeds take the mainstage as we see the journey of the seeds and their significance to their seasons and cultures displayed in local paintings and drawings. From different varieties of indigenous rice to unknown species of yams and gourds to some very rare and medicinal varieties of turmeric - you'll see this and more if you venture out to these festivals.

Guardians of The Seed

In indigenous practices, a variety of seeds are saved each season by the custodians of the land and stored to be able to use again the next season for growing food and cash crops. These seeds are stored in containers made using naturally available, biodegradable, organic materials and also stored in many unique designs, keeping in mind good airflow for a temperature-controlled environment – typically a dark and dry space as bright light can cause germination of stored seeds and also to keep pests at bay.

For seeds that must be saved in large quantities, for example grains of rice and pulses for large tracts of land, farmers build enclosures made of cow dung, rice husks and soil with additives of Neem leaves and wood ash so as to keep pests at bay. Smaller quantities are saved and sealed in bamboo baskets that are pre-lined and sun dried with a similar concoction. While seed saving is a practised skill that anyone can develop over time, there are a few things that will help or mar your journey. I've listed out a few below.

Always start with singular varieties of plants in about 10 square feet of space - for example a single variety of basil instead of two to three different varieties. This is to ensure that in the process of open pollination, the genetic makeup of two different varieties of basil don't mix as far as possible, to give us the same fragrance and uniqueness of the original seed. This is a crucial step to ensure the uniqueness of each sub-species in the species of plants we want to save for the next generation.

If you are practising seed saving in your private garden or a space where you have the freedom to grow what you wish, then you need not worry about any issues other than spacing the plants out like I've mentioned above. But if you are attempting growing and saving seeds in a community garden, ensure you take steps towards informing all members of the community about your seed saving experiments, so as to safeguard from pods being harvested by mistake or thrown away by anyone not aware of the process.

For rare varieties of seeds, try to add a layer of protection by shielding the plants from slugs/snails, birds or rodents, who can easily devour the leaves, fruits, and sap of the plants. You can use fine *mulmul* cotton fabric or a nylon net mesh, which will also protect the plants from getting cross pollinated.

Once you have harvested the seeds from their seed pods, ensure they are thoroughly dry by exposing them to the sun for a few hours and then, sprinkle a little wood ash on them (it acts as an antibacterial, antifungal agent that keeps seed borers away) before packing them in an air-tight glass or plastic container and store in a cool, dry place like your refrigerator or a dark and dry cabinet.

You can also mix a variety of seeds from different families and save them in a single container, for example a mix of winged bean, bitter melon, okra and chilli. This is a smart way to keep seed borers away who prefer feasting on one variety of seed over the other. The mix of seed smells and textures confuses them and your seeds are well protected this way.

Seed Foraging in a City

Trees all around us, be it in urban jungles or in dense forests, are constantly living the cycle of life - they germinate, grow into robust trees, their flowers bloom to attract pollinators, they give bountiful harvests. And at the core of each fruit are the seeds that will give birth to a forest all over again. Animals and birds in a forest will munch on the fruits for food and throw the seeds to the ground, thereby playing the role of the perfect seed dispersers in the act set up and fine tuned over millions of years by Nature . But in an urban jungle, with concrete grounds all around, even though the seeds have matured and fallen to the ground, they seldom get the opportunity to germinate and grow into their full potential. So it is a good idea to explore your neighbourhood and observe the seasons that the trees follow. Once you have identified the season in which the trees around you begin dropping their seeds, head out on a seed-picking trip with your friends and family and a tote bag! In older neighbourhoods that have mature trees and lesser concrete, you will be pleasantly surprised to find some rare and unique forest species of trees too.



Image 4: Varieties of seeds collected during a walk

And then follow the same seed saving process: ensure they are dry, transfer them in airtight containers with a dash of wood ash, and label them with their known name and date of saving. Once you've prepped and saved your forest trees, connect with farmers or land custodians around you and encourage them to plant these forest trees in appropriate spaces on their land. An even more adventurous act is to head out and look for open/ abandoned spaces in your city and practise some guerilla gardening - the revolutionary act of greening a space. With seeds, the possibilities are literally endless - with this cutting edge-technology in your hands, you can sow, harvest, and save over and over seasons for many generations to come. Tell us what you will do with your seeds?

Reference Links:

Season Watch <https://www.seasonwatch.in/>

MAPUCA <https://www.facebook.com/groups/mapuca>

Googa Seed Keepers Collective <https://hoogaseeds.com/>

Sahaja Seeds <https://www.sahajaseeds.in>

Navdanya Seed Bank <http://navdanya.org/living-seed/navdanya-seed-banks>

Oota From Your Thota <https://www.facebook.com/ofyt.org/>

Annual Seed Festivals <https://grain.org/e/4202>



“Small is Beautiful” – Growing Microgreens in a Concrete Jungle

Berenice da Gama Rose

Getting Started

I started growing microgreens during the pandemic when we were faced with mobility restrictions which resulted in us not being able to go out much for fresh vegetables. I had already begun to study permaculture at that point and was dying to get hands-on experience without a lot of investment, since timelines for reopening were so uncertain. I first did my research on what veggies could be eaten as microgreens, for and realized that there was a whole variety of leafy, cruciferous and even root vegetables which make for wonderful, nutritious microgreens.

The Wikipedia definition of microgreens is as follows: *Microgreens are vegetable greens harvested just after the cotyledon leaves have developed with one set of true leaves. They are used as a nutrition supplement, a garnish, and a flavour and texture enhancement.* This is a comprehensive definition and it is incredible how microgreens really pack the flavour of the vegetable that we are used to eating, all in the tiny plant bodies (stem and 2 leaves), grown over as short a time as five to eight days from planting.

Microgreens are usually packed with nutrients because the new shoots are generally very strong and literally bursting with life. The fresher they are eaten, the more of this nutrient is derived from consuming these little powerhouses of flavour and nutrition.

Plants which grow as Microgreens:

Here is a comprehensive list of all the plants which can be grown as microgreens.

1. **Amaranthaceae family:** Includes amaranth, beets, chard, quinoa, and spinach.
2. **Amaryllidaceae family:** Includes chives, garlic, leeks, and onions.
3. **Apiaceae family:** Includes carrot, celery, dill, and fennel.
4. **Asteraceae family:** Includes chicory, endive, lettuce, and radicchio.
5. **Brassicaceae family:** Includes arugula, broccoli, cabbage, cauliflower, radish, and watercress.
6. **Cucurbitaceae family:** Includes cucumbers, melons, and squashes.
7. **Lamiaceae family:** Includes most common herbs like mint, basil, rosemary, sage, and oregano.
8. **Poaceae family:** Includes grasses and cereals like barley, corn, rice, oats, and wheatgrass. As well as legumes including beans, chickpeas, and lentils.



Pic: Freshly harvested green and red oakleaf lettuce microgreens

Leaves of the nightshade family are toxic, so tomatoes, chilies, peppers, aubergines and potatoes are not suitable to be eaten as microgreens.

Commercially available seeds which have been treated with fungicides or pesticides can have high degrees of pesticide residue when consumed as microgreens and therefore sourcing the seeds from the appropriate place is very important. Spice and herb seeds found in organic stores may also be unsuitable as they may have been irradiated to prevent pests, resulting in germination being inhibited. The same applies to most of the organic kitchen seeds that we have in our cupboards at home such as chia seeds, flax seeds, pumpkin seeds and the like. Most of these are heat-treated to preserve them for longer and would not germinate as a result.

One can experiment with microgreens by eating seedlings of plants which are **not known to be toxic**. For instance, as we ate a lot of papaya at home, I planted the seeds regularly and we have eaten the tree-lings ever since, as microgreens, with no ill effects whatsoever.



Pic: Papaya tree-lings can also be eaten as microgreens

Toolkits and Preparation

To start, I got together some ordinary plastic containers (from yoghurt and other supermarket containers), made some holes at the bottom with a hot nail, and then filled them with ordinary soil from the garden (no fancy potting mix). Since my garden soil has a lot of leaf-mulch, I sifted it a bit to take out the really big leafy bits so that the soil in the containers would be level and the microgreens would grow evenly, making for easy harvesting.



Pic: Yoghurt containers repurposed as microgreens planters.

I did not fill up the soil till the top so that it would be easy to harvest the microgreens (without touching any of the soil base/ getting any dirt along with the greens). I repurposed my mum's potato masher (she saw the humorous side to it, luckily!) and levelled the soil in the containers so that the harvesting would be easy (snipping along the same level) rather than getting different lengths of microgreens due to uneven soil level.

The last task was to buy seeds (these are ordinary seeds by the way, the only difference is that they are usually sold in microgreens packs by the hundreds rather than the ordinary packs, where they come in fewer quantities). I bought 16 packs of different seeds, so that we could have enough variety and different micro-nutrients in our diet. It is important to choose a source of seeds that is trusted and definitely organic, because microgreens are very dependent on the quality of the seed itself, and any toxin in the seed risks to be consumed in the fresh, new greens.

I very lightly watered the soil with a spray bottle before planting to ensure that it would not get waterlogged but there would be enough moisture for maximum germination. Then I made little labels with toothpicks and little bits of card so that I could identify which microgreens were growing in which container.

The last task was to actually sow the seeds in the soil – to make sure they were evenly spaced, I used a washed spice container with little perforations at the top, so that the seeds would spill evenly out on to the soil in the container and not bunch up in one place or on one side. Wherever there was unwanted bunching, I just patted the seeds out of a bunch into an even spread with my finger.

It's important to remember that there are two ways of planting microgreens seeds...some people prefer to soak the seeds before planting, especially sunflower seeds and pea seeds which tend to be bigger and have a harder seed-cover. Soaking makes it easier for the germinating shoot and root to emerge and reduces the time for them to germinate by providing the required moisture to kickstart the process before they are actually planted. However, with most microgreens seeds which are not heavy with hard covering such as herb seeds and salad greens (spinach, lettuce, amaranth, etc), it is easier to sow them without soaking as soaking would make them clump together. Mucilaginous seeds (basil and some other herbs) give off a mucous coating when they are soaked in water and this makes them clump together and could even increase the chances of mould, hence soaking before planting is not really advisable.

A couple of squeezes of the spray bottle just to get the seeds moist, and the seeds were ready to be covered and left alone for their germination process, usually 2-3 days in a dark moist environment. To ensure that no sunlight bothered the seeds (they respond best to a dark, moist environment), I simply covered the containers with their original covers, but not closing them completely air-tight as the moisture would lead to development of mould. Instead, I just placed the covers lightly on top so that there would be a very little aeration but no light bothering the seeds.

Microgreens can also be grown hydroponically or on coconut matting or even cotton as a substrate. However, I would suggest not to complicate the process by using substrates which are susceptible to mould or require high maintenance. Microgreens usually carry the nutrition which is inherent in the seed, which is why the substrate that they are grown in or on does not particularly matter. However, once the greens grow slightly bigger, the roots begin to derive nutrition from the substrate, which is why it is advisable to grow them in soil.



Roots of wheatgrass microgreens grown hydroponically using a colander in a bucket.



Pic: Little “water diamonds” appear on dainty pea microgreens after spraying

Post-harvest, it is advisable to recycle the soil as it would be depleted of some nutrients and also would be full of the compacted roots of the harvested microgreens. It is best to compost this soil in a kitchen composter or just tip the soil into a big bag of recycled soil which can be later mixed in 1:2 proportion with fresh potting mix or revived the same proportion of vermicompost or kitchen compost. It is advisable to break down the roots while recycling the soil, even cutting them into small bits with scissors is fine.

Another way of regenerating the post-harvest soil is to drench it with worm tea or liquid vermicompost derived from vermiculture. However, this depends on availability of the same, and unless one has a worm bin or worm farm at home, it is a bit complicated to do this as it entails ordering quantities of the worm tea, entailing transport and packaging costs and wastage. Best to keep it simple by mixing with fresh soil.

Monitoring the Process till Harvest

With microgreens, since the planting-growth-harvest process is so short, a total of 8 days on average, it is necessary to monitor well, right from the second or third day after planting. Usually, depending on the variety, the germination takes place by the third day from planting. The biggest challenge when growing microgreens for the first time is getting the moisture right. Too much moisture makes the seedlings susceptible to mould and it is usually difficult for the seedling to recover from a mould attack. So if there is any sign of mould, make sure that the container is exposed to more aeration, and do not spray water for a while. The water in the soil before planting is usually enough to last the seedling for the first 3-4 days without any challenge, especially since there is no exposure to sunlight.

For watering, make sure to spray very lightly, targeting the soil (at the base) rather than the tiny shoots from the top, as there is a risk the shoots will keel over with the weight of the drops of water. Light spraying will also ensure that the moisture penetrates into the root zone gently rather than draining quickly and leaving the root zone dry. Do not at any cost water the microgreens with a regular watering can or hose, the seedlings will just drown and die.

Ensure that after 2-3 days, when the germination is evident, that you remove the covers from the containers and expose the seedlings to indirect sunlight, so that the seedlings can develop normally and derive the maximum nutrition from exposure to sunlight, while they do not risk getting burnt by direct sun rays.

It is very important to ensure that the exposure to sunlight is at the appropriate time, so that the germination has actually begun in most of the microgreens. If hurried, the sunlight prevents germination and the process is compromised. If delayed, the greens grow, but they do not get a green colour, rather they remain yellow, which makes for an interesting science experiment of sorts. However, this mistake is easy to correct, just twelve hours exposure to sunlight will result in the leaves turning green.

Last, but not least, check regularly that there aren't ants eating up your seeds! This happened to me more than once and it was quite heart-breaking to see an army of ants going after my seeds and ensuring every single one was neatly hollowed out within hours of planting.

Once the seedlings have produced their true leaves (the first set of leaves after the shoot-leaves), the microgreens are technically ready to be harvested, although this is really up to the grower, whether to harvest right away or leave them for a while longer. The possibility of the microgreens growing really big is limited because of the limited space in which the seeds are placed in very close proximity. However, if left to themselves the seedlings will fight each other for space until only a few survive, or they will remain uniformly stunted until harvested. To harvest, ensure to use a special scissor which is not used for any other purpose, so that it is entirely sanitized and there is no source of any contaminant on the blade. Other than scissors, even a sharp knife or a grass cutter /grass-shears are fine, if using wide trays where the volume of microgreens to be harvested is large. The main factor is cleanliness and being able to cut at the same level in a wide sweep so as to avoid much manual contact with the tops of the microgreens, as these are very delicate and can get bruised while harvesting.

Make sure to cut at least 1-2 centimetres away from the soil or substrate so that no dirt comes up along with the harvested microgreens. Gently wash the microgreens, preferably in a colander or strainer, under a gentle spray from the kitchen tap. Ensure minimal hand contact to preserve the microgreens from getting bruised, while effectively removing small bits of dirt and pollutants.



