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HUMAN SETTLEMENTS

Sowing Sustainable Cities

Lessons for urban agriculture practices in India

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Urban and peri-urban agriculture as green infrastructure (UP-AGrI), a three-year research project, examines the implications of urban agriculture on human well-being and urban sustainability. The project draws on research in Tanzania and India. The three broad project objectives are:

- To examine the impacts of urban and peri-urban agriculture (UPA) on built infrastructure, ecosystem services, land and water use, using geospatial and forecasting techniques;
- To explore how UPA is socially differentiated and privileges/marginalises certain people/groups with varied human well-being outcomes;
- To co-develop and test strategies that allow UPA to contribute to urban sustainability with a focus on scaling;

The project UP-AGrI (project reference no. UWB190091) is funded by The British Academy, United Kingdom.

Know more about the project at www.upagri.net
To access the online exhibition, visit exhibition.upagri.net

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Preface

Sowing Sustainable Cities: Lessons for Urban Agriculture Practices in India

Sheetal Patil, Nitya Rao, Maitreyi Koduganti, Chandni Singh, Prathijna Poonacha, Swarnika Sharma, Parama Roy, Ashwin Mahalingam, and Nishant

India still lives in her villages but is increasingly becoming more urban, with about 35 per cent of its population now living in cities. While cities, with concentration of people in dense settlements, provide higher incomes, jobs, foster innovation and learning, they also face challenges of urban poverty and inequality, environmental pollution and shrinking green spaces, and more increasingly, poor health and human well-being. Even then, narratives of city imaginaries in earlier times predominantly focused on built infrastructure that boosted economic growth and signified progress. As urbanisation marches on, what tools do we have to reimagine sustainable cities that allow humans and ecosystems to thrive? How can cities become sites where people meet their aspirations but also lead healthy and fulfilling lives, especially those who are most vulnerable?

When we think about how human beings, nature, and buildings interact, John Dixon Hunt (2000) gives us a powerful way to categorise these interactions. 'First nature' includes wild natural spaces with minimal human interference; 'second nature' includes cultivated landscapes like farmlands and built landscapes like cities; 'third nature' includes gardens, which are a combination of nature and culture. However, in recent times a 'fourth nature' has evolved from the third nature that overlaps between urban ecosystems and human settlements. Urban and peri-urban agriculture (UPA) are manifestations of this 'fourth nature' in cities. It is estimated that over 200 million urban residents across the world produce food for urban markets and account for about 15–20 per cent of the world's food production (Armar-Klemesu 2000).

Nowadays, UPA is often recognised as a nature-based solution or 'green infrastructure', which means that it holds potential to address challenges emerging from complex, coupled problems like climate change, food insecurity, declining biodiversity, and the public health crisis (Artmann and Sartison, 2018). There is growing evidence on UPA contributing to multiple Sustainable Development Goals (SDGs) including enhancing urban food security, reducing urban poverty, promoting social inclusion, enhancing urban environment management, contributing to local economic development, and overall resilience.

Despite the growing interest and recognition of UPA as a nature-based solution, there is limited empirical evidence in countries like India on its role in reconfiguring goals on environmental functions (such as biodiversity, waste management, water recycling, micro-climate regulation, etc.) and social

well-being (such as food and nutrition security, gender relations, work burdens, land tenure, and community ties). A need to address this gap led to the ideation of the project Urban and Peri-urban Agriculture as Green Infrastructures (UPAGri).

What is this Compendium?

When we started this project in 2019, we realised that while the academic literature on UPA in India was thin, practical experience across Indian cities was extremely rich and built on decades of bottom-up experimentation and experience. We found vibrant communities-of-practice sharing seeds and knowledge, engaged online influencers discussing composting and water reuse, and stories of farming becoming sites of multi-generational bonding and nutritional security, in our ever-changing cities.

This compendium is a recognition and celebration of some of these UPA innovators and practitioners, and forms a collection of innovative UPA practices from across the country. It serves as a repository of good practices and lessons for peer-to-peer learning, and a guide that shows how the links between UPA can be one of the many solutions towards sustainability and well-being in Indian cities.

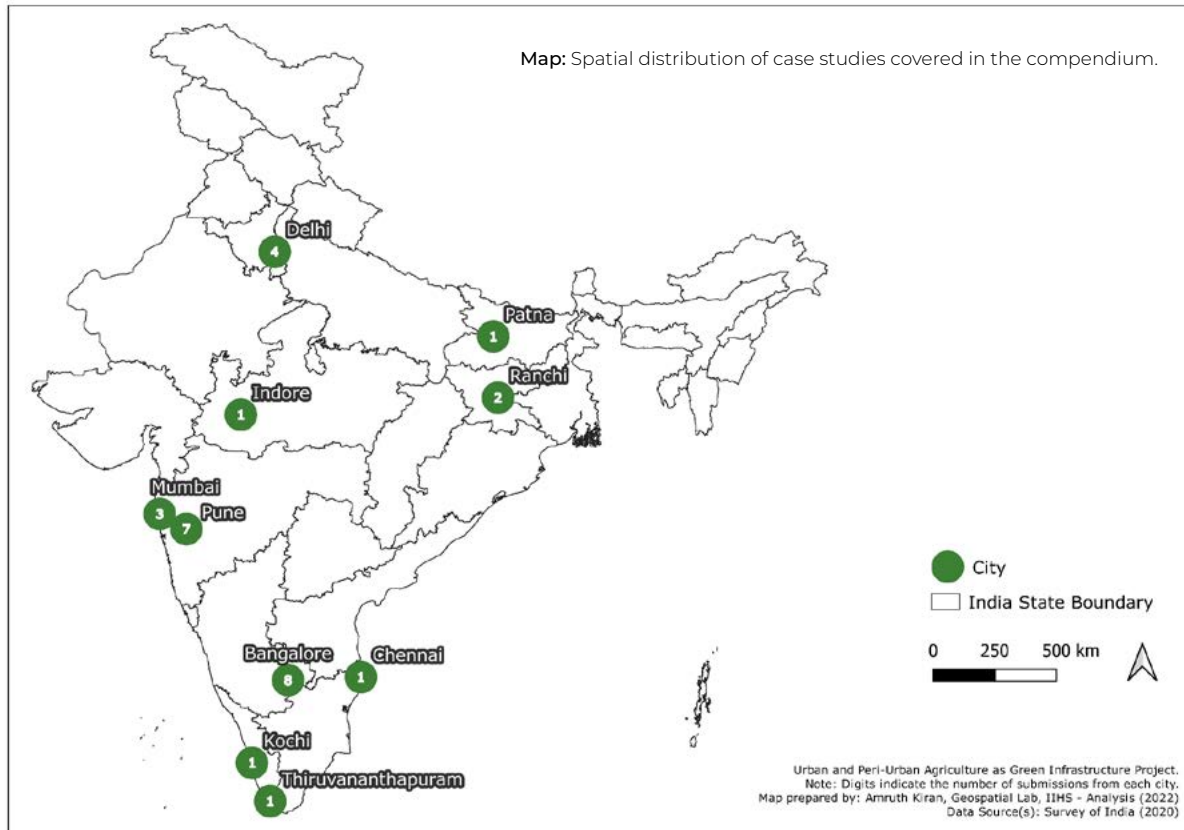
The compendium covers 29 case studies that are broadly categorised into four themes : environment and sustainability; food, nutrition, and livelihood; gender and subjective well-being; and urban policy and planning. While conducting fieldwork for UPAGri over 2020–2022, we approached practitioners to understand their motivations, challenges, outcomes, and suggestions for mainstreaming urban agriculture. In this process, we identified several compelling stories and invited these practitioners to contribute them towards the compendium. After a preliminary invitation to examine their willingness to contribute, the UPAGri research team conducted a workshop that aimed to structure the compendium's case studies and support the contributors in writing their cases. Hence, most of the case studies are written by the practitioners themselves, with the Word Lab at the Indian Institute for Human Settlements (IIHS) providing editorial support. In addition, researchers from People's Resource Centre, New Delhi, have contributed to the compendium based on their in-depth studies around urban and peri-urban agriculture in multiple cities across the country. The IIHS Word Lab helped write and copy-edit all the case studies, moving iteratively between the case writers and the editorial collective that included project team members, and IIHS Word Lab. The illustrations used throughout the compendium have been carefully designed and curated to depict the respective themes.

The case studies stem from multiple Indian cities (see Map) and ecosystems ranging from urban wetlands, common lands, individual, community, or institutional (including government) owned lands, leased land (either by collective or individual), river banks, and so forth.

In addition, the case studies cover a diversity of practitioners involved, differentiated by gender, class, ethnicity, and institutions (both government and non-government). Several innovative initiatives are also highlighted in this compendium that have enabled community action, environmental awareness and education as well as helped generate livelihoods, often for the most marginalised, demonstrating the cascading outcomes UPA can have. For the ease of reading and analysis, we have categorised the case studies thematically, though many of the cases are rich enough to cover multiple themes.

Environment and Sustainability

The Environment and Sustainability theme covers a range of practices such as rooftop gardens,



farm-based education in schools, seed-keeping, community composting and growing spaces, and large institutional and municipal gardens for food growing and seed keeping. Each of the eleven case studies highlighted multiple benefits: wet waste management, biodiversity conservation, environmental awareness, and ambient heat mitigation, to name a few. For instance, Dr. Rahul Banerjee’s experiments in Indore epitomise how ‘green’ design principles can be used in practice and also show how the presence of vegetation in close proximity to built environment can indeed help reduce temperatures and provide avenues for water recycling. Waste recycling, composting, and the need to utilise land efficiently led to the emergence of food gardens in large institutes like IIHS and Cochin International Airport. Despite daily monitoring and maintenance being a challenge, the models demonstrate efficient waste management that also motivates the public who visit them. The cases of gardens in schools and municipalities indicate how enthusiastic teachers, students, and citizens can foster environmental awareness and community engagement by not only producing food and enhancing the green cover in a city, but also in engaging students in green activities. Their experiments highlight the need to incorporate farm-based education in school curriculum to create the next generation of environmentalists.

Cases of small-scale individual farms point to pathways towards self-reliance and low-carbon lifestyles providing a variety of vegetables and fruits. Another case of a community initiative to save indigenous vegetables seeds emphasises the importance of conserving and expanding the local and national genetic biodiversity of vegetables. Although all the cases list a host of challenges— such

as a constant tension between allocating land for urban farming vs real estate, as seen in Pune—significant environmental and sustainability benefits do accrue from them.

Food, Nutrition, and Livelihoods

Although benefits of urban agriculture (UA) such as food, nutrition, and livelihoods are more tangible than subjective or relational well-being outcomes, often one fails to recognise them. Ten out of 29 cases focus on food and nutrition provision and livelihood benefits of urban farms. Considering concerns over contamination in vegetables and fruits consumed everyday, a large number of citizens take to growing organically on their terraces or backyards. Organised into formal and informal networks, rooftop gardeners meet regularly to exchange ideas and knowledge and share vegetables and other produce with each other, as in the case of Oota from your Thota. Similar to the Environment and Sustainability theme, the need to link individual efforts to create a citizens movement with the momentum to sustain is a key lesson that we learn from this case. Apart from the contribution of UA in providing fresh food, the cases also underscore co-benefits such as reduced food miles, providing seasonal and tastier food, and maintaining diet diversity.

The case of organic produce market in Indore showcases the entrepreneurial opportunities available to small organic producers within and around the city, in addition to highlighting the transformative effects and contributions towards sustainable environment through conscious actions both by producers and consumers. The cases of iKheti in Mumbai and Mrudgandh in Pune showcase how individual entrepreneurs are transforming urban agriculture practices in cities by developing models that allow city dwellers to rent or lease land for growing food. In addition to growing fresh and nutritious food within the city, these enterprises aim to create a lasting behavioural change amidst people, especially children. Abhinav Farmers Club in Pune adds to these cases to highlight how urban and peri-urban farmers can supply fresh and healthy organic food while ensuring profitability and sustainability of their farming practices. The case studies on fisherfolk in coastal cities like Mumbai and other inland fishermen and women in Delhi and Patna showcase that allied food-producing sectors like fishing also provide livelihoods in addition to nutritious diet for poor households.

Several cases also show how many practitioners go beyond creating sustainable urban farms to act as social entrepreneurs and contribute to larger capacity building efforts—such as the efforts of Mohit Kumar in Ranchi to create kits that may be helpful for others, or those by the Garden City Farmers or the SwachaGraha Kalika Kendra in Bengaluru, with the latter even creating a park where visitors can experience waste management as well as engage directly.

Gender, Equity and Well-being

Five cases in this compendium highlight how urban and peri-urban agriculture has different outcomes for men and women, as well as their quality of life or 'subjective well-being.' The case of collectivising women in informal and low-income settlements in Delhi by Action India is a good example of attaining multiple goals through UPA—improved food and nutrition, improved hygiene, waste recycling, and constructive learning activity for children. This case emphasises the means and processes (awareness building, active participation of women) used as much as the outcomes, giving women a sense of dignity and purpose, and over time, recognition and support even from men.

In contrast is the case of an urban working woman (Case 25), who started gardening on her terrace out of necessity, as her family moved to a house on the outskirts of the city which is not well served by

fresh horticultural produce. She learnt to farm along the way, making mistakes at times. Apart from providing fresh fruits, vegetables, flowers, and herbs, the garden saves them money and also helps recycle waste. Over time, she has learnt to deal with numerous challenges, enjoying the produce, while equally experiencing satisfaction from the greenery around her. The health and well-being of her family has improved, their lifestyle changed. Starting at the individual level, she too now seeks to share her insights and experiences with other women like her.

Urban Planning and Policy

Urban agriculture remains under-acknowledged in urban planning and policy in India. The three cases on this theme in the compendium argue for mainstreaming urban agriculture into city master plans and sustainability projects, to reap its sustainability and well-being benefits. The case of floodplain farming in Patna describes how agroclimatic advantages of river islands are beneficial for the dependent farming communities. The case from Chennai demonstrates how gardening in shelters for the homeless, informal settlements, and Integrated Child Development Centers (*anganwadis*) ensures food security of the most vulnerable populations. Programmes like the Chennai Urban Horticulture Initiative are demonstrative of such efforts. Aligning such programmes with national, state, and local policies such as National School (Kitchen) Garden Guidelines and National Urban Livelihood Mission, can benefit large populations. The third case of policy intervention for strengthening urban home gardens in Kerala through the Vegetable Development Programme highlights how state government support for urban farmers and their networks has helped mainstream home gardening and made it accessible to all sections of society.

Key Messages

Taken together, the compendium features stories of change-makers in urban farming and highlights directions for infrastructural, technological, societal, and policy shifts. The case studies highlight challenges and opportunities in implementing, operating, and maintaining UPA models and initiatives, potentially giving others insights on how to adapt the model in their own context. A few case studies highlight trade-offs and synergies between the various outcomes of UPA, which will inform decisions on scaling up or widening its scope. Thus, we hope that this repository of cases also allows urban policymakers to value and leverage the benefits of UPA in ongoing urban sustainability initiatives. The plethora of experiences indicates that urban and peri-urban agriculture is gaining in both popularity and impact, and can become a critical strategy for transitioning towards sustainable urban futures.

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We hope this compendium will be a valuable addition to your knowledge and experience.



A vertical illustration on the left side of the page. At the top, a bee is shown in flight. Below it, another bee is shown from a top-down perspective. At the bottom, a red mushroom with a yellow stem is growing out of a pile of dark brown soil. The background is a light green gradient.

1

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1

A Zero-waste Household in Indore

Jayashree and Debapriya Chanda

Urban Household Waste

Urban India generates 62 million tonnes of waste annually, which is predicted to rise to 165 million tonnes by 2030. Minimising household waste and recycling it sustainably are thus crucial for better urban waste management.¹ Household waste management comprises segregation of household waste into different categories, such as biodegradable and non-biodegradable waste, dry and wet waste, and so on, with the aim of turning some waste material into useful resources. Indore has been ranked India's cleanest city for six consecutive years from 2016 to 2022 by Swachh Survekshan, the central government's annual cleanliness survey. Here, Dr. Rahul Banerjee, a researcher, has successfully created a zero-waste household by experimenting with and implementing cost-effective and sustainable home-based solutions to manage water supply and sanitation requirements.

How Did It Start?

After working in several Adivasi villages in the Alirajpur district of Madhya Pradesh for a few years, Dr. Banerjee moved to Indore in 2001. He resolved to adopt a lifestyle that would allow him to impose the least possible burden on nature. He designed his house in alignment with this

idea and actualised his vision of a self-sufficient household in terms of sanitation and waste management.

What Makes It Work?

Dr. Banerjee's house operationalises sustainable living through several innovative features. Out of a plot of 1,500 square feet (sq. ft), 500 sq. ft has been set aside for gardening. The house takes up the remaining 1,000 sq. ft. Fruits, vegetables, and flowers are grown in the garden primarily for self-consumption. Varieties of creepers and climbers cover the walls of the structure right up to the rooftop, ensuring natural cooling and abundant greenery. The windows of the house have been constructed to enable adequate ventilation and natural light. The curtains are made of *khus*, which absorbs and retains moisture, serving as a natural air conditioner for the house. Even in the scorching heat of more than 40°C in peak summer, the house remains relatively cool. As the windows allow the entry of natural light, electric lights are required only in the evenings, significantly lowering household energy consumption. The house is powered by solar energy. Initially, a system with a battery capacity of 1,500 kilowatts was installed.

In 2017, the Madhya Pradesh government introduced a policy that allowed households

¹ Tewari, S. (2021, February 25). *Why India's solid waste management system needs a digital overhaul*. Down to Earth. Retrieved from <https://www.downtoearth.org.in/blog/waste/why-india-s-solid-waste-management-system-needs-a-digital-overhaul-75671>

to supply excess solar energy produced by solar panels back to the power grid.² Since Dr. Banerjee's household does not consume a lot of energy owing to its design, a system was devised in which the house would provide energy to the electricity company during the day, and purchase power from it at night. On average, 3–4 units of electricity are supplied to the company daily. Therefore, the house has become an energy generation centre, making it a carbon positive unit.

Water scarcity is a major problem for Indore's residents. High infrastructure and environmental costs need to be incurred for supplying water from the Narmada River, located 60 km away, to meet the city's requirements. Groundwater sources are also tapped into to meet the supply gap. This increases the price of water in the city, although only one-third of it can be taxed by the municipal corporation to partially recoup the procurement and distribution costs. In this context, proper usage and recycling of water must be ensured by minimising wastewater generation. Wastewater can be further segregated into two categories—grey water and black water. Greywater, or the water left behind after bathing, washing, cooking, and cleaning, is not very dirty as it is mixed with soap, detergent, or other cleaning agents. It can be purified easily at the household level using low-cost techniques such as filtering. Black water, or residual water from toilets, is contaminated and requires a more expensive purification process. Therefore, these two types of wastewater must be collected and treated separately as per their unique requirements. However, when they flow out of the household into the drainage system, they often get mixed, as making two separate sewer lines is not cost-effective. However, it is possible to implement

this at the household level, as Dr. Banerjee shows. Grey water is purified in a soak pit of brick crush and sand, which is reused in the toilet flush as well as in the garden for growing vegetables. Black water is treated in a septic tank and absorbed in the ground. This self-contained system ensures sustainable wastewater management within the premises itself. Rainwater harvesting is also practiced by collecting rainwater in an open well for drinking purposes. Approximately 40,000–50,000 litres of rainwater is collected in a year, out of which 15,000 litres is stored separately in an underground tank for consumption in the summer when there is acute water shortage.

Policy Opportunities

Basic knowledge and skills required to fix minor technical issues are key to ensure day-to-day running of household waste management practices. Inadequate skilled personnel is a major hindrance to replicating such self-sustaining models. To meet this pressing need for efficient maintenance and support services, a dedicated and time-bound policy framework must be implemented to incentivise self-sufficient and sustainable households like Dr Banerjee's and conduct training and awareness programmes. A strong demand for specialised services, such as establishing and implementing household waste management, will help create a market for and support a steady supply of skilled waste managers. Policy efforts must also focus on strengthening rainwater harvesting in all housing societies within the city, which can comfortably meet Indore's freshwater requirements.

Presently, the richest 20–30 per cent of urban dwellers consume 90 per cent of water and electricity in cities like Indore³. This increases the vulnerability and exclusion of the urban

² Singh, A. (2017, February 25). *Now, domestic users can produce electricity, sell excess to discoms*. Energyworld.com. Retrieved from <https://energy.economicstimes.indiatimes.com/news/renewable/how-domestic-users-can-produce-electricity/57339666>

³ Tewathia, N. (2014). Determinants of the household electricity consumption: A case study of Delhi. *International Journal of Energy Economics and Policy*, 4(3), 337-348. <https://dergipark.org.tr/en/download/article-file/361315>

poor, who have limited access to the same. The economic benefits that will accrue out of scaling up similar systems will benefit the urban poor immensely.

Conclusion

Current systems of sanitation and wastewater treatment in big cities like Indore are unsustainable and inadequate to meet rising water demands. They are also inherently unjust, creating deprivation in suburban areas and outskirts of cities by diverting resources to meet massive urban demand. Building a large-scale model facilitating wastewater management within households can go a long way in reducing pressure on the urban ecosystem and help in cutting down economic and environmental costs to a large extent. A decentralised approach to water and waste management will help cities secure a substantial degree of self-reliance. Home-based waste management practices, in conjunction with efforts such as gardening and energy conservation which contribute towards a self-sustaining household, will go a long way in making our cities climate resilient.



2

Learning through Food: The Ragi Project* in Bengaluru

Roshni Ravi and Pallavi Varma Patil

Introduction

Food is an essential part of history and culture. We engage with food in its various avatars and stages—from sourcing ingredients to preparing meals, reminiscing about family recipes, fulfilling yearnings for certain foods, marking important days with special preparations, and perhaps even debating the politics of food bans and restrictions.

Food can be a starting point for conversations in a school classroom. Food education entails working with the land, growing food, and inviting questions about our individual and collective food choices. It allows students to examine the relationship of food with their own bodies, their immediate environments, local communities, and the crises the world is facing today. Hands-on learning about food as part of the school curriculum can catalyse students, teachers, and school groups to take action and be stewards of their communities.

This case study elaborates on one such urban school farming project called The Ragi Project that attempted to achieve these multiple goals in the city of Bengaluru. Students and teachers at an alternative school called Poorna

Learning Centre¹ participated in the project from 2017 to 2019.

Food and Farm-based Education: The Ragi Project

The school community at Poorna had been engaging with food in different ways: students cooked local, healthy, and delicious meals for their fellow students and staff once a week. A small group of students maintained a vegetable garden on the school premises and composted the food waste. While these activities were regularised and part of the school ethos and timetable, they were standalone activities, with discussions and debates around food and related issues confined to small activity groups. What more could be done to enable the school community to become change agents?

The seed for introducing a curriculum inspired by food and food-based activism was sown during a workshop on food memories held at the school in the summer of 2017. Teachers got to think about the memories we associated with certain foods—dishes that reminded us of family celebrations and special occasions and instantly transported us back to childhood.

*To know more about The Ragi Project, visit: <https://theragiproject.weebly.com/> or <https://www.facebook.com/ragiproject/>

¹ Poorna Learning Centre is an alternative school on the outskirts of Bengaluru city that began as a homeschooling experiment in 1993. The school is child-centric in its practice and encourages several sustainable and ecologically conscious initiatives and experiments. Poorna and its peri-urban environs are rapidly changing, with farmlands being built up and divided into plots for sale.



Figure 2.1: The Ragi Project's logo representing different stages of the ragi crop **Source:** Roshni Ravi



Figure 2.2: Experiments in the kitchen to create ragi dishes—ragi *mudde* **Source:** Roshni Ravi



Figure 2.3: An illustrated recipe book documenting all the ragi recipes tried out by the students and teachers **Source:** Roshni Ravi

When a group of teachers brainstormed on integrating food into the curriculum, one teacher enthusiastically proposed, “Let’s farm!”. Radha, a support staff at Poorna, generously offered a portion (0.5 acre) of her land close to the school. With this, we had the two most important things for the project to work: land, with its immense potential, and people, with their energy and ideas.

What should we grow? This question was couched in a larger understanding of changing food habits and the growing presence and resurfacing of millets in our diets, which led us to grow ragi or finger millet. We called this teaching–learning experiment The Ragi Project. Ragi, a hardy crop that requires very little water and care, suited our needs and was congruent with the local culture, ecology, and geography. Ragi stirred something in everyone. It was familiar. It was local. It was forgotten. It had to be revived and reinvented.

The students, teachers, and parents all had something to say. One 10-year-old student claimed excitedly that he knew everything about cultivating ragi. There were others who were glad to be away from the classroom and spend time outdoors, and even some others who protested and complained about ragi’s unappetising taste.

The school kitchen became a hotbed of activity. Each class decided to make one ragi-based dish for the weekly community lunch. The experiments in the kitchen were exciting and enjoyable. Children, parents, and teachers came up with recipe ideas—from the familiar ragi *mudde* to delicious ragi *muthias*, crispy ragi *kharpole*, and sweet laddus, cakes, and cookies.

Grades 4, 5, and 6 were actively involved in the farming process. Weekly farm visits involved keen observation and description of the space, the soil, the farming process, the various stages of growth of the ragi crop and the myriad insects and birds we encountered on the farm. Ragi brought everyone together. Through ragi, we



Figure 2.4: Activities on the farm—measuring and marking plots, making compost, building a scarecrow and learning to transplant, thresh, and winnow **Source:** Roshni Ravi

learnt language, science, geography, history, art, botany, and maths.

Hands-on work at the farm helped students imbibe the skills of a small farmer. They learnt how to work with the land and prepare it for sowing, source water and irrigate the crop, prepare nursery beds, and transplant saplings, restore soil health, know when the crop is ready for harvest, and how to thresh, process, and store the crop. The farming cycle guided conversations and learning in the classroom. What emerged was a multi-disciplinary food pedagogy informed by the land, lived experiences of students and

teachers, experts in the community and the unique location of the farm.

Preparing the Land, Tilling, Sowing, Irrigating and Transplanting

When the children first visited the farm, they took in the sights and learnt the paths that led to the farm from the school. They measured a plot of land and decided how to maintain distance between rows using non-standardised methods like using their own feet to measure their plots. They marked these plots and loosened the soil. They familiarised themselves with farm tools and

learnt their names. They explored different ways to water the saplings.