Freshly harvested red and green amaranth microgreens

Common Mistakes to Avoid

- Mould arising from too much moisture within the container.
- Not exposing the germinated seedlings to the sun soon enough, which leads to stunting and can also be an enabler for mould.
- Allowing the microgreens to etiolate (getting long and spindly in search of the sun).
- Forgetting to spray the microgreens resulting in them drying out and dying.
- Harvesting with knife/ scissors used for general purposes (this can lead to the tips exposed to the cutting implement getting contaminated with any other substances which the scissors have touched before, and sometimes this can actually be poisonous as well!)
- Cutting too close to the base of the stem and getting dirt along with the harvested microgreens.
- Not observing the development of the microgreens quick enough to take corrective action.
- Investing a lot in equipment such as microgreens trays, special lights and cutting equipment before experimenting first and getting the knack of growing microgreens with basic material in the house.

Tips and Tricks

After harvesting the microgreens, they can be eaten straight away, either plain, or with a bit of dressing, as a salad, or spread over regular foods such as salads, eggs, etc. as a garnish or flavour enhancer. It is best to add them to the dish when it is not piping hot so that the crunch and flavour of the microgreens is retained. Also, because the nutrition is highest when fresh, not when wilted with the heat of the dish the microgreens are accompanying.

If you want to store microgreens, they last 2-3 days refrigerated in an airtight Ziploc packet or airtight container, as long as they are not crushed while packing. Again, don't keep them for very long because the nutrition is highest when just harvested.



Pic: Microgreens sandwiches are packed with freshness and flavour

In salads, sandwiches, juices or just crunched up plain, microgreens carry with them a powerful pack of nutrition, crunchy texture and flavour, their varied colour and appearance are an added plus. With a minimal expense and effort, microgreens are easy for urban gardeners to experiment and grow confidence with, before going into full-fledged vegetable gardening on balconies and terraces.



Pic: Red amaranth microgreens waiting to be harvested.

Once you have grown microgreens over and over again, you can elevate the standard to larger-scale cultivation for the entire family, or even make a business out of it by investing in some simple equipment such as microgreens trays, shelves or stacked system with several trays being placed in racks for simultaneous growth within a limited space. This scale of cultivation would warrant investing in a high quality potting mix to use as a base, and good quality seeds with a high rate of germination. There are also several electronic and hydroponic aids to grow microgreens in a sanitized and controlled environment where the growth is enhanced by controlled lighting for up to eighteen hours a day, all maintained electronically so as to avoid

human error. However, such interventions are for those who have taken their microgreens passion to the next level and want to experiment with high productivity rather than just the enjoyment of growing for one's own consumption.

There is honestly nothing as joyful as harvesting something from your own garden and eating it absolutely fresh, I can rank my joyful journey with microgreens as quite high on my list of achievements from that perspective alone, not to mention the amazing health benefits.



Pic: Cross section of fully grown microgreens, and root zone showing highly compacted roots.

Reference Sources:

- How to Grow Microgreens from Start to Finish (Complete Guide): Epic Gardening
<https://www.youtube.com/watch?v=dtvuMNVLIso>
- <https://grocycle.com/types-of-microgreens/>



Naomi (Left) and Berenice (Right) with their tiny harvest of Brazilian spinach and pumpkin flowers.

Understanding the undercover life: Mulching your way to healthy soils.

Priti Bhosale

Have you ever wondered about feeding the very land that grows food to feed you? Yes, that is precisely the aim of mulching. Let us understand how mulching can feed our soil. To mulch is to spread a blanket over the earth. It is very similar to how we drape a blanket to protect ourselves from cold, mosquitoes, etc., while we sleep. Mulch is like an edible blanket for the soil!

Now how do we put a blanket on the soil? Have you ever been on forest trails? What are the difference in the ground of the path you walk on and off-trail land under the thick forest canopy? A litter of dry leaves! Some trees shed leaves annually and some all year round. So the forest land is always covered with leaf litter. And where there are fewer or no trees, typically an opening in the forest, the land is covered with numerous small plants, grasses, ground creepers, mosses, etc.

The soil under the leaf litter is usually dark, crumbly, sweet-smelling humus, which is decomposed organic matter rich in nutrients and microbes. You might see many critters scrambling to dark corners if you lift the leaves and expose the soil to bright sunlight. At this point, you might be thinking – “Don’t plants need a lot of sunlight?”. Well, only the plant leaves require sunlight when they are performing photosynthesis. The soil, on the other hand, provides nutrients for plants to do photosynthesis successfully. So, where does the soil get these nutrients from?

To understand the function of soil, let us understand how soil forms. When rocks weather down due to exposure to the natural forces of wind and water, they eventually turn into mineral-rich powder. When plant and animal matter die and fall to the ground, millions of tiny microbes and insects eat it, which we call decomposition and convert it into microbial/insect dung that is rich in humic acid. Some examples of animal matter are dung, urine, dead animals, and body parts that can be shed like hair, nails, feathers etc. When the humic acid and mineral powder mix due to the constant movement of microbes and insects, it becomes fertile soil. Plants access the minerals and nutrients through their roots that penetrate the soil underworld and transport them up to the leaves, branches, and fruits. The cycle of decay and growth continues when the leaves fall on the ground and are decomposed by microbes, insects and fungi. Now you may be asking – “Okay, I get this. But what does mulching have to do with the process?”

The idea of mulching

Most microbes, critters and fungi prefer moist, shade-like conditions that are favourable to their growth. Their presence in the soil ensures that matter is constantly decomposed, and the movement of critters keeps the soil from compacting. The slightly loose structure keeps the soil aerated and allows for vigorous root growth. Next time, try pushing a finger through soil that is covered with some biomass and compare it with pushing a finger through the exposed

soil you might see near sidewalks. Taking a cue from forest floors, mulching, therefore, means covering any portion of exposed soil with dry organic matter, be it in a single pot or acres of farmland.

Why dry? Because green organic matter (that is rich with water content) slowly rots in an anaerobic (in the absence of air) fashion. This releases a lot of heat, stinky water and methane gas (yes, biogas). The heat released from the decomposition process could cause the burning of plant roots and stems or fungal infection while it stands amidst, or too close to the mulch. So, let's check out some basic principles of mulching:

A good thumb rule to live by is that soil should never be left exposed. Mulching is useful in all seasons. In summer, it protects soil from harsh sunlight and helps retain soil moisture by reducing the area for evaporation. This reduces the need for frequent watering as well. During monsoons, a layer of mulch prevents the rain from eroding the rich topsoil. In winter, mulch provides a layer of warmth and some ambient temperature for the microbes to survive the cold.

By now, if you are hopefully convinced of the benefits of mulching, here are some options for mulch:

- Dry biomass: Leaves fallen on the ground in your locality are ideal for mulching. Leaves from Eucalyptus trees are an exception (although they can be added in small quantities). Eucalyptus trees are allelopathic^[1], and its parts release chemicals that affect nearby plants adversely. Mulch should ideally include a good diversity of organic matter. If mulched with freshly cut greens like grass or leaves, it is better to let the green matter dry out in the sun and then use it. This reduces the chance of the plant stem or roots getting affected by the heat released by the decomposing green matter. Dried kitchen waste, chopped into smaller pieces, also form good mulch material.
- Coconut coir: Depending on the size of the plant, the strength of its stem and so on, even broken coconut shells, coir and similar kinds of plant fibre can be used. These can be avoided around plants with delicate stems to prevent the risk of damaging the stem due to careless placement.
- sugarcane bagasse: Vendors selling sugarcane on the road would be happy to pass you on the fibres that remain after extracting the juice. These can be dried and used for mulch, as they have a lot of organic matter, but the molasses-like smell takes some getting used to. Gathering and drying bagasse is a good idea if you have a lot of space (terrace or land).
- Live mulch: Shade-tolerant creepers can be used as a cover crop, and this acts as a living mulch. Legumes and Herbs can be planted in pots along with the main plant, and gourd creepers like bottle gourd, cucumber, ash gourd etc can be used if large areas need to be covered. The obvious additional advantage is getting two crops for the same amount of soil used! The *Iroquois* people of North America traditionally plant Maize, Beans and Squash in the same area, with each plant growing at different heights and drawing various nutrients from the soil such that all the crops thrive^[2].
- Wood chips and sawdust: Wood chips and sawdust can be obtained from construction areas or workshops. However, sometimes these may be chemically treated, and it is better to get untreated wood bits for mulching.
- Plastic mulch: Sometimes, the plastic cover is also used to cover the soil, especially over larger areas. However, the insulation built due to the material can trap excess heat and moisture in the soil. Additionally, the plastic itself adds to the waste being generated.



Mulching idle beds with banana leaves



Covering soil with mixed, dry biomass



Saplings mulched with dried bagasse

How to mulch

Mulching should be done at a short distance from the plant/ tree trunk. Avoid any abrasions to the plant stem or trunk due to decomposing organic matter. Mulch layers for mature (above 3 ft) plants and trees should be a minimum 2 cm to a maximum 4 inches thick. For small plants (below 3ft - above 1 ft) should be min 2 cm to max 2 inches thick.

Immediately after seeds have been sown, mulch extremely lightly with lightweight biomass like tamarind tree leaves, an extremely thin layer of finely cut grass or fine sawdust, etc. This mulch should ideally last till the seedling has sprouted up. Top up mulch with the same light material whenever needed (that is, when soil seems exposed and dry) until the seedling is at least 6 inches high. As the plants grow bigger, the intensity of mulch can increase and heavier material like bigger dry leaves, not so finely cut grasses and weeds, wood chips etc, can be used.

This brings us to another advantage of mulching. Heavy mulching can help suppress weed growth. The logic behind it is that the thick layer of decomposing mulch doesn't let sunlight seep in and makes it tough for the seed to germinate and shoot up from all that heavy weight. So, if you heavily mulch your vegetable seeds, they will not germinate. Timing then becomes an important factor. You should wait for the seedling to grow a bit, before mulching heavily such that other weeds find it challenging to sprout.

It is also a good practice to keep idle soil covered in mulch to preserve the microbes in the soil, and allow the critters to do what they do best – keep the soil alive!

That's it! Mulching is the most straightforward and essential activity in your balcony, backyard garden/farm to keep your soil healthy and protected. Happy growing!



Raised beds mulched with hay

[1] See Allelopathy. (2022, July 24).

In *Wikipedia*. <https://en.wikipedia.org/wiki/Allelopathy>. Allelopathy is a biological process involving one plant inhibiting the growth of a neighboring plant through chemical signalling processes.

[2] See <https://www.nal.usda.gov/collections/stories/three-sisters>

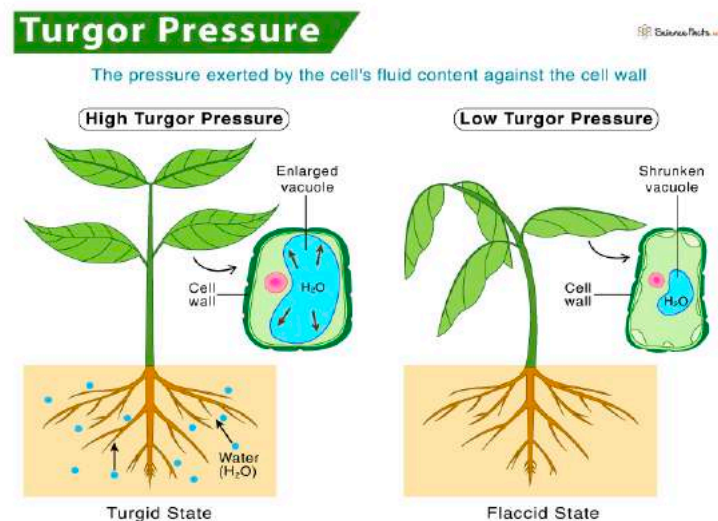
Don't go with the flow! Watering plants the right way

Trupti Kedari

When we talk about urban farming - “farming” which means the **act** of growing crops, in “urban” areas, we are mostly dealing with spaces that have negligible direct access to the ground and soil. This also means that unlike a forest, plants grown in our balconies or rooftops don't have access to a natural water reservoir from where the roots can draw water depending on their *need*. In urban spaces, watering becomes a crucial activity as we are guessing the plant's need (ideally) and providing water. In that sense, watering plants can be like a Zen practice; Seemingly easy, yet ridiculously hard to master. Too little can stunt plant growth, and too much can cause root rot, fungal infections etc.

Why water plants at all?

A simple answer is – because they are alive! A fundamental role of the plant is to create oxygen and energy in the form of sugar for other beings on the plant. Plants do it through the process of photosynthesis for which it requires **water**, sunlight and carbon dioxide. Water also helps the plant to transport nutrients from the soil to the plants. When the water pressure of the plant drops down the plant starts to wilt. Water pressure of the plants is called the turgor pressure which helps most of the plant maintain its structure, like the skeleton does to the human body.



Most of us show our love for our plants by watering excessively. Some of the hobby gardeners on social media also believe in overwatering the plant till the water starts to drain out.

It's not at all a good idea to over water the plants, as most of the soil and nutrients of the soil gets washed away with the water. This is one reason many societies in urban areas restrict residents from having plants in their balcony as all the soil gets washed away with the water and can lead to formation of stains. Excess watering can also lead to root rotting, as affects the ability of the roots to access oxygen by filling up the air pockets in the soil.



The ideal water content in soil just requires it be moist, like a nicely wrung sponge. You can check the moisture of the soil by simply poking your finger in the soil, if the soil sticks to your finger that means it has moisture and the plant doesn't need watering. That said, it is also important to make sure to have the right planter for your plants. If you have a small pot for a big plant or a plant with heavy foliage then the plants will wilt even if you water it daily due to heavy water transpiration through leaves.

When is the right time to water?

As we know that plants need water during photosynthesis, it's better to not put the plant in stress during its process. Also when you water the plants during noon the water gets evaporated from the soil surface instead of going to the roots of it.

According to my experience the *best* time to water the plants is before the sun is too harsh on the plant, or after. This will help the plant to use the water at its slow and steady pace.

How to water?

Using a watering can or pipe with shower head at low pressure is the best way to water the plants. This helps the water to penetrate the soil with ease, while giving the soil time to absorb the water. When we pour water on the soil with force the water splashes out of the pot disturbing the soil which can result in root exposure. Generally, roots don't like to be exposed, and roots exposure can damage the plant (unless they are aerial roots). Also, when

the soil is dry and we water the plant with pressure, most of the water drains out without staying in the soil for long. When we water slowly with a few pauses we give time to the soil to get moist and soak in more water.