Teachers, parents and students shared their lived experiences and taught the group various methods of carefully transplanting young ragi saplings.

Soil Health and Ecology

High school students conducted soil tests at various stages of farming. To enrich the soil, they prepared manure and *jeevamrutha* (natural liquid fertiliser) by using their maths lessons on ratio and proportion. The children also observed the various creatures during their farm visits. The school invited an entomologist to learn about the crucial role of insects and earthworms in an ecosystem.

Harvesting, Threshing, and Storing

Students who grew up on farms and came from farming families showed us what to look for when the crop was ready. Harvest day was a joyous occasion marked with folk songs and stories, where everyone cut and bundled the ripe stalks of ragi. We gave thanks to the land and the sun and sang songs in praise of the earth.



Figure 2.5: Ragi harvest and Sankranti celebrations
Source: Roshni Ravi

In the following weeks, students dried ragi on the school's terrace, and we learnt how to thresh and store the harvest. The children engaged in threshing and winnowing the ragi, stomping their feet and making rhythmic motions on the terrace. That year (2018), Sankranti/Pongal celebrations were special with the community's first harvest of 20 kg of ragi from half an acre!

Ragi Recipes: Tastes, Preferences, and Cooking

Throughout the year, students and teachers experimented with ragi in the school kitchen. They used different cooking methods, from steaming to frying and baking. They played around with various ingredients, and documented and illustrated their recipes.

In language and social science classes, conversations were centred on festivals, songs, and folklore that celebrate and connect nature, seasons, and the food we eat. The names and preparations of ragi in different cultures and geographies were also discussed. Class discussions introduced students to current debates in farming and agriculture around mono-plantations, genetically modified (GM) crops, plastic food packaging, and carbon

Cocoa Powder ½ cup	$\frac{1}{4}$	1	$\frac{3}{4}$
Grated Carrots 2	4	4	6
Chopped Almonds or Walnuts 8	4	6	24
Powdered Sugar ½ cup	$\frac{3}{4}$	3	4
Baking powder 1 pinch	$\frac{1}{2}$ Pinch	2 Pinch	3 Pinch
Butter 100 gms	50 gms	200 gms	300 gms
Egg 1	$\frac{1}{2}$	2	3
1 drop Vanilla Essence	1/2 drop	2	3

Method:
Mix Ragi flour, wheat flour, cocoa powder, baking powder and chopped nuts in bowl. Mix butter and powdered sugar till they combine well. Next, add one egg, carrots and a drop of vanilla essence and mix well.

Fold in the dry mixture slowly and transfer into a greased baking tray.

Bake at 170 °C for 15-20 mins.

Do the toothpick test!

If the quantity of ragi flour is halved, doubled or tripled, fix change in the quantity of the rest of the ingredients to make perfect cake.

Figure 2.6: Maths, measurements, and data handling to keep track of farm activities
Source: Roshni Ravi



Figure 2.7: The school kitchen was a hotbed of activity Source: Roshni Ravi

footprints. Children started thinking about making conscious purchases such as choosing apples from Himachal over those from New Zealand. Along with their maths teacher, the students designed a survey to capture the tastes and preferences of the school community and learnt how to interpret the results.

Ragi upturned interactions in classrooms. Students who did not particularly enjoy conventional classroom teaching and learning began to interact. They shared the knowledge they had imbibed on their farms in their villages generously and unassumingly. A 10-year-old student showed teachers how to carry a pot of

water on the hip without spilling a drop, another feisty child held up a dung beetle, and yet another one came running with purple lips and news of the discovery of manathakkali/blackberry nightshade (*Solanum nigrum*) on the farm. Ragi was the entry point for discussions on language, food choices, local culture, and water shortage. It was the catalyst that changed the colour and flavour of classroom discussions, infusing them with personal anecdotes and stories.

Ragi was also cause for celebration and boundless joy—the ragi farm was green, beautiful, and unrecognisable after a three-week Dasara break! One of the kids said the farm



Figure 2.7: Ragi-inspired arts and crafts Source: Roshni Ravi



Figure 2.8: Bringing the farm to the classroom—mapping the farm, observing insects and understanding soil health Source: Roshni Ravi

looked like a mini forest. We celebrated Children’s Day that year (14th November 2017) with renditions of Purandara Dasa’s ‘Ragi Tandira?’ (Have you brought ragi?)

Food Education in Schools: Learnings and Recommendations

Field trips involved visiting organic farms and a ragi flour mill in the neighbourhood, a city museum for historical agricultural tools, and an insectarium to learn about entomology.

The initiative allowed for discussions between teachers about the politics of small-scale

farming. They set up interviews with local farmers, worked with available indigenous knowledge around the school community and discussed the challenges in rain-fed farming using the experiential knowledge of students involved with the farm.

In the 2018–2019 academic year, the farming and school gardening group learnt permaculture techniques and intensive organic farming. They grew another millet, *jowar* (sorghum), and organic vegetables to use in the school meals. This year too, the teachers integrated learning various subjects with experiences from the farm by creating contextual and relevant lesson plans and assessments.

A project of this nature and scale required us to rework the school timetable, manage teacher and student workloads, and be creative in integrating it into the curriculum. Logistical issues included identifying a reliable water source at the farm, having a volunteer to take care of the farm during school holidays, finding the right seeds, acquiring skills and expertise in caring for the crop, and knowing when and how to harvest.

Documenting and synthesising our experiences required us to set aside time for reflection—a precious resource for a schoolteacher.

Curriculum integration was a challenge, forcing teachers to be creative in preparing lesson plans that accounted for the unpredictable farming journey. That said, such collaboration requires one to tread an unpredictable but rewarding path. Therefore, having a group that works together, focuses on problem-solving and makes the most of every learning opportunity is essential.

Teaching children to grow their own food has a far-reaching impact. Students begin to understand what is on their plate, where their food comes from, and how it is grown. Food is an effective medium to engage children and parents in conversations about sustainable

living. Perhaps small gardening and farming initiatives can help schools change the unsustainable, consumerist narrative.

Conclusion

There is widespread recognition of how the current industrial food system paradigm negatively contributes to the health of the planet and its people. Land clearing and deforestation significantly increase greenhouse gases; indiscriminate use of fertilisers, insecticides, and pesticides in agriculture deplete nutrients in the soil; fossil fuel-based transportation—the engine for global food distribution chains—contribute to increased carbon emissions; and improper food waste disposal practices contribute to soil and air pollution.

Bengaluru as a city has seen much activism to rescript the future of food. It includes a multitude of alternatives involving different actors from the grassroots to the city-level policy scape. Urban kitchen gardens, community gardens, organic gardening and composting workshops, community-supported agriculture, farmers markets, seed exchanges, solid waste management policies, Oota from your Thota² movement and Ragi Kana³ are just a few of the initiatives the city has witnessed in the last decade or so. Such disparate yet integrated actions around food embed well into the framework of food sovereignty, which is defined as 'the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems.'⁴

To sustain this activism and propel it in new directions, urban education must play its part. A food-based curriculum must take shape and

gain traction to teach the skills, knowledge, attitudes, and values towards a lighter carbon footprint. Teachers must be empowered with the skills, zeal and motivation to participate in making a new future around food. The Ragi Project allowed us to glimpse into this future and learn that it is possible to imagine and take collective action for a sustainable future for all.

Acknowledgements

The authors would like to thank the children, the teachers and the school community who participated in this rewarding experience with their time, effort, and enthusiasm. We hope our experiences at the ragi farm continue to find their way into more conversations in a school space and continue to affect our personal food choices.



² Vinita. (2011, August 22). *Time to get 'Oota from your Thota'*. Citizen Matters. Retrieved from <https://bengaluru.citizenmatters.in/3308-oota-from-your-thota-organic-kitchen-garden-event-at-btm-3308>

³ Ragi Kana. (2022, June 14). *Story of 5th Anniversary of Ragi Kana*. Ragi Kana. Retrieved on July 11, 2022, from <https://ragikana.wordpress.com/>

⁴ Declaration of the Forum for Food Sovereignty, Nyéléni, 2007.

3

Towards a Greener Generation: Lessons from Urban Gardening in Pune’s Ahilyadevi High School for Girls

Maitreyi Koduganti and Swarnika Sharma*

“Very few people in our generation know what *maati* [soil] is. I feel proud that I can do all this in school. Learning how to grow, compost and connect with nature at such a young age are things that will create a greater impact on our mind in the long run,” notes a 15-year-old student of Ahilyadevi High School for Girls in Pune. The school is among the few educational institutes in India that gardens in a dense urban locality. However, the school’s journey into urban agriculture started with a rather different objective — waste management.

The 80-year-old school operates under the Deccan Education Society. In 2012, when images of excess waste overflowing at the city’s Uruli Devachi landfill site hit the headlines, the school administration took notice of the growing challenges around solid waste management in Pune and decided to act. They invited waste management experts from the Institute of Natural Organic Agriculture (INORA)¹ and Praj Foundation² for a training programme, inspiring teachers to take action. They realised, waste from daily rituals and worship (*puja*), called *nirmalya*, comprising flowers, fruits, dried leaves, and rice, was not disposed of with kitchen waste,

but into the river. During festive seasons like Ganesh Chaturthi and Diwali, *nirmalya* from across the city covers riverbanks. With the help of local NGOs, the teachers collected significant amounts of *nirmalya* and converted them into composting beds to grow vegetables.

Catalysing Innovation

To motivate students to engage in composting and gardening activities, the teachers spun the whole exercise into a competition by allotting different composting beds to different classes. The teachers encouraged a healthy competitive spirit among the students and pushed them to ensure better plant growth. Students innovated their growing techniques so much that they decorated used bottles and planted in them.



Figure 3.1: Students stacking *nirmalya* in composting beds
Source: Shubhada Rajguru

* With inputs from Shubhada Rajguru

¹ (n.d.). INORA. <https://inora.in/>

² (n.d.). Social Responsibility, Praj. <https://www.praj.net/praj-foundation/>

Winners were rewarded with plants and produce to take home. Many students became avid gardeners. Valuing their contribution, these students were at times exempted from some assignments.

Despite limited space and time, a team of six to seven teachers continued their efforts to grow food on the school premises with regular schedules and plans. As technology advanced, they experimented with various gardening techniques. They planted in PVC pipes, discarded bottles and tyres to grow smaller plants and employed automatic timers for watering them. Currently, they produce several food crops and medicinal herbs, including chillies, mint, *ashwagandha* (winter cherry), *brahmi* (Indian pennywort), spinach, fenugreek, beans, and so on.

Easier Said than Done

Though composting and gardening proved to have significant outcomes, sustaining these activities has been challenging for teachers and students. Being a government-aided school, it does not collect fees from students, and the government pays the teachers directly. Often, this meant limited funds for extra-curricular activities, owing to which the school administration approached private foundations to help set up the composting and planting



Figure 3.2: Students engaged in maintenance activities
Source: Shubhada Rajguru

activities. Instead of seeking funds, the school requested students to bring discarded materials from their homes to set up the garden. One of the parents donated 25 plastic drums to initiate the project. The goal was to divert waste from the landfill at a school level while inspiring students to compost waste and grow their own food.

To be able to garden, choose the right kind of inputs, maintain plants, and troubleshoot pest infestation were skills that did not come naturally to many of the teachers. The school management did not provide training for teachers, so they relied on private training and external networks, which meant additional expenses for them. One of the teachers noted, *“there are no government programmes or policies that train and recognise the efforts teachers put into urban gardening activities.”*

When the teachers conceptualised the idea of gardening, they were apprehensive about student motivation and engagement. In the first two months, students were asked to observe sowing, composting, watering, and daily maintenance. Shubhada Rajguru, one of the teachers, noted, *“Most girls were not even ready to touch the soil, let alone the wet waste or worms, which was a big challenge.”* The teachers strived for six months to maintain the garden, after which they appealed to parents and students to visit the garden. The blooming garden with flowers, fruits, and vegetables evoked an interest in students. The next task was to ensure a constant supply of wet waste. Teachers stepped up to lead by example and collected waste from nearby temples and small-scale vegetable and fruit vendors. Similarly, purchasing enough soil, worms, and gardening material was a serious challenge. They did not have enough pots to grow various vegetables, herbs, and fruits. The school bought inputs like worms for composting from INORA and Praj Foundation. Shubhada notes, *“Recently, a teacher from another school reached out to me to understand the initiative and replicate it. I explained everything, and a day later, she*

called back requesting if I could set it up for her.” For an initiative like this, teachers must be dedicated and motivated enough to sustain the activities.

Gardening becomes an additional responsibility in addition to teaching and planning the curriculum. Watering plants, weeding, and maintaining composting drums needs daily attention. It was an additional chore to empty the pots and repot them when plants were infested. Since not all teachers were involved in the initiative, the school management stepped in to tend to the garden when these teachers were busy. Shubhada recounts, *“We could maintain and expand the garden only because our management was supportive. Such an understanding and collaborative effort between teachers and management will only motivate other schools to undertake such an important initiative.”*

Towards Healthy and Green Outcomes

By 2016, four years since the initiative took shape, the perseverance of the teachers and school management was starting to bear fruit. Schoolchildren were equipped enough to manage the composting and gardening process almost entirely by themselves. They started to learn the latest and innovative pest control techniques with the teachers' help. Many students continued to engage in school farming activities even after they completed schooling, demonstrating a long-term connection with growing food.

Food production was, however, not the sole purpose of this initiative. Teachers believed that urban gardening would enrich students with a diverse learning experience, enabling them to serve as ambassadors of change and share their success stories at their homes, neighbourhoods, and peers, spreading environmental awareness. Teachers also educated parents about the importance of better waste management practices and growing chemical-free food at home. According to the school principal,



Figure 3.3: Growing vegetables and plants in old and discarded tyres **Source:** Shubhada Rajguru

“More than 20 percent of the students compost waste at home. In a school educating 2,500 students, this is a huge impact.” Many parents are happy that their kids are involved in such activities and report a higher concentration and emotional quotient among students. The journey has taught children to be mindful of healthy food, to remain connected to nature, and to reuse and recycle waste.

Composting and gardening activities enabled the school to expand its social network. For example, the school participates in events organised by Vanarai, a green social enterprise. In return, the platform funds the school's gardening activities and provides collaboration opportunities with other institutions. Overall, the school's advent into urban agriculture has empowered the girl students, equipping them with innovative techniques to manage waste and grow food, giving them a chance to boost confidence, creativity, and resourcefulness.

Looking Ahead

Setting up such gardens in school plays a critical role in shaping the knowledge and experience of students from an early age. While giving them a real, hands-on experience of growing and composting, these initiatives have the potential to guide students into a career path that fosters a new generation of agropreneurs and urban farmers. Several teachers recollected, *“During our school days, gardening was taught as a part of their curriculum. This faded away with time.”* Incorporating urban gardening into the school curriculum will help students learn key social skills, such as interpersonal and communications skills. They would also practice at their homes and motivate their family members to compost and grow food.

Recognising the benefit of gardening, in 2019, the Ministry of Human Resource Development

suggested all urban and rural schools to develop and maintain gardens under the School Nutrition (Kitchen) Gardens Guidelines. Under these guidelines, schools can avail seeds, saplings, manure, technical assistance, and training by collaborating with the Department of Agriculture/Horticulture, state agriculture universities, and the Food and Nutrition Board.

With growing urbanisation and mounting waste mismanagement, such policy guidelines will encourage more schools to take up gardening activities within school premises, allowing students to be at the forefront of building a safe, nutritious, and green future in large cities like Pune. In this process, as Shubhada notes, *“Teachers are the pillars of a nation’s advancement, and they should take the responsibility of guiding students towards a clean and green future.”*



Figure 3.4: Students watering the plants Source: Shubhada Rajguru

4

SwachaGraha Kalika Kendra: A Model for Knowledge Diffusion

*Bala Panchanathan**

The SwachaGraha Kalika Kendra¹ model demonstrates the different ways of recycling organic and inorganic waste, composting practices, and benefits of urban farming. Using public spaces like parks as a demonstration site at the ward or area level promotes holistic engagement with sustainable living practices through decentralised waste management, urban agriculture, and community building. It grounds the community to their surroundings and motivates them to adopt these sustainable practices as a way of life. The SwachaGraha Kalika Kendra (SGKK) centre aims to:

- Maximise the efficiency of solid waste management (SWM);
- Decentralise SWM;
- Manage wet waste effectively by composting at an individual and community level;
- Use the compost to maintain the community garden in the park and sell the manure to farmers (in and around Bengaluru—mostly in peri-urban areas) for a nominal price;

- Promote the park/demo unit as a centre of education/awareness to educate and sensitise citizens, students, and apartments, among others.

Kalika Kendra: The Inception

Located in Ananthavanavana, HSR Layout, a quiet residential area in southeast Bengaluru, SGKK is a one-of-its-kind park-cum-demonstration centre started in 2018. It is a public park converted into a demonstrative learning centre to promote sustainable solid waste management at an individual and community level. The Kendra is the product of a collaborative effort between HSR Citizens Forum, Solid Waste Management Round Table (SWMRT), and Bruhat Bengaluru Mahanagara Palike (BBMP). It is funded by the incumbent MLA of Bommanahalli, under which the HSR constituency falls, along with support from CSR funding from various corporate firms. A robust civil society and a responsive government are important factors for its success.

‘SwachaGraha’ translates to clean planet and ‘Kalika Kendra’ means training centre. Doctor-turned-sustainability practitioner, Dr. Shanti

* With inputs from BNS Ratnakar

¹ (n.d.). Solid Waste Management Round Table, Bengaluru. Swacha Graha. <https://www.swachagraha.in/about>

Tummala, a member of HSR Citizens Forum and SWMRT, was one of the key persons responsible for establishing the Kendra. With support from Ms. Vani Murthy of SWMRT and active citizens of the HSR Citizens Forum, the Kendra has emerged as a one-stop centre to learn and experience sustainable solid waste

management practices. HSR Citizens Forum is the fulcrum that streamlines these activities—waste collection and segregation, composting, and community garden maintenance through workshops and demonstrations. It has hosted around 6,000 visitors from India and abroad in the past three years.



Figure 4.1: Demonstration of different types of waste segregation **Source:** Swarnika Sharma

Vision, Mission, and Motivation

Driven by a mission to inculcate sustainable solid waste management practices, ensure segregation at source and decentralised handling of wet waste, SWMRT launched several campaigns, such as Trashonomics, 2Bin1Bag, and SwachhaGraha Compost Connect to sensitise citizens about the importance of composting and other eco-friendly practices. The park has been envisioned as a model to educate a wide range of actors, from students to novice composters and policymakers.

All these campaigns culminated in the creation of SGKK in 2018, which was visualised as a one-stop shop and training centre to imbibe sustainable waste management practices. SGKK aspired to decentralise waste management and prevent wet waste from entering landfills. Using the HSR Layout area as their main site of advocacy and action, SGKK encouraged fellow citizens to segregate wet and dry waste. SGKK also established lane composters in every street to collect and compost wet waste from households. Live demonstrations and training sessions showed how the wet waste could be composted at an individual and the community level. SGKK uses the twin strategies of sensitisation (awareness campaigns by citizen groups) and punishment (fines imposed by BBMP Marshalls) to ensure compliance from fellow citizens in the locality. Presently, HSR Layout segregates almost 90 per cent of all its waste.



Figure 4.2: Information boards on waste management
Source: Swarnika Sharma

Alchemists and the Creation of Black Gold: A Tour of SGKK

SGKK looks like any other park in Bengaluru, but the magic in the air is evident as soon as one steps in. The park has a community garden right at its entrance. In addition, information boards throughout the park display interesting facts on why composting is important, in addition to tips and tricks for novice composters.

Creative installations include an old bathtub repurposed into a lily pond, a flower made of



Figure 4.3: (From left to right) Old bathtub repurposed into a lily pond; An arch made of discarded paint buckets
Source: Swarnika Sharma

bottle caps carrying the stories of rag pickers who have climbed the ladder of social and economic mobility, and an arch made of old paint buckets. The storeroom where the composting materials are stored is made entirely out of recycled tetra-pak. These remind visitors that creating wealth out of waste can be a way of life.

However, the treasure the citizens of HSR layout hold most dear is the 'black gold' created after composting. It is a nutrient-rich supplement that can be used for gardening or enriching depleted soil. One of the focus points of SGKK is to help citizens make composting a habit. The park is home to different models of composting units, all of which are functional. An experiential and visual learning experience about composting has been curated for visitors. Several live-demonstration workshops have been conducted at SGCC, many of them now online, owing to the COVID-19 pandemic. In these workshops, participants learn about the various models of composters. Vendors' contact details are shared to help them make an informed choice. Citizen volunteers also hand-hold novice composters in the initial days of their composting journey through WhatsApp and Facebook groups, in addition to value-addition workshops for gardening enthusiasts.

The park has separate sections for individual and community composting units of varying capacities. Visitors are shown the 45-day process of composting in detail. The compost produced at apartments is often sold to organic farmers on the outskirts of Bengaluru for a nominal price. Kalika Kendra plays a key role in mediating these transactions. Wet waste generated from temples is composted using the leaf composters in the park. In addition, the park boasts of vermicomposting units where earthworms are used in the composting process.

SGKK is an ecosystem of its own. The park is home to two beautiful, brown Gir cows named Lakshmi and Gowri, gifted by a local politician. The cow dung is used to make slurry for the compost. The park also has several chickens, which feed on the



Figure 4.4: Demonstration of composting units
Source: Swarnika Sharma



Figure 4.5: Demonstration of large-scale community composting units
Source: Swarnika Sharma



Figure 4.6: Two Gir cows Lakshmi and Gowri
Source: Swarnika Sharma



Figure 4.7: Community garden at SwachaGraha Kalika Kendra **Source:** Swarnika Sharma

maggots in the wet waste. The chicken excreta are used as manure.

The community garden at the park literally and metaphorically symbolises the fruits of the HSR citizens' labour. A part of the black gold generated in the park is used in the community garden. Old paint buckets, bathtubs, and old tyres are repurposed into plant holders. The community garden is open to all the volunteers of SGKK. Vegetables like brinjal, cabbage, okra, and pumpkin, and medicinal plants and flowers are grown here. The produce is shared among the volunteers or donated.

Challenges

SGKK did face some challenges during its inception, mainly public reticence about setting up a wet waste management unit in a public park. This concern was due to the fear of foul smell emanating from the waste. However, SGKK convinced the community that composting wet waste mitigates the smell from untreated waste. Another imminent challenge to this model is its sustainability. The park is successful largely due to the committed and concerted efforts of the citizen volunteers, mostly from elite backgrounds and the support of the local administration. Their socio-economic standing, power, and influence

makes it easier for them to establish good ties with local administrators. However, community involvement and ownership must be sustained for the park to maintain its role as a one-stop learning centre. The younger generation must also lead the movement for decentralisation of waste and sustainable waste management practices.

Conclusion

The story of SGKK as a community learning space and garden is inspirational. The cooperation among powerful stakeholders has led to wondrous benefits for the community. Ninety per cent of waste in HSR layout is segregated at source, and almost 25 per cent of citizens in the area compost their waste.

SGKK also demonstrates the benefits of decentralising waste management. Wet waste is composted, black gold generated is sold to nearby organic farmers while visitors to the park are privy to the dual purpose of the park—recreation and learning. The park has impressed many municipal officials across the country, and the Government of Karnataka recognised this model and mandated similar learning centres in all districts across Karnataka. Inspired by SGKK, a similar park was set up in Telangana.

5

The Eco-conscious Urban Farmers of Pune

Rosamma Thomas and Debapriya Chanda

Introduction

Pune is home to many rooftop and kitchen gardeners, who aim towards greater self-reliance by adopting an ecological lifestyle. The city boasts a close network of farmers with a keen understanding of the connection between soil and human health. Urban farming is gaining popularity due to several encouraging initiatives, such as the Swadhaa Waldorf School in Pashan, where the curriculum requires children to participate in gardening and cultivation on a patch of land on campus.¹ The Pune Municipal Corporation (PMC) facilitates the sale of farm produce through weekly markets. Presently, fifty such markets are operational in wards across the city.

Urban Farming Practices

Several generational farmers are settled in Pune's Baner area. Here are few of their stories.

Balkrishna Tapkir and his brothers have been engaged in farming and milk production on their farm off NH48 for generations. Although he is a builder by profession, Balkrishna has no plans of selling the three acres of inherited farmland, where he grows mango, papaya, and drumstick trees.

Anil Gaikwad is a retired scientist from a government institution in Pune who now practices organic farming, while his son runs a small store selling organic produce. He uses Zero Budget Natural Farming (ZBNF) techniques

to grow turmeric, onion, beans, chillies, wheat, groundnut and maize. He has four cows, and he uses cow dung as manure and cow urine with lime on seeds to prevent fungal growth. He is also trying to revive and grow varieties of sugarcane that are not cultivated commercially. In addition, he has set aside a patch of land for agroforestry. While his family owns a larger farm in their ancestral village, which yields profit, the purpose of this farm in the city is to popularise organic farming. Other farmers and interested individuals are also invited to participate in farm activities.

Madhuri Bhaskar Somalwar has a terrace garden, about 15 sq. ft in size, where she grows plants rich in diversity, including flat beans, jowar (sorghum), fennel, garlic, figs, spinach, radish, pomegranate, bitter gourd, yam, tomatoes, turmeric, brinjal, *kalmegh* (green chiretta), sunflowers, roses, and other plants with medicinal properties. She has also planted banana and areca nut trees in a little space on the ground floor. She uses the produce to cook her own meals and uses kitchen waste to fertilise her plants.

Afrin Kale owns a five-acre farm in Pimpalgaon Ghode village of Ambegaon. She grows wheat, millets, rice, fruits, and vegetables. She does not use any chemical fertilisers or pesticides as her farm is within a 40-kilometre radius of the Bhimashankar Wildlife Sanctuary, which has been declared an eco-sensitive zone. She supplies vegetables from her farm to the city and uses garden waste from the city on her farmland. She

¹ Thomas, R. (2021, June 29). *State of Urban Agriculture in Indian Cities: Pune*. People's Resource Centre. Retrieved from <https://prcindia.in/publications/state-of-urban-agriculture-in-indian-cities-pune/>

works in partnership with 15 organic farmers in the area. They share production and marketing costs to expand their urban consumer base. Consumers are also free to visit the farms to see how the city's food is grown.