For better understanding of this, you can do a small experiment -- take two pots of same size, same soil, and same quantity of soil, give equal amount of water both pots (take 2 watering containers, one for each pot) but in pot 1 directly pour water without any break, till water starts to drain, also collect the drained water and in pot 2 sprinkle water slowly and gently taking a few pauses of few seconds, stop when the water starts to drain out. Water left in the watering container will tell you which pot holds more water. The container which has watered the pot gently and slowly will contain less water than the container used for pot one. This simply means pot 1 is holding less water than pot 2.

What can we learn from nature?

Unlike the forestscapes, we are attempting to grow plants on a concrete jungle; and to succeed in that we need to understand and observe nature, how plants thrive naturally, and what can we do to create a microclimate for our urban food forest... the key question is, how do we mimic nature?

When we walk in the forest the soil there is always covered with organic matter mostly dry leaves, twigs and dead branches. This dead organic matter covering the soil is called mulch. It covers the soil and reduces the chances of evaporation, Also over the period of time the dry leaves will convert into compost for the plants. All of this organic matter acts like a sponge in the forest and holds water. Even after watering your plants in the right manner, always cover the soil with dry leaves.



When we decide to grow something in pots or other planters or even in our backyard, it will help us if we study a bit about the plants that we chose to grow, especially where it comes from. The knowledge of a plant's native habitat gives us a rough idea about the climatic condition, type of soil, preferred by the plant to grow well. Each plant's needs are different. And it's different throughout the year, depending upon the season.

This understanding helps us choose the right plant for the season, pick the right soil for the plant, water the plant according to its need etc.

for eg. If you want to grow Okra, just look up for basic information about okra in your search engine, like origin of okra, and cultivated in which regions,



Abelmoschus esculentus is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round, white seeds. It is among the most heat- and drought-tolerant vegetable species in the world and will tolerate soils with heavy clay and intermittent moisture, but frost can damage the pods. In cultivation, the seeds are soaked overnight prior to planting to a depth of 1–2 centimetres ($\frac{3}{8}$ – $\frac{13}{16}$ in). It prefers a soil temperature of at least 20 °C (68 °F) for germination, which occurs between six days (soaked seeds) and three weeks. As a tropical plant, it also

Gathering this basic information helps us understand that it will be easy to grow Orka in Mumbai as the climate is favorable. From the second screen shot I understand that okra will grow well in monsoon, it can tolerate my city's heat as well, and can also thrive in the heat if I give it the right soil which holds moisture. Now if the soil that I am using has less clay and more sand (basically a soil that doesn't hold water) I will have to make sure that I water it frequently.

How to use grey water for our garden?

Using grey water for gardening sounds like a great idea but one needs to be determined to take up this project in their garden. Be ready to fail and experiment multiple times. It can be very messy as well as difficult for beginners.

It definitely works, what makes it difficult is our urbanised thinking and habits. You will find it easy to design one for yourself if you observe and understand nature closely. If you observe areas near rivers and pond, you will see that there are natural water filters in our wetland in the form of plants. These plants have been filtering water for us humans and animals. The roots of these plants are loaded with colonies of bacteria and fungi that can biodegrade most minor pollutants from the water. There are wide varieties of plant species in the wetland. Wetland flora can be broadly classified into submerged water plants, floating water plants, emergent water plants and riparian water plants. For treating the grey water for the garden, a constructed wetland is ideal. This can be easily designed in your backyard or terrace. For this kind of treatment system, we need emergent plants, floating, and submerged plants. Emergent water plants grow above water with their roots submerged in marsh localities. Floating water plants are found in slow-moving water and have small roots. They are a source of food for avian species. Submerged water plants are 100 per cent under water, and provide food source for native fauna and habitat for invertebrates. They also possess filtration capabilities.

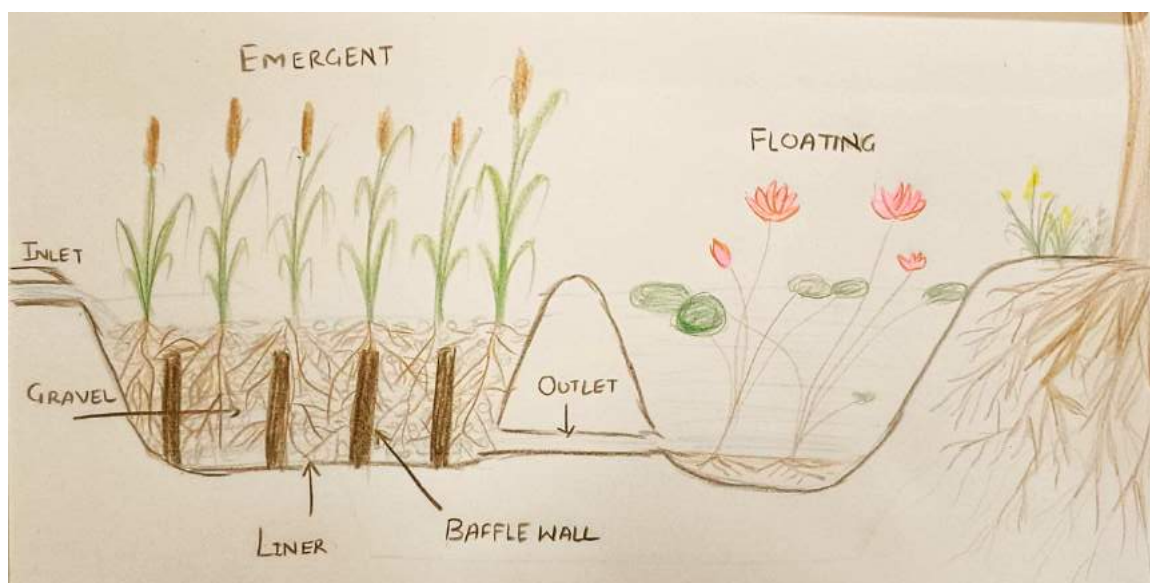


While constructing this wetland, I suggest avoiding waste water from their kitchen as it will be difficult to deal with the grease that comes along with it. Ofcourse, water used for washing rice and dal can be directly used for gardening. Besides this, water from laundry and showers can be filtered easily if eco-friendly washing materials such as soap-nuts are used. To optimise the effect, make sure there is maximum contact between wastewater and plants root.

Few things to consider while making the contributed wetland are:

- Size of the constructed wetland depends on amount of water used and sent out as grey water
- There shouldn't be any seepage other than the one designed for out flow
- Building baffles can help slow down the flow of water, this will ensure maximum contact between water and roots
- Divide the constructed wetland in two parts,
 - a) One for emergent plants where major filtration will happen this tank will be filled with gravel, brick pieces or pebbles. Make sure the water stays below the gravel. Emergent plants like colocasia, canna, elephant grass etc. are known well for this level of filtration.
 - b) Second where the water will be further filtered by floating and submerged plants. This is more like a pond in your garden, plants like water lily, water bamboo, water hyacinth, duck weed etc. can be grown here. Adding guppies in this pond will ensure this pond is not a breeding ground for mosquitoes.

Note: In a backyard the pond can be avoided and the filtered water can be sent directly to plants or trees through trenches.



How do you water the plant while you are away for a few days?

The best way that I use for watering is by making a bottle dripper. This is one of the best DIY by my mentor.

For this you need:

One 2-3 feet stick about an inch thick (*strong enough to carry 1 ltr. of water bottle*)

8'-9" jute rope

2 pet bottles 1.5 ltr., 2ltr.

Scissors

Ties

Steps:

Cut a 2 ltr bottle from the center, we will need the upper half of the bottle for this dripper (without the cap).

Make 4 holes with the tip of the scissors or soldering iron in order to tie the bottle to the stick.

Tie the bottle upside down on the top of the stick. Your holder for the dripper is ready.

Now insert the bottom of the stick in the pot you want to be watered.

Now take the other, smaller pet bottle and make a whole at the bottom and on the cap.

Tie a knot on one end of the jute rope

Insert the rope from the inside of the cap (*knots stays in side of the cap*)

Fill the smaller bottle with water, cap the bottle.

Place the filled bottle upside down in the holder.

Flow of the water can be controlled by fastening or loosening the knot.



You can also buy pipes and drippers from local agrimart and set up drip irrigation systems for your garden. These things are easily available in the market. However, it is fun and sustainable to reduce, reuse and recycle. Hence, I prefer using pet bottles for watering or paint buckets or drums for growing plants.

Similar methods of grey water treatment and drippers are there on YouTube® too, find the one that suits you. Following are a few videos for reference.

- (Grey Water Treatment Method in Eco home) <https://youtu.be/ezSJPrQ5AEM>
- (Water Management in Permaculture | Filtering Water with Reed Beds) <https://youtu.be/2glY7HdDxW8>
- (Eco-Friendly Domestic Water Treatment System, Bangalore) <https://youtu.be/g7U9r9UCFIY>
- (How to make drip irrigation with plastic bottles) https://youtu.be/gGwFr4CE_U4
- (Automatic Irrigation System for Home Garden) <https://youtu.be/cPV7vLQ9Wiw>
- (Install a Automatic Micro Drip Irrigation System For Raised Bed Garden) <https://youtu.be/81tjJQIe>

I was also once a beginner, and knew nothing about gardening. These are my learnings from my mentor and my observation of nature. And there is much more to it which needs to be learnt and understood from mother nature. All we need to do is get started!

Making planters for a kitchen garden

Julius Rego

There are many options available in the market, but you can be innovative and experiment with various materials to make planters. Generally, a good planter should allow for aeration, and drainage of excess water. It should also be made of materials which don't leach any harmful chemicals into the soil such as colour pigments from print material. Smaller plants, such as herbs can be grown in planters of depth 6-10 inches. Plants such Brinjal, Chilli, Tomatoes, Ladyfinger, and Capsicums require a 10 to 20 L capacity planter. In general, it is a good idea to plant fruiting crops in larger pots, since the plants will grow as per the space provided. Depending on the shape and size of the planter, multiple plants can also be grown together. The following table lists some common planters, along with its pros and cons. An Internet search will provide you many more ideas that people have used, ranging from grow bags, jute bags, old metal containers, rubber tyres, plain cardboard boxes, bags made out of old clothes and so on.



Image1: Planter made from discarded crate, lined with cardboard and topped with mulch

Type	Pros	Cons
Clay Pots	Easily available; Provides natural aeration and drainage; Thick walls prevent soil from heating up.	Need regular watering; Heavy to move around, and add to the load on terraces etc
Plastic containers	Easily available; Light weight; Can be upcycled from discarded waste	Becomes brittle and prone to cracking under prolonged exposure to sunlight; Tends to

		heat up; contributes to plastic consumption if buying new containers.
Wooden containers	Aesthetically appealing. Larger containers can be designed to allow for mutli-cropping.	Can be difficult to sources (fruit sellers can have crates, especially during Mango season), can leach toxins if the wood is painted, chemically treated etc. Can be prone to termite infestation
Raised Beds (enclosed area of soil/compost that is higher than surrounding area). Variety of materials such as bricks, concrete blocks, wood, bamboo etc can be used to make the bed	Don't need much maintenance once constructed; Can plant bigger plants together. Easy to control soil conditions and look out for pests.	Can be laborious to construct initially (depends on building material).
Trellis/Support can be made from various materials such as coir ropes, thin strips of wood, nylon ropes etc.	Helps in growth of creepers and climbers such as gourds, plants with weak stems such as Tomato, cluster beans etc.	Can be a little cumbersome to make initially.

Usually, you might notice that the pots available commercially have holes at the bottom of the planter to allow for aeration and excess water to seep out. However, in this design, the excess water also carries away soil nutrients along with it, and daily watering rituals end up harming the plant. In such cases, nutrients have to be frequently added to the soil, and is not a sustainable practice.

Alternatively consider what happens if there is no hole at the bottom of the container. Instead, if we make the holes at about 1/10 th to 1/3rd height from bottom, excess water will collect at the bottom of the container. Any nutrition dissolved would also collect at the bottom. This would ensure that the soil does not leach out nutrients and the plant will be healthy. Any overflow of water will be released from the holes. Adding mulch to the soil would further ensure minimal loss of water due to evaporation. Adding regular mulch would also ensure that the fertility of the soil does not deteriorate.

If one makes a few additional holes at the sides of the container, we can grow small herbs like basil, palak, brahmi etc. This will ensure that more harvest is got from the container. These holes will take care of aeration of the soil, thus making " living soil " in the container.

Growing plants this way takes care of several things.

- 1) minimises usage of water.
- 2) generates compost
- 3) avoids loss of nutrients.
- 4) ensures healthy growth of plants.
- 5) maximizes harvest.

Depending on the size of the planter one can grow fruit trees like Guava, Lemon, Pineapple etc.; Vegetables like Spinach, Tomato, Chilli, Brinjal, Cucumber, Bitter Gourd, Cabbage, Cauliflower, Onions, Garlic, Sweet potato, Corn, etc.; Herbs like Basil, Coriander, Lettuce, Mint etc.; Flowering plants like Periwinkle, Marigold, Rose, etc. One can even grow trees like Mulberry, Neem, etc, although they will not grow to their normal size.

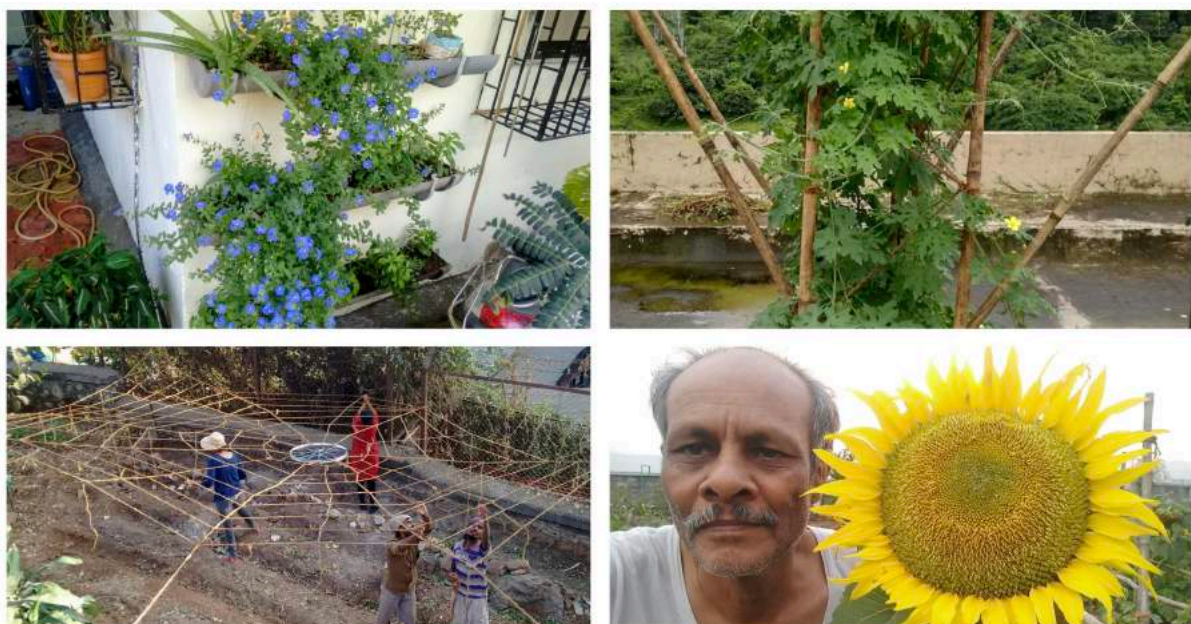


Image2: Clockwise: variety of planters and trellis designs, Julius with homegrown sunflowers!