Parikshit and Prachi Dhulugade undertake vegetable farming activities on 30 guntas² of land in Nasrapur, Velhe Road, about 35 km from Pune. Their farm also serves as a waste-recycling unit for the city. With their friend Abhijeet Wagh, they gather household, food, and garden waste from housing societies in Kothrud, Karve Nagar, and Warje, and use it as compost to enrich the soil, which also saves them the additional expense of transporting large quantities of manure.

The Community

Most organic farmers in the city do not rely on government certification. They prefer visiting each other's farms to discuss farming practices, plan the crop cycle, and market their produce in a collaborative manner. The Sustainable Living Store in Karve Nagar, run by former engineer Bhushan Patil and his partners, is one such platform for Pune's urban farming community. Customers can purchase organic vegetables, ghee, jam, soap, and other produce here. They can also reach out for support in planning kitchen gardens in the space available to them. In the two years since its inception, close to 50 people have benefitted from this programme. For instance, Shridhar Nagnoor, an 83-year-old resident of Karve Nagar and a retired Central Bank employee, grows vegetables and greens on his terrace, including spinach, mint, coriander and methi (fenugreek leaves). Patil and his partners also offer consultancy services for managing city spaces with potential for growing plants. The Sustainable Living Store hosts regular events where people can meet and share their ideas and experiences about urban farming practices. Dissemination of information through social media further strengthens community bonds.

² 1 *gunta* is equivalent to an area of 101.17 sq. m

Challenges and Opportunities

Some farmers in Pune function at the heart of urban settlements, which increases the cost of transportation of inputs. Under the Smart City programme, several places like Aundh have built fresh pavements and street furniture that hamper the percolation of rainwater. This worsens the urban heat island effect—a phenomenon where intense concretisation causes pockets of land near these sites to heat up. There has also been a massive conversion of green areas into built areas in the city. Urban farmers face challenges from the real estate industry, as construction projects make attractive offers to acquire farmland. Balkrishna and his brothers have been struggling to retain their farmland in Baner. They have had to stop milk production as the land was taken over by a builder. Further constraints exist in waste recycling. As per estimates provided by the PMC in 2016, the city generates nearly 1,600 tonnes of waste every day. At present, Abhijeet's device has a capacity of one tonne of waste per day, and he processes around 600 kg each day. Although the scope for upscaling this model is limited, more farms can be integrated in this process of waste management. This would reduce the use of chemical fertilisers and other expensive products that are harmful for the soil and water.

Despite poor government support, urban farming provides various ecological services to the city. It contributes to waste management, limits the impact of the urban heat island effect by improving water retention, and reduces energy and transport costs by boosting local production. For women, urban farming gives them agency over their time, skills, and resources, while simultaneously providing a decent source of income. Close-knit ties between urban farming practitioners fosters a spirit of community participation for a cause that is rooted in sustainability.

6

Why Should You Become a Seed Keeper? The Journey of Hariyalee Seeds

Prabhakar Rao



Figure 6.1: Book cover—*Cook and See* by Meenakshi Ammal
Source: Prabhakar Rao

When I was pursuing my doctoral studies in agriculture sciences in the 1970s, one day I stumbled across a treasure while rummaging through an old dump of books in my parents' attic: *Samaithu Paar* or *Cook and See* by a Tamilian housewife Meenakshi Ammal, first published in the early 1950s. The recipe book had been gifted to my mother Prema when she got married, and it was a bible for many South Indian brides in those days.

A student of the soil and its bounty, I began exploring the book for recipes, and to understand the kinds of ingredients that went into foods in the early 1950s. Curiously, I found that some of the vegetables mentioned in the book were unknown to my mother and everyone else I then checked with.

Thirty years later, my wife Rugmani received an English translation of *Samaithu Paar* in her trousseau. The same recipes, the same unavailable vegetables. No one seemed to have checked if the vegetables mentioned were still available in the market when the book went to reprint.

While my curiosity was piqued, I was also angry. Why would so many vegetables that formed a part of our culinary heritage disappear right from under our noses? This burning question and the quest that followed resulted in two things happening in my life.

First, I began to question the very fundamentals of the Green Revolution that I was a part of as a student and researcher in the 1970s. In the lineage of agriculture's giants like Dr. Norman Borlaug and Dr. MS Swaminathan, I had then persuaded farmers to adopt chemical farming and use hybrid seeds. The reasoning seemed valid then. The world needed food to feed its growing population, and here was a solution that successfully addressed food security.

However, I was also around to see the impact of industrial agriculture on the soil and the lives of millions of farmers who were now trapped by high-cost, high-risk chemical farming. As a result, almost 30 years later, it became my life's purpose to revive sustainable vedic natural farming¹ practices in Indian agriculture and reach out to hundreds of thousands of farmers across India to restore chemical-free farming and use of indigenous seeds in their farming practices.

Second, I actively joined the universal guild of seed savers, an organic and committed group of people who work across the globe to protect and propagate indigenous seeds and preserve the integrity of the earth.

While I never stopped being a farmer at heart, I had diversified my career path and began practising landscape architecture, a decision that took me to live and travel in other parts of the world. I met farmers, many of whom, like me, were challenging the fundamentals of the Green Revolution. They had either never adopted the practices or, if they had, were returning to

natural farming techniques that revived the use of indigenous seeds. Many had preserved a few seeds from their family lineage. I began collecting and exchanging indigenous seeds, and as a part of the International Seed Savers Exchange, a non-profit organisation based in the United States, I shared these seeds with many other seed keepers across the world.

In 2011, I stumbled across an incredible article² in the July edition of the National Geographic magazine that carried an infographic on how large seed companies had monopolised the global farming sector creating dependencies on hybrid and GMO seeds, resulting in hundreds of varieties of indigenous seeds going extinct. The article quoted a study by the Rural Advancement Foundation International in 1983, which had researched the seed biodiversity that existed in 1903 and found that in just 80 years, the earth had lost 93 per cent of all vegetable varieties that existed. The same year, my family and I returned home and to our farm on the outskirts of Bengaluru after 20 years of living abroad.

We had bought the farm eight years earlier during a trip my wife had made to Bengaluru. She had called me saying she was standing on a beautiful piece of agricultural land, snuggled between a brook on one side and hills on the other. "*Let's buy it,*" I said, and we did.

When we returned to see the land a year later, we realised we had been duped. The land we chose and the one allotted to us was not the same. The broker had disappeared, and we were left with a piece of rocky, barren, inarable land. One that all

¹ Agricultural heritage in India has roots in ancient texts such as the Rig Veda, Krishi Parasara, and Vrukshayurveda. In Vedic agricultural practice, nutrient solubilizing microbes (NSMs) from the gut of indigenous cows (*Bos indicus*), are inoculated into the soil through formulations like Panchagavya, Kunapjala and Jeevamruta. They help break down complex mineral salts to release abundant amounts of nitrogen, phosphorus, potassium, and other essential elements required for plant growth. Along with these microbes, use of mulching, earthworms, indigenous varieties, and mixed cropping form the basic pillars of Vedic Agriculture.

² National Geographic Magazine: Food Ark. (2011). *Saving Seeds*. National Geographic Magazine. Retrieved from <https://education.nationalgeographic.org/resource/saving-seeds>

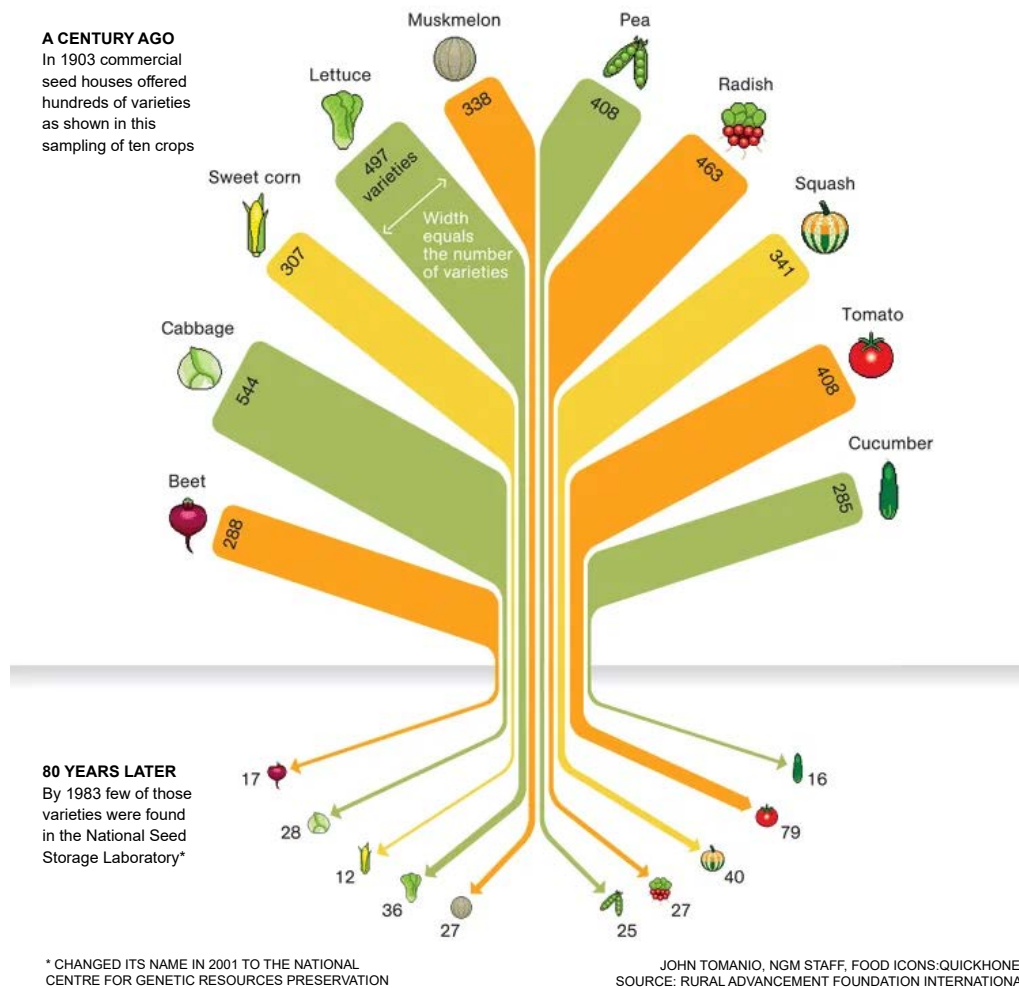


Figure 6.2: Seed varieties Source: National Geographic Magazine, 2011

my farmer friends said had no hope. Little did I realise that this was the universe’s way of getting me to explore the power of natural farming.

For the next seven years, during my visits to India, I worked to revive the land with natural farming techniques that used cow urine and dung as its base for nourishment and protection. Not one drop of synthetic chemical touched the soil. As a proof of concept for everything I believed in, this ‘land of no hope’ slowly developed into a beautiful fruit and vegetable orchard. And when I finally returned in 2011, our company,

Hariyalee Seeds was established on this lush and verdant farm.

I use traditional techniques for seed preservation, such as preserving the seeds in an airtight bottle with a pinch of asafoetida and a few pieces of dried neem leaf. Today, at Hariyalee Seeds, we have 23 varieties of tomatoes, 11 varieties of tulsi and basil, 6 varieties of brinjal, 5 types of okra, 15 varieties of edible lettuce and mustard, and many more. In the past six years, we have tested over 600 varieties of endangered vegetables, and successfully stabilised and multiplied 176



Figure 6.3: (From left) Image of Clove bean in *Cook and See*; Image of Adalakai (spine gourd) in *Cook and See*; Image of Maakeli beru in *Cook and See* **Source:** Akash Muralidharan

varieties of indigenous vegetables that anyone can grow in India.

While I continued my consultancy work in landscape architecture leading several prestigious projects, my real work was with the farmers. As a part of an NGO that worked with lakhs of farmers, I travelled the country, training farmers on sustainable farming. I met hundreds of farmers from whom I received and exchanged small handfuls of seeds that were going extinct. I also met extraordinary seed-savers from remote villages who, each in their own way, were connected to each other by the sacred code of 'Seed Savers' committed to creating seeds that would propagate to create more seeds, keeping the genetic biodiversity of vegetables alive by the laws of nature.

Meeting these rural seed keepers, I realised that I had two advantages. One, my doctoral studies in Plant Breeding and Genetics gave me an edge, which enabled me to test these varieties for genetic stability and environmental suitability and successfully propagate them on our farm near Bengaluru. Second, on account of my education, travel, and exposure, I could stand up and tell the story and tell it powerfully. I realised I could be one of the voices for these silent but extraordinary seed keepers and draw attention to the urgency of protecting indigenous seeds. I speak several languages and have been interviewed widely in national and international media. My 'Save the Seed' campaign is discussed on various platforms. It

impacts both urban gardeners and rural farmers across India, who join me in my mission to help restore India's seed diversity.

I never recovered from my peeve of finding so many vegetables in the recipes of Meenakshi Ammal's book unavailable in the market. So, I made it a pet mission to track these seeds and begin propagating them. I found the '*lavanga huruli*' (clove beans) with Venkatesh, a fellow seed keeper from Andhra Pradesh with whom I had been exchanging seeds for a while. I found '*adhalakai*' or *Mormordica tuberosa* with a professor from Coimbatore who had saved some from his germplasm.

I found '*makali beru*' or *Decalepis hamiltonii* with a retired Conservator of Forests in Karnataka who, knowing that I was a seed keeper, gave me a handful of the precious seed to propagate.

My greatest joy is when I hear from someone who has taken seeds from Hariyalee Seeds and successfully propagated them and is sharing the seeds with others. For instance, Chhavi Methi, a yoga instructor from Delhi, became a passionate urban gardener after growing the desi vegetables from Hariyalee Seeds. "*I was instantly addicted, after seeing the pink bhindi and blue tomato grow right in front of my eyes*", she said. Krithika Raman from Bengaluru believed that in addition to growing these beauties, she was grateful that she could contribute to preserve biodiversity.

After COVID-19 struck, I started conducting free gardening workshops online. Thousands of participants became rookie gardeners. The demand for my seeds grew exponentially and I imagined a future where every family grew at least a part of their food on their terraces, balconies, and kitchen gardens. I taught new ways of growing microgreens for those who had just a windowsill to grow food on. It doesn't matter if the vegetable grows in a pot on a balcony, in a kitchen garden, or in a farmer's field in a remote part of India. The fact is that we are giving a chance for that vegetable variety to remain with us for posterity. We are bringing back the sacred code of seed keepers. We are saying that these ancient varieties have a place in today's world, and their seeds belong to all mankind. We are saying that these seeds are not the proprietary right of any individual or company. Seeds that were created over thousands of years by nature belong to the earth.

Each of us needs to become a seed keeper!



7

Designing a Rooftop Circular Food Garden

Vishwanath S

Introduction

Through the idea of urban metabolism and urban footprints, Wolman (1965)¹ points out that cities are great consumers of materials and resources. Processed materials from cities, such as sewage or solid waste, have a large impact area. Water is drawn from farther and farther sources, food footprints are international in scale, and energy footprints are almost national in scale. Bricks, sand, and stone from granite quarries required for buildings and roads can desecrate rivers and landscapes far away from the consumption centre that is the city.

The detritus or waste left after the consumption of these large volumes of materials also leaves a big footprint. Sewage flows can be for tens of kilometres, seen in polluted rivers and even nutrient-rich zones in oceans. Solid waste landfills can reach hill-like proportions, and the need for urban landfills threatens villages far away from cities. Construction waste ends up in valleys and lakes, altering landscapes and water flows.

How can this problem be addressed? One idea is that of circular economies, closing the loop on material flows, using the waste of one process as the resource of another. This can be imagined at a city, neighbourhood, and even individual scale. This case study is developed as a prescriptive

description of the process of building design, following examples of circular economy principles that a small plot of about 150 sq. m individual residential site can easily adopt. Following the principles of subsidiarity, solving problems at the lowest possible scale, one can look at the endowment of natural resources on a particular site where a building is to come up and, through design, seek to minimise the material and energy footprint of construction and occupation of the building.

Water, energy, earth, biodiversity, wind, and the ability of soil to grow food and absorb waste are some parameters that can be worked with at a building scale. These parameters are discussed in brief in the following sections.

Soil

As our common understanding goes, almost every site has earth or soil. Topsoil, with its organic content and microbial life, is rich in biodiversity. Taking the topsoil away carefully, stocking it and then returning it to the terrace for gardening is one way of circular design with minimum impact on local biodiversity.

The rest of the soil below the topsoil then becomes a good construction material. Earth construction has several advantages, the primary one being the ubiquitous

¹ Wolman, A. (1965). The metabolism of cities. *Scientific American*, 213: 179-190.

availability of the material. It can be used to make either adobe blocks or compressed earth blocks. Incorporating a semi-basement into the building design provides enough earth for two-storied constructions. The earth blocks can be made on-site using a manually operated machine. Earth construction replaces fired bricks or cement-heavy concrete blocks, thereby reducing embodied energy in construction, and requires no plastering or painting, and blends with the environment.

By designing a roof to carry the removed and replaced topsoil, it is possible to grow plants, trees, and vegetables that provide nutrition for the household. The rooftop soil garden can also be a biodiversity space, full of native species harbouring insects and birds.

Water

The water footprint of a city like Bengaluru is huge. Sourced from the river Kaveri, about 95 km away from the city, water must be pumped

up 300 m in three stages, consuming about 1.8 units of energy for every 1,000 litres, to arrive at the city. Distribution of this water and the local pumping at household and apartment levels add to the embodied energy of water and costs.

The rainfall in the city is also spread over eight months and is, on average, 970 mm annually. A significant amount of a household's water requirements can be met by harvesting rainwater in barrels, tanks, sumps, and aquifers. Furthermore, grey water recycling systems (water from the bathroom, washing, and kitchen) can provide additional water for the terrace garden and other secondary purposes like car washes, cleaning household surroundings, and washing solar panels.

Composting toilet systems that require very little water and that too only for ablutions and provide urine as a fertiliser for the terrace garden, can be designed and placed on the terrace itself. The solids from the toilets can be composted and reused as manure safely.

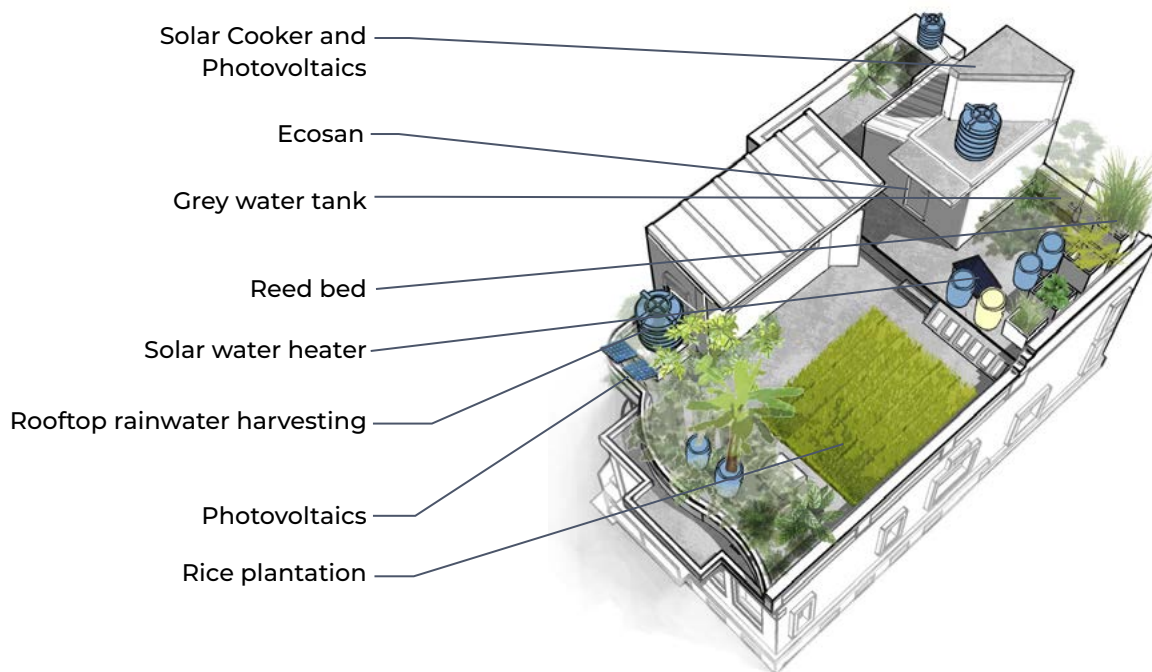


Figure 7.1: Productive use of a rooftop—designing with nature Source: Vishwanath S

Energy

Photovoltaic systems can utilise solar energy incident on rooftops in Bengaluru to generate the energy required for the household. A 10-sq. m roof area with photovoltaic panels can generate 1 kW of energy, typically described as lifeline energy. In addition, solar water heaters can meet domestic requirements, and solar cookers can be used for cooking. Solar energy also nurtures the plants and crops growing on the terrace.

Food/Vegetables/Crops/Plants

Design and zoning are crucial to crops, vegetables, and small trees grown on the terrace. Structural stability and the ability of the roof and walls to take the load must be ensured. Waterproofing must be well designed, especially if grains are to be grown.

Plant zoning can be done in a manner where the area with the most sunshine is reserved for plants that need the sun most. Pots can be used to grow vegetables such as brinjals, chillies, and beans. By placing two layers of pond-lining High-density Polythene Sheets (HDPE), a small zone can be created for growing grains. Even paddy can be grown in this parcel alternating with millets.

Three crops can easily be grown in a year. High yields of up to 0.7 kg of paddy per sq. m of cultivation can be obtained depending on the variety being grown. Paddy also absorbs the urine from the ecosan toilet as a fertiliser and completely consumes it.

Compost from the solids portion of the ecosan toilet can be placed in 60-litre drums and covered with leaves and allowed to desiccate for 6–8 months. Small trees such as lemon, citrus, curry leaves, moringa, avocado, custard apple, and sapota can be grown in these drums.

Waste Management, Greywater Recycling and Eco-sanitation

Eco-sanitation is a system of sanitation that uses less water and safely recycles human waste. A simple urine-diverting dry toilet is an example of Ecosan where urine is collected in small barrels, diluted with grey water, and used as a fertiliser for the terrace garden. The solids are covered with sawdust, composted for 8 months in drums and reused as manure.

Biodiversity Design

Designing for biodiversity includes simple tasks such as providing a water bowl for birds in a secluded place or damp sand or soil for bees to drink from. Enhancing biodiversity may also mean allowing weeds to grow in place of grains, providing a habitat for insects, whose global population is on a dramatic decline. Providing sacrificial plants from the citrus species for caterpillars to feed on enhances butterfly breeding. Timing and knowing when to grow the right plants are crucial. Creepers from the ground up to the terrace provide continuity of ecological space. However, one should be prepared to see reptiles (including cobra) occasionally climbing up to the terrace in search of food or shedding their skin.



Figure 7.2: Standing rice crop on the roof Source: Vishwanath S

Table 7.1: Water savings with Ecosan and grey water recycling Source: Vishwanath S

Consumption Purposes	Before ECOSAN Recycling (in litres of water/day)	After ECOSAN Recycling (in litres of water/day)
Drinking	3	3
Cooking	4	4
Bathing	15	15
Clothes	23	20
Utensils	25	25
Garden	25	0
Flushing	40	0.5
TOTAL	135	67.5 ECOSAN Savings

Table 7.2: The 40 sq. m design idea Source: Vishwanath S

Elements	With 20 sq. m per Person	With 40 sq. m per Person
Earth	Enough for 2,000 blocks	Enough for 4,000 blocks
Water	20,000 litres annually	40,000 litres annually
Sun	2 units of power per day	4 units of power per day
Food	40 kg of rice annually	80 kg of rice annually
Waste	Consumes all waste	Consumes all waste
Biodiversity	Minimal	Sufficient

Conclusion

City development is usually guided by master plans/land use plans and building by-laws. The current paradigm for city planning is using a Transit-Oriented Development framework. The work-home relationship and the link between places of work and residence with various modes of transport have been the major parameters for city design. While master plans seek to conserve ecological spaces such as water bodies, channels connecting water bodies, wetlands, and urban forests, building by-laws encourage rainwater harvesting and solar energy use.

The fast-urbanising and heating world needs a comprehensive vision to address water security, energy security, food security, waste management and biodiversity from within the city itself, reducing the various footprints and minimising the impacts of urban metabolism.

Roof gardens can be nutrition-rich, productive, and absorb waste streams such as grey water, toilet waste and kitchen waste, reducing the burden on the city infrastructure. Low-rise, high-density, walkable neighbourhoods with mixed land use and a focus on natural resource management are the need of the day. The '40-sq. m of roof per person' design principle has emerged in the Bengaluru context. The six elements from small parcels of land—earth, water, sun, food, waste, biodiversity—can be put into circular use.

As permaculture practitioner Bill Mollison said, *"The greatest change we need to make is from consumption to production, even on a small scale, in our own gardens. If only 10% of us do this, there is enough for everyone."*



8

Leading from the Top: Wet Waste Composting and Rooftop Gardening in Pune Municipality Offices

*Chandni Singh, Maitreyi Koduganti, and Sheetal Patil**

Urban agriculture is often seen as something led by individuals, visible through patchworks of balcony and backyard gardens, started by enthusiastic city dwellers, and very small-scale. However, there are growing calls to reimagine unused and underutilised spaces in cities. Indian cities are experimenting with different models of growing food, from collectives in urban peripheries to state-led initiatives in schools and prisons. In this case, we present one such initiative by the Pune Municipal Corporation, where municipal building rooftops are being reimaged for multiple productive uses, including growing vegetables and medicinal plants, rooftop solar energy generation, and harvesting rainwater.

Pune Municipal Corporation: Sustainability Forerunner

The Pune Municipal Corporation (PMC) has been a forerunner among Indian municipalities in supporting urban sustainability solutions at various scales. They have not only offered economic incentives for adopting sustainable

practices, but also invested in setting up models to showcase multiple benefits of the same. For example, PMC has focused on organic waste recycling and terrace gardening, and introduced two tax rebate schemes in 2008¹ to incentivise household sustainability. One of them is for rainwater harvesting and organic waste composting that gives a 5 per cent house tax rebate, and another is for installing solar panels, which attracts a further 5 per cent tax rebate. These incentives have grown in reach, and today, it is estimated that approximately 82,000 individuals benefited from these schemes.²

While most of these benefits cater to individual homeowners and apartment complexes, there is a move to involve large private sector campuses as well. Through its property tax rebate scheme, PMC aims to reach 2 lakh beneficiaries within 2022. In addition, PMC hosts the annual Swachata Puraskar Competition³ to recognise and reward the best solid waste management practices in the city. Such recognition promotes awareness and boosts large-scale participation of citizens in keeping the city green and garbage-free.

* With inputs from Dnyaneshwar Molak

¹ Punekar News. (2021, January 8). *Pune: PMC discontinues property tax rebate of 3081 housing societies*. Punekar News. Retrieved from <https://www.punekarnews.in/pune-pmc-discontinues-property-tax-rebate-of-3081-housing-societies/>

² The Times of India. (2020, January 28). *Subsidy to equip 2 lakh properties with waste disposal units*. Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/pune/subsidy-to-equip-2-lakh-properties-with-waste-disposal-units/articleshow/73676893.cms>

³ Pune Municipal Corporation. (2020). *Swach Survekshan League - Swachh Puraskar 2020, Pune's got talent*. Pune Municipal Corporation. Retrieved from <https://www.pmc.gov.in/sites/default/files/Swachh-Puraskars-2020.pdf>

From Wet Waste Management to Terrace Gardening

Pune city generates nearly 2,000 metric tonnes of waste daily⁴, of which 1,400 metric tonnes is processed, and 350 metric tonnes is recycled. As per the revised Solid Waste Management Rules (SWM) 2016, every city needs to show progress in waste management and recycling. The 2016 SWM Rules lay out the responsibilities of all, including the role of citizens in segregating wet and dry waste. Further, urban local bodies are expected to transport inorganic waste and impose fines on citizens if they do not comply with segregation.

Recognising that in addition to self-motivation, economic incentives will encourage more citizens to compost their organic waste, PMC started to offer subsidies to individuals and housing societies to procure composting or



Figure 8.1: Roofs as multifunctional spaces—solar panels, rainwater harvesting, and vegetables all find place in PMC's Ghole Road office rooftop **Source:** Maitreyi Koduganti, September 2021

waste processing units in place of compost pits. Another subsidy is given for promotion of waste segregation at source. Individuals can claim up to INR 1,200 per house, whereas housing societies can get up to INR 1.2 lakh. PMC has also constituted a monitoring team to inspect the operational status of the units installed.

- (6) All resident welfare and market associations shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.
- (7) All gated communities and institutions with more than 5,000 sqm area shall, within one year from the date of notification of these rules and in partnership with the local body, ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorized recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.
- (8) All hotels and restaurants shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.

Figure 8.2: Solid Waste Management (SWM) Rules 2016 **Source:** https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

⁴Pune Municipal Corporation. (2022). *Solid waste services - Waste management overview*. Pune Municipal Corporation. Retrieved from <https://www.pmc.gov.in/en/waste-management-overview#:~:text=In%202016%2C%20Pune%20generates%201600,of%20198%20tons%20per%20day>

Motivation through Demonstration: Terrace Gardening on PMC Rooftops

To encourage citizens to garden, the PMC office on Ghole Road set up a terrace garden in 2014–15. The initiative was the brainchild of a few government officers who were also terrace farmers and well-connected in the Pune urban farming community. One of them is current Additional Commissioner Dhyaneshwar Molak. On what motivated him, he said, “...people who visit the PMC office are mostly in a complaint mode, some of them are nice and cooperative, but many are distressed. When they see these gardens, it keeps them happy and cool. It is also a way to motivate them and get them to garden even in smaller spaces.”

The model

While cities have focussed on incentivising citizens to segregate and then compost wet waste, the real challenge starts after this. *“Once the waste is segregated, people start thinking about what to do with it and composting is a natural next step. In our case, we wanted to see if doing soilless farming using compost works,”* noted Mr. Molak. Some like-minded urban farmers in Mr. Molak’s circle like Shyama Desai and Dr. Ram Datar realised that accessing public spaces that allowed for communal work such as this was an issue. This is where Mr. Molak realised that the PMC Ghole Road building had a 1200-sq. ft terrace⁵ lying vacant. *“Drawing on existing volunteer*



Figure 8.3: Chillies, tomatoes and brinjal grown on PMC’s Ghole Road office rooftop **Source:** Maitreyi Koduganti, September 2021

⁵ Kulkarni, P. (2019). *PMC ward terrace is now a garden aiding compost*. Pune Mirror Bureau. Retrieved from <https://punemirror.com/pune/civic/pmc-ward-terrace-is-now-a-garden-aiding-compost/cid5113207.htm>

groups, we decided to start composting and growing vegetables on the roof in 2019.”

In terms of gardening equipment, PMC provides crates and soil. All the other work, including planting, sowing, and garden maintenance, is carried out by around 20 citizen volunteers who are a part of the Snehavardhana group. Typically, volunteers divide themselves into smaller groups, set up time slots, and visit the garden every 10–15 days, for 3–4 hours at a time. All coordination happens through WhatsApp, and most maintenance work is done over weekends. Volunteers include doctors, engineers, students, homemakers, as well as PMC staff.

The garden has a range of herbs, vegetables, and a few ornamentals. The most commonly grown vegetables are chillies, tomato, brinjal, curry leaves, mint, aloe vera, and coriander. Often, staff pick some vegetables to take home and spend their breaks on the terrace amidst the greenery.

Challenges

There were numerous challenges in setting up the rooftop farm. Bringing all the material from the ground floor to the terrace, located on the fifth floor, was logistically challenging. Second, getting employees involved in the maintenance work took time, and women from the ward committee in Model Colony would come to do the maintenance work. Working in the sun during summer was also difficult. Third, this kind of space was not available in all PMC offices and was possible only because this building was built recently and had a huge space that could be used for gardening. Unfortunately, COVID-19 and related lockdowns also meant the garden suffered with no watering or maintenance work.

Looking Forward to a Multidimensional Space

PMC’s rooftop garden is a dynamic space where multiple sustainability initiatives are on display—from large solar panels to tanks for rainwater harvesting and crates growing a range of vegetables. This multifunctional space:

<p>Acts as a demonstration site</p>	<p><i>“It is like a pilot. If people can practice it here, they can practice it at their home also. Inspired by me, many sevaks are doing this. And there is no need for a big budget as such - it’s not that expensive. We are doing it along with NGOs.”</i> — Dnyaneshwar Molak</p>
<p>Has ripple effects</p>	<p><i>“‘Yeh toh koi bhi kar sakta hai’. [Anyone can do this] After seeing this, I felt anyone could do gardening, all you need is a pot and some wet waste. For now, we grow tomatoes. I keep seeing how they grow, I go out in the morning and come back in the evening and see it grow.”</i> — Shivaji Gaikwad, PMC Officer- Ghole Road, Pune</p>
<p>Encourages sustainable living</p>	<p><i>“Having a rooftop gives triple benefits; it helps manage wet waste, supplies fresh produce, and lets you avail tax rebate benefits from the PMC”</i> — Dnyaneshwar Molak</p>
<p>Improves moods</p>	<p><i>“Your mind gets fresh. You get a lot of oxygen, and you get happiness by growing. You can get some vegetables too.”</i> — Dnyaneshwar Molak</p>

9

To the Final Frontier: Learning to Compost through Experimentation

Savita Hiremath

When I began my journey as a solid waste management (SWM) volunteer in 2011, I was well aware that pushing the everyday boring and mundane activity of waste disposal into the realm of morality would mean years of hard work. In hindsight, I think this is what kept me going.

My initial journey and change, as they say, began at home when I reluctantly took to waste segregation in the flat we lived in earlier, after it was ‘imposed’ upon the residents by the apartment management committee. Being a working woman and mother of a two-year-old girl, I thought waste segregation was like emptying the ocean with a ladle and took to it reluctantly. Just a week into this activity, my family realised we were establishing a new equation with the rubbish we generated. We began reflecting seriously on what came into our home and how much was thrown out. From there on, this seemingly mechanical act of segregating waste into three categories began to carry a deeper ethical significance because it made us look at waste as not just a technical problem but also a moral problem.

In other words, this experience was what Gay Hawkins says in *The Ethics of Waste*, ‘*Instilling of a collective sense of individual responsibility.*’ It transformed the whole SWM exercise from a

mere habit into an ethic and brought the word ‘sustainability’ into our everyday functional vocabulary. The realisation that we generated multiple bins of trash to feel ‘whole’ still humbles me.

Even as the struggle to learn large-scale kitchen waste composting with no prior experience was on, my deep belief that putting a positive spin on one thing would inevitably lead to another refused to desert me. The thought process ran like a dream: segregation would lead to composting, composting would lead to organic gardening (both at home and community level), and all the garden rejects would come back to composting—creating a beautiful positive cycle that would invite earthworms, butterflies, bees, and birds into our living space.

It took no less than two years of hard work, but that dream did come true!

By this time, I was a community volunteer at my upscale apartment in north Bengaluru, where I played an instrumental role in setting up a highly advanced SWM system. The model was recognised as one which could be emulated across Karnataka and helped me widen my circle and engage myself with citywide campaigns.

Unrelenting Pursuit to Understand Composting

The nuances of kitchen waste composting can be difficult and annoy even the most determined learner. There are standardised composting solutions in the market now, but the situation was quite different in 2011–12. Before arriving at a workable composting solution, I conducted five or six experiments and failed in all of them. The most painful was a vermicomposting experiment that killed the earthworms introduced into three tanks filled with waste. They had to be emptied, and the stink triggered a backlash from my community that I was least prepared to handle.

Eventually, backed by volunteers, I managed to bring out loads of nice-smelling compost. I could never forget the thrill of digging my hands into a bucket filled with freshly harvested compost and feeling the life throbbing inside.

Turning a heap of unwanted waste into a life-giving substance was a soul-stirring transformation I witnessed. So, the next step naturally was organic gardening. Although I always had a thriving balcony garden, I switched to growing edibles instead of only ornamentals. I wanted to grow something edible and cook with it. Once I knew what it took to grow healthy food, my family moved from conspicuous consumption to conscientious consumption. That's how life came full circle!

All these experiences irreversibly transfigured my elemental understanding of reality that Mother Nature puts up with all our transgressions so long as we understand and protect the fundamental underlying unity and interconnectedness between all living beings. Beyond my family, I moved on to the mammoth exercise of involving my community and transforming the entire 8 acre garden in my apartment in north Bengaluru into an organic garden

by shunning all chemical pesticides and fertilisers.

Meanwhile, I joined Solid Waste Management Round Table, Bengaluru (SWMRT)—a collective of SWM practitioners. While I had been blogging all my experiences meticulously, SWMRT helped me redefine my focus to research and document composting methods. The continued traction to my blog 'Endlessly Green' eventually led to a published book with the same title. Does that mean the loop has closed: waste segregation to composting to organic gardening—an eminently replicable end-to-end solution? Not yet.

Several challenges remain. For instance, some volunteers spearheading composting initiatives in their communities did not know what to do with the excess compost stockpiling on their premises, even after using it for their own gardens. To deal with this, we launched a campaign in 2018–19 called SwachaGraha Compost Connect (SGCC)¹ to take the biomass back to the soil. Our mission was to breathe life into the degraded soil that was hungry for four Ms: microbes, moisture, mulch, and matter (organic). To do this, we built a network of compost producers and buyers using a WhatsApp group where only producers who use sustainable methods were allowed.

Several farmers feared heavy metal contamination in case the compost came from mixed garbage. High transport costs also posed major hurdles. We kept talking to farmers and persuaded them to take the plunge. Sometime in mid-2020, even as the COVID-19 pandemic was wreaking havoc all over the globe, sales took off. One farmer's confidence in what is being called 'city compost' influenced another and yet another. Terrace gardeners and resellers slowly trickled in. By December 2021, over 150 tonnes of 'SGCC compost' reached nearby farmlands in and around Bengaluru and many

¹ (n. d.). SwachaGraha Compost Connect. <https://www.swachagraha.in/sgcc>

home gardens. That year alone, about 450 tonnes of waste was prevented from landfilling as composting substantially reduced the weight and volume of waste.

As the lead campaigner of this initiative, I know that it's just the beginning, and we have miles to go. But still, whenever I see trucks loaded with a surplus of goodwill in the form of compost driving out of apartments, and when we get fantastic feedback from our SGCC farmers, one thing becomes clear: never underestimate the significance of individual contribution in every household and community through segregation and composting, and its cumulative effect somewhere far away. We can contribute to the planet's health in so many little ways, beautifully and endlessly. Segregation and composting can be the two powerful tools to start with.

From this seedbed of learning, a crystal-clear fact has emerged: it is possible to close the loop and reduce the urban-rural chasm by entering the final frontier—the soil.



10

***Suriya Prakashathil Krishi*¹: The Story Of Cochin Airport**

*Maitreyi Koduganti, Sheetal Patil, and Chandni Singh**

Cochin International Airport, operational since 1999, is the first greenfield airport under the public–private partnership model. The Kerala Government is a 35 per cent stakeholder, and the remaining 65 per cent is owned by approximately 18,000 shareholders², mostly Non-Resident Indians (NRIs) from Kerala. The airport stands fourth in handling international traffic and seventh in the country in total traffic, having handled more than 10 million passengers in 2017–18³. The airport is operated and managed by Cochin International Airport Limited (CIAL).

Cochin International Airport is also one of the first airports fully powered by solar energy. However, the shift to solar energy was unanticipated at the inception stage. In 1999, the Kerala State Electricity Department increased the electricity tariff from INR 4 to INR 7 per unit. To reduce the costs and transition to renewable energy, the then director of CIAL, V J Kurian, suggested tapping into solar energy. In 2000, CIAL piloted a

100kW solar photovoltaic (PV) system, which was completed in March 2013. However, it generated a mere 400 units, less than 1 per cent of the airport's total energy requirements, prompting the airport to increase capacity by 1 MW in the same year. Based on the evaluation of the plants' performance and positive feedback, the initiative was scaled up to 12 MW comprising 46,150 solar panels⁴.

In 2015, the airport's electricity requirement was about 48,000 units, and through the solar set up, they produced a whopping surplus of 52,000 units, making the airport 'power neutral', which meant that they did not consume any power from the Kerala State Electricity Department. Their investment into the solar project was INR 62 crore, and as of today, CIAL claims that the cost has been completely recovered over six years of operation. The development of the PV plant within the 52 acres of vacant land close to the cargo complex made CIAL the biggest and one of the first airports in the world⁵ to

* With inputs from Mr Jose Thomas, Infrastructure Director, CIAL

¹ Farming under the sunlight

² Quoted by the Infrastructure Director, CIAL

³ CIAL. (2018, July 27). *CIAL wins UN's highest environmental honour*. The Hindu. Retrieved from <https://www.thehindu.com/news/national/kerala/cial-wins-uns-highest-environmental-honour/article24524222.ece>

⁴ Express News Service. (2016). *Next: Organic farming at CIAL*. The New Indian Express. Retrieved from <https://www.newindianexpress.com/cities/kochi/2016/mar/05/Next-Organic-Farming-at-CIAL-899892.html>

⁵ CIAL. (2016). *Organic farming*. Cochin International Airport Limited. Retrieved from <https://www.cialinfra.in/Projects/ORGANIC-FARMING>



Figure 10.1: Aerial view of the solar PV project **Source:** Bosch Building Solutions (<https://www.boschbuildingsolutions.com/x/en/news-and-stories/cochin-international-airport-india/>)



Figure 10.2: Vegetable farming between and beneath the solar panels **Source:** <https://www.cag.org.in/blogs/agrivoltaics-solution-food-energy-conflict>

be completely powered by solar energy. This initiative also bagged 'The Champions of the Earth Award 2018' from the United Nations⁶.

Foraying into Vegetable Farming

Though several national and international dailies lauded this project, our discussions with the officials revealed that one criticism⁷ was from a Norwegian author who remarked, '*This precious land should have been used for feeding hungry Indians*', and this statement propelled the officials into action. Organic vegetable gardens were developed on three acres of land in and around the periphery of the solar PV plant. Since 2016, a separate unit of CIAL has been cultivating vegetables between the solar panels, spaced at 1.5 m.

Initially, they cultivated creepers and dwarf varieties of vegetables like okra, long beans, pumpkin, ash gourd, melons, and ginger. Over the last five years (from 2015–2020), the organic gardens have produced a rich harvest of 400

kg of okra, 400 kg of long beans, 2,184 kg of ash gourd, and 378 kg of pumpkin. The PV panels required regular washing to eliminate dust, and the same water was used to grow the plants. In addition, the airport was situated in a tropical climatic zone with good rainfall, which reduced both the input watering costs for farming and the maintenance costs for the PV panels.

Subsequently, the cultivation extended to growing vegetables and spices like tomato, turmeric, ginger, and melons. As noted by the Director of Infrastructures, CIAL, "*The broad leaves of turmeric partially block the sunlight and provide a cooling effect for the panel, which tends to increase the efficiency of solar power generation. Furthermore, these vegetables absorb dust and pollution, therefore providing multiple co-benefits. Hence, turmeric was cultivated in major portions of the land.*"

The airport set up an organic vegetable stall to sell the produce, attracting close to 30,000 air

⁶ Champions of the Earth. (n. d.). *Cochin International Airport - Entrepreneurial vision*. United Nations Environment Programme. Retrieved from <https://www.unep.org/championsofearth/node/46>

⁷ Ittype, M. (2018). *Why Cochin Airport does not deserve UN's 'Champions of the Earth' award*. Outlook. Retrieved from <https://www.outlookindia.com/website/story/why-cochin-airport-doesnt-deserve-uns-champions-of-the-earth-award/317322>

passengers. Employees at the airport too bought vegetables from the stall. When produce like turmeric and ginger were in surplus, they were sold to bigger organic stores and Ayurvedic pharmaceutical companies in bulk as raw materials.

Benefits Beyond the Produce

The benefits of vegetable farming transcend harvesting fresh organic produce. It provides continuous employment to nearly 12–14 local labourers managed by an agency. They earn INR 600/day, higher than the average national farm wages⁸ which stand at INR 310/day, thereby economically benefiting the labourers. More than half of the labourers have worked here since 2016. The officials noted that no labourers were dismissed unless they voluntarily left, making this an assured source of income for them, which in the agricultural sector was hard to find. In addition, the gardens offered aesthetic pleasure like fresh air, and a calm and green environment to visitors. CIAL encouraged visitors from schools, colleges, and other firms to motivate other enterprises to replicate and scale this model.



Reflecting on the initiative, the infrastructure director mentioned that they were “*not thinking of sustainability at first.*” This shift was purely an economic initiative, primarily to cut electricity costs. Over time, they realised the importance of this double shift to renewable energy and organic farming as a green initiative. Though growing vegetables was not highly viable in terms of production costs, they kept the initiative going because they believed it would inspire visitors to the airport and promote and raise awareness about sustainable farming.

Not an Easy Path

While the cultivation of vegetable gardens seemed to be a successful initiative, growing vegetables was not part of the objectives of the CIAL. Their primary responsibility was to operate and maintain the PV plant. The Infrastructure Director noted, “*We are neither farming specialists nor farmers. Moreover, we don’t have too many labourers employed at the plant.*” This made harvesting certain vegetables, for example, cluster beans, on a daily basis, a serious challenge. They also realised that if vegetables were not harvested every day, they could not be



Figure 10.3: Produce from organic farms Source: CIAL

⁸ Mathew, G. and Verma, S. (2021). *Rural wages: Kerala tops list, 15 states lag national average.* The Indian Express. Retrieved from <https://indianexpress.com/article/business/rural-wages-kerala-tops-list-15-states-lag-national-average-7649853/>



Figure 10.4: Labourers working at the farms Source: CIAL

sold, leading to erratic maintenance of the airport stalls. Therefore, they experimented with cultivating vegetables that have longer growing seasons, such as ginger and turmeric. Currently, they cultivate turmeric in about 15–20 acres, which is harvested once a year.

The vigorous growth of weeds is another challenge the labourers find difficult to tackle. CIAL cannot hire additional labourers in the PV plant farms due to safety concerns. Furthermore, a few engineers who work closely with the PV plant consider vegetable cultivation a ‘nuisance’ because they worry that the plants may damage the solar panels. Despite such challenges, the CIAL officials are motivated to continue cultivation.

A Sustainable Business Model

The transition to solar energy and setting up organic farms have not only ensured optimal use of land but also demonstrated to the world that big infrastructure projects like this can be made fully operational and ‘power neutral’ by using alternative energy sources⁹. Mr. Kurian

adds, “This setup has the potential to minimise CO₂ emissions by more than 9 lakh metric tons over the next 25 years, which is equivalent to planting 90 lakh trees or not driving 2,400 million miles.” With such tremendous mitigation benefits, this integrated concept has also increased the airport’s green cover, providing a cooling environment amidst the tropical climate. In addition, these farms provide a safe and nutritious supply of vegetables to the passengers and close to 8,000 employees¹⁰ of the airport and the organic farms. Such locally produced vegetables also reduce the food miles associated with food production and supply.

Providing livelihood opportunities to localites also aids in reducing poverty within the region. With the aim of achieving net-zero emissions by 2070 as pledged at COP 26¹¹, projects like this with multiple mitigation co-benefits showcase how we can progress towards these targets. In addition, the Infrastructure Director reinforces that “Initiatives like these cannot be forced, neither by the government nor by the public.” They tend to be sustainable only when people willingly commit to them. The chances that one will take up this model is perhaps 1 per cent, but CIAL officials are determined to show the world that this model is viable both economically and environmentally.

⁹ Sigler, D. (2019). *A solar airport profits from vegetables*. Sustainable Skies. Retrieved from <https://sustainableskies.org/solar-airport-profits-vegetables/>

¹⁰ Team Prakati. (2020). *Kochi Airport grows vegetables under solar power plant*. Prakati India. Retrieved from <https://www.prakati.in/kochi-airport-grows-vegetables-under-solar-power-plant/>

¹¹ The Hindu. (2021, November 26). *India to reach net zero emissions by 2070; industry should take note on sustainability: Bhupender Yadav*. The Hindu. Retrieved from <https://www.thehindu.com/news/national/india-to-reach-net-zero-emissions-by-2070-industry-should-take-note-on-sustainability-bhupender-yadav/article37696519.ece>

11

Sustainable Urban Agriculture Practices at the Indian Institute for Human Settlements Kengeri Campus

Pooja Vasanth and Dwaipayan Banerjee

Urbanisation in Indian cities is often accompanied with modifying the existing landscape. This often confines local biodiversity to small green spaces like gardens or parks. Campuses and academic institutions also host such green spaces that boast rich diversity of flora and fauna¹. A recent study² by the Wildlife Institute of India estimated that academic campuses in India host nearly 800 bird species, which is an astonishing 58.7% of the total 1,327 bird species found in this country. With such biodiversity, these campuses could serve as *“living repositories and evolutionary labs for plant and small animal species that remain isolated due to fragmentation”*. With a similar goal of understanding, and eventually establishing a self-sustaining social-ecological system, the Indian Institute for Human Settlements (IHS) set up its main campus on a 54-acre site at Kengeri, Bengaluru. Enabling interdisciplinary teaching-learning, research, and practice, its buildings and facilities are equipped to host nearly 3,000 students and 600 faculty and staff on campus in the long run.

This case highlights experiments with sustainable urban farming on the IHS, Kengeri

Campus, including catering to basic food and water requirements while generating minimal waste and becoming a centre for learning and experimentation for future urban planners and practitioners. In 2016, we started on this journey to set up an urban farm and allied activities of vegetable farm, seed bank, poultry farm, beekeeping, and fishpond.

Agricultural Practices on the Campus

Vegetable farm

Before venturing into any farming activities, it was essential to collect a baseline information regarding soil type, hydrological parameters and weather patterns. Following well-established scientific protocols, a series of topography and biodiversity surveys, ecology studies, hydrogeology assessments, and land use analysis were conducted to map local ecosystem functions. Tree plantations and the locations of the food farms and ponds were planned based on these baseline studies. The journey began in 2016, where the in-house operations team set up vegetable farms on 30 plots of around 100 sq. ft each. The initial set - up cost around

¹ Ghosh, S. (2020). *The wild side of India's educational campuses*. Mongabay India. Retrieved from <https://india.mongabay.com/2020/08/the-wild-side-of-indias-educational-campuses/>

² Guthula, V. B., Shrotriya, S., Nigam, P., Goyal, S. P., Mohan, D., and Habib, B. (2022). Biodiversity significance of small habitat patches: More than half of Indian bird species are in academic campuses. *Landscape and Urban Planning*. (228), 104552.

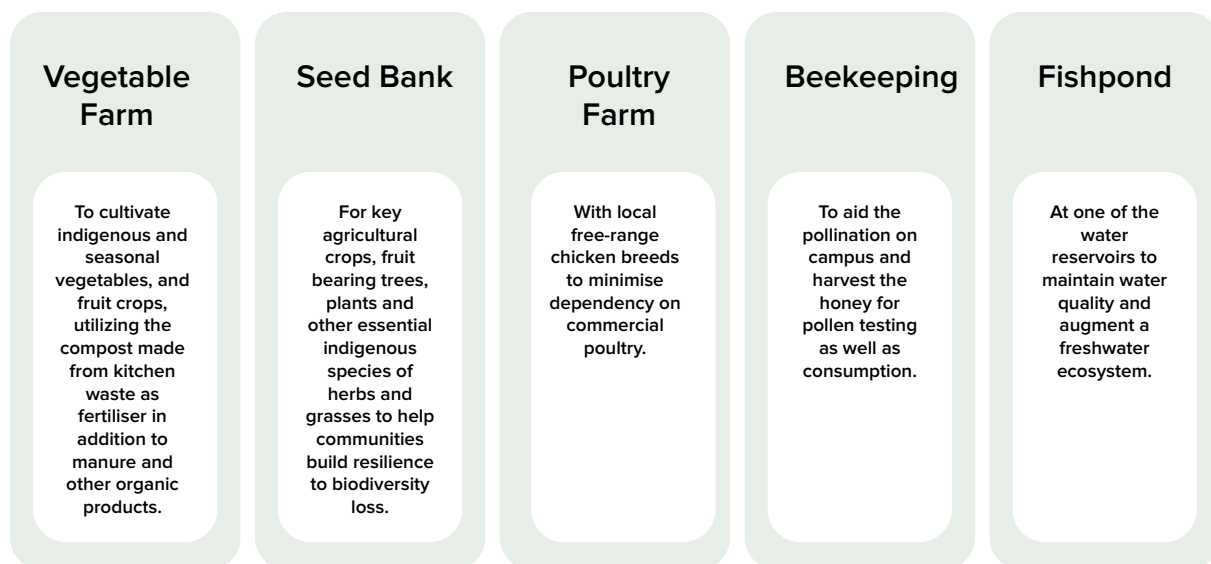


Figure 11.1: List of activities done at the IIHS, Kengeri Campus and their core objectives **Source:** IIHS Campus team

INR 1,950 per plot. Within an area of 1,125 sq.m we started experimenting with growing common vegetable crops like brinjal, tomato, okra, coriander, fenugreek, spinach, onion, beans, green chillies, radish, carrot, beetroot, bottle gourd, cucumber, ridge gourd, bitter gourd, cauliflower, and cabbage.