A note on soil

Soil is a complex entity consisting of a mind-boggling variety of microbes, inorganic materials, and other organisms. It is a medium for plant growth, but also plays a vital role in storing Carbon that is captured by plants (through photosynthesis) stored in its roots, stems etc, and finally decomposing into the soil. The soil organic matter (SOM) improves its fertility through better absorption of water and nutrients. SOM also reduces erosion, improves soil structure and contributes to a healthy soil ecosystem, which in turn provide plants with access to nutrients and minerals.

Ideally, the soil for growing plants should be loose, fertile, have a neutral pH level (~7; neither acidic not basic), and have good water retention. Ways to improve soil fertility include adding kitchen compost, making nutrient rich SOM called *Amrit-Mitti*, making Bio-char, adding green manure, mulching, and natural fertilisers.

A potting mix recipe used by me is as follows: The mix should be made by mixing red earth, compost and cowdung 30% each by volume. Remaining 10% can be a mix of Goat Dung, Neem cake, Rock phosphate, wood ash and Cow urine (2% each). Add some dry leaves while mixing. This will ensure aeration of the mixture. The ingredients should be properly mixed. Make it moist and keep it for a week. Stir daily. The potting mix is ready to use after a week. An Internet search may provide many such home 'recipes' to improve soil fertility. It is advisable to test on one plant, and observe the results. Feel free to experiment and widely share your experiences!



How do you imagine growing food in cities?

Why is the pest a pest?

Anshuman Das

Pests are often seen as a menace, adversely impacting plants and harvest. However, eradicating them through the application of synthetic chemicals is not a sustainable or healthy option. Instead, if one can mimic an ecosystem, pest-predator relationships and healthy plants can deal with pest attacks without the need for harmful interventions.

The farms we usually see today consist of monocultures of rice, maize, tomato, or other grains and vegetables. To get maximum harvest, farmers typically ensure that the crop is kept clean from weeds and insects by thorough cleaning and by diligent mechanical and chemical interventions during the growth and fruiting phase. Use of fertilizers, irrigation, and other inputs are used to ensure a lush, uniform growth from one end of the field to the other. Other plants are considered undesirable and out of place. However, the dominating presence of only one kind of plant without alternate vegetation as food sources and shelter for the natural enemies of pests, accompanied by a high frequency of mechanical and chemical intervention, creates an environment prone to disruption and resistance. Pests tend to develop resistance to pesticides over a period of time, ultimately leading farmers to apply more pesticides, thus creating a vicious cycle.

The land is a living organism

A piece of land is much more than the visible crop. It is the soil full of minerals, biomass, microflora and fauna, water and air hiding between the soil particles. It is also the plants we see growing on the soil or the plants we don't want to see – the weeds. It is also the trees, wild plants, bees, and many other insects. It is also the sunlight falling on a particular piece of land. All this forms a system – the components and the processes. Processes like recycling energy and nutrients, photosynthesis, and degradation of biomass usually take the form of dynamic equilibrium. When this balance is disrupted, the system can experience unwanted changes manifested in the form of pests or diseases, nutrient deficiency in soil or yield loss.

Unfortunately, however, our farm can't be exactly a natural system. We can't allow animals and birds to feast on our wonderful harvest. We need to control it and design it as per our need. The need may be for income or for family nutrition. A good farm is a farm which follows the principles of the natural system – which tries to remain as close as an ecosystem.

This chapter is built on the obvious contrast between our sustainable approach of making use of the built-in defences and the interventionist treadmill approach. As a matter of fundamental principle, the application of external corrective actions into a system can be effective only for short-term relief. Long-term, sustainable solutions can only be achieved through imitating natural systems. Otherwise, we will always need new and better pesticides

as a constant competition with nature. A pest management strategy should always start with the question, 'Why is the pest a pest?'

When does a creature become a pest?

There cannot be any cultivation without insects – because there cannot be pollination without them. So are all insects harmful? Herbivorous insects are our potential competitors as they eat many plants that we consume too. Many such insects have natural predators, such as spiders and birds. If the population of predators decreases, the number of harmful insects may increase. If the vegetative growth of a plant is remarkable, which can happen because of an overdose of nitrogen fertilizer, the insects will come in hoards seeing good food all around. If the plant is weak, it will have low immunity to protect against diseases - then the insects may attack. Now, why does a plant become weak? Well, that is like asking why we fall sick.

There are multiple reasons, ranging from seed quality, nutrition available from soil, sunlight, availability of water and so on. Healthy soils allow plants to become resilient, and they can recover faster from pest attacks. Conversely, if the soil is unhealthy, the plant is weak. If the same crop continues to be cultivated repeatedly, newer generations of plants are more likely to be afflicted by pests. So, the pest attack on a plant depends on the soil, the crop, the life around and the health of the plant. But technology says, "If there is X pest, give Y pesticide, if there is Z bug, here is a different pesticide for that." This is reductionism – a very simplistic way of looking at the world. Often, those who are proponents of organic/natural farming fall into the same trap of technology. Even if it is organic/natural, it is boiling down to concoctions and prescription of using *Brahmastra*, *Neemastra*, *Dasaparni Dawai*, Cow urine etc. The more organic technology and organic 'medicine' you know, the bigger expert you are. Even the natural farming that has gained popularity nowadays put forward *Beejamrita*, *Jeevamrutha* and Mulching – again falling back on a prescriptive mode of few technologies. There are also many brands of 'organic' hormones, fertilizers and pesticides available in the market these days. Have we, at all, moved a few steps forward by breaking the cycle of chemical fertilizers and pesticides – if we have to again fall back on another kind of technology cycle?

The challenge in urban spaces

Urban gardening proposes some additional challenges for imitating nature.

- Limited space – Urban spaces do not have the liberty of using an ample amount of space. In-home – it is either on the roof, balcony or hanging on the window. Community-based gardening is sometimes taken up in common parks or small patches inside residential complexes. In balconies and other small spaces, mostly pots are used, and the use of individual planters limits the scope of nutrient recycling and the natural growth of beneficial organisms in the soil.
- Limited time for taking care – Agriculture needs close observation. Growers in the urban space are not full-time farmers – they often plant out of passion or to utilize

leisure time. So, the demand for intricate design to imitate nature and continue necessary adaptation after each season or each harvest is not often fulfilled. Long absence is also a concern. These are also true for a school garden in an urban setup.

- **Water** – When plants are growing on pot, it is difficult to have moisture from the process of breaking down biomass. Regular but need-based watering is required. Urban gardens, particularly in pots, are often a victim of over-watering.
- **Sunlight** – The increase of cloud cover days increases the possibilities of pest attacks. In an urban home garden, as it is mostly in a covered or partially shady place – getting sunlight is also an issue.
- **Higher cropping intensity** – space in an urban garden is limited, so the number of plants is quite high – so is the nutrient uptake from the soil. As there is also significantly less interaction with a natural ecosystem, natural soil replenishment does not happen. Available nutrient in the soil for the plant thus is low, affecting the health of the plant.

All these above aspects affect the pest and disease profile of an urban garden, which needs to be addressed by design.

Creating and managing an ecosystem in urban spaces

Crop Management

Monocropping is a feast for pests, while mixing crops has many advantages. Due to a dense plant stand, the foliage and roots cover a larger area, thus increasing the sunlight, nutrient and water capture. Mixed cropping also controls weed growth and lowers the number of pests that find it difficult to detect specific host plants. While mixing crops, we need to mix crops of various root depths – so that there is less competition. Coriander, Amaranthus, Mint, Carrot, Onion, Spinach, and Cucumber are of shorter root depth. Bottle gourd, Fenugreek, Beans, Brinjal, and Pumpkin, are of medium depth. Broad beans, Okra, Tomato etc. are of longer root depth. It is also better to mix crops from different families in two consecutive seasons. Tomato, Chili, Brinjal, and Potato are from the same family.

Similarly, Mustard, Cabbage, Cauliflower, Radish, and Turnip are from the same family, and so do Coriander and Carrot. To understand which plants belong to the same family, you may try to find out the similarity of structure between leaves and flowers. Plants which have a strong smell, like Basil, Turmeric, Onion, can also be used for repelling pests, so it is good to have a few of them in the garden.

The above crops, however, can be altered and improved further, keeping the constraint of an urban garden in mind. We can select crops whose management requirement is low and which produce more food. For example, a bottle gourd in an urban garden could be preferred over a brinjal because bottle gourd plants can climb up without taking up much space, and every part of the plant can be eaten. Gourds also require less maintenance, and they can start

producing harvest after 1-2 months. Selection can also be on the basis of your need – so one chilli plant, if the right variety is selected, is good enough for the entire family. Papaya, Drumstick, Curry Leaf and Lemon can also be good choices as the pest attack is lower.

Allowing birds, especially predator birds like Drongo, is a good insect controller. Yellow flowered gourd family, like bitter gourd, is a good choice for urban gardens as it attracts pollinators. Insects are not all bad, you see!



A raised bed is being used to grow multiple plants. Can you identify all of them?



Marigold is effective in distracting common pests, and thus protects the main crop

Soil Management

Healthy soil is key to a healthy plant – insects do not prefer a healthy plant. Healthy soils serve as the foundation for complex biological communities. Such communities are more stable in the face of external perturbations. Gardening in a pot needs better support of organic inputs. Organic soil amendments increase populations of soil microorganisms which results in, plants receiving stimuli that trigger their general immune responses to possible pathogens. Various methods of composting can be adopted, including recycling kitchen waste and vermicomposting to generate organic manure.

Mulching by covering the soil with dry leaves, straw or green leaves or by cover crops like sweet potato is another way of soil water conservation which indirectly helps reduce pest attacks. Reduction in pest populations on mulched plots may be driven by several mechanisms. First, insect pests may spend more time searching for suitable hosts when vegetables are hidden in a thick stand of mulch than when on bare soil – particularly in the case of tuber crops. Secondly, mulching may increase natural enemy abundance, thus improving biological control. Furthermore, mulches limit the evaporative loss of soil moisture, which decreases the frequency of irrigation needed and perhaps limits the risk of humidity-driven foliar pathogens. Additionally, mulch eliminates the risk of incurring wounds on the crop during cultivation. This may reduce the occurrence of bacterial diseases that require a break in the outer tissue in order to infect the plant. Adding Neem cake while preparing the soil can also help address soil borne pests and diseases.

Seed Management

For an urban gardener, as the main target is growing for family, it might often be difficult to maintain seed. In that case, you have to find out a reliable source of seed. A healthy seed is also key to a strong plant. Before planting, one can treat the seed. One method is to add cow dung (1 portion), cow urine (2 portions) and vermicompost (1 portion) into 3 litres of water. Soak the seed, and dry it in the shade before planting. Another method is to mix 2 litres of water, 500 gm cow dung, 500 ml cow urine, 5 gm limestone or lime, and 5~10 gm soil – preferably from under a banyan tree. Keep this solution under shade for 24 hours. Spread seeds on a plastic sheet, sprinkle the prepared solution on the seeds - sow them in the early mornings or evenings. Before transplanting any sapling, you can also dip the roots in the solution for a few seconds.

If you want to keep seeds - keep them dry; always dry them in the shade. You can keep charcoal in the seed storage, which will absorb moisture. Adding a spoonful of Neem oil or dry neem leaves can be mixed with seed to avoid pest attack. While collecting seeds, take seeds from fruits which are of medium size, and keep seeds from fruits from the mid portion of the plant and middle of the season.

Few concoctions

If none of these systemic approach helps in reducing pests in your garden, here are a few easy concoctions you can prepare to keep the pests away.

Leaf extract - Take 350 grams of any bitter leaf, 350 grams of leaves (can be of any weed as well) which has a strong smell and 350 grams of leaves which have a milky substance (eg. Calotrope). Crush all these well. Soak it in 5 litres of water for three days and then mix it with 5 litres of water and 25 grams of soap. Spray it in the afternoon after sundown. This is effective against leaf-eating insects and shoot borers.

Chili-garlic-ginger - Take 100 grams of garlic, crush it well and mix it with 10ML of kerosene oil. Keep it airtight for one night. Add 50 grams of green chili and 50 grams of Ginger. Make a paste and extract the juice from this mixture. Mix it with 500ML of water and 30 grams of soap. Add 9 litres of water before spraying.

Tobacco leaf solution – 50~100 grams of tobacco leaves need to be chopped well. Soak these in 2 litres of water overnight. Take the solution, mix it with eight litres of water and spray during the evening. This is good for fruit and stem borer, whitefly and other larvae.

Milk-Basil solution - Crush 50 grams of basil leaves, soak it in 1 liter of water for 12 hours. Take the solution and mix it with 9 liters of water and 500 millilitre milk add 30 grams of soap and spray. This is good against mosaic virus and fungal infection.

But please note, if you don't see any insects in your garden - something is wrong, for sure! They are markers of a living ecosystem, and no garden can thrive without the presence of insects and other critters. In most cases, simply observing the plants regularly can help in identifying if they are being attacked by pests. Early interventions can be as simple as washing affected parts, removing any leaves, or pruning stems that look excessively impacted by pests. Plants usually are able to revive at early stages. In fact, allowing plants to revive from pest attacks on their own helps the plant become more resilient, just like overcoming diseases helps our body to improve its immunity. Our real learning lies in understanding the fundamental connections between a healthy mind, body, environment and the larger ecosystem.