If we examine the expenses for setting up a food farm and preparation of vegetable beds, raw materials (including irrigation pipes, poles to support creepers, setting up of a borewell and other plant growing material) take a significant share, of 44 per cent, followed by compost, and seed and sapling related expenses (see Figure 11.3).

Currently, about 3,000 litres of borewell water is used to irrigate the vegetable farm everyday, and we aim to minimise water consumption by setting up drip irrigation systems. We are also considering adopting various sustainable agriculture practices that involve mulching, micro irrigation, composting, integrated pest

control, soil fertility management, and water recycling. Similarly, to make our farming practices sustainable and efficient, we continuously build internal capacity through team visits to various research institutions, agencies, and facilities, which enhance their skills and knowledge. For instance, in February 2022, the team visited the Indian Institute of Horticulture Research (IIHR) to understand the usage of improved varieties of indigenous species and study new technologies to enhance yield. They also visited the seed bank at IIHR to understand how seeds can be maintained and stored. With canopy architecture, we aim to increase the number of trees per plot and maximise high-quality yield on the next batch of fruit-bearing trees.

Poultry farm

Subsequently, we approached a local poultry farm owner at Magadi village. We learnt that the local, free-range nati koli³ chicks were suitable to be reared as they did not require vaccination or other medical treatment, making them

³ Indigenous hen



Figure 11.2: Vegetable farm just before sowing
Source: IIHS Media Lab

easy to maintain. Owing to the small scale of operation, it was prudent to opt for layer chickens (which are essentially reared for eggs) instead of chickens reared for meat, which must be reared in greater numbers to maintain a steady stock. We validated this concept through discussions with veterinary experts.

A 10x5-ft polycarbonate sheet coop was set up to house seven chickens (five hens and two roosters) in September 2021, which was increased to 11 chickens (eight hens and three roosters) in February 2022. The chickens have not been given any supplements so far. Their feed mainly consists of ragi (finger millet) and jowar (sorghum), along with medical interventions like unienzyme tablets, milk powder, sugar, salt, and baking soda.

Beekeeping

In July 2021, we connected with Keystone Foundation in Kotagiri, Tamil Nadu, to understand the basics of beekeeping. We identified the Asiatic honey bee or *Apis cerana* as a suitable species for the experiment. The team contacted the Centre for Apiculture Studies, Department of Zoology, Bangalore University and the newly established Indian Pollinator Initiative for more guidance. The team learnt that coconut and eucalyptus trees, within a 3 km radius of the campus, would be a good source

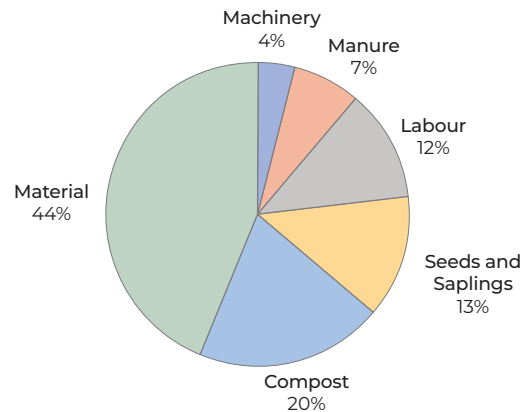


Figure 11.3: Break-up of expenses for setting up a vegetable farm
Source: IIHS Operations records, 2016-17

of food for the bees. With the help of a local beekeeper, five bee boxes were placed in three different land zones with ample shade, each box at a distance of 4 ft. Each bee box costed INR 4,500, including installation. The monthly maintenance charges amounted to INR 500 for the five boxes.

Initially, 500 g of sugar mixed with water was put in the apparatus below each box as a supplement for the bees every fortnight. The beekeeper trained the in-house gardeners to maintain the bee boxes and the equipment, protect them from animal attacks and damage, and treat bee stings. A repellent oil is also placed below the bee box, on the same stand, to prevent predator insects. Safety measures were also put in place as part of the standard operating procedures. Now the sugar mix has been stopped and the bees are able to find sufficient food in the surrounding vegetation.

Fish pond

In August 2021, we set up a fish pond within one of the three water bodies at Kengeri campus with a surface area of 2,000 sq. m and 4.5 m overall depth, and showing signs of good water retention with water depth of around 1.2 m. The plan was to introduce local fish species in the pond and help its propagation. Recently, the team visited Cauvery river stream to catch local



Figure 11.4: Present-day poultry farm setup
Source: IIHS Campus Operations Team

fish species and could get one variety of fish, barb, that was introduced in the pond.

Outputs from Sustainable Urban Agriculture and Allied Activities

The vegetable farm was initially set up to understand which seasonal vegetables can be consistently produced in these plots. This knowledge would help design the kitchen menu, ensuring that at least one item on the menu consisted of vegetables grown on campus. We found that vegetables like brinjal, tomato, okra, coriander, fenugreek, spinach, onion, beans, green chillies, radish, carrot, and beetroot can be grown sustainably all year round with an average harvest ranging from 30 to 90 days. Vegetables like bottle gourd, cucumber, ridge gourd, and bitter gourd can be grown all round the year, however, some vegetables like pumpkin and potato can be grown only during the monsoon months from June to September. In addition to these crops, cauliflower and cabbage are also grown to increase the variety of the produce. Maximum harvested quantity also ranged from 5 to 40 kg, with tomato, bottle gourd, and radish providing the maximum yield.

Similarly, the poultry farm at Kengeri was established as a pilot to study the set-up and maintenance of a small-scale poultry



Figure 11.5: Checking and maintenance of bee boxes
Source: IIHS Media Lab

farm, its impact on campus operations, while also assessing the interdependence with agroecosystem. With a commendable feed conversion ratio of 2.65, the exercise demonstrated that the stock is healthy and can be compared with free-range chickens. Since January 2022, the birds have started laying eggs, and currently, the four hens are laying 28 eggs per week on average. The successful pilot project has prompted the team to double the poultry production and understand the impact of scaling up the operations.

In terms of beekeeping, the colonies took three months to grow and another three months to make honey, with each box yielding approximately 250 g of honey. We are in the process of identifying different types of bee species on the campus to understand if the implementation has been successful and if the number of bee boxes need to be increased. In the fishponds, we plan to start the growth monitoring of the fish and also create an environment to augment its propagation.

Key Lessons Learnt

Though sustainable urban agriculture on the IIHS campus is still a work in progress, learning experience and sustaining the activities has not been easy. Here are some key learning lessons from all the initiatives:



Figure 11.6: Feeding fish in the pond **Source:** IIHS Campus Operations Team

Vegetable farm

The food farms have seen a good yield of most vegetables. However, it must be mapped to the kitchen requirement to avoid wastage and overspending on seeds and maintenance. Keeping the yield in mind, the weekly menu is set in such a way that at least one item is made using the farm produce. The quantity of produce is also monitored by modifying the sowing and harvesting schedules. This is also being used for the new food farm zones on the campus.

Poultry farm

One of the roosters died immediately after the birds were placed in the coop. Experts attributed the cause to the poor constitution of the bird and suggested a natural supplement drink to evade such a situation.

Beekeeping

The bees from one of the boxes abandoned the colony within a couple of days. The beekeeper suggested that a similar colony nearby and natural food sources could be the cause. A new bee colony could not be introduced immediately since October was not the right season for colonisation. Fresh bee boxes were set up again in November and December 2021.

Fishpond

It is essential to maintain the depth of the pond at a minimum of 1 m for the fish to survive. Water level metres were installed in all the ponds and recorded daily. So far, a mean depth of 1.2 m and a minimum depth of 1 m is being maintained. A borewell at the north valley pond is on standby to augment the water supply before the onset of monsoon when the water table drops below the permissible limits. The local fish species introduced in the pond are being monitored for their growth and propagation.

Way Forward

In the first phase of on-campus sustainable urban agriculture, we focused on setting up the food farm and planning allied activities. In the coming years, our efforts will move towards recognising the interactions between different systems in order to make the systems more efficient and resilient. For instance, interaction between hydrological and food systems would lead to conserving water resources and resilient food growing. We aim to acknowledge flows of resources and ecosystem services from one system to another and if required, modify it to enhance sustainability on campus—in short, create a 'circular campus'. In addition to giving opportunities to experiment various innovative methods of farming and related activities, such a campus will help learners and practitioners to enhance their skills and knowledge.





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12

Jaivik Setu Farmers' Market, Indore

Debapriya Chanda and Jayashree

A New Demand

In India's big cities today, a new category of consumers has emerged – those who can afford organic food, and create demand for organic and sustainable food practices. A large contributor to this phenomenon is the rising awareness about the different kinds of pollutants that contaminate food. While organic farming offers a solution, its cost and access determine the market dynamics. Several initiatives have come up in recent times to meet this newly-generated demand. One such initiative is flourishing in the city of Indore, Madhya Pradesh – the Jaivik Setu, a farmers' market that provides a platform to promote chemical-free agriculture in urban and peri-urban areas.

A Brief History

New groups of environmentally-conscious consumers have come to exert growing influence in the local market by creating demand for organic fruits and vegetables and are willing to pay commensurate prices for these products. The lack of readily-available trustworthy sources opened a viable space for an initiative that involved and brought the focus on local farmers. A group of 25–30 farmers involved with initiatives started by Shripad Dabholkar, a prominent agriculture researcher and activist, formed a discussion forum that met every month. This platform facilitated the exchange of best practices and innovations among farmers and led them toward finding ways to improve their earnings. According to estimates, out of a

revenue of INR 100, only INR 19 reached farmers, while middlemen usurped the remaining amount. These leakages included advertising, transportation costs, and profits to giant retail firms. The ones who toiled to grow food for the city benefited the least.

From the farmers' meetings, it emerged that ensuring fair compensation and recognition for farmers is necessary to make the supply chains sustainable and resilient. To encourage organic farming, establishing a direct connection between farmers and consumers was found to be essential. Another pressing need identified in the discussions was to educate the urban population about organic farming and generate awareness about the sources that are crucial to meet their food requirements, the people responsible for growing the produce and so on. These needs led to the foundation of Jaivik Setu, the first farmers' market in Madhya Pradesh, in 2014. Dr. Janak Palta McGilligan, a Padma Shri-recipient and social worker who is also the founder of the Indore-based NGO Jimmy McGilligan Centre for Sustainable Development, was one of the pioneers of this initiative. The associates of Jaivik Setu include organisations like the Sustainable Food Network, Prayog Parivar, Scientech Eco Foundation, and Young Indians.

The Initiative

Farmers were encouraged and supported to obtain organic certification from the administration to ensure there were no doubts



Figure 12.1: Local farmers selling their produce at *Jaivik Setu*. **Source:** Jayashree

regarding the chemical-free nature of the produce sold in this market. The market allows only produce from certified farms to be sold, and the farmers themselves fix the rates. Slowly, the word spread, and farmers from neighbouring districts also started bringing their produce to the market. Around 30–45 farmers from 30 neighbouring areas currently sell their produce here. Leaflets carrying information about the market were circulated among households in the city to raise awareness. Since it was a relatively new concept, it captured the curiosity of consumers and led to strong word-of-mouth publicity. With time, the space evolved to accommodate different brands of organic products. The market remains open only twice a week, on Sundays and Wednesdays. Food grains, pulses, spices, oil, *ghee*, sugar, and honey are some of the products sold in the market. Clay utensils, khadi fabric and clothes, chemical-free shampoo, and cosmetics are also sold. On Sundays, home cooks from the city put up food stalls.

Impact and Policy Lessons

The impact of this initiative has been immense for consumers and producers alike. For the former, a reliable platform now fulfils the existing demand gap. It has established a direct communication channel between farmers and buyers in the urban space, significantly improving their livelihood opportunities. In terms of policy lessons, *Jaivik Setu* is an excellent model that can yield favourable results upon suitable replication in other urban contexts. In states like West Bengal and Maharashtra, one can find Adivasi villages close to small towns in relatively remote areas. Weekly markets to trade perishable items are a useful and feasible way to meet the demand and supply gaps, ensuring favourable outcomes for all stakeholders. To implement this model successfully in other locations, adequate training for farmers and awareness generation regarding sustainable consumption practices among urban population groups is crucial. Policy efforts must also focus on



Figure 12.2: Fair-like atmosphere at Jaivik Setu on a regular Sunday afternoon Source: Jayashree

a seamless process for farmers to obtain organic certification to encourage organic farming practices in urban areas.

The Path Ahead

The Jaivik Setu initiative has had a transformative effect on Indore, contributing towards a sustainable global environment by putting consciousness into action, providing comprehensive training and enhanced livelihood opportunities to the farming community, and promoting wellness and healthy living among urban consumers. What started as a platform for local farmers to showcase their products and earn their livelihoods has now become a showcase for national and imported organic goods. Jaivik Setu has also become a brand, producing pulses and other food products. This transformation, however, poses a potential threat to local farmers, because high-end imported produce might continue to register a higher demand in the city at the cost of local produce.

When rapid urbanisation is pushing more and more farmers out of the agriculture sector, especially in peri-urban areas, spaces like Jaivik Setu hold immense potential to sustain urban and peri-urban agricultural practices by making it a commercially viable livelihood opportunity. It will be interesting to note what shape such initiatives take soon.

13

Terrace Farming in Ranchi

Debapriya Chanda and Manoj Singh

Introduction

Food security has become a prominent part of the discourse on urban food production. It is common knowledge that commercial farming uses chemical fertilisers, which often contaminate vegetable produce with harmful substances¹. Ranchi-based social entrepreneur Mohit Kumar started an initiative to reduce the use of fertilisers in food production by practising farming in small plots of land to secure nutritious organic produce for urban households. He is the founder-director of Semina Agro, an organisation focused on the welfare of the farming community. He has nearly two decades of experience working with organisations promoting agriculture and allied activities. Semina Agro offers varied services, including providing quality seeds and planting materials, low-cost and high-quality agricultural implements, training, hand-holding and monitoring support for farmers. Agricultural management professionals in the organisation provide consultancy services, as well as explore options for forward and backward linkages from procurement of seeds and fertilisers to accessing distributional channels and markets.

Inspiration and Practice

Mohit believes that organic produce from a 20x20 ft plot of land can feed a family of five. The primary objective is to ensure organic food reaches urban homes. Farmers are often forced to use chemical fertilisers due to a lack of awareness or profit-related compulsions. However, it is feasible for individual households to grow their own food through kitchen gardening or terrace farming if they receive adequate resources and guidance. This is where Mohit's social entrepreneurial initiative steps in to fill the gap in the availability of and access to such knowledge networks.

In addition to cultivating small plots, Mohit is working on improving the methods of kitchen gardening and terrace farming in cities. For several years, he has been practising terrace farming at his Kantatoli Chowk residence. He spends around INR 200 to procure seeds and has prepared a kit comprising *kharif* and *rabi* crops. Chemical fertilisers are not used. Plants can be grown in pots or polythene bags, with or without soil. For the latter, he uses a mix of *sal* leaves, cow dung, and coconut husk as a replacement for soil, suitable for growing any vegetable. He grows a diverse variety of vegetables in his kitchen garden. By running a successful model

¹ Kumar, K.S. (2018, Aug 25). *Veggies, fruits becoming storehouse of toxic chemicals, warn scientists*. Hindustan Times, Allahabad. <https://www.hindustantimes.com/lucknow/veggies-fruits-becoming-storehouse-of-toxic-chemicals-warn-scientists/story-mQWjpXx22xrN104k0E2YHM.html>.



Figure 13.1: Leafy vegetables at Mohit Kumar's house in Ranchi
Source: Manoj Singh

at his own residence, he is able to reach out to more people and convince them to adopt sustainable food farming practices. In addition

to nutrition and livelihood, the organisation also works on the application of digital technologies to farming. Data-based solutions are provided for common problems faced by farmers, which has a transformational impact on agriculture. Field operations on a farm are made more efficient and insight-driven with the help of digital technologies and analytics. Digital farm services also boost yield and improve financial performance while minimising expenses and chances of crop failure.

Impact

Mohit's initiative of farming in small plots of land has reached close to six lakh farmers in more than 12 states. As per estimates provided by the organisation, around 40 households in the capital city have received technical assistance and seeds for setting up their rooftop kitchen gardens. The organisation has worked with several schools in and around Ranchi to set up kitchen gardens on 400 sq. ft of land. The produce from these kitchen gardens is used to provide mid-day meals to students, thereby improving nutrition standards within the community. These initiatives also help provide training and raise awareness among students, who have now become well versed in farming techniques. Several schools in Ranchi have also integrated theoretical and practical



Figure 13.2: Terrace gardening at Mohit Kumar's house in Ranchi **Source:** Manoj Singh

urban farming modules into their curriculum, to shed light on the linkages between farming and its outcomes on the environment and health. For practical lessons, small plots of land are being cultivated on campuses.

The Way Forward

The initiative focuses on raising awareness and popularising terrace farming practices among women, as they largely exercise control over food consumption within the household. Targeting women as key beneficiaries helps in increasing the reach of the initiative. The organisation plans to reach out to more women beneficiaries through door-to-door visits and also establish market linkages in case households wish to sell surplus produce. Mohit believes that this model can be replicated and scaled up across Indian cities to meet the subsistence food demand of the urban population. Key policy lessons from such initiatives point toward the need to give due recognition to urban farming activities. City planners must develop a comprehensive strategy to promote urban farming through an appropriate incentive structure, for the benefit of all stakeholders. These incentives can include subsidised provisioning of inputs like seeds and fertiliser, technical support in marketing and distribution, as well as awareness and skill-building workshops. These steps will encourage more city dwellers to take up urban farming and break the monotony of concrete and reintroduce fresh greenery to rejuvenate urban spaces.



14

Mumbai's Fisherfolk: Their Catch, Culture, and Commerce

Geetanjali Gurlhosur and Debapriya Chanda*

Introduction

Mumbai derives its name from Mumbadevi, the patron goddess of the Indigenous Koli community. The Kolis, along with the Agri and Bhandari communities, are traditional artisanal fishing communities whose lives and livelihoods have been dependent on the sea for centuries. Artisanal fishing refers to small-scale, low-technology, and low-capital fishing practices undertaken by traditional fishing households in ethnic communities. In Maharashtra, the urban population largely depends on these communities for their seafood. Prominent areas of practice for the fisherfolk include Sassoon Docks and the jetties at Cuffe Parade, Worli, Khar Danda, Chimbai, Mahim, Juhu, Versova, Borivali, Madh, and Manori. Thousands of fishing boats go out to sea from the docks and jetties every morning before sunrise and return to the shore with the day's catch by noon. According to one community member, around 130 engine boats sail out of the Worli *bateri* (canal), and over 200 smaller boats sail out to the sea from the jetties. Every boat has a minimum of 20 fishing nets, each about 100 metres long. The traditional *kolambi* net, used for all kinds of catch, has been used for generations. All the

boats at the Worli jetty belong to members of two prominent fishing societies— the Worli Koliwada Nakhawa Machhimaar Society and the Worli Koliwada Sarvoday Society.¹ The Nakhawa Society has around 465 members, although not all members own fishing boats. Around 4–5 fishers go fishing in the same boat with the boat owner, which implies that on an average, the meals of five families depend on one fishing boat. All the fishers have fixed spots for stationing their boats. While the men are engaged in fishing, the women of the community take on the role of selling fresh catch in the local fish markets or to fish traders.

Constraints and Challenges

Fishing on the shores of Mumbai is a high-investment activity involving substantial expenses. For the Koli community at Worli, setting up a new boat with an engine costs up to INR 4 lakh. A fishing boat requires at least 5 litres of diesel for spending six hours at sea and a round trip. Recouping these costs are difficult for small-scale fishers, especially during the off season when catch hits a low. Fisherfolk in Mumbai also face challenges in the form of unsustainable practices such as overfishing

* Gurlhosur, G. (2021, June 29). *State of Urban Agriculture in Indian Cities: Mumbai*. People's Resource Centre. <https://prcindia.in/publications/state-of-urban-agriculture-in-indian-cities-mumbai/>

¹ The term *nakhawa* means boat owner in the local language of the Kolis, and *koliwada* translates to village of the Kolis.

by large, mechanised trawlers, which results in the depletion of fish stock in the Arabian Sea. Discriminatory development processes such as construction of roads along the coastline also threaten to disrupt their livelihood. Facilitated by greater access to advanced infrastructure and capital, large private companies have started venturing into the fisheries industry, going into deeper waters to catch huge amounts of fish, which are then stored and sold across Maharashtra. Due to their inability to adapt to the increased competition, many Koli families have had to give up fishing and shift to other sources of income.

Additionally, the rapid pace of construction projects in the city damages ecosystems along

the urban coast. The Coastal Regulation Zone (CRZ) notification of 1991, made under the provisions of the Environment (Protection) Act, 1986 aims to preserve these ecologically fragile areas by regulating land use on the coast. Although the CRZ rules used to be effective earlier, subsequent amendments in 2011 and 2019 have introduced several relaxations for construction projects and made it relatively easy for the real estate sector to encroach on fishing grounds and villages. Sedimentation due to construction work, noise pollution, and construction of structures such as pillars in the water disturb traditional fishing grounds and negatively impact the incomes of Mumbai's fisherfolk. Although prominent environmental activists routinely oppose coastal development



Figure 14.1: Wholesale vendors and traders at Crawford fish market, where all kinds of freshly-caught, frozen, and cultivated fish are available to Mumbai's seafood consumers **Source:** Geetanjali Gurlhosur

projects to preserve marine ecology and vegetation along the Mumbai coastline, the discourse against unsustainable development rarely considers the livelihoods that depend on the maintenance of ecological balance.² Exponential development that excludes the indigenous coastal population tends to be harmful for the ecosystem. The fisherfolk are not involved in the planning stage of these projects, despite being one of the key stakeholders whose lives are greatly impacted as a result of their implementation.

A prime example of a large-scale infrastructure project aimed towards urban development which poses a challenge to Mumbai's fisherfolk is the Bandra–Worli Sea Link. This 5.5-kilometre-long bridge was opened in 2009 to ease traffic in the western suburbs. As of 2017–18, around 32,312 cars used the bridge daily.³ The fishing spots of Worli fishermen now fall under the structure, reducing their catch by 50 per cent. According to the estimates provided by members of the fishing communities, catch worth INR 30,000–40,000, including varieties of sea bass, crabs, catfish, and smaller fish, used to come from these spots. Vibrations from vehicles on the road above reach the water below, due to which the fish swim away from these spots farther into the sea. Boats cannot venture that far as their movement is restricted by the pillars of the bridge, increasing chances of collision in rough waters. Vijay Patil, head of the Worli Koliwada Nakhawa Society and a third-generation fisherman, explained how the sea link was built without the consent of the community, despite their protests. Leaders of fishing societies are in negotiation with the Brihanmumbai Municipal Corporation (BMC) to secure adequate compensation for the

loss of fishing spots. They also demand that a proper channel be constructed for the passage of fishing boats under the upcoming Coastal Road Project that will connect Marine Lines in the south to Kandivali in the north. The project, in its construction stage, has already caused considerable damage to fisheries by reclaiming rocky waters that used to be breeding zones for fish during the monsoon. The INR 15,000-crore infrastructure project aims to build a 22-km-long road for easy commute to the suburbs, proposing the reclamation of about 50 hectares of land from Koli villages, jetties and fishing waters. Mangrove belts, which used to be natural breeding grounds for fish like millets, snappers, crabs, and prawns, are also undergoing rapid deforestation due to constant reclamation, digging, and dumping of sand. This has further led to the erosion of long stretches of *koliwad*s along the coast.

Besides occupational risks, the Koli community is also battling issues of identity. They are often put under the broad category of poor urban population⁴. The BMC's draft Development Plan of 2014 excluded Koli and Adivasi villages, sparking widespread protests. Even after extensive surveys, 40 per cent of *koliwad*s remain unmapped, making them vulnerable to the receding coastline and rising construction projects. As a result, the *koliwad*s are losing out on space for housing and essential fishing activities like anchoring, hanging nets, and drying and selling fish.

Impact of the COVID-19 Pandemic

The pandemic has exacerbated existing challenges and brought new ones as well. The

² Arora-Desai, P. (2021, October 17). *Mumbai coastal road project: Koli fishing port to face permanent closure?* Hindustan Times. Retrieved from <https://www.hindustantimes.com/cities/mumbai-news/mumbai-coastal-road-project-koli-fishing-port-to-face-permanent-closure-101634477001367.html>

³ Sharma, R. (2018, April 30). *Bandra-Worli sea link: Traffic falls 13% in 2017-18*. Financial Express. Retrieved from <https://www.financialexpress.com/infrastructure/roadways/bandra-worli-sea-link-traffic-falls-13-in-2017-18/115021/>

⁴ Mehta, L., Parthasarthy, D. and Bose, S. (2022). *The Koli fishing community has lessons on climate resilience for Mumbai and the rest of the world*. Scroll.in. Retrieved from <https://scroll.in/article/1035626/the-koli-fishing-community-has-lessons-on-climate-resilience-for-mumbai-and-the-rest-of-the-world>



Figure 14.2: Worli Koliwada Source: Geetanjali Gurlihosur

sudden imposition of lockdown restrictions led to huge amounts of rotting and wastage due to blocked distribution channels and inadequate storage facilities. After the lockdown was lifted, high labour charges for workers at the fishing grounds created more complications for fish vendors and traders. The price of common fish in the market more than doubled in 2020, which was unaffordable for the masses with their reduced purchasing power, due to which fisherfolk suffered losses amounting to INR 200 crore. The distribution of one-time compensation by the state through direct benefit transfers was deemed to be inadequate by the fishing societies. Women fish vendors were the worst hit, with drastically reduced earnings and restrictions on mobility. Many of them have had to quit fish trade and shift to relatively steady sources of income like domestic work. Additionally, traditional fish vendors face stiff competition from online start-ups that have gained popularity during the pandemic.

The Way Forward

Due to severe constraints, many members of the traditional fishing community are moving out and changing professions. These trends are more prominent among younger community members. Competition and hostility between artisanal fishing communities and commercial

fishing companies is worsened by the lack of support from the state. As a consequence, many fishermen have stopped fishing in the traditional way and moved to commercial fishing. They are also moving away from traditional knowledge systems and becoming increasingly dependent on modern technology like GPS tools. The logic of profit drives fishermen to capture more and more fish for export purposes as well, which points towards a need for promoting aquaculture. Against this backdrop of shrinking practices of artisanal fishing, policy interventions should focus on reversing the loss of livelihoods by creating a robust support structure for the fisherfolk, including skill development activities, access to small loans, as well as technical knowledge.

To safeguard the interests of Mumbai's fisherfolk, it is necessary to rethink the concept and practices of mainstream development projects. What is put forth as progress is often a skewed understanding of development, one that does not take into account distinct lived realities and livelihoods in urban spaces. In this exclusionary process, the voices of marginalised communities are erased, resulting in a fundamental imbalance that eventually leads to injustice. Fishing communities are key stakeholders in Mumbai's food economy and must play a role in decisions and policies that affect their lives and livelihoods.

15

Fishing in the Yamuna, Delhi

Akshita Rawat, Nishant, Debapriya Chanda and Rajendra Ravi

Introduction

The Indian fisheries sector contributes significantly to national protein supply and food security. For urban populations, fishing in rivers and lakes is a leisure sport as well as a livelihood activity that significantly contributes to urban food security. For fisherfolk in Delhi, the river Yamuna is one of the few remaining sources of a decent catch. Whether they are involved in recreational or professional fishing, they all have distinct experiences and views about the current condition of fisheries in the capital. A closer observation of their practices will help us better understand the lives and livelihoods of fisherfolk in Delhi.

Most of the water resources in Delhi have dried up. The Wazirabad barrage over the Yamuna is the only place where year-round water supply is maintained. The river supports aquatic life during the monsoon but remains polluted for fish to survive the rest of the year. In the ghat near Jagatpur village, many fisherfolks use large nets for a better catch. Bigger fish usually get trapped in such nets, which are then transferred to a plastic bag filled with water to keep them alive. While some sell their catch in the market, others, especially younger generations, use it to meet their family's consumption. Substantial fishing activity happens in this area, but only a certain percentage of fishers possess a valid licence. The licence is issued for INR 150 and is valid for a year. Rajendra, a resident of Indira Vikas and a government employee, says there are several

perks to holding a licence. Besides a legal right to fish in the Yamuna waters, it also makes him and his family eligible for insurance of INR 2 lakh in case of accidents while fishing. However, there is limited awareness about licences among the fisherfolk.

Fishing as Leisure

Puran and Ajit are *dhol* (barrel drums) players in wedding ceremonies and fish at the Yamuna Biodiversity Park near Jagatpur village, a 9,770 hectare biodiversity area located on the riverfront. The Delhi Development Authority developed the park as an alternative habitat for migratory and resident bird species and to augment freshwater availability by boosting groundwater recharge. On days when they have no work, they fish on the banks of the Yamuna. Ram Singh, a native of Sultanpur in Uttar Pradesh, is a construction worker in Delhi. He frequents the riverbanks during his free time to fish.

Anil Minj leads a fishing collective of six to seven migrant tribal youth from Jharkhand and Chhattisgarh. They currently reside in Santnagar, Burari, and drive cycle rickshaws and e-rickshaws. Fishing is a hobby for the group. Even though he comes from a family of generational farmers in Jharkhand, Anil says that he developed an interest in fishing since childhood. After his father's death, he funded his school fees by selling fish caught from a lake in his village. He claims they never get fish

weighing more than 500 g in the Yamuna. Most of the catch weighs between 50 and 200 g. The varieties found in the river include *rohu*, koi, prawns, *bam* (Indian mottled eel), *tengra* (grass carp), and crabs. The group had once caught fish weighing 15–16 kg, their biggest haul to date. He also states that irrespective of the size, the catch is always enough to feed Anil's family of three. The group uses makeshift equipment like mosquito nets and successfully brings in the catch through coordinated collective efforts. The catch is equally divided among all members of the group. They prefer to fish in shallow water near the weeds and grass near the riverbank.

Commercial Fishing Practices

Robin Halder, a resident of Bengali Colony in Burari, is a professional fisherman who sells his catch in local markets. He uses a boat and a large net and sets out for fishing with a large group

of 14–15 people. They all live in the same locality and belong to the same community and hold separate licences. The amount of catch varies according to the volume and current of water – on good days, they take back two or three quintals of fish, and on lean days, the catch barely amounts to 15 kg. The catch is always distributed equally among the group members at the end of the day. The river changes its course during the monsoon season every year, which impacts the surrounding ecology. As Halder describes, the natural habitat of the fish also changes. Therefore, fisherfolk may need to modify their techniques and practices, and identify new spots to fish.

An Uncertain Future

The fish population in the Yamuna is declining, primarily due to pollution, exacerbated by the release of untreated effluents from some



Figure 15.1: Fisherfolk of Delhi at work in the river Yamuna Source: Avikal Parashari

factories in Haryana, such as dyeing units, wool mills, plywood, agrochemical, rubber, and other small-scale industries. Every year, thousands of fish are found dead in the ghats on the southern stretch of the river in Delhi.¹ The chemical waste from factories is harmful to aquatic life as it destroys their natural habitat and reproduction abilities. The fisherfolk fear that without adequate measures to contain water pollution, fish might completely disappear from the Yamuna in a few years. Due to the depleting resources and expensive equipment, only four large fishing boats are currently operational. On the other hand, Delhi registers massive demand for fish from consumers. Ghazipur is a prominent fish market with high demand. Another major fish market is found near the Majlis Park metro station, where catch from Haryana and other states is sold. Additionally, there are numerous smaller local fish markets in the neighbourhoods and informal settlements of the city. This indicates that while there has been a fall in supply, the demand for fish has risen significantly.

Policy Lessons

While the challenges of fishing in the Yamuna have a long history, there has been no serious consideration and examination of alternative practices at the policy level. There are immense possibilities in the Yamuna itself for boosting fisheries in the city if it receives adequate attention from policymakers. Technical and financial support can be extended to the fisherfolk, making fishing a lucrative opportunity, and reducing food miles, thereby reducing greenhouse emissions. Technological and scientific advancement has opened new pathways for pisciculture endeavours. It is essential to urgently evaluate the situation and frame better policies, keeping the concerns of

the fisherfolk at the centre of the policy discourse. A secure livelihood can be guaranteed for the fishing community only when the Yamuna is protected, as their income is crucially dependent on the health of the river ecology. Since other water bodies like lakes are often under private ownership, fishing is relatively riskier and restricted. The river, on the other hand, falls under the definition of commons, which is why all stakeholders, including the government and civil society must take up the responsibility for its restoration.



¹ Singh, S. (2022). *When Yamuna's 'dead fish will be fresher'*. United Nations Development Programme. Retrieved from <https://www.undp.org/india/when-yamuna%E2%80%99s-%E2%80%98dead-fish-will-be-fresher%E2%80%99>

16

Entrepreneurial Peri-urban Farming in Palla, Delhi

Radheshyam Mangolpuri, Debapriya Chanda, and Rajendra Ravi

Introduction

The shift from farms to farmhouses has been significant in urban and peri-urban areas of Delhi. While farmers used to practise agriculture in open fields in the past, most of these fields in the northern fringes of the city have now been sold to affluent individuals and families, who have built lavish houses and gardens on these plots. Farming is rarely practised; these enclosed properties are often rented out for weddings and other social functions instead. In contrast, a lot of young professionals in the country are quitting their desk jobs in multinational companies and taking up farming, often motivated by the desire for a more sustainable lifestyle. In the Palla Gaon area in Faridabad, northeast Delhi, many of these young farmers are practising agriculture with innovative experimental styles and techniques.

Peri-urban Farming in Palla

Vishal Shaukeen, a 25-year-old resident of the Mangolpur Kalan locality, is one such farmer. His family has been practicing agriculture in the region for generations, owning a vast stretch of 108 acres of land in the past. Decades ago, the family had bought a total of 23.5 acres of land in Mangolpur Kalan, with 17 acres in Palla and 6.5 acres in Jhangola. Eventually, over the next couple of generations, the family moved towards other professional domains like engineering. Vishal himself is an engineer by training and has worked in a high-paying corporate job for a

year, after which he found his calling in farming. Inspiration came at an agricultural conference that he attended in Rajasthan, which changed his perspective. He quit his job and for the past couple of years, has been successfully cultivating on the family land by using various experimental techniques like soil and water testing, minimising the use of chemicals, and implementing various cropping practices.

The soil quality is tested at the Indian Agriculture Research Institute at Pusa, New Delhi. Water quality is monitored by Vishal himself. Chemical fertilisers are used as little as possible. Thirty-two tonnes of cow dung is procured from dairy farms. It is combined with grass and leaves and is used as manure for the crops. Wheat, rice, and mustard are the main crops cultivated on this land for generations. Several new varieties of crops are also grown, such as red, yellow, green and orange capsicums; red, yellow and orange cherry tomatoes; unseeded varieties of English cucumbers; white and red onions; garlic; spinach and methi. Varieties of fruits and vegetables such as radish, peas, watermelon, cabbage, and cauliflower are also grown. Some of these vegetables are grown for the sole purpose of consumption of the family. Groundnuts, strawberries, and coriander, along with different kinds of greens used in salads, are also produced on this farm. Vishal is constantly on the lookout for new varieties of crops that are suitable for the soil, as well as improving existing farming techniques for better yield.

Experimental Methods for Entrepreneurial Agriculture

The experiments have been yielding good results. The soil quality has improved significantly, and Vishal is confident that they will be able to stop the use of chemical fertilisers and pesticides completely in a few years. Soil fertility is maintained by practising crop rotation. The production is moving toward organic farming by adopting methods like vermicomposting. A polyhouse has been installed to grow capsicum, English cucumber, and cherry tomatoes. The seeds for these crops are imported from the Netherlands and planted in nurseries, after which they are shifted to the polyhouse where the temperature can be controlled. Water is also used more effectively in the polyhouse through drip and sprinkler irrigation which ensure water reaches the roots of the crop directly.

Vishal has a team of five people who assist him in day-to-day activities on the farm. They hire up to 22 labourers during peak season. Mechanisation has replaced the need for farm labour and revolutionised farming methods to a significant degree. Vishal has tied up with several companies to help sell the farm produce. The remaining produce is sent to various *mandis* across the city. Vishal says that the companies eat into the profit share of the farmers. Radish, for instance, is purchased at the rate of INR 1.70 per kg from the farm and sold to the final consumers at INR 24 per kg. To stop this exploitation, attempts

have been made to establish a farmers' network to help improve their bargaining power in the market. Vishal enhances his access to information about agriculture and markets by reading a lot of literature on the subject. He tests the theoretical concepts in the practical domain to verify their efficacy. He also interacts with other farmers to learn from their experiences, knowledge, and practice. He also plans to go abroad for an advanced course in agriculture to enhance his grasp over the subject. In his temporary absence, his team will take care of the farm while he remains informed about their detailed functioning.

Challenges

There are several challenges, especially in the form of adverse weather conditions and pest attacks. An attempt had been made to grow sweet corn, but the crop got ruined due to heavy rainfall. On the other hand, groundwater resources in the city are rapidly depleting, which makes it essential to adopt farming techniques with lower irrigation requirements. Animals like nilgai, deer, and wild boars also pose a significant threat to farming. To guard against wild animals, fences have been built using wires and plants. Crops cannot be grown in the polyhouse during the summer and in stormy weather. The cost of repairing and reinstalling the fence is very high. Farming in Delhi is also more expensive as urban and peri-urban farmers do not receive any subsidies from the government.



Figure 16.1: Farming and grazing in Palla, Delhi Source: Joe Athialy

This raises expenditure on seeds and fertilisers as well. High costs often discourage young entrepreneurs from entering the agriculture space. There is a distinct lack of coordination among the administration at the central, state, and local levels. To compound the problem, urban and peri-urban agriculture in Delhi does not receive enough support at the policy level. Experimentation with entrepreneurial agriculture has its own risks, as people or state officials can raise questions about whether the produce from such methods meet food safety standards. This poses a major roadblock in the path of advancement of such agriculture. Since Vishal is not a resident of Palla, he is not very familiar with the farming community there. According to him, this increases the threat of a hostile environment.

When asked about his idea of a successful farming venture, Vishal says that while he would like to earn a profit, he is not too concerned about the same. To him, self-satisfaction plays a huge role in success, and he is content with the pace at which he is progressing towards his goals. He believes that while experience plays a major role in the success of agriculture, one must also be prepared to embrace change and evolve farming techniques with time.

The Way Forward

To encourage more farmers like Vishal to start and scale up their efforts towards a sustainable lifestyle, suitable policy interventions and government support will play a key role in building a holistic environment for the growth of innovative and experimental agri-entrepreneurial ventures. These urban farming practices can be strengthened through support structures in the form of easy access to loans for medium and small-scale entrepreneurs in agriculture, ensuring they receive fair prices, and devising marketing strategies that will allow them to reach a wider customer base in urban and peri-urban areas. These ventures can also prove to be beneficial for farm labour through adequate skilling programmes and opportunities provided by the government which would enable small and marginal farmers to scale up their businesses. Initiatives that promote unity and cooperation among farmers must be encouraged. Keeping in mind the diverse set of challenges faced by farmers in cities, comprehensive and sustainable solutions need to be developed at multiple levels. Such an approach will help secure the welfare of the urban farming community.



17

Indigenous and Migrant Food Producers in Aarey, Mumbai

*Debapriya Chanda and Geetanjali Gurlhosur**

Introduction

The Aarey Forest is a 3000-acre eco-sensitive zone in the city of Mumbai, bordering the Sanjay Gandhi National Park. It is spread across the suburban region of Goregaon, reaching up to Powai in the south and Bhandup in the east. Popularly known as Mumbai's 'last green lung', this green space was originally home to indigenous communities. It has undergone a massive transformation in the last seven decades, presently comprising a milk colony, a film city, training institutes, real estate projects, a zoo, and a metro-car shed. In 2020, the Maharashtra government declared 600 acres of Aarey as a Reserved Forest in a move to protect the rights of the tribal residents of Aarey. However, several urban development projects have encroached upon its farmlands, displaced families and communities, and damaged the ecology of this area.

Thousands of families live and practise cultivation in 27 tribal hamlets or *padas* spread across the area. They have been engaged in farming, fishing and poultry-rearing activities for many generations. Farmers in Aarey pay an annual minimum tax of one rupee per *gunta*, which is about 1,000 sq. ft of land. Their agricultural practices are primarily for subsistence, although surplus produce is sold by women in areas like

Marol, Jogeshwari, and Vijay Nagar in the city. Seasonal fruits and vegetables from these small farms are in high demand among suburban residents. In the monsoon, the forest supplies the hamlets with *raan bhaji* or vegetables from the forest. These include *shevli* or dragon stalk yam, *kurdu* or celosia and *koli* or black-eyed peas. Residual water and excreta from cattle sheds in Aarey flow into the farmlands and become manure for crops. Fish and crabs are also found in these drainage channels in monsoons.

Horticulture and Poultry Rearing in Aarey – Lived Experiences

Prakash Bhoir, an environmentalist, tribal activist and Warli painter, is a farmer belonging to the Malhar Koli community in Kelti *pada*. He shares a 1.5-acre family farm with his four brothers, where they grow a variety of fruits, vegetables, and flowers. Prakash and his wife Pramila grow mustard seeds, radish, spinach, fenugreek, cowpea, brinjal, tomato, and drumstick. They also have seven mango trees, 50 coconut trees, some banana trees, pineapple shrubs, and a few plants of white jasmine. Pramila, who heads the farm, sells the produce in the residential areas of Jogeshwari, outside of Aarey. They also give out coconut, jackfruit, and lemon saplings to people in the vicinity for free. The Bhoir house is a homestay for domestic and foreign researchers,

* Gurlhosur, G. (2021, June 29). *State of Urban Agriculture in Indian Cities: Mumbai*. People's Resource Centre. <https://prcindia.in/publications/state-of-urban-agriculture-in-indian-cities-mumbai/>

environmentalists and activists. The couple is closely involved with environmental activism in Aarey and were arrested (later released) for protesting the construction of the metro car shed in 2019. Talking about their farming practices, they emphasise that their focus is on providing for themselves and sharing food with those who visit their house. Selling produce and making profits is not a primary goal. They have plans to start beekeeping in the future. Poultry-rearers in Aarey's hills face the challenge of wild animals like leopards and snakes from nearby forests attacking hens. This has become more frequent owing to rampant urbanisation that destroys habitats of wild animals. Although most families have stopped poultry-rearing activities, a few of them like the Bhoir brothers continue doing it higher up on the hill in sheds outside their houses.

Apiculture in Aarey: Challenges and Opportunities

Although Aarey's vegetation is declining, local people are committed to increasing flora in the area through activities like beekeeping to induce natural pollination. A bee farm in one of the villages in Aarey, housing about two lakh Indian honeybees, is one of the few prominent ones in Mumbai. It was set up by Johnson Jacob, a hobbyist apiarist who came to Mumbai from Tamil Nadu about 15 years ago. Having studied and observed the behaviour of bee colonies over the years, he is presently a trainer, exhibitor and famous beekeeper who helps other apiarists in the city set up farms and harvest honey for commercial purposes. However, he is not a commercial farmer himself and does not intend to utilise the honey produced in these man-made hives for commercial purposes. His primary concern is ensuring that the bees are healthy and reproducing, especially during the monsoon period when they do not produce enough honey for their own consumption. His annual expenditure on maintaining and feeding the bees amounts to INR 40,000. He runs a parallel wholesale honey retail business,

buying from farms in Uttar Pradesh and selling to medical stores in Mumbai, Chennai and Kolhapur. Most often a small-scale farm like the one in Aarey is not financially viable. The extra honey produced on the farm is consumed by his family. Jacob has sold bee colonies to farms and housing societies across Maharashtra, including Vile-Parle and Chikoowadi in Mumbai, Thane, Panvel, Pune, and Nasik.

Beekeeping and breeding for honey production is recognised as a rural industry by the Maharashtra State Khadi and Village Industries Board, constituted under the Bombay Khadi and Village Industries Act, 1960. The Board provides bee colonies and equipment at reasonable rates to farmers, with the aim of increasing employment and pollination in the state. Besides providing training for skill development and technical assistance to rural bee farmers, loans and subsidies are also offered under several schemes. However, comparable benefits are not extended to beekeepers and breeders in urban areas. While talking about the challenges in beekeeping in Mumbai, Jacob states that the government has done little for bee breeders. Since it is an activity that largely depends on natural processes, the risk of suffering losses is high. Therefore, adequate incentives are essential for replicating such successful ventures.

Railway Farmers: An Innovative Approach to Urban Farming

Railway farmers in Mumbai have carved out a niche for themselves on the city's food landscape. Since 1975, the Indian railways has been temporarily leasing out its vacant land to farmers from marginalised communities to cultivate seasonal vegetables, under the 'Grow More Food' scheme. The main objective is to protect surplus land owned by the railways from encroachment. These small pieces of cultivated land can be found along Mumbai's Central, Western and Harbour railway tracks. The Central Railway has leased out 101 acres of unused land between Kurla and Vidyavihar railway stations

and near Mankhurd railway station and Thane. A large portion of the city's local agricultural produce such as spinach, *pui* or Malabar spinach, cowpea, fenugreek, and radish are grown in these areas, wherever there is sufficient water supply through a *bavdi* or well. This scheme generates revenue through a licence fee of INR 4,047 per acre per year, while labourers earn INR 6,000 to 7,000 monthly. Near the Kurla Terminus, land has been allotted to railway employees who hire *seths* to work on the land and oversee the process of cultivation. The produce is sold to residents of Chembur, Ghatkopar, and Kurla.

Most of these railway farmers are migrants from Ambedkar Nagar in Uttar Pradesh, who have been forced to migrate to Mumbai due to

inadequate yields and income in their villages. Workers sleep in shelters around the railway farms. Constant fear of displacement renders their living conditions precarious as the railway authorities have the power to withdraw the lease at any time with a notice period of three months. Additionally, adverse weather conditions and floods during the monsoon force the migrants to return to their villages. Recently, there have been complaints against railway farmers for using polluted sewage water to irrigate these farmlands.

Aarey Milk Colony: Declining *Tabelas*

The Aarey Forest is home to 32 *tabelas* or cow sheds, making it an ideal site for systematic cattle rearing, milk collection and processing. Many of



Figure 17.1: A buffalo at Aarey Milk Colony produces an average of seven litres of milk every day **Source:** Geetanjali Gurlhosur

the cattle rearers and labourers are migrants from other states. The milk from this colony used to be bought and distributed by government-run dairies and selling booths in different parts of the city, making Mumbai self-reliant under this dairy development scheme. Local estimates suggest around 32,000 cows and buffaloes are reared here at present. Buffalo milk, which is thicker, is preferred to cow milk, thereby fetching more profit for dairy farmers. On average, each lactating buffalo produces around seven litres of milk per day. The milk is supplied to households in Tilak Nagari, Pant Nagar, and other suburban localities of Mumbai. The fodder for cattle comes from neighbouring villages like Dahanu and Palghar, costing around INR 200 per kg. Some dairy farmers in Aarey supply milk to distributors, hotels, and private dairies as well.

However, these well-built stables and living quarters for buffalo rearers are now in a run-down and neglected state, with no grazing grounds around. Various factors make running *tabelas* in the middle of the city difficult. Urban citizens, who are often bothered by the associated smell and noises and animal waste in public spaces, prefer such establishments to be in the suburbs. The mobility of cattle is also restricted in cities. Out of the 32 units, four have shut down. Over the past two decades, cattle rearers have stopped selling milk produce to the Aarey Dairy due to falling prices. There is a significant difference of about INR 5-7 between the prices paid by Aarey Dairy and those offered by private wholesalers. Selling directly to consumers and local vendors in and around Aarey is even more profitable for cattle rearers due to the much higher retail prices. Furthermore, given the current political climate of rising polarisation, transporting cows across state borders has become an additional hassle with high costs. Farmers have also been demanding improved access to better roads and other infrastructural amenities and recognition for their contribution to the city's milk supply.

Conclusion

To protect the rights and livelihoods of indigenous and migrant food producers in Aarey, it is essential to make them central to development discourses and policy recommendations for this area. It is imperative to safeguard their interests and promote their economic activities, to ensure a smooth supply of food in Mumbai and its suburbs. More specifically, strict vigilance on encroachment of forest areas will help curb the human-wildlife conflicts that Aarey's small poultry farmers face frequently. An extension of rural schemes to urban beekeepers would assure livelihood sources for the forest dwellers, in addition to honing their beekeeping skills. This will also enhance pollinator diversity, thus, leading to rejuvenation of the forest itself. Long-term lease agreements for railway farmers would enable them to access land for vegetable cultivation, while providing a sense of livelihood security. Price assurance for milk and maintenance of cow sheds would allow small-scale cattle rearers in Aarey to sustain their livelihoods and continue to supply milk to the city.



18

From Your Garden to Your Plate: Citizen-led Gardening in Bengaluru

Maitreyi Koduganti, Rajendra Hegde, and Sheetal Patil

Cognisance about unsafe and contaminated food is growing among citizens in India. People are now aware that due to inadequately regulated fertiliser and pesticide use, the food on our plates, especially fruits and vegetables, is a cocktail of synthetic chemicals. Fruits like apples and oranges are waxed with pesticides and chemicals at the production stage and by supermarkets to increase their shelf life.¹ Vegetables like cauliflower, cabbage, and microgreens are dipped in chemicals² to make them look fresh. There is plenty of evidence that prolonged consumption of these vegetables and fruits can be fatal, affecting vital organs² like kidneys and liver and, in severe cases, leading to genetic alterations and cancer. Though these findings are alarming, the situation is unavoidable. We exercise caution by washing vegetables before consumption. Sometimes we also purchase vegetables and fruits from local farmers and small vendors to ensure traceability. Many find alternatives by growing their own food on balconies and terraces. Though cities continue to depend on large-scale agriculture,

often distantly located, urban agriculture is slowly becoming a movement that significantly contributes to food production.

Urban farming, an umbrella term for growing food within a city, is nurtured by the principle of 'grow what you eat and eat what you grow.' However, before looking at growing food in the city, one needs to keep in mind the space constraint as our cities are urbanising rapidly, especially in Bengaluru, where the built-up area boomed from 7.9 per cent in 1973 to 58.3 per cent in 2012³, which severely constrains land for cultivation within the city limits. Hence, an alternative is to plan, design, and grow vegetables, fruits, and other food items organically on terraces and balconies. Organic terrace gardening is a simple step towards increasing green cover in densely built-up cities, irrespective of the space crunch. This is an achievable activity; however, the ways of planting, nurturing, and harvesting vary significantly for each plant in an urban setup. Moreover, there are no formal guidelines or support to promote urban agriculture in cities.

¹ Nandi, J. (2007). *Toxic pesticides linger in cereals and fruits*. The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/bengaluru/toxic-pesticides-linger-in-cereals-and-fruits/articleshow/7141746.cms>

² Prasher, G. (2013). *Plates loaded with pesticides: Survey shows fruit, vegetables are high on chemical content*. The Times of India. Retrieved from <https://timesofindia.indiatimes.com/city/bengaluru/toxic-pesticides-linger-in-cereals-and-fruits/articleshow/7141746.cms>

³ (n.d.). *Bangalore: Green spaces and its significance*. UPAGri. Retrieved from <https://www.upagri.net/bangalore>



Figure 18.1a. A publicity poster for the Oota from your Thota event Source: Garden City Farmers

With this underpinning, many organisations across the country have been trying to promote the benefits of urban farming, specifically terrace farming. Garden City Farmers (GCF) is one such organisation established in Bengaluru in 2011. GCF aims to promote organic urban farming and terrace gardening practices to create a better future.