Bountiful joy: Harvesting of vegetables, herbs and fruits in small urban gardens

Ashwin Paranjpe

Introduction

Harvesting is perhaps the most exciting part of growing food! Although it may seem like a simple thing to do, harvesting is actually an art, as well as a science. Humans have been hunter-gatherers for more than 95% of the time they have inhabited this Earth. Roaming the diverse ecosystems of this planet, they knew exactly at which stage to harvest a fruit, which plant could be eaten and which one might be toxic, or which tuber they could dig out and eat without cooking and which one could cause irritation to the throat. Hunter-gatherers knew all this because their very survival depended on it. However, modern humans living in cities have lost this knowledge since they no longer need to forage through forests to obtain their food – they just buy it from the market! But for those of you who wish to reconnect with nature and grow your own food in urban spaces, this chapter might offer you some interesting tips!

A new home gardener is often faced with some confounding questions:

- *How do I harvest a capsicum (bell pepper) without using a knife or damaging the branch?*
- *Can I harvest strawberries before they become red?*
- *Can I eat the leaves of radish and beetroot?*
- *Will bananas and papayas ripen if I harvest them when they are still green?*
- *Can I harvest the same spinach plant multiple times?*
- *Since potatoes grow below the ground, how do I know when to harvest them?*
- *What is the correct stage for harvesting ginger?*

As it turns out, the harvesting stages and methods for different vegetables, herbs, flowers and fruits are significantly different and unique. This chapter provides some basic harvesting tips of a few selected species, and tries to answer some of the most common questions which we all encounter when we start nurturing a food garden.

Understanding the stages of plant growth

Because humans consume plants at every stage of plant growth – seeds, sprouts, flowers, tender pods, immature fruit, mature fruit, roots, rhizomes, etc., it is useful to know what these different stages of growth mean for the plant, and for us!

Birth or germination

It all starts with the seed! When a seed is planted in soil or in any other suitable substrate, it absorbs water and ‘germinates’ or ‘sprouts’. This signifies the ‘birth’ of a plant. The root is driven by gravity and grows downward into the soil in search of moisture and nutrients, while the shoot grows upwards in search of light. Most crops

such as beans, tomato, brinjal, chillies, gourds, etc. are best multiplied by seeds. However, some crops are different. Their seeds are not able to germinate easily and they have evolved to multiply by other methods: through cuttings (e.g. mint), through rhizomes (e.g. ginger, turmeric), through suckers (e.g. banana, pineapple), or through daughter plants (e.g. strawberry). As mentioned in one of the earlier chapters, young shoots or sprouts of various crops such as alfalfa, fenugreek, mung, radish, mustard, peas, etc. are used in salads, pickles, smoothies, and for making and garnishing various dishes.

Growth

After a seed germinates, or a cutting/ rhizome/sucker or daughter plant is separated from the parent and planted in a new place, growth begins. Plant growth occurs as a result of three main processes: (1) uptake of water and nutrients from the soil as well as air and their transportation to different parts of the plant (2) photosynthesis – wherein the plant leaves use energy from the sun to combine carbon dioxide from the air with water within the plant cells (in the presence of chlorophyll) and convert them into sugar and oxygen; and (3) respiration – wherein the sugars produced during photosynthesis and oxygen from the air are used for expanding and multiplying the cells within different parts of the plant. In reality, these three processes occur simultaneously and involve complex biochemical transformations. But generally speaking, increase in height of the plant, increase in size and number of leaves, production of branches, flowers, fruits and seeds are all signs of ‘growth’. Green leafy vegetables such as spinach, coriander, fenugreek, amaranth, etc. are harvested when maximum growth of leaves has occurred, but before flowering begins.

Flowering, Pollination, and Fruiting

When a plant reaches sexual maturity it produces flowers. Flowers can be male, female, or bisexual, depending on the type of plant you are growing. Flowers can have very attractive colours and shapes or can be ordinary looking. They may produce beautiful fragrance or no fragrance at all. Some may produce sweet nectar while others won't. Regardless of their characteristics, the main function of any flower is to attract pollinators such as bees or butterflies or to harness wind, so that pollination can be achieved and the continuity of the species can be ensured. Pollination is the second step in reproduction wherein male anthers are transferred by pollinators (bees, butterflies, wind, etc.) to the stigma and then to the ovary. Properly fertilized ovules become seeds, and the ovary that houses several ovules eventually becomes the fruit. Generally speaking, plants of most species produce flowers. Several flowers are edible, and are harvested before pollination occurs. Flowers of banana, pumpkin, roselle, hibiscus, moringa, hadga, etc. are commonly consumed in various forms. Often, all three stages of reproduction, i.e. flowers, fruits, and seeds of the same species are edible if you know the correct stage to harvest each one of them. For example, in case of the pea plant, its flowers, tender pods, immature seeds, and mature seeds can all be eaten! On the other hand, some plants such as potato, strawberry, ginger, etc. produce flowers, but they

prefer to reproduce through vegetative means (asexual reproduction) by producing tubers, rhizomes, suckers or daughter plants.

Ripening and senescence

In case of crops that produce fruits (e.g. tomato, chilli, capsicum, brinjal, cucumber, gourds, okra, etc.), plant growth slows down gradually after it has produced sufficient fruits that can ensure the survival of the next generation. The stage when rapid plant growth decelerates and the plant invests most of its energy in nourishing the ovules in the fruit, the process of 'ripening' begins. Once fruits ripen fully, the plant gradually enters its last stage of life called 'senescence'. Typically, when bananas start turning yellow, or tomatoes start becoming pink, it is a sign that they are maturing and entering senescence. Fruits of crops such as tomatoes, chilli, bell pepper, banana, papaya, etc. can be harvested when senescence has begun. These are also called *climacteric* fruits because they are capable of maturing fully even if they are harvested when they are green but have just started to show some colour. In commercial farming, most fruits are harvested when they are still green but have just started to turn colour. However, home gardeners should ideally harvest fruits when they have developed 80-90% of their colour because this is the stage when they acquire their full size, accumulate maximum sugars, and develop the best flavour. For example, pinkish tomatoes are capable of turning fully red after they are detached from the plant, but the flavour and taste of vine ripened tomatoes is much more intense than tomatoes that are picked pre-maturely. For making a good tomato soup or for sun-drying tomatoes, it is better to harvest fully red tomatoes that are vine ripened. Having said that, since the texture and flavour of various fruits during the immature stage is very unique, some dishes specifically require raw or immature fruits. For example, raw papaya salad, green tomato chutney, or raw banana subji.

Which family does your vegetable belong to?

Like us, vegetables also belong to different families. The shape (geometry) of flowers, growth habits, preferred environmental conditions, and even the type of pests and diseases that infect crops are 'family specific'. For example, since chillies and tomatoes belong to the same family, they both like to grow under warm conditions, and both get affected by practically the same pests and diseases.

Some of the commonly grown crops and their families are presented below:

Family	Crop
Amaranthaceae	Spinach, Amaranth (green & red), Beetroot, etc.
Amaryllidaceae	Onion, Chives, etc.
Asteraceae	Lettuce, Sunflower
Bromeliaceae	Pineapple
Caricaceae	Papaya
Cruciferaeae	Mustard, Radish, Broccoli, Cauliflower, Cabbage, Kholrabi, etc.

Cucurbitaceae	Cucumber, Bitter/Bottle/Snake/Ash Gourd, Pumpkin, Watermelon, etc.
Fabaceae	Methi, Cluster bean (guar), Soybean, Greenpeas, Chickpea, etc.
Lamiaceae	Mint, Basil, Sage, Rosemary, Thyme, Oregano, Marjoram
Malvaceae	Okra, Cotton, Cacao
Moraceae	Fig, Mulberry
Moringaceae	Moringa (drum-stick)
Rosaceae	Strawberry, Raspberry, Peach, Pear, Apple
Solanaceae	Tomato, Chilli, Capsicum, Brinjal, Potato, etc.
Umbelliferaceae	Coriander, Cumin, Fennel, Carrot, Celery, Parsley, Dill, Anise, etc.

Harvesting tips

Tomato

- There are various types of tomatoes such as large tomatoes, cherry tomatoes, cluster tomatoes, grape tomatoes, etc.
- Regardless of their type, multiple tomatoes are produced on a single cyme¹³ (a flower-bearing branch that grows from the axil of the branching node, which is the point between the main stem and the side-branch).
- Tomato plants have weak stems and cannot stand erect on their own. Therefore, they need to be supported or staked using a stick and twine so that the plant remains upright. If the plants are not supported/ staked and if the soil remains moist after watering or rain, the fruits that touch the moist soil may be attached by fungus and/or bacteria and will rot shortly after that.
- Most tomatoes will require 45-60 days from flower to mature fruit, depending on the variety and season. Tomatoes mature relatively fast during summer, very slowly during winter.
- Generally, the tomato fruit closest to the main branch is the oldest and will mature first.
- The point where the tomato fruit is attached to the cyme is slightly bulged – this is called the point of abscission. To harvest tomatoes without injuring the plant or stripping the outer skin of the branch, just put your middle finger on the layer of abscission, your palm touching the fruit, and bring your thumb up to move the fruit upward. You will see that the tomato fruit detaches itself easily and in a clean way exactly at the point of abscission. If tomatoes are harvested using this method, the exposed area where the tomato was removed heals very quickly, thus avoiding the entry of pests or diseases.
- If you want to use green tomatoes in your food, you can pick them once they are full sized but still green. Please note that green tomatoes will not turn red once they are removed from the plant.
- If you want to use ripe tomatoes but get more shelf-life out of them, then you can harvest them as soon as they have turned pinkish-red and then store them at room temperature for a couple of days until they turn completely red.
- If you want to use fully ripe tomatoes in your cooking, you should wait until the tomatoes become fully red on the plant. Such tomatoes are also called vine-ripened tomatoes. However, the longer you wait, more is the likelihood that birds, caterpillars or insects will get to the tomato before you can!

¹³ A cyme is a branch that bears the inflorescence. *Tomato plants have cymose inflorescences that are determinate, with a note that the inflorescence meristem does not terminate into a flower, and in fact maintains indeterminacy (Welty et al. 2007).

- Tomatoes can be consumed fresh, or they can be sun-dried, blanched, canned, or made into a chutney, puree or ketchup.



Chilli Peppers and Capsicum

- Chillies or chilli peppers are native to Peru and Central America and were introduced in India by the Portuguese. Interestingly, there are several varieties of chillies that have evolved in India as well, especially in the North East.
- Capsicum (bell peppers or Shimla mirch) are also native to central America and were probably introduced in India by the Portuguese. Morphologically, chilli peppers and capsicums are almost identical, but they differ greatly in the amount of capsaicin they contain.
- There are various types of chillies: the very small and hot Bird's Eye chilli, the very very hot Bhoot Jolokia, the not so hot Bedgi and Kashmiri chillies that are known for the intense red colour they bring to curries, or chillies like the Bhavnagri or Shimla Mirch which are fried and eaten green. Bell peppers come in various sizes and colours such as red, yellow, purple, etc.
- In some varieties of chilli peppers, multiple fruits are produced in a bunch on the sub-branch, while in others, a single chilli is produced on the main branch itself or on the sub-branch.
- Although most chilli plants are able to stand erect, when they are bearing many fruits, the plant can droop and even fall to the ground. Therefore, they need to be supported or staked using a stick and twine so that the plant remains upright. If the plants are not supported/ staked and if the soil remains moist after watering or rain, the fruits that touch the soil may be attacked by fungi and/or bacteria and will rot shortly after that.
- Under sub-tropical conditions, most chillies/ capsicums require 45-60 days to develop from flower to mature fruit, depending on the variety and season. Chillies mature relatively fast during summer, but very slowly during winter.
- The point where the chilli/ capsicum fruit is attached to the branch is called the point of abscission. To harvest chillies or capsicums without injuring the plant or stripping the outer skin of the branch while detaching them, just put your middle finger on the point of abscission, your palm touching the fruit, put your thumb on the blossom-end of the fruit and turn your thumb up to move the fruit upward. You will see that the chilli/ capsicum detaches itself very easily and in a clean manner, exactly at the point of abscission. This method is especially

important while harvesting capsicums. If harvesting is done using this method, the exposed area where the fruit is detached from the branch heals very quickly, avoiding the entry of pests or diseases. In commercial practice, most chillies are just pulled from the branch but a home gardener who is not pressed for time can follow the proper method mentioned earlier.

- Chillies whose seeds have not fully formed are called tender chillies which are generally not that hot. When the seeds inside the chilli are fully formed, the chilli bulges at the base and their hotness increases. The hotness of fully mature red chillies is generally greater and their flavour is significantly different compared to green chillies of the same variety.
- Interestingly, most varieties of chillies will turn colour after removing them from the plant as long as the seeds inside the chilli are fully formed. Thus, green chillies whose seeds are fully formed, will become red, purple, orange or yellow (depending on the variety) even after they are detached from the plant.
- Once harvested, it is best to keep chillies in a moist cotton cloth in the fridge. During monsoon and winter season, chillies can remain fresh for 10-12 days even if they are kept outside the fridge.
- Chillies can be consumed fresh, or they can be stored in brine, dried and used whole or in powdered form, smoked over wood fire, or fermented.



Lettuce

- Lettuce originated from Asia Minor or Middle East. However, wild races of lettuce such as *Lactuca virosa* (bitter lettuce) are also found in India. *L. virosa* is believed to have sedative and analgesic (pain relieving) effects.
- There are several varieties of cultivated lettuce such as Romaine, Butter Head, Iceberg, Batavia, Oak Leaf, etc.
- Lettuce prefers to grow in winter, but most modern varieties are heat tolerant. Lettuce is a short duration crop (30-45 days) and needs to be harvested before flowering occurs. After flowering (also called bolting) lettuce leaves develop a bitter taste and become thicker and smaller. Flowering in lettuce is primarily a response to hot temperatures coupled with water stress. So when a lettuce plant produces flowers, it is often a response to environmental stress and the

leaves develop a bitter taste possibly as a defence mechanism to discourage ruminants from eating the plant in order to ensure that the flowers will mature and produce viable seeds.

- In varieties such as Romaine, Batavia, and Oak Leaf, you can either harvest the entire head (cluster of leaves after full maturity but before flowering) or harvest just a couple of leaves at a time and let the remaining ones grow. The latter method enables a family to obtain 5-6 leaves every week for almost a month, rather than harvesting the entire lettuce head in one go.
- However, varieties such as Iceberg and Butter Head are generally harvested only after they develop a full 'head'.
- Lettuce can be harvested with a knife or with bare hands. It's a good idea to keep the harvested lettuce head or leaves in a moist cotton cloth after dipping them in chilled/ cold water. This increases their shelf life.