Garden City Farmers: Paving the Way for Terrace Farming

One might ponder while starting farming in cities: *Where is the space to grow?* According to Dr. Viswanath BN, the founder of GCF, a feasible option seems to be the rooftop. In 1995, when Dr. Vishwanath was flying to Bengaluru, the plane hovered over the city for a few minutes. He observed that tall buildings engulfed the city with minimal green cover. This stark sight motivated him to promote terrace gardens and conceptualise the idea of foodscapes on rooftops. Since then, he has dedicated his time to conduct classes on growing food crops on the rooftops and terraces.



Figure 18.1b. A picture from the Oota from your Thota event Source: Garden City Farmers

In 2010, a national seminar on organic terrace gardening was held in Bengaluru, bringing hundreds of like-minded people together to join the revolution of growing their food on rooftops. Dr. Vishwanath iterated that rooftops are perfect spaces for foodscapes since they get ample sunlight which is primordial for plants' health and growth⁴. Furthermore, innovations like hydroponics, aquaponics, among others make rooftop farming simpler and easier. Consistent efforts by Dr. Viswanath eventually led to the formation of the NGO – Garden City Farmers in 2011 to promote organic terrace gardening and urban farming more effectively within and beyond Bengaluru.

Garden City Farmers (GCF) primarily creates awareness on cultivating foodscapes on rooftops of urban dwellings. In addition, they conduct trainings and organise seminars at the local, state, and national level. GCF also organises a

quarterly fair called Oota from your Thota (OFYT) (meaning Food from your Garden in Kannada)⁵ in different parts of Bengaluru. The OFYT brings rooftop gardeners under one umbrella, creating awareness and learning opportunities through discussions and debates. It also allows the urbanites to get acquainted with different enterprises related to organic urban farming. GCF has conducted 24 such one-day events so far. In addition, it formed a Facebook group, Organic Terrace Gardening⁶, for members to share their gardening experiences. This group is also a platform for gardening newbies to pose their queries and get them answered by experts.

Simple, but Not Easy

Though the idea of having foodscapes on rooftops seems simple and doable, the journey of GCF in creating awareness of growing one's own food was not an easy task.



Figure 18.2: Chinnari Kaithota workshop (gardening workshop for children) Source: Garden City Farmers

⁴ Govind, R. (2020, August 29). *How green is my terrace garden*. The Hindu. Retrieved from <https://www.thehindu.com/life-and-style/homes-and-gardens/get-on-a-virtual-experience-of-oota-from-your-thota-in-memory-of-bn-vishwanath-kadur/article32473833.ece>

⁵ K, M. (2020). *The journey of Oota From Your Thota*. Oorvani Foundation. Retrieved from <https://oorvani.org/the-journey-of-oota-from-your-thota-1850>

⁶ (n.d.). *Oota From Your Thota*. Facebook. Retrieved from <https://www.facebook.com/ofyt.org/>

Convincing people to grow food

When the core members of GCF started organising trainings and workshops, their biggest challenge was to reach out to a larger urban population and persuade them to cultivate foodscapes on their rooftops. Though many people attend the workshops and trainings, only a small percentage practice it. Many are skeptical about having terrace gardens since they constantly face questions about the growing medium, seed availability, and use of pesticides. Many are also concerned that terrace gardens may attract pests or damage their building structures due to water leakages. GCF conducts multiple one-day organic gardening workshops to teach the nitty-gritties of foodscapes on rooftops to respond to these challenges. In addition, the OFYT event hosts a congregation of urban farming practitioners who share their practices.

Educating children

Sparking a passion for organic gardening among children has also been equally challenging. Today's children have little opportunity to connect with and appreciate the environment around them. GCF believes that engaging children in growing foodscapes gives urban children a chance to learn, grow, nurture, and reconnect with nature and ecology. School

curriculums often overlook these skills. GCF conducts multiple awareness sessions in schools to offset these concerns, in addition to *Chinnari Kaithota*, the gardening workshops for children hosted at the OFYT events.

Partnering with governments and institutions

An initiative's effectiveness partly depends on the recognition and support it receives from the government or public institutions. GCF joined hands with the University of Agricultural Sciences, Bengaluru, to conduct an Urban Krishi Mela (urban farmer market, a first of its kind in India) in 2013, where urbanites had an opportunity to visit and learn about urban foodscapes. This event gained enormous visibility, with over two lakh people attending.

Reaping Benefits

Despite multiple challenges, GCF has successfully manoeuvred its way to keep up the momentum of developing foodscapes on Bengaluru's terraces. GCF has successfully reached out and trained more than 50,000 citizens since 2011. In addition to 24 GCF events, it conducted a state-level seminar on organic terrace gardening in Hubli in 2011, where GCF collaborated and reached out to many institutions of northern Karnataka. GCF also conducted national seminars on



Figure 18.3: Success stories of Garden City Farmers Source: Garden City Farmers



Figure 18.4: Terrace garden of Laxminarayanan Swamy, ISRO Layout, Bengaluru **Source:** Garden City Farmers

In his 400 sq. ft terrace, Mr. Swamy, a software engineer, grows more than 50 species of herbs, vegetables and flowers. His terrace garden helps him meet 40 per cent of his daily vegetable requirements. Being an active member of the OTG, he shares his experiences through different workshops and training, motivating others to venture into terrace farming.



Figure 18.5: Terrace garden of Soubhagya Sadashiva, Jayanagar, Bengaluru **Source:** Garden City Farmers

With a motivation to create a mini Lalbagh on her terrace, Soubhagya started her garden in 2005 with a few croutons and tomatoes. Today, her garden hosts different vegetable, medicinal, fruit, and ornamental plants that are as diverse as the Lalbagh garden. She allows citizens to visit her garden, shares her growing experiences and is a role model for many in her colony who want to practice terrace gardening.

organic terrace gardening in Bengaluru in 2010 and 2013, while it was part of similar events in Mumbai (2014) and Chennai (2015).

In addition, one of GCF's biggest successes is inspiring green entrepreneurs, who in turn pass on their knowledge to fellow gardeners, newbies, and the younger generation. More than 20 urban gardening start-ups have emerged since the inception of GCF. It is estimated that more than 20,000 gardeners in Bengaluru city are experimenting with rooftop gardening.

Looking Ahead

The primary goal of GCF was to motivate urbanites to create small foodscapes in their homes that provide fresh, safe, and organic produce directly to their plates. Much of the momentum with GCF has been ground-up with citizens taking active efforts to green their terrace and contribute to the larger sustainability of the city. Be it the rooftops of Dr. Vishwanath or engineers like Laxminarayanan, these gardens emerge as spaces where citizens gather to learn from each other, grow their own food, and participate in shaping their urban environments. Furthermore, events like Oota from your Thota have enabled the citizens to acquire the required resources, create and manage spaces for physical exercise, a getaway from daily urban living, and the extraordinary pleasure of growing their own food.

The activities of GCF demonstrate that organic terrace gardening can go beyond being a hobby or an ornamental pursuit. It provides an opportunity for the urban farmer to be a potential transformative actor and a catalyst who shapes the spatial production of their micro-urban environments. However, the starting point to all of this is to start a garden. As Rajendra Hegde, the former chairman of GCF says, *"All you need is a pot"*, and that is enough to drive citizens towards creating sustainable, green, and self-sufficient cities.



19

Samrudh Shetkari, Chaangle Bhavishya¹: The Story of Abhinav Farmers Club

*Parama Roy and Maitreyi Koduganti**

Introduction

Every day, more than 2,000 farmers across India give up farming² due to seasonal uncertainties, water shortage, fragmented landholdings and increasing development pressure on land in the outskirts of cities. While this is not an easy problem to solve, there have been increasing attempts by farmers and farmer collectives to find better ways to deal with these issues. Dhyaneshwar Bodke, one such farmer and horticulturalist from Mulshi, Pune set out to find a solution to this challenge. Amidst the growing demand for organic produce among the urban middle class in the early 2000s, Bodke set out to establish a club, the Abhinav Farmers Club (AFC). Today, the club has over one lakh members across several states of India, and has proven to be a profitable, sustainable model that benefits and empowers farmers.

Bodke's journey in this field started in 1999, where he led a group of 11 farmers in the Pune area with the dual aim of linking peri-urban and rural farmers directly to urban consumers and supplying chemical-free food. In 2004, the AFC was formalised with support from National

Bank for Agricultural and Rural Development (NABARD) and Canara Bank. By this time, the area-based farmers' collective had 850 farmers on board, who farmed in an area of around 153 hectares of land within a 17-20 km radius of Pune. They had less than 20 customers in Pune city initially, but within a year the quality of produce and word-of-mouth marketing led to a manifold increase in AFC's customer base, making it a profitable venture. Mr. Bodke recollected:

"Earlier I used to do it alone, but soon word spread in different societies. As a result, customers also increased. More farmers reached out saying they have an acre of land. We brought them to the group and taught them organic farming of different vegetables. We bought their produce and got it sold."

Abhinav Farmer Club: Features of the model

Membership model

The Abhinav Farmers' Club currently has about 1,56,000 farmers across the states of Maharashtra, Madhya Pradesh, Uttar Pradesh, Gujarat,

* With inputs from Dnyaneshwar Bodke

¹ 'Prosperous farmers, Better Future' in Marathi

² Magapatra, R. (2020, September 24). *India's agrarian distress: Is farming a dying occupation*. Down to Earth. Retrieved from <https://www.downtoearth.org.in/news/agriculture/india-s-agrarian-distress-is-farming-a-dying-occupation-73527>

Karnataka, Andhra Pradesh and Telangana.³ In Pune and its surroundings alone, there are close to 300 farmers collectively cultivating 867 acres of land.

Any farmer can join AFC and there is no membership fee for joining, but joinees must go through a three-day compulsory training on organic farming techniques. The cost of this training is INR 4,000, which covers food and lodging during the training period. In the training, farmers are guided on organic farming, polyhouse and polytunnels management, open cultivation techniques, Gir cow dairy management, organic seeds and manure, and direct marketing. AFC also provides post-harvest support to its member-farmers. AFC's vehicles pick up harvested produce, bring it to backhouses where the harvest is cleaned and labelled with AFC stickers, and then delivered directly to customers (households, restaurants, or markets.) AFC operates 56 vans to cater to all 305 farmers in the Pune area, and the club also maintains one packhouse to cater to approximately 40 farmers.

Nature of produce

Initially, the club also experimented with floriculture and exotic vegetables, but currently the club largely produces local Indian vegetables (99 per cent), cereals and organic milk. AFC maintains almost 2.5 lakh Indigenous cows and sells nearly 6,000 litres of milk per day, at INR 100 per litre. Catering to the growing demand for organic produce, AFC draws on a three-layered farming technique, where tubers are grown in the first layer, microgreens on the second and cereals or pulses in the last layer. This technique allows farmers to grow more in limited space.

Technology and innovation

In addition to ensuring organic methods of production (such as using cow dung and urine to make fertilisers and neem oil for prevention of diseases) AFC also banks on technological innovations to improve efficiency and sustainability of their farms. For example, smart watering systems have been put in place in many



Figure 19.1: Indigenous cattle rearing by Abhinav Farmers Club **Source:** Maitreyi Koduganti

³ (n.d.). *Abhinav Farmers Club*. Retrieved from <https://www.abhinavfarmers.club/about>

farms with automated mobile-based valves that allow them to operate from anywhere, with minimal loss.

These units cost about INR 50,000 and are used for both irrigation and adding fertilisers. These smart watering systems save nearly three litres of water each year for every 1,000 sqm area. Similarly, filtration units have been introduced to remove excess salt from water. With the help of IIT Bombay, AFC has also put in place an online app, 'AbhinavCart'⁴, which customers can use to place orders.

Education and awareness

Beyond training its member-farmers, AFC has also taken up the role of educating other farmers. In 2006, AFC started a Farmers Training Institute⁵ where people from all over India come to learn organic farming techniques, how to make organic fertilisers and pesticides, set up drip irrigation and introduce automation in agriculture. According to Mr. Bodke, 90 per cent of the participants for these weekly three-day training sessions have been engineers, advocates, or businessmen, while only 10 per cent are farmers, indicating the increasing interest among the former group to engage in agricultural activities. AFC has built capacities of over 15,000 people in Mumbai on urban farming so far. Responding to growing demand among non-traditional urban farmers to set up terrace farms and polyhouses, AFC has also started providing services to help set up these practices in Pune.

In essence, AFC has leveraged the collective power of small and medium scale farmers to create a business model that can be scaled to directly connect urban consumers with urban

⁴ (n.d.). *Abhinav Cart*. Abhinav Farmers Club. Retrieved from <https://abhinavfarmersclub.org/>

⁵ (n.d.). *Our Farming Model*. Abhinav Farmers Club. Retrieved from <https://www.abhinavfarmers.club/model>



Figure 19.2: Three-layered farming technique. Source: Prathijna Poonacha



Figure 19.3: Smart Water Units in farms Source: Prathijna Poonacha

and peri-urban farmers so that the farmers receive correct prices for their produce. Such a model contributes to positive outcomes on the soil, water and environment.

Impact: A livelihood strategy

With an intent to make farming more lucrative and sustainable in cities, Mr. Bodke notes that AFC has enabled over a hundred thousand farmers across the country to secure better prices for their organic produce and enhance their income. Bodke hails from a farmer family which was under heavy debt, forcing him to sell a part of his land. Most farmers who are now members of AFC have similar backgrounds and stories. AFC's business model has, over a period, given these farmers a chance to be debt-free.

AFC has not only guaranteed improved livelihood opportunities for the farmers, but also created a substantial number of jobs in packaging, transportation, and marketing, along its entire supply-chain. According to an article in *The Business Standard*⁶, this has generated employment for close to 730 men and women, out of which 445 are women who work under self-help groups. For example, in the Hinjewadi suburb of Pune, which is a thriving tech hub, the presence of IT parks call for a high demand for labour in taxis, and the wives of many taxi drivers have now become an integral part of AFC's SHG, who work in the packaging and marketing team. The women work with AFC thrice a week for 4-5 hours a day and earn INR 200-300 per day. Some women also drive vans and help make agricultural tools and machineries.

AFC's production model is rooted in principles of empowerment and equity. Regular meetings are held with marketing teams (SHG), and the

farmers collectively take important decisions about what to grow, how much to grow and where to sell.

For instance, if there is a need for 110 kg of cabbage a week, the farmers supply the required quantity and AFC pays INR 16 per cabbage to them and 100 per cent of the margin is given to the farmers for cultivation. Since marketing rights are no longer with the *mandis* or markets, the farmers and vegetable sellers can fix their price, and middle-class consumers who are consciously seeking healthy food are willing to pay better prices. After production, the SHG picks up the products from the farm, takes it to the warehouse, cleans it and puts the tag of AFC. In this example, they sell each cabbage at INR 30. Out of the profit of INR 14, INR 10 goes to the SHG and INR 4 goes for management which covers the cost of the packhouse, and services like cleaning equipment, toilets, and other infrastructure. AFC does not make any money from this, and the farmers profit from the model.

Along with support from NABARD and Canara Bank, AFC received a 50 per cent subsidy from the Department of Agriculture and Farmers Welfare, Maharashtra, to buy vehicles and a subsidy of INR 2 lakh from the government to set up packhouses. This support proved to be a critical initial investment to start this club. It is noteworthy to add that AFC has successfully tapped into some of the government schemes for agriculture because their operations remain primarily concentrated in peri-urban areas that fall under rural administrative boundaries. Similar businesses operating within urban boundaries usually do not have access to public schemes to support urban agriculture.

⁶ Godbole, P. (2013, January 29). *Pune farmers join hands to improve earnings*. Business Standard. Retrieved from https://www.business-standard.com/article/beyond-business/pune-farmers-join-hands-to-improve-earnings-108121701063_1.html



Figure 19.4: Women selling AFC produce Source: Swarnika Sharma

Challenges and Way Forward

The key challenge AFC faces is changing people's perceptions towards organic farming. A majority of the farmers whom they have interacted with did not initially believe in organic farming owing to lower yield and higher chances of disease occurrences when compared to chemical farming. Through AFC training, Bodke preaches the benefits of organic farming, highlights that organic pesticides can effectively tackle diseases, and explains how organic farming does not mean less yield, but only that the size of the vegetables could be smaller compared to chemical farming. But this challenge will be offset by lower production costs in organic farming. Further, 20-30 per cent extra profit can be used to cultivate a greater yield.

With the support from the government in the form of subsidies and the growing demand for organic food, AFC is planning to start-up similar clubs in every village and has presented this suggestion to NABARD. AFC is an excellent example of how urban and peri-urban farmers can work collectively to benefit from the growing demand for healthy organic food while ensuring profitability and sustainability of their farming practices.

20

Compost–Sow–Grow: iKheti’s Journey of Creating Green Jobs through Agropreneurship

*Swarnika Sharma and Maitreyi Koduganti**

Staying connected to nature is perhaps one of the most fundamental human urges. While for urban dwellers, the connection may be limited to visits to a nearby park, for Mumbai-based entrepreneur Priyanka Amar Shah, it led to founding a start-up and generating livelihoods for dozens of people. Today, her start-up, iKheti, has developed into a full-fledged social enterprise.

‘Compost–Sow–Grow’ has been iKheti’s mantra for promoting sustainable and organic farming practices among urban residents. A small nursery situated in the heart of Mumbai in Andheri West forms the epicentre of its operations.

Priyanka’s steps into urban agriculture started off very young with a kitchen garden, where she nurtured some basic ingredients for family meals. As a part of her B-school concept show in 2011, she pitched the business idea of iKheti to large-scale corporate businessmen of different sectors and thus started her journey as an urban entrepreneur. Priyanka received positive response at the show and got the opportunity to pitch her idea to industry icons like Rahul Bajaj at a UTV-Bloomberg event. The judges also encouraged the idea, acknowledging that pesticide-free food is the way forward for human health and the environment.

To support her business and inculcate the entrepreneurial hustle, Priyanka worked in an IT start-up for three years. Her love of the outdoors, coupled with now-acquired financial acumen enabled Priyanka to set up iKheti, which now operates across more than 10 Indian cities enabling urbanites to grow food on their premises. As her venture showed results, queries started coming in, and she started hiring more gardeners. What started out as a gardening service provider grew into a larger firm offering green consultancy and developing large community gardens and butterfly parks.

The Business Model

The venture initially started off with workshops, where they trained people how to grow and maintain plants, “*But that did not seem enough,*” noted Priyanka. For people to apply what they learnt, she felt the need for a more holistic approach, i.e., providing raw materials, maintaining gardens, and consulting services for home gardening and composting. Thus, these became the pillars of the business. She wanted to create a ‘one-stop shop’ for urban gardeners in the city.

Guiding beginners in the urban farming journey, Priyanka suggests growing herbs and

*With inputs from Priyanka Amar Shah



Figure 20.1: iKheti, Mumbai Source: Swarnika Sharma

microgreens since they grow fast and require minimum maintenance. *“Growing herbs like pudina, tulsi, ajwain¹ sounds very simple, but more than 90 per cent of individuals whom I meet do not grow anything,”* Priyanka adds. In addition to setting up gardens at homes, iKheti scaled up their services to large communities, corporates, schools, and housing societies, offering unique services like butterfly parks and air-purifying plant gardens. In the city outskirts, they serve clients with large commercial farms, helping them with soil testing, irrigation systems, saplings, and guidance on how to grow efficiently. Gardeners and horticulture specialists from iKheti help identify the right seeds, inputs and combination of crops based on the location of the land, quality of the soil and preferences of the client.

iKheti also offers ‘do-it-yourself’ kits for vegetables and microgreens that one can buy from their Instagram and Facebook pages.

The kit contains open-pollinated non-GMO seeds, a jute container, biodegradable pot (for vegetables), a sprayer, a cutter, cocopeat, and an instruction leaflet to encourage kids and adults to start sustainably growing their own food. In addition, iKheti works with schools where they host a 12-session series called ‘sustainable living sessions’ teaching ways to grow, compost and recycle.

For Priyanka, iKheti is not just a business but a place to exhibit her love for growing. *“Once a luxury hotel purchased a few indoor plants from me but was unable to maintain them since they were kept in an air-conditioned environment with no sunlight. So, I replaced them with new ones suitable for such conditions, and I took back and revived the older plants too,”* she says, explaining how sustaining the plants is more important than a mere transaction of services.

¹ In English mint, basil and fennel



Figure 20.2: iKheti nursery in Mumbai Source: Maitreyi Koduganti

Livelihood and Training through Urban Agropreneurship

“Malis [gardeners] are the backbone of iKheti’s success,” prides Priyanka. *“We are like family. If they have to work overtime, they do so without any squabble, and I pay them for the extra hours.”* iKheti also supports their gardeners by providing two meals a day, daily travel allowances, and loans in times of emergency.

Most gardeners migrate from Uttar Pradesh, Bihar, and Chhattisgarh due to economically unsustainable livelihoods in their villages. Since they do not have enough documentation, they cannot avail loans from banks, and private moneylenders charge them a hefty interest rate, as much as 10 per cent a month. Therefore, loans and advance payments from employers like iKheti can create a much-needed safety net for the migrant labourers in times of emergency.

Over the years, more gardeners joined iKheti’s network, mostly through word of mouth. Today, the enterprise supports the livelihoods of over 40 gardeners and many other employees within the business operations. Priyanka also hired a horticulturist and a site manager for maintaining the nursery but could not continue the



Figure 20.3 DIY kit from iKheti Source: Swarnika Sharma

engagement during the pandemic. Currently, the horticulturists are mainly engaged in larger projects on the outskirts of the city.

Not all gardeners possess the necessary skills to engage with customers, and Priyanka also trained them in interpersonal skills, to better manage customers. This training was more personal than formal, and many gardeners in the company have been working here for over five years. Most migrant workers came from a farming background and were accustomed to using extensive chemicals on fields. Training them on organic farming within limited space was a challenging affair. She adds, *“Once they adopt organic farming practices, some of them carry it back to their native places and help spread the movement.”*

A gardener from Uttar Pradesh shared that his experience with the company has been very productive. He came to Mumbai for a stable livelihood and had been working with iKheti for the last three years. He says, *“What my farming was to me at home, gardening is to me in the city. Before iKheti, I was not able to find continuous work. Now, I work here and outside iKheti, and the training I received here has helped me find more work.”*



Figure 20.4: *Malis* working in iKheti nursery Source: Swarnika Sharma

Challenges in the Path

It was not a walk in the park for Priyanka, who entered the field without any formal training or prior experience. Owing to budgetary constraints, she started with just one gardener. But convincing customers about the importance of home gardening was a serious challenge. Since she started at a time when the concept of urban gardening was still nascent, she had to execute a couple of projects for free as a proof of concept. Priyanka and her team have trained over 25,000 people over the last eight years in setting up microgreens, self-watering planters, and general growing techniques. However, only 20 per cent of those who attend take-up farming seriously, says Priyanka.

Interestingly, being situated in India's commercial capital also posed some constraints. Unlike cities like Pune, Mumbai does not have a lot of balconies and terraces, and space continues to remain the biggest constraint. Owing to the growing space limitations in cities like Mumbai, iKheti is venturing into vertical farming and hydroponics. Furthermore, Mumbai's infamous rains that pour in intense spells also hamper the gardens, by either flooding them or infesting them with pests. The market for acquiring raw materials for

gardening remains highly unorganised. There is no one seller or standard price for gardening inputs. Priyanka, thus had to carefully build her networks over the years.

She also adds that many nurseries across the city offer ornamental plants rather than edibles or food crops. It is here that Priyanka envisioned to make iKheti a platform for individuals and communities that will enable them to grow healthy edible plants on their premises, while promoting sustainable and organic urban farming in Indian cities.

Working with schools and corporates, according to Priyanka, has been relatively simple as there are only a few decision-makers involved. But when it comes to setting up gardens within communities or housing societies, it becomes challenging since there are multiple perspectives which may not align. Also, despite nearly a decade's work, she has not been able to serve in all demographics and mainly caters to an upper-middle class population who are interested in organic farming and have access to additional spaces like terraces and balconies. However, she adds that the situation is changing. As people were forced to stay indoors during the COVID-19 pandemic, she witnessed a

higher demand for her services among people from almost all socio-economic backgrounds. *“A clear driver for this change includes understanding the importance of immunity. Fitness and health have become a priority for most people. Eating right and growing what you eat have been the main activities that people want to start,”* says Priyanka.

Towards Sustainable Urban Agriculture Entrepreneurship

Despite the challenges, iKheti is attempting to create a few lasting tangible and intangible impacts on environment, health, and well-being. Priyanka advocates for urban agriculture as not just a hobby but a way of life. She calls for such behavioural changes at the early stages through schools, because she feels that it is easier for children to take up a new habit compared to adults. By setting up gardens in schools and academic institutions in over 50 institutions till date, iKheti creates an ecosystem of teaching where children learn how to grow, compost, and recycle, making urban agriculture a part of their daily lives.

As iKheti attempts to expand and upscale its operations across multiple cities in India, their diverse undertakings demonstrate the potential of urban agri-businesses to generate livelihoods, while promoting sustainable farming practices and lifestyle choices. According to Priyanka, policies in India do not particularly focus on urban agriculture. *“We have schemes on waste management and composting, but they do not include the practice of growing food in the city or generating livelihoods through urban agriculture. Hence, it is imperative that policy thrust happens in this direction,”* she says. Currently, as India redirects its focus on green jobs, recognising the potential of enterprises like iKheti to generate livelihood for skilled and unskilled labour among economically weaker sections, in addition to promoting urban agriculture for a sustainable and healthy city, must be recognised and strengthened.



21

An Innovative Venture of Mrudgandh Farms: Transforming City Dwellers to Urban Farmers

*Pragati Khabiya and Gayatri Naik**

Background

Living within densely built-up cities, with very little land available to expand, buy, or lease, city dwellers find it difficult to farm or grow their own food. Moreover, the investment to set up a farm and the time and effort required for maintenance is not easy for people with jobs and other commitments. Given these limitations, one must travel far to rural areas or towns beyond the city boundaries to carry out any agriculture-related activities. Mrudgandh, an urban farm in the Vadgaon Khurd area of Pune, is a recent initiative that addresses this, enabling city dwellers to rent a piece of land to grow their own vegetables. Creating such a space within the city was brought to life by two friends, Abhijeet Tamhane and Pallavi Pethkar.