Strawberries

- Strawberry is a non-climacteric fruit. This means that the fruit does not mature or turn red if it is harvested prematurely when it is still green or white.
- Strawberry is technically not a berry, but an 'aggregate' where the fleshy part is not derived from the ovaries but from the receptacle that holds the ovaries. It is also one of those rare fruits whose seeds are outside the fruit!
- In India, strawberry plants should be ideally planted in the first week of October. Flowering occurs in response to cooler temperatures in November, and it takes about 30-45 days from flowering to mature fruit, depending on climatic conditions.
- Strawberries are attached to the plant by a long green stem called the pedicel which can vary in length from 2-3 cm to 8-10 cm, depending on the variety. You can harvest strawberries with the pedicel intact by cutting it about 1-2 cm from its point of attachment with the crown, or you can simply cut the pedicel closer to the fruit. Premium strawberries are harvested with the pedicel intact. This also increases the shelf life of strawberries. In both methods, it is recommended to harvest the strawberries with the calyx (small green leaf-like parts) since it looks pretty and it also increases the shelf life of strawberries.
- Some of the popular strawberry varieties are Camarosa, Sweet Charlie, Chandler, Festival, etc.
- Strawberries can be consumed fresh, sliced and cooked in sugar syrup and served with ice cream, made into a jam, or made into a milk shake. Strawberries can also be sun-dried for increasing their shelf life.

References

Welty N., Radovich C., Meulia T., E. Van der Knaap (2007). Inflorescence development in two tomato species.



Happy Harvesting!

Edible weeds: The story of forgotten greens and knowledge

Shruti Tharayil

I founded an initiative called [Forgotten Greens](#) based on my journeys with multitude of communities, who showed me the fundamental intersections between biodiversity, caste and food systems. Forgotten Greens has been on a journey of creating platforms for people to reconnect to their immediate ecosystems, revive the fast disappearing knowledge around the culture of consuming uncultivated greens as food and in the process unlearn and redefine the fundamentals of food. Food according to our current system is grown by a farmer, somewhere out in the village, brought by an invisible third party who makes it available for us in the shiny supermarkets. Food according to our schooling system is something that comes from a cultivated farm, grown under intensive labour and chemicals to make sure they are healthy. These homogenised narratives have always turned a blind eye towards the rich diversity of our traditional food systems. One of the important aspects of the traditional food system are the uncultivated greens that are an integral part of our ecosystem as much as our cultivated plants are. The work of Forgotten Greens has been to throw light on this aspect of the Food system; to bring back the knowledge system which is gradually disappearing but very much alive in our collective memories.

The Indian ecosystem is highly bio-diverse however, we are aware and use only a small portion of it. Most of us have been taught A for Apple – a fruit that doesn't grow in the tropics but Phalsa (*Grewia asiatica* known as **Indian Sherbet Berry**) which is a locally growing fruit during the hot summers in mainland India isn't known to many, most of us know about the famous cherry blossoms but hardly we know about the beautiful *Gliricidia sepium* or the Cassia fistula tree that blooms in all their glory in the subtropics painting the landscape pink and golden yellow.

What are weeds?

Weeds are described as plants that are not valued where they are growing and are usually of vigorous growth especially **the** one that tends to overgrow or choke out more desirable plants. The understanding of the plants as weeds evolved around when homo sapiens moved to agriculture from hunting and gathering¹⁴.

In today's context with extreme concretisation around us, intensive monocropping and lawnisation of our garden spaces, plant's which we are unaware of are often considered "weeds". This comes from an understanding that is disconnected and separated from nature itself and is more commonly used in mainstream, profit oriented agriculture. If we look at traditional systems of agriculture, weeds or uncultivated plants are often seen as part of the ecosystem,

¹⁴[*"The Origin of Cultivation and Proto-Weeds, Long Before Neolithic Farming"*](#)

often seen in symbiotic relationship with the crops growing. Every plant has a use. It is our limited knowledge that doesn't know their uses and properties in its entirety.

Henceforth, I'll be referring to weeds as uncultivated greens in order to subvert the role these plants play in maintaining balance in our eco-systems, our diet and health.

Forgotten Greens and where to find them?

The resilient uncultivated greens grow in every nook and corner with rigour that cultivated plants fail to replicate. Traditionally, the uncultivated greens grew in farmlands alongside cultivated crops, scattered across common land, moist riversides and lake bunds. In our modern, urban landscapes, uncultivated greens grow on the roadsides, sewage canals, in between interlocking blocks, concrete cracks and terrace gardens alongside cultivated plants. Basically, uncultivated greens grow wherever there is a possibility of wilderness to grow. No matter how well manicured we keep our lawns, the wild edibles will pop up there too! So next time you step out into a public space or just your garden space, do keep an eye out for these wild edibles.

Foraging - A way of Life

Our ancestors were primarily foragers and hunters before the advent of settled agriculture. Even today in communities with less land holding, foraging is one of the ways in which they procure their food. During my time with the Konda Reddi adivasi¹⁵ community in the East Godavari district of Andhra Pradesh, I witnessed foraging as their main source of collecting food during summer and monsoons, when the agricultural land is either left fallow or tilled and seeds for the next cycle have been sowed. During these months they hike up to their forests to forage tubers, wild flowers, wild leaves, mushrooms, red ants, birds, freshwater crabs to name a few.

During the monsoons season in Kerala called the *karkidaka masam* according to the traditional Hindu solar calendar, the traditional month is considered as the darkest month of the year due to incessant and heavy rain. *Karkidaka masam* witnesses people in Kerala foraging uncultivated plants that crop up soon after the first rains to make different dishes like the *path-ila thoran* (10 leaves dish) and having it with the *mernzhu kanji* (medicine porridge). *Path-ila thoran* as the name suggests is a dish made from 10 different leaves put together. Eating the 10 leaves during this month when going out to the market is difficult and foraging from the immediate land is the only possible choice. I have often found women foraging for 10 edible leaves that grow wild in their immediate backyard. These 10 leaves are never the same and vary depending on the locality and the accessibility and availability of the wild edibles. *Mernzhu Kanji* is a rice porridge made by adding a mixture of wild and cultivated herbs which supports different aspects of the body's health like inflammation, back pain, muscle tears etc. Traditionally the *mernzhu* mix used to be foraged by people given the rice biodiverse landscapes they used to live in, which is no longer the case.

Foraging is one of the ways to reconnect to our immediate ecosystem whereas we spend more time with nature around us, we learn so much more about the world of other beings with whom we share this space.

¹⁵ Indegenous community that come ----write more

Before you step out, a few reminders!

- If you recognize a plant from this book, however, aren't fully sure and need a second opinion, ask a local elder or someone who has knowledge about the plants.
- Do not eat anything that you don't recognize. Do your research!!
- Have a little bit first to check if it works for your system, maybe cook it with other greens.
- Be sure you forage from 'clean and safe' environment. Refrain foraging from sewage canals, highly polluted concrete patches, places with stagnant water.
- Take your children, your partner along with you, introduce more people to this world of wilderness.
- Identify the plants with their Botanical names. The local names and common English names differ according to the region, use, local lore and culture of the place. It can be very misleading if you try to find out plants based on their common English name or the local name. It is often safe to identify and learn about a new plant using its Botanical name.
- Anything in excess is poison. Please make sure you consume the plant in whatever format in moderation.
- While foraging, refrain from uprooting the plant as uprooting leads to killing the plant and it won't regrow the next batch. If you are weeding the space, then feel free to uproot the plant! :)
- Always take a moment and connect to the plant while foraging. We often come from a consumerist approach where we only think about the utility of the plant and how it will benefit us. The invitation here is to shift from this perspective and really connect to the plants as co-travellers and witness the world of knowledge, health, and gourmet it opens up for you.

And eat them too..!??

Yes, you can eat uncultivated plants and cook some really delicious recipes with them. The wild edibles given their resilience to grow in the most difficult terrains, they are the most nutritious, organic and naturally growing plants you can get your hands on.

- All plants have some use in the ecosystem however not all plants are edible.
- Some plants are edible and medicinal and some plants are just medicinal.
- Some plants are edible however they are not palatable and hence cannot be used for extensive culinary cooking.
- Some plants are edible with light traces of toxicity in them which will require a particular process to remove it for example- leaving tubers in flowing water for a few days, adding tamarind to the dish, soaking in salt water for sometime, eating it within 2 hours of plucking, cooking with other dominant greens so the toxicity is diluted with the presence of the other greens. These are few methods I have personally come across and I am sure there are millions of more such methods, it is now your turn to find these out.
- Some plants are not entirely edible. Some parts of the plant would be edible and the rest would be poisonous. The best example for this is *Abrus precatorius* commonly known as the

Rosary Pea plant in english. The leaves of the plant are famously used in *Mukhwas* (Mouthfreshners) as the leaves give a soothing menthol after taste. The seeds of the plant are toxic and cannot be consumed.

- Plants foraged from sewage canals and tarred roads should be avoided as the plants absorb the toxic elements from the ground which is not good for our systems.
- If you are foraging from a lesser polluted area, you can simply rinse the leaves and use. If you are foraging wild flowers, you can skip the rinsing and use it directly. However, if you are foraging from a polluted area, especially from roadsides, you can soak the leaves in salt water (preferably rock salt) and a pinch of turmeric if the place was really polluted for an hour or so before cooking it.

Know your Weeds :



1) Common name – Asthma Weed, Common spurge

Scientific name - *Euphorbia hirta*

Sanskrit - Dugadhika

Hindi – dudhi

tamil – amman paccharisi

Malayalam – Nelapalai

Telugu – Nanabala

Kannada – Hachchedida, Kempu nene

Euphorbia hirta grows erect on a central hairy stem that produces abundant white latex. Elliptical leaves occur in opposite pairs on the stem. Flowers are unisexual, purplish to greenish in color, dense, axillary, short-stalked clusters

Known Uses : Can remove warts over time. Latex oozing out when plant is cut is applied to warts externally.

Treats asthma – Traditionally used to treat asthma, hence the name. *Euphorbia hirta* brewed tea can be consumed as part of diet to eventually regulate asthma.

The plant is also high in Iron content, it supports in adding to the Iron content in the body when consumed. *E. hirta* is one of uncultivated plants that does not enjoy being “domesticated”. It is very difficult to propagate the plant in your garden spaces.

Please note – the plant should only be consumed in small doses. Large doses may result in nausea and vomiting



2) Common name – Purslane

Scientific name – *Portulaca oleracea*

Hindi name – Lunia

Sanskrit name – Loni

Tamil – Paruppu keerai

Malayalam – Koluppa

Kannada – Dudagorai

Telugu – Gangavalli

Purslane is a common “weed” in India and grows commonly in the urban concrete spaces. The succulent leaves grow alternate at stem joints. The flowers are yellow in colour. The seeds form in tiny pods which opens once the seeds are ready. Purslane grows as a creeper

and grows parallel to the ground mostly. The colour of the stems vary from light to dark pinkish- green.

Another version of the same plant is Wingpod Purslane or Portulaca, scientific name – Portulaca Umbraticola. This is more commonly used for ornamental purposes and not for culinary purposes. The difference between the wild purslane and edible purslane are the leaves and flowers. The leaves are tiny in ornamental purslane whereas the wild edible leaves are usually broader and bigger in size. The flowers in ornamental purslane are of varied colours and often are big petalled whereas the wild purslane flowers are usually smaller in size and most commonly yellow in colour.

Another version of the plant is wild purslane, botanical name unknown. Wild purslane has tiny leaves and creeps over the ground. This version of purslane is edible and highly nutritional.

Known Uses : Purslane is very low in calories and contain more omega-3 fatty acids. It is also an excellent source of Vitamin-A.

The plant can be added to your food in any format – lentils, salads, chutney to name a few usual recipes.



3) Commelina Benghalensis.

Common name – Bengal Dayflower, Whiskered Commelina, Wandering Jew

Botanical name - Commelina benghalensis

Sanskrit – Kanchata, Kosapuspi

Hindi – Kena, Kankawa, krishna ghas

Kannada – Gubbachchi, Kanne Soppu

Malayalam – Kanavazhai, Vazhaipadathi

Marathi – Kena

Tamil – Kanangkozai, Kanan valai

Telugu – Neerukaassuvu, nirukassuvu

Bengal Dayflower usually grows during the rainy season. However, you will find it growing in moist regions through out the year. The leaves are usually ovate with velvet like hair. The flowers are beautiful blue coloured. The plant creeps like a blanket on the surface where it grows.

Known Uses – The paste of the leaves can be applied on wounds for healing.

The leaves were used traditionally to make fritters/ bhajiyas during monsoons. The leaves can also be cooked as any other green leafy vegetable. Please note, while foraging pluck only the top 3/4 tender leaves as the non tender leaves can be difficult for the system to digest.

The easiest way to propagate *Commelina* is by cutting the stem nodes and put into wet soil, it usually willingly grows in ‘domesticated’ garden spaces too.

4) **Common name:** Green Amaranth, Slender Amaranth

Scientific name – *Amaranthus Viridis*

Hindi – Jungli Chaulayi

Sanskrit – Tanduliya

Kannada – Kere soppu

Malayalam – Kuppcheera

Tamil – Kuppaikeerai

Telugu – Chilika Thotakoora

5) **Common Name** – Prickly Amaranth, Spiny amaranth

Scientific name – *Amaranthus Spinousus*

Hindi – Kanta Chaulai

Sanskrit – Tanduliuyah

Tamil – Mullukkerrai

Malayalam – Kattumullencheera

Telugu – Mulltotakura

Kannada – Mullu haruve

Both these amaranth varieties are the less famous wilder cousins of the amaranth variety we get in the market. Both of the varieties are edible, self seeding and much more nutritional than the ones we get in the market.

Slender amaranth commonly grows wild in urban India. You can easily identify this plant with the red tinged stems and broad leaves. Both the Amaranth varieties host spiky flowers with brownish-green coloured flowers. Slender Amaranth is known for having high iron content. As the name suggests, Spiny Amaranth hosts thorns. Tender thorns when cooked are edible. However, if you are foraging non-tender thorns make sure you remove the thorns and then cook them as the non-tender thorns tend to get hardy.



6) Common name – Creeping wood sorrel, Creeping oxalis

Scientific name – Oxalis Corniculata

Sanskrit - Amlapatrika, Changeri, Shuklika

Hindi name – Amrul, Changeri, Tinpatiya

Tamil – Puliyarai, Paliakiri

Malayalam – Puliyarila

Telugu - Pulichinta

Kannada – Pullampuriche, Hulihulise, Pullampurachi

This plant grows as a creeping ground cover. The plant branches from the base and has roots at the nodes with very thin stem on which the leaf and the flower stand. The leaf and the stem can sometimes be hairy. The plant usually has clusters of 3 beautiful heart shaped leaves on one stem and delicate tiny yellow flowers.

The plant can be propagated either by collecting tiny seeds from the seed pods and distributing in your pots or pluck the plant by its root nodes and plant it in wet soil. Wood sorrel prefers moist soil over dry soil.

Known Uses : Oxalis is rich in iron, calcium, Vitamin B1 and Vitamin C. The leaves supports in hemoglobin levels in the body given the high iron content. The plant contains Oxalic acid and consuming high doses of Oxalis can be toxic. However, the amount you will consume after foraging does not fall into the toxic amount.

The leaves can be a great addition to salads, dals, chutney or just eat a couple of leaves raw on a daily basis.

Hope your next walk along your neighbourhood reveals itself in a new light and palate for you!



Shruti showing people how they can rewild their garden

Scaling urban agriculture initiatives: need for supportive policy ecosystems

Anita Pinheiro

Urban agriculture is a social-ecological-technological system that acts as a vital Nature-based solution for urban and agri-food system transitions by offering multiple functions, including social-ecological-economic benefits. Yet, they do not get adequate attention from the policymakers primarily for two reasons. Firstly, urban areas are considered sites for resource imports and consumption, not for production. Secondly, the dominant notion of agriculture revolves around the idea of massive production to ‘feed the masses’, and hence food production in the conventional sense will create competition for resources such as land and water. However, ample examples show that historically urban agriculture has received considerable government support to act as a source of resilience and food security in times of crisis.

In India, urban agriculture is increasingly getting traction, mainly as independent initiatives. The emerging government-level support for urban agriculture primarily focuses on large cities. How can we scale up urban agriculture to facilitate sustainable urbanisation? This article explores the supportive policy ecosystems for scaling urban agriculture initiatives in India.

Scaling urban agriculture initiatives: prospects for India

The specific context and the kind of practices determine the sustainability potential of urban agriculture and who gets its benefits. In India, the idea of urban agriculture consists of many practices catering to different socio-economic sections of society. Each of these practices has its potential and scope for further improvement to make it more sustainable and inclusive.

In many urban and peri-urban areas, agrochemical-based cultivation on farmlands is a livelihood option for people from economically weaker sections, including migrant workers. Although these farming activities provide economic benefits to the farmers and enable short food supply chains, the lack of recognition of agriculture as an urban activity hinders its further development to make it socially just and ecologically sound.

In its varied forms and scales, urban home gardening is practiced by different income groups across the country. It is an urban re-creation of the rural memories of farming and human-

nature connectedness. However, there is a vast disparity in the capacity of different income groups to set up a functional home garden. In metropolitan cities, this gap is much broader. Only middle- and upper-class people living in metropolitan cities have adequate space, resources, and support systems for having a well-functional home garden.

Urban home gardening has enormous potential in creating edible cities and towns in India. With adequate planning and support systems, urban home gardens can become sites of integrated production (vegetables, fruits, poultry, and small livestock-- depending upon the specific context). Urban home gardening can also reduce the issue of urban waste by integrating vegetable production with household waste management. Therefore, creating edible urban areas through the wide popularisation of urban home gardening practice in India can considerably reduce waste at the source while bridging the urban systems with food production and reducing its dependency upon the rural areas.

Urban agriculture in India, especially in metropolitan cities, also encompasses technology-aided, capital-intensive entrepreneurial initiatives such as hydroponics, vertical farming, and aquaponics. However, they need to have scrutiny. The mere practice of urban agriculture does not ensure sustainability outcomes. Although such enterprises contribute to short urban food supply chains, their promotion should be based on a holistic and nuanced understanding of their functioning in intensive production methods and external dependence on inputs.

Previous and Existing policy landscape for urban agriculture in India

In India, urban agriculture is yet to receive national-level policy attention as a Nature-based Solution to urban sustainability. At present, there are no active government programs that promote urban agriculture across the country. The only initiative that attempted to promote urban agriculture in select cities across India was Vegetable Initiative for Urban Clusters (VIUC). Recently, some state governments have shown a growing interest in fostering urban home gardening using funding from central government schemes.

Vegetable Initiative for Urban Clusters (VIUC)

The VIUC programme was launched in 2011-12 as a subset of *Rashtriya Krishi Vikas Yojana*, RKVY. This program for strengthening the urban and peri-urban vegetable production is however no longer operational.

VIUC aimed to strengthen vegetable production and its supply chains in urban areas, and it was intended to implement in each state, either in the State capital city or any other city having a population of one million or above (Department of Agriculture and Cooperation 2011). Horticulture Missions were assigned with the implementation of the VIUC scheme.

In most of the states, the VIUC initiative has focused more on commercial agricultural production and little focus on the adoption of agroecological production methods (SFAC n.d.-a, n.d.-b). The focus was on the mere expansion of conventional agriculture into the urban areas without trying to adapt to and integrate into the dynamics of the urban fabric. One exception is Kerala, where rooftop vegetable cultivation in urban home gardens was promoted instead of commercial farmland cultivation.

State government initiatives for urban kitchen gardening

Some of the states that promote urban agriculture, especially urban home gardening include Bihar, Delhi, Kerala, Tamil Nadu, and Telangana. The promotion is mainly through subsidy support, ranging from 50% to 75%, for setting up home gardens on the rooftops or in the backyards of private residential buildings in urban areas.

Bihar

In Bihar, five smart cities (Patna, Muzaffarpur, Gaya, Bhagalpur, and Biharsharif) with large populations are selected to promote rooftop gardening. Gardening is expected to provide additional income to people, improve environmental conditions, and address the climate imbalance to an extent (Anon 2019). People are provided 50 % subsidy (with a maximum amount of RS. 25000/-) for inputs for setting up a home garden in 300 sq. ft area (Singh 2019). A subsidy is provided to purchase inputs such as plastic sheets, containers, seeds, plants, fertiliser, and tools for irrigation.

Despite the intentions to provide environmental contributions, the initiative restricts its benefits only to high income groups. In order to become a beneficiary, people need to have a minimum of 300 sq. ft area in their backyard or on rooftop and be able to afford Rs. 25000/- after the subsidy (Anon 2022). Although the initiative tries to incorporate representation from different social groups (women 30 %, 16 % scheduled casts, 1 % scheduled tribes) in the Bihar Rooftop Horticulture Scheme 2022 (Anon 2022), the initiative clearly excludes the economically weaker sections in benefiting from having a home garden in their premises.

Delhi

In their latest budget for 2022, the Delhi government has recently announced the launch of ‘smart urban farming’ to promote kitchen gardening for self-consumption as well as an entrepreneurial activity. The program is yet to launch.

Kerala

Kerala has been promoting urban home gardening across the state as part of the Vegetable Development Program (VDP) that was launched in 2012. The state has been allocating nearly 10 % of the annual budget support for VDP to the component ‘promotion of urban clusters’ that primarily aims to the subsidised distribution of ready-to-gardening kits at a rate of Rs. 500 after 75 % of subsidy. In specific years, the component ‘promotion of urban clusters’ also incorporated household solid and liquid waste management to integrate with vegetable gardening. However, in the financial year 2022-23, there is no specific attention given to urban home gardens as earlier. Instead, container cultivation in urban areas is included in the working instructions for VDP 2022-23 ([Directorate of AD & FW 2022:20](#)) only as one of the three home garden technologies promoted across the state, with no specific budgetary allocation for the urban areas.

Tamil Nadu

In Tamil Nadu, urban home gardening, mainly rooftop gardening is promoted through an urban horticulture development scheme called ‘do-it-yourself kit’ program in two large cities, i.e., Chennai and Coimbatore. The kit contains containers, inputs, and an informative manual. The program aims to motivate city residents to grow their food, enhance nutritional security, and environmental improvement (Government of Tamil Nadu n.d.).

Telangana

Telangana has initially started its promotion of urban home gardening in Hyderabad city and has recently planned to extend it to Secunderabad city. The program aims to provide healthy vegetables to the city residents, improve their physical activity and stress relief, and improve the micro-climate ([Anon n.d.](#)). However, to avail of the subsidy benefit, people need to have 50 -200 sq. ft area either on the rooftops or in the backyard.

Gaps to address

The ongoing state government interventions that promote urban agriculture focus mainly on home garden vegetable production. While this is important, focus also needs to be given to incorporating multiple types of urban agriculture that suit the local context.

Most of the government interventions mentioned above focus on cities with a large population. Except for Kerala, which has a rural-urban continuum, all the other states do not consider small towns and cities in their interventions to promote urban agriculture, specifically urban home gardening. Unlike large cities, small urban areas have the flexibility to embed urban home gardening into the design and planning to ensure sustainable urbanisation. In large cities, urban home gardening may act as a mitigation strategy, whereas in small urban areas, urban home gardening can contribute to adaptation measures.

The design of the programs that promote urban home gardening in the states mentioned above are primarily focusing on the middle-class and high-income groups. Having stringent criteria regarding the minimum available area for applying for the subsidy schemes excludes low-income groups with less vacant space at their residential premises. Moreover, the cost incurred to the beneficiaries after deducting the subsidy amount is also very high in some instances.

Facilitating supportive policy ecosystems: major focus areas

A more comprehensive policy approach must be developed to ensure the wide promotion of urban agriculture practices to enhance sustainability. Such a policy approach must think outside the box to be inclusive, holistic, participatory, and creative. Some focus areas for facilitating a supportive policy ecosystem for scaling urban agriculture are mentioned below.

1. Physical infrastructure

Multifunctional urban agriculture as an integral part of the urban fabric

The multifunctionality of urban agriculture needs to be recognised to ensure comprehensive planning and interventions. As urban agriculture consists of diverse practices, adopting a multifunctionality perspective is essential for recognising contributions as well as negative impacts of urban agriculture on the local community and environment. Recognising the multifunctionality of urban agriculture will also help to adopt holistic approaches to make it an integral part of the urban fabric.

Edible city/town approach in urban greening initiatives

Currently, many urban greening initiatives in the country focus on growing ornamental plants. While they provide an aesthetic appeal, the benefits of growing food crops in urban areas are manifold. Apart from providing local sustainability benefits, food growing in urban areas also helps to enhance agri-food system sustainability by facilitating short food supply chains and reducing the dependence upon rural areas. Urban greening interventions need to have a Nature-based 'edible city/town' approach to ensure the design and development of edible urban green infrastructure.

Ongoing greening initiatives can incorporate food production within and on the existing grey infrastructure with a few additional steps. Ornamental plants can easily be replaced with suitable edible plants in green walls, spaces under flyovers, and median strips of major roads and highways. Introducing edible landscaping in these spaces will bring aesthetic beauty to food production. By involving the local community in the planning, implementation, and monitoring of edible urban green infrastructure in public spaces, the possibility of undesired urban green gentrification can be avoided. Such inclusive approaches will help keep edible urban spaces more connected with communities (from all socio-economic groups) while providing food security, health, and job.

Appropriate modification of existing buildings and creative designing of new buildings are instrumental in facilitating food gardening on rooftops. This is essential to avoid leakage and structural damage to the buildings due to food cultivation. Incentivising for building designs that integrate food production spaces can be another motivation for the creation of edible green infrastructure. However, caution should be taken to avoid the adverse effects of urban green grabbing such as the extraction of additional rent to facilitate green amenities.

Extending the focus to small towns and cities

India is expected to contribute a large share of the urban population increase in the world. Large cities are home to a highly concentrated population, whereas small towns and cities are growing faster. As most of the urbanisation is expected to take place in small towns and cities, there is huge potential for early interventions to incorporate urban agriculture in the policy and planning to facilitate sustainable urbanisation. However, as pointed out earlier, many ongoing government interventions for promoting urban agriculture ignore small towns and cities as their focus areas. This needs to be addressed.

2. Fiscal infrastructure

There should be appropriate fiscal infrastructure to strengthen urban agriculture through annual budget allocation for the promotion of various urban agriculture initiatives and research.

In order to cope with the increasing urbanisation in India, research on food production in urban areas needs to be given equal priority to food production in rural areas. Therefore, research support from government research institutes is vital for developing locally adapted space and resource-saving technologies.

At present, some government research institutions and agricultural universities are engaged in urban agriculture research. This needs to be supported with a sufficient budget. Furthermore, emphasis should be given to developing urban agriculture technologies and practices that are cost-effective, nature-positive, and suitable to different types of urban and residential areas of the country.

There are possibilities for developing urban-friendly integrated production methods, i.e., integrating crop cultivation with aquaculture, poultry, or goat rearing. Such integrated production can be low external input-less-technology intensive, low-budget or technology-and-capital-intensive methods. To make urban agriculture a wide practice and inclusive, it is pertinent to develop the former that would benefit the ordinary people.

3. Educational infrastructure

The development of educational infrastructure will help to create awareness among the young generations regarding the importance of sustainable actions such as urban food production. This can be achieved by making urban agriculture part of the curriculum and using educational spaces for food production.

Agriculture needs to become part of the school curriculum to inculcate agricultural knowledge and skills in students. Urban agriculture practices in schools also enhance students' awareness of nutrition and sustainable food production and help them to connect with nature. To enable hands-on-learning in food production, there should be adequate infrastructure and support systems for using educational spaces for food gardening.

In some of the states, there are already government initiatives to promote nutrition gardening in government and aided schools and to link it with the mid-day-meal scheme. However, food gardening should need to be extended to available spaces in all educational institutions, including those in urban areas. With adequate and continued support for tools, inputs, and irrigation, nutritional gardening can be made a long-term activity in educational spaces.

4. Institutional infrastructure

Key focus areas for developing institutional infrastructure are briefly discussed below.

Strengthening extension services

Extension services should be strengthened to facilitate the wide dissemination of urban agriculture technologies and government initiatives. Providing adequate training and continued support to the beneficiaries is also crucial. As being done in a few states as part of extension support for urban agriculture, field visits can be organised to demonstrate urban agriculture technologies in government farms and other independent initiatives.

Facilitating adequate supportive infrastructure (government-controlled)

Setting up urban agro-service centers at government levels is essential for providing continued support to the farmers. This is particularly relevant for promoting agroecological cultivation methods and popularizing small-scale building-integrated production on rooftops and balconies. Such agro-service centres can act as support systems for agroecological inputs (for commercial and home-based cultivation) and technological services for space-saving cultivation in residential buildings. At present, there are private initiatives that serve this purpose. However, their service is not affordable for all income groups. Therefore, adequate budget support should be ensured to set up agro-service centres to promote urban agriculture.

Accommodative land use policies for vegetable gardening in allotted spaces

Accommodative land use policies and lease agreements are required for the short-term allocation of vacant land and public spaces for vegetable gardening. Depending upon the context, such allocation can be made to individuals or communities. Effective lease policies

are required for short-term leasing of private lands for vegetable gardening without posing any challenges to land ownership.

Integrating food production with household waste management (in kitchen gardens)

Vegetable gardening in residential buildings needs to be integrated with household-level waste (kitchen waste) management. Small and affordable composting technologies need to be promoted so that kitchen waste can be effectively recycled for gardening purposes. This helps to reduce waste at the source and circularisation of resources within the urban system. Waste management methods need to be incorporated into training programs.

Emphasis on inclusive approach to accommodate marginalised sections

Without having specific efforts to accommodate people from socio-economically weaker sections, it is highly likely that urban agriculture initiatives will become an activity of the elitist population. Therefore, emphasis needs to be given to planning and designing the interventions that can benefit marginalised sections of the urban population, including low-income groups and migrant workers.

Collaboration between different government divisions and agencies

At present, implementing urban agriculture initiatives is mainly the responsibility of agriculture or horticulture departments of respective states. However, effective implementation of urban agriculture initiatives requires collaborative planning between government departments, including Local Self Governments and Environment and climate change departments. Otherwise, it is highly likely that depending on the priorities of agriculture/horticulture departments, the overall benefits of urban agriculture may not be explored to the full extent of urban agriculture and may not get the adequate attention it deserves.

Participatory decision-making

Inclusive and participatory decision-making needs to be ensured at all stages of planning and implementation. The involvement of citizens from all sections of society is pertinent to design urban agriculture interventions that benefit all urban populations. Participatory decision-making is also crucial for ensuring sustainable urbanisation that keeps in line with the Sustainable Development Goals.

Recognising and promoting grassroots innovations in urban agriculture

Especially in urban home gardening, there are many innovative technologies and practices developed by people for space-saving cultivation, kitchen waste management, and cost-effective water-saving irrigation methods. Such grassroots innovations in urban agriculture need to be encouraged, recognised, and promoted. Field visits organised as part of extension services can be used to introduce these innovative methods to other people. In addition, it would also be encouraging to incentivize people for the development of space-and resource-saving urban agriculture methods.

Farmer networks

Collective organisation of urban farmers is important for participatory learning, co-innovation, sharing or exchange resources, and technical support. It also acts as a platform for collectively addressing challenges and finding options for marketing the produce.

Linking urban agriculture with urban short food supply chain

Integrating urban agriculture with the urban fabric is incomplete without linking it with the urban short food supply system. Small quantities of urban agriculture produce may not be a good fit for the common marketing channels of urban food supply chains. Therefore, urban agriculture products, especially those produced by agroecological methods, need a separate marketing channel to link to the food supply chain. It would be helpful if there is a platform for organising weekly markets to sell organic home-grown surplus vegetables that can connect producers directly with customers. This would help earn additional income from home gardens and other urban agriculture initiatives.

Conclusion

Considering the increase in urban population in India, it is necessary to carefully plan for wide popularisation of urban agriculture initiatives in the country to ensure inclusive and sustainable urbanisation. Policy actors have a huge role for making adequate institutional and infrastructural level changes to make urban agriculture an embedded activity within the urban system.

References

- Anon. 2019. '70 People Apply for Roof-Top Farming Project in Gaya'. *Hindustan Times*. Retrieved 25 September 2022 (<https://www.hindustantimes.com/patna/gaya-set-for-roof-top-farming-70-apply/story-PUDpS1G96j00gbCX4P0sOL.html>).
- Anon. 2022. '(Registration) Bihar Chhat Par Horticulture Scheme 2022: Online Application, Application Form - PM Modi Yojana 2022'. Retrieved 25 September 2022 (<https://pmmodiyojana.enfluencer.in/registration-bihar-chhat-par-horticulture-scheme-2022-online-application-application-form/>).
- Anon. n.d. 'Urban Farming'. Retrieved 25 September 2022 (<https://horticulture.tg.nic.in/Ufarming/UFarming.html>).
- Department of Agriculture and Cooperation, Government of India. 2011. 'Guidelines for The Vegetable Initiative for Urban Clusters'.
- Directorate of AD & FW, Kerala. 2022. 'Vegetable Development Programme 2022-23. Working Instructions.'
- Government of Tamil Nadu. n.d. 'Urban Horticulture Development Scheme 'Do-It-Yourself Program Operational Manual'.
- SFAC. n.d.-a. . 'Impact Study of Vegetable Initiative for Urban Clusters Volume 2. Arunachal Pradesh, Gujarat, Jharkhand, Nagaland, Punjab, Uttarakhand'.
- SFAC. n.d.-b. 'SFAC. Impact Study of Vegetable Initiative for Urban Clusters Volume 1. Andhra Pradesh, Goa, Karnataka, Kerala, Manipur, Tamil Nadu.'
- Singh. 2019. 'Government to Promote Terrace Gardening in Bihar: Prem Kumar'. *The Times of India*, June 7.



A community rooftop garden in Mumbai that had to be shut down due to change in management and infrastructure concerns.

References and Further Reading

Here are a few resources¹⁶ that we found interesting, inspiring and creative. Though they are all related, we have broadly attempted to thematise them under educational, practical and civic action categories.

Practical guides

- A handy little graphic guide for the amateur and professional gardener in rural and urban areas by Vanastree
(URL: <https://secureservercdn.net/160.153.138.178/t6v.ab1.myftpupload.com/wp-content/uploads/2020/04/Grow-a-Garden.pdf>)
- Heirloom Rice Recipes from the Malnad
(URL: <https://secureservercdn.net/160.153.138.178/t6v.ab1.myftpupload.com/wp-content/uploads/2020/04/Rice.pdf>), More resources can be accessed here: <http://vanastree.org/more/publications/>
- Guide to set up a city farm by Urban Leaves, an initiative of Vidya Varidhi Trust, Mumbai (URL: https://docs.google.com/file/d/0B_dgmMwooSjeMWY1ZmNjNTEtNTc5ZC00NDk0LWEzZjEtZmRhNGVlMTYxNzQy/edit?pli=1&hl=en&resourcekey=0-TFPmkLjSoA09gf7_0Cta3Q#)
- Creating a home garden* (URL: <https://csa-india.org/product/home-garden-grow-your-own-food/>)
- Leafy Greens in the Food Culture of Puducherry and its Bioregion (URL: <https://www.ifpindia.org/bookstore/keerai/>)
- Seasonal Sowing Calendar (URL: https://yarrowayfarm.com/wp-content/uploads/2018/11/YarrowayFarm_SowingCalendar.pdf?v=a98eef2a3105)
- Planting guide for terrace farms* (URL: <https://organicterrace.in/blog/book-organic-urban-farming-the-indian-way-out-now/>)
- Notes and resources on foraging wild edibles (URL: <https://linktr.ee/forgottengreens>)
- A practical guide to growing food * (URL: <https://www.aurovilleconsulting.com/my-pumpkin-roof-urban-farming-at-home/>)
- General guidance on growing edibles in small spaces (URL: <https://urbanthottam.com/knowledge-base/#general-guidance>)

Educational references

- A guide on tending to a schoolyard garden (URL: <http://arvindguptatoys.com/arvindgupta/schoolyard-nyla.pdf>)

¹⁶ (Those marked with * are resources that can be bought online)

- A land-based environmental curriculum (URL: <http://arvindguptatoys.com/arvindgupta/ourland-ourlife.pdf>)
- A colouring book on edible weeds * (URL: <https://auroville.org/page/edible-weeds-and-naturally-growing-plants-in-auroville>)
- A school project based on Ragi cultivation and consumption (URL: <https://theragiproject.weebly.com/about-us.html>)
- A module on food and diversity (URL: <https://ithinkbiology.in/book/text/c1-rice.html>)
- Reflections on a school terrace farming project (URL: <http://publications.azimpremjifoundation.org/2106/>)





Civic action and social entrepreneurship

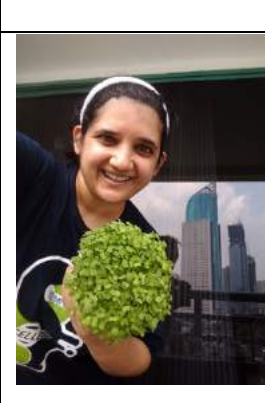
- A platform for enabling natural farming in urban vacant land through crowd-sourced data (URL: <https://urbannaturalfarms.com/>)
- Magazine issue on urban agriculture (URL: <https://leisaindia.org/urban-agriculture-march-2022-issue-24-1/>)
- Practical resource for saving dry leaves through community initiative (URL: <https://brownleaf.org/wp-content/uploads/2020/12/Not-a-single-Dry-Leaf-should-be-Burnt-in-India-A-Step-by-Step-Guide.pdf>)
- Narratives on environmental benefits of urban farming in Indian cities (URL: <https://upagri.netlify.app/exhibition-rooms/environmental-sustainability/rooftop-farming-to-beat-the-heat/>)
- Newsletters on various dimensions of urban agriculture (URL: <https://prcindia.in/category/publications/beejpatra/>)

Books (by no means a comprehensive list! Just some recommendations)

- The Green Sprout journey by Satoko Chatterjee
- Mother Earth, Sister Seed: Travels through India's farmlands by Lathika George
- Genetically Modified Democracy: Transgenic Crops in Contemporary India by Aniket Aga
- Bringing It to the Table: On Farming and Food by Wendell Berry
- Food and Climate Change Without the Hot Air: Change Your Diet: The Easiest Way to Help Save the Planet by S L Bridle (The e-book is free)
- One-Straw Revolution by Masanobu Fukuoka
- The Essential Agrarian Reader: The Future of Culture, Community, and the Land by Norman Wirzba
- The Seed Detective by Adam Alexander
- A Small Farm Future by Chris Smaje
- Be My Guest: Reflections on Food, Community and the Meaning of Generosity by Priya Basil

List of Contributors

	<p>Amrita Hazra Amrita is a faculty at the Indian Institute for Science Education and Research, Pune. She obtained a Ph.D. at Cornell University in Chemical biology followed by a postdoctoral stint at the Department of Plant and Microbial Biology at the University of California, Berkley. With an abiding interest in food and nutrition, she co-founded “The Millet Project” (TMP) was initiated at the height of California’s drought in 2015. The goal of the project is to investigate how different millet varieties grow in various microclimates in California and the effect of drought and semi-drought conditions on their yield.</p>
	<p>Anita Pinheiro Anita is an adjunct faculty at Ambedkar University Delhi. She is an interdisciplinary researcher having trained in both biological science and social science research. Her research areas include sustainability issues, transformation, agri-food system transitions, agroecology and regenerative food systems, circular agri-food systems, and Nature-based agriculture. https://www.researchgate.net/profile/Anita-Pinheiro</p>
	<p>Anjali Choudhary Anjali Choudhary is a compost enthusiast and sustainability practitioner. She is a development professional and holds an MBA from the Institute of Rural Management Anand (IRMA). Currently, she is associated with Indian Institute of Management, Ahmedabad and FarmBridge Social Support Foundation. She promotes sustainable initiatives through her Instagram handle @sunheri_mitti and the website https://sunherimitti.com</p>
	<p>Anshuman Das Anshuman Das is a food activist, with 20 years of experience as a trainer and researcher. He is currently associated with Welthungerhilfe, and is responsible for managing programmes in South Asia related to agriculture, environment, and economic development. Anshuman has travelled to many countries to conduct training as a guest lecturer and a consultant. He played an instrumental role in designing, monitoring, capacity building and methodology development in BIOFARM programme with DRCSC.</p>

	<p>Ashwin Paranjpe Ashwin is the founder director of Gorus farm association. The organization is involved in organic certification, farmer training, organic food processing and community supported agriculture. He has decades of experience as an educator and researcher in sustainable farming. He holds a Post Graduate degree in Sustainable Management of Natural Resources and Nature Conservation from Ecological Society Pune, and a Masters Degree in Horticultural Sciences from University of Florida, Gainesville.</p>
	<p>Berenice De Gama Rose Berenice is an alumnus of the Institute of Rural Management and a microfinance professional for over 17 years. She is based in Jakarta, Indonesia where she heads Back-office processes and Risk as the Chief Business Support Officer of a leading microfinance company. She is also a classical pianist and a nascent permaculture practitioner, apart from being an enthusiastic scuba diver and nature lover.</p>
	<p>Deborah Dutta Deborah completed her PhD from the Homi Bhabha Centre for Science Education, Mumbai. Her research areas span the field of environmental education and sustainable transitions, with a focus on community-practice based approaches such as urban farming. Her work explores community engagement, socio-technical systems, and sustainable food systems. She is a member of the South Asian Learning Sciences Collective, and a 2021-22 fellow of the Education for Sustainable Development (ESD) Leadership programme hosted by Engagement Global, Germany.</p>
	<p>Diipti Jhangiani Diipti's experience in soil regeneration, kitchen and garden composting, farm design and management, training and development spans over 12 years. After working, assisting and volunteering at several farms and community gardens across the country, Diipti setup Edible Gardens in 2017, as a consultancy that specialises in regeneration of degraded soil, afforestation and setting up of food forests across India. https://ediblegardens.in/</p>



Julius Rego

Julius is the co-founder of the Greensouls volunteer group in Mumbai, and has decades of experience in growing plants based on the principles of agroecology. The Green Souls team was based out of Kharghar, New Mumbai, where the organization ran a farm behind St. Jude's Children's Hospital and supplied them fresh produce. He has mentored many youth, and guided well-known organisations to set up urban farming and waste-treatment initiatives.



Priti Bhosale

A poet at heart, in 2014 Priti walked out of her profession in advertising to pursue a sustainable lifestyle and found mentorship with an urban farming network 'Greensouls Volunteer Group'. Since then, she professes to have grown in the company of people, plants, birds and insects. In 2017, she pursued Analog Forestry from IAFN (Srilanka, Belipola). She is currently associated with Earth4Ever Conservation Foundation, and they set up regenerative food forests with farmers of Palghar and Aarey forest.



Shruti Tharayil

Shruti has a penchant for weaving stories at the intersection of biodiversity, caste and food systems. Her world-view is shaped most significantly by her experiences of her journey with a multitude of communities – indigenous, dalit and pastoral communities across Southern India, which has strengthened her narratives and collaborative work. A self-taught herbalist, Shruti founded [Forgotten Greens](#) – an initiative that works on reviving the fast disappearing traditions of consuming uncultivated greens. Shruti is invested in thinking about sites of knowledge through questions of local food systems, traditional knowledge, decolonisation and biodiversity.



Trupti Kedari

Trupti's journey with gardening started as a hobby 12 years back with weekly volunteering for growing food on the rooftops of a few apartments in Mumbai. She was then introduced to a group called 'Green Souls' and volunteered for most of their projects in Mumbai and Navi Mumbai. Since then, she gradually moved from volunteering to vocation, and felt her passion grow with every project. She has worked with diverse communities ranging from growing food for cancer patients, orphans, teaching gardening as green therapy in remand homes, schools and colleges.

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