The Motive

Abhijeet and Pallavi's familiarity with farming since childhood and passion for nature prompted them to start a space that allows city dwellers to explore farming and grow food without worrying about owning a piece of land. The initiative not only provides organic farming enthusiasts an opportunity to grow their own food but also an activity for rejuvenation while 'learning by doing'. Abhijeet Tamhane, with more than two decades of experience in digital marketing

and event management, handles the business and commercial aspects of Mrudgandh. Pallavi Pethkar brings her expertise in landscaping and ecological planning to the project. According to Pallavi, working in the soil and spending time farming *"has a positive impact on personal well-being. Some families have also expressed that nurturing their plots gives them much-needed time away from screens."*

The Process

Abhijeet and Pallavi had been thinking about this project for a long time, but they conceptualised it in June 2020. The project aimed to provide an accessible farming space within the city, negating the need to travel far. Luckily for them, a few friends owned vacant agricultural lands (Kodre Farms) that were ideal in terms of location and lease. Most community farmers in Mrudgandh lived within a 5 to 10 km radius of the farm.

After leasing the land for seven years, they tested the soil quality in government-run labs and developed a sample plot where they tested what types of vegetables could be grown, and the quantity and quality of the produce. The experiments showed that a plot of 750 sq. ft was adequate to cover vegetable needs for a family of four to five. Based on this, the entire plot was

*With inputs from Abhijeet Tamhane and Pallavi Pethkar

developed by de-weeding, soil loosening with tractors, and allowing herds of goats on the land for three months to get manure. Once the soil was ready, plots were designed.

Services Offered

Within a total area of 1.6 acres, Mrudugandh Farms has carved out 70 plots each measuring 750 sq. ft.

The plots are rented on a subscription-based model – for a monthly fee of INR 3,750, either for six months or a year. The annual fee is INR 45,000. Renters can take home all the harvest in their plots. Abhijeet and Pallavi visit the farm every day



Figure 21.1: Mrudugandh farms is surrounded by residential buildings. Many city dwellers find it an easily accessible way to farm **Source:** Pragati Khabiya

to assist the members in setting up their plots and help in sowing, choosing, and collecting the harvest. They prepare the plots by recreating the soil bed when new bookings are taken, or a new plot is used, which helps the members to sow or plant saplings easily. Abhijeet and Pallavi help the members mix manure into the soil the first few times. They also guide and assist them in choosing the vegetables according to their preferences. Members are free to bring their own seeds or saplings or buy the saplings sold at the farm for INR 250–300 per month and tools and manure are provided at the farm.

Vegetables grown on the farm include tomatoes, brinjal, ladyfingers, calabash, cabbage, leafy vegetables, broccoli, lettuce, ivy gourd, carrots, kohlrabi, and herbs such as curry leaves, kale, basil, and coriander. Some members have also planted roses and marigolds. Water is supplied from a well through pipes and sprinklers to all 70 plots. The service is included in the monthly/yearly payment. Four caretakers have been appointed for everyday maintenance of the plots.

Challenges, Responses, and Outcomes

Pallavi and Abhijeet said Mrudugandh's urban farmers initially expected a quick harvest. However, when they underwent the process themselves, they realised that farming needed patience. Unprecedented situations like crop infestation or heavy rainfall proved a great learning journey for the members.

Apart from that, some people would calculate the money they spend on getting vegetables from the market to the costs of our subscription model that gave them the services to grow their own food. However, with time, they realised that the benefits from growing their own food surpassed the time and money invested. The motive of hands-on learning and working directly in the field has made many appreciate the efforts that go into producing food. Word-of-mouth marketing also attracted several urban farming enthusiasts to Mrudugandh and at present, 65 out of the 70 plots are booked.



Figure 21.2: Bamboo sticks demarcate each member's land
Source: Pragati Khabyia

IT professionals and people above 50 years have shown most interest but recently, younger people, in the age group of 25–30 years, have started engaging with the initiative.

Neha and Varsha¹ are two friends who purchased a plot together. Varsha said, *“We look forward to coming here every week and working on the farm. I live 4 km away, and Varsha lives 8 km away. The commute is short and easy. When the harvest is surplus, we share it with our house helps and friends.”* Neha said that her mother observed that the leafy vegetables grown on the farm tasted better than the ones in the market and also took less time to cook. *“Having caretakers here is a big advantage since we do not have to worry about maintenance. I have also learned about the varieties of vegetables and flowers I can grow, the best season to grow them, and the time it takes to grow,”* she added. Pallavi shares, *“We have witnessed children and their families actively participate and eager to learn how to grow their own food. All our members visit the farm at least once a week, depending on the activities and the crops to harvest. During the COVID-19 lockdown, we couriered their produce. We love to watch the joy on our members' faces when they harvest their first produce.”*

¹ Names changed



Figure 21.3: Soil beds help grow a variety of vegetables in the available space
Source: Gayatri Naik

Future

The duo plans to expand the initiative to nearby areas, especially in townships with ample space for cultivation. In 2022, Mrudugandh expanded to Chavan Farms near Amanora township, Hadapsar, in Pune. They have also established their base in other neighboring cities.

Models such as Mrudugandh Farms demonstrate how bottom-up enterprises can provide city dwellers a space to farm. Primary benefits are growing fresh, healthy vegetables, while secondary benefits are improved diets, environmental awareness, and creating a community of like-minded citizens. The Mrudugandh example also shows how urban farming can become a thriving enterprise.





3

Gender, Equity and Well-being

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22

Women Animal Rearers in Delhi

Debapriya Chanda, Radheshyam Mangolpuri, and Rajendra Ravi

Introduction

In the many informal settlements and so-called ‘unauthorised’ colonies of Delhi, women rear goats, pigs, and poultry for subsistence and sharing. Conversations with a few of these women present a different imagination of urban life in the middle of dense human settlements, where trees or vegetation are sparse. The lives and livelihoods of these women also offer a glimpse into the gendered dimensions of work and leisure in Indian metropolises.

Lived Experiences of Women

Ruby Yadav lives in Sharda Vats Colony in Prem Nagar, next to the railway tracks. Her two-storeyed house is located in front of a temple at



Figure 22.1: Women have been doing animal rearing in migrant and displaced communities in areas like Gautampuri, Delhi
Source: Avikal Parashari

the end of a narrow lane. Ruby is a middle-aged woman hailing from a village in Uttar Pradesh’s Kannauj district. Although she comes from a family of traditional livestock rearers, animal rearing in Delhi started as a hobby for her. While she pursued other professional pathways, her love for nature and animals drew her to livestock rearing. Currently, she raises a few dogs, rabbits, and white rats. She also feeds pigeons and sparrows in the neighbourhood. She has cared for cows for about 15 years, between 2003 and 2018, healing injured and diseased cattle and restoring them to strength. In her own words, she develops a bond with the animals she rears, which makes it difficult for her to sell them or their products for profit.

Ruby purchases animal feed from the market. She has tried to grow plants like *tulsi*, *mogra*, and *peepal* in the space in front of her house, but her efforts have not been successful owing to open drains near the garden patch that prevented healthy plant growth. However, Ruby is not one to give up and works in the garden for two hours every day, trying to grow vegetables. She uses animal manure as fertiliser for the garden, and part of the waste from the garden becomes fodder for her animals. In this way, livestock-rearing activities and gardening complement one another.

Pushpa Devi, a resident of Prem Nagar, has been rearing animals in the space beside the two houses she owns — a 40-yard and 25-yard plot, respectively. She has nearly 10 years of experience

in cattle rearing. Two of her cows were poisoned, and she has been fighting the case in court. The incident has made her reluctant to continue rearing cattle. It also highlights the precarity of livestock-based income. She has a dog, a goat and its two kids, and four hens. She uses fruit and vegetable peels from her neighbour's juice stall as feed for the goats. She also feeds them wheat and barley straws. She does not take the animals for grazing elsewhere, ensuring adequate nutrition at home itself. She keeps a strict vigil on the goats due to the frequent instances of stealing and poisoning in the area.

Despite high demand and price of INR 1,000 per litre, Pushpa Devi does not sell the milk. Instead, she shares it with her neighbours for free. She used to sell cow milk in the past and used the revenue to meet cattle-rearing expenses. However, according to Pushpa Devi, goat rearing has its own distinct advantages; it is low-maintenance and cost-effective. Goat milk is healthy and can be sold for meat, and goat kids also fetch a good price in the market. Pushpa Devi uses the same strategy with her poultry. Instead of selling the eggs, she waits for them to hatch and then sells the chicks for a higher profit.

Challenges and Opportunities

Some goat rearers graze their animals in an open field near Burari in the afternoons and early evenings. This field, which now lies fallow, was used for cultivating a variety of vegetables and crops until a couple of years ago. Though livestock rearers of both genders graze their animals here, women make up a prominent section. One of the women, 40-year-old Samina Khatun, grazes her two goats here. She bought the goats for INR 8,000 on the occasion of Bakri Eid and was tasked with their care till the following year's festival. She says that animal rearing has allowed women to step outside their homes, interact with their friends, and enhance their social lives.

Animal theft from streets and houses is the biggest challenge for livestock rearers in this area. Sixty-year-old Kamlavati claimed that 11 goats were stolen from her neighbour's house recently and almost lost her own goats during a house break-in in the summer. The stolen goats are sold to butchers. Kamlavati recently sold two of her goats for INR 2,500 and INR 5,000, respectively. Animal rearing allows her to spend her time in a productive and healthy manner and meet other women.

Leela, a 50-year-old Dalit woman and her son rear pigs. They live in a makeshift hut in a slum on the fringes of the city, rearing pigs in a small, confined space. Though she has been rearing pigs for about 20 years, her earnings have never been enough to save money and just about meet her daily expenses. Pig rearing has become a risky activity, fuelled by the transfer of urban commons to private capital across the city, resulting in the loss of open spaces for pigs to move around.

Conclusion

Although livestock provides a livelihood opportunity to women in the city, the rapid shrinking of urban commons makes it unreliable. Moreover, the gendered definitions of work and leisure put women animal rearers in Delhi outside formal policy, as their efforts are often not counted as work. This invisibility significantly exacerbates the precarity in their incomes, which further contributes to food insecurity. Most women, especially those with larger families, cannot keep more than four goats at a time due to space constraints. Many are unaware of existing schemes and protections they can claim. Greater inclusion of women animal rearers in urban policy is essential for recognizing their labour as a vehicle for overall community well-being.

23

Women's Agency and Urban and Peri-urban Agriculture in Delhi

Peehu Pardeshi and Soma K P

*'Mere dada ne nadi aur kuwaan dekha
Mere papa ne nal dekha
Mein ne botal mein paani dekha
Meri agli peedhi kyaa dekhegi?'*

'My grandparents saw rivers and wells
My father saw the tap
I saw water in a bottle
What will my next generation witness?'

Evolving Farming Communities in the Urban Context of Marginality

City dwellers in slums often migrate from rural areas to seek livelihood opportunities but are resource-poor and live in squalor and congestion. In these conditions, building an environmental program that empowers women is a challenge and an opportunity.

The COVID-19 pandemic magnified rural-urban linkages when urban migrants were compelled to return home to rural areas, reflecting their lives at the edge of the urban economy. Other marginalised populations that have permanently migrated to cities had no such choice and were captive in their homes during the lockdown with little access to wages and income opportunities.

Action India, established in 1976, with a vision of a gender-just egalitarian society has consistently undertaken several initiatives in and around Delhi to organise women from marginalised

communities for leadership, to resist violence and atrocities, claim their space as citizens in the city, demand entitlements, and influence governance systems in their localities. The present effort was undertaken within a project named Clean and Green Delhi NCR (implemented in 2019–20) to encourage communities to adopt and experiment with ecologically resilient activities in their neighbourhoods. It piloted urban agriculture and micro gardens in informal settlements, examining their potential to meet equity and gender goals.

Project Area

Action India and Action Aid Association (AAA), along with DXC Technology India, reached 5,000 women to experiment with creating environmentally sustainable development models for a clean and green Delhi. The project engaged with 10 schools and 10 slum and resettlement colonies for 18 months.

These *bastis* (slums) have come up as a consequence of rehabilitation efforts by displaced populations and are marked by poor civic services and high congestion. Women from the *bastis* are primarily employed in the informal sector, working mostly as domestic workers, piece-rate workers, beggars, or waste collectors. Average family size is higher than the city average of 4.2 members. It is in this context



Figure 23.1: Depiction of multiple land use **Source:** Peehu Pardeshi and Soma K P

that an environmental intervention holds specific significance as enabling communities and women to make visible and positive sustainability efforts.

The planting work happened mostly around *pucca* houses. The residents cleaned up the surroundings and planted trees and plants. People also cleared waste and open defecation areas to make space for gardens. To address

the open defecation issue, the women lobbied for toilet facilities.

Strategy and Implementation

Home gardening is often considered an elite or middle-class activity. There is a common perception that only people with a terrace, balcony, or a large windowsill can grow plants in the city. However, this initiative challenged this paradigm, showcasing how even the poorest communities are changemakers and actors for ecological resilience, pollution control, waste disposal, water conservation, and better personal health.

Initially, the families were reluctant to implement the project despite showing interest as they felt the space was inadequate. However, the team from Action India engaged with women and children holistically through awareness campaigns, training programs, and street plays to educate them about the judicious use and reuse of water, composting kitchen waste, use of compost as manure, the importance of toilets, gardens, and public spaces. Gradually, the people warmed up to the idea of growing plants.



Figure 23.2: Recycling old container pots **Source:** Peehu Pardeshi and Soma K P

Choosing the Right Plants

The choice of plants was based on their medicinal and nutritional value. Some of the plants proposed were *tulsi* (holy basil), neem, *ajwain* (carom), garlic, *genda* (marigold), rose, and ginger. Vegetables such as bitter melon, coriander, banana, papaya, French beans, broad beans, climbers, ladies' finger/okra, brinjal/eggplant, green chillies, and lime were cultivated in pots, drums, and recycled containers. Plants such as neem, *sadabhar* (periwinkle), moringa, curry leaves, snake plant, money plant, and *pathar chatta* (succulents) were also planted.

Outcomes

Organic plantation was one arm of the bigger initiative '*Khud Ugao and Swasth Khao*' (Plant Healthy and Eat Healthy) campaign where nearly 350 families started planting vegetables at their homes. They produced about 3 kg of organic vegetables every week. Approximately 25,000 kg of organic vegetables have been produced through the project intervention.

Don't Think of Waste as Waste: The workshops on waste management proved effective as many women in the community started making compost using tea waste and wet waste and using them in their gardens.

The community representatives reported an improvement in personal wellness as well as the taste of food ever since they started cooking the produce from their gardens. Women expressed joy in planting and working with soil, bringing back memories of rural childhoods and giving them a sense of hope. A few women also reported saving up to INR 3,000 per month in medical costs. This urban farming initiative provided a sense of control over their lives, well-being, and environment, especially during the pandemic when there was distress and isolation.

The success of the initiative prompted more members of the community to take up urban

farming in their houses. Seeds and saplings were shared with them. As a result, most rooftops in these settlements sport the look of a lush green garden while the residents continue to plant more saplings.

The women's groups demanded community toilet facilities, parks, and gardens from the local municipal council. They even asked for a presentation of the budget earmarked for the development of their community from the local government bodies. This kind of solidarity was possible only because people united to pursue a common cause.

The families benefited as they worked together and children found motivation from such work. Men were initially resistant but later realised the benefits of composting and obtaining local produce from their plants. A couple of men also emerged to bring plants of their choice to promote greening.

Challenges in Implementation, Operation, and Maintenance

Behaviour change

Food and livelihood are the primary concerns in a community with limited education and earnings. Their priority to environmental concerns seldom designed to suit their needs is relatively low.

Working with women

Mobilising 5,000 women and making them Green Ambassadors after household work was challenging. Initial bottlenecks of space and time were overcome by knowledge sharing, distribution of saplings, and discussions to supplement resources with low-cost options. For example, bottles with holes punched in them were used to grow garlic. Films on environmental issues such as plastic use, water scarcity, and climate change were screened. WhatsApp groups were formed to share information.

Government support

The initiative received limited support from the authorities. Government personnel participated in plantation programmes and helped remove waste from streets once they realised that communities were keen to change their environment. Wall art was used to spread green messages for which the government departments allowed painting. Messages for waste segregation, greening, and composting were spread through the wall art, along with the ways of managing waste and avoiding poor sanitation. The municipal corporation *safai karamcharis* (sanitation workers) were involved in supporting public meetings and assisting in cleaning the areas. Such Municipal Corporation of Delhi functionaries were also awarded and given recognition for their work and support, something that rarely happens. This led to their motivation in all areas.

Councillors in every area ensured support for the work and encouraged the work to be supported. The mayor was approached for support and provided support to clear areas of encroachment and socially negative activities, for activities with children and women, and gradually the space came to be occupied for leisure, recreation, and greening initiatives.

Lessons for Policy and Practice

This initiative does not require a huge investment in space and money and can be adopted and replicated in other low-income communities. Community cooperation and solidarity, in addition to capacity-building initiatives, will help sustain such interventions. Government support and recognition will go a long way in institutionalising these efforts. Some ways to scale this up are:

- Include such initiatives in local solidarity development and climate resilience building activities;



Figure 23.3: Negotiating slum space to accommodate the plants **Source:** Peehu Pardeshi and Soma K P



Figure 23.4: Young women take the lead in sustaining the plants, involving children and youth in the greening project **Source:** Peehu Pardeshi and Soma K P



Figure 23.5: Woman in informal settlement tending to plants
Source: Peehu Pardeshi and Soma K P

- Explore solidarity supply chains for direct sale of produce. Women's collectives can carry this forward by networking with other NGOs and training more women;
- Explore nursery projects as a means of livelihood and maintain parks and other public spaces, with the support of local political leaders and councilors. It also presents opportunities to converge with state initiatives through the Haryali programme for which the government provides saplings;
- Strengthen initiative with insights from ecologists on native species of plants which will contribute to sustainable development.



24

No Greens on the Plate! Bringing Urban Farming to Underserved Communities

Suchismitha Pai

Supriya Bhadakwad, a waste picker in the sprawling city of Pune and a board member of SWaCH¹, has been collecting waste for over two decades. She has won several accolades for her service to the city and the waste pickers, especially during the recent pandemic. Yet, she is often unable to provide enough green vegetables on the plate at family meals.

Accessing safe and healthy food is as challenging as accessing clean drinking water in cities, particularly for underserved communities. Waste pickers, one of the underserved communities, are always on their task to make cities free of waste piles. This is a story of a few innovative waste pickers who, when deprived of greens during the COVID-19 pandemic, made some forays into urban gardening, highlighting challenges as well as new possibilities of accessing safe and healthy food in their settlements.

Supriya has been a waste picker in Pune for over 20 years. What started out as an informal work of scavenging from bins and roadsides was eventually formalised into a group of 3,600

waste pickers who follow specific rules and schedules for waste collection across the city. They have enabled the city to be bin-free to a large extent and saved the city money that would have otherwise been spent on collection and transport of waste. Despite their significant contribution towards keeping the city clean, their daily earnings do not allow them to put a healthy spread of meals on their plates.

Groceries such as millet flour, rice, and sugar are staple foods distributed through ration shops and also available at shops. However, their access to fresh vegetables is subject to price and local availability, which means that they often have to do without them and use lentils or dried legumes. *"We could not buy vegetables and leafy greens for more than two months during the COVID-19 lockdown. We occasionally eat meat and eggs, but we cannot afford them on a regular basis. Who would have thought the staple would become a rare delicacy we crave?"* Like many others, the waste pickers too were unprepared for the COVID-19 lockdown and ran out of groceries soon. The challenges prompted

¹ SWaCH is a self-sustainable social enterprise of waste pickers aiming to improve their living conditions, with a focus on sustainable solid waste management (SWM). It is India's first fully-owned cooperative of self-employed waste collectors and other urban poor. It is an autonomous enterprise that provides front-end waste management services to the citizens of Pune, covering over 8 lakh homes in the city. Nearly 3,800 waste pickers divert over 70,000 tonnes of dry waste annually, which would otherwise end up in landfills, and provide composting services to some societies. Their mission is to engage an entrepreneurial workforce of waste pickers into an efficient, responsive, and accountable organisation and work in partnership with the Pune Municipal Corporation.

the waste picker communities to think about how they could make use of whatever little resources they had to grow their own food in the available space.

Asha Thorat and Purnima Jadhav, who live in less than 200 sq. ft homes in the *bastis* of Pune, started growing hardy plants in small spaces within or near their homes. Asha even experimented with onion, garlic, and guava. Curry leaves, chillies, and roses were the preferred plants, as these were less likely to be eaten or vandalised.

Significance of Growing Food within the Settlements of Underserved Communities

Asha Thorat says she grows these plants solely for the joy of it, and not for reaping monetary benefits. *"Waste is what remains at the end of the life cycle while a life emerging from a seed is the beginning of life. We do one with great efficiency, why can't we do the other?"*

Gardening provides benefits that extend beyond the practical or material benefits, such as the harvest. For Purnima, one of the greatest pleasures during the lockdown was picking chillies off her solitary plant. *"With the lockdown confining us to our homes, I watched them grow, and I understood why people get so enthusiastic about their gardens,"* she says.

Kitchen gardens generate awareness about nutrition and health benefits. Experts on women's health have identified the consumption of foods rich in iron, such as leafy green vegetables, as one of the most effective ways to eradicate iron deficiency and anaemia. Growing one's own vegetables provides further encouragement to add these greens to one's daily diet.

While there is a growing interest within the waste-picking communities to grow food, there are numerous challenges too.

Space constraints

Availability of space is one of the most important factors that prevents people in waste picking communities from growing their own food. Apart from land and/or space, waste pickers also lack access to other resources like soil, seeds, and tools to nurture plants and harvest any meaningful amounts of produce.

Lack of knowledge and training

Creating vertical gardens, planting fast-growing crops, securing the produce, and harvesting require expertise and skills, which the waste pickers do not possess. Urban farming is relatively unexplored and traditional knowledge seems to be inadequate.

Security and sharing

Casual vandalism of property, including plants, is prominent in small settlements. Damage to pots during vehicle or people movement and goats or other animals eating the plants are severe constraints to growing plants in these spaces. Rekha Shirsat, a SWaCH member notes, *"A wandering goat might make a meal of them [plants] or anyone could take them away, including a neighbour. How can we prevent that?"*

Though the availability of water is not an overwhelming issue in most parts of the city, it does pose a problem during summer, when nurturing the gardens is difficult. *"With a little direction and support in terms of skills and infrastructure, we could grow greens,"* adds Rekha.

How It Could Come Together

The majority of the waste pickers were happy to spend some of their time gardening and learning how to grow food. They felt that it kept the children and youth occupied, allowing them to learn how to grow and nurture. However,

they need support to start. *"Teach us how to make our roofs strong, tell us how to take care of our plants despite the challenges we face,"* says Supriya Bhadakwad, a waste picker from Jai Bhavani Nagar *basti* in Kothrud, Pune.

In these circumstances, creepers and prolific climbers like bottle gourd and pumpkin would be good choices as they can be trained to grow vertically and take up little space while giving enough in return. Growing a mix of food plants and thorny plants would minimise the risk of plant damage by goats and other small animals.

Paving the Way for More Greens

Underserved communities in urban areas like the waste pickers of SWaCH often struggle to include green vegetables in their daily diet, leading to poor health, especially for women. Enabling any form of farming/gardening in these communities requires space and infrastructural support. The School Nutrition (Kitchen) Gardens Guidelines², issued by the Ministry of Human Resources Development in May 2019, is a unique opportunity that aims to involve waste pickers to source paper for recycling and hopes to extend to include training for waste pickers on green nursery skills.

Apart from immediate benefits such as easy availability of vegetables, gardening could also have enhanced benefits such as higher productivity, better emotional and psychological health, greater health awareness, and lower public healthcare costs.



² Ministry of Human Resource Development (2019). *School Nutrition (Kitchen) Gardens Guidelines*. Retrieved from https://samagra.education.gov.in/docs/SNG_Guidelines.pdf

25

Transforming a Tiny Terrace into a Flourishing Vegetable Garden

Ashwini Gajendran

The Beginning

I started a terrace garden at my home in 2017 after we relocated to the outskirts of Bengaluru. Moving away from the city centre meant vegetable shops and restaurants were far and sudden cooking plans could be an issue. So, I started growing a few plants like tomatoes, chillies, coriander, and hibiscus on my terrace, essential for cooking and pooja. Garbage disposal, especially wet waste, was also an issue as the waste collection time and my office hours overlapped. Hence, the need for composting arose. Gardening, which thus began as a necessity, later became a hobby that changed my lifestyle, including the way I cooked, shopped, dined, celebrated festivals, managed my home, and spent my free time. My small terrace garden offered solutions, albeit small but significant, to some of the civic as well as cultural challenges the city has been facing — from waste disposal to ornamental gardens taking over food gardens, to forgotten food recipes, to gadget addiction among kids.

Initial Challenges

Space

I was new to gardening, especially growing vegetables. Due to lack of space for an in-ground garden, I utilised our 800 sq. ft terrace to grow essential vegetables, flowers, and fruits. However, choosing the right kind of containers and potting

the soil and manure was a challenge. The terrace had a single drain outlet, so I had to keep the containers at an elevation for easy flow of water. The weight of the containers was important while choosing the potting soil. I found that cocopeat mixed with soil and vermicompost made for a lighter potting mix, and I could move the containers around effortlessly. The cocopeat also retained water, which helped manage watering problems.

Procurement

Procuring materials to set up the garden wasn't as easy as I thought. I experimented with growbags, buckets, bathtubs, and rice bags for potting containers. I scoured local markets, online stores, and nurseries for economical and good quality vermicompost and cocopeat. I started by planting seeds from my kitchen spices to grow *dhania* (coriander), chillies, mustard, *methi* (fenugreek), peanuts, and tomatoes, among others. Almost everything, from sprouts in the vegetable shops to roadside samplings, was tried out in the garden. To cut costs, I bought potting stands from a local nursery store and used wooden planks.

Harvesting Begins

The first harvest from my organic vegetable garden was tomatoes. By the end of 2017, when tomato prices were soaring, I did not have to spend a penny on it as my garden was producing



Figure 25.1 Ashwini Gajendran's terrace garden Source: Ashwini Gajendran

them in abundance. This encouraged me and changed my family's perspective towards gardening. No longer did they consider it a waste, but also started helping me maintain and improve the garden. By this time, the flowers started contributing to the daily prayers, resulting in a direct saving of INR 20 per day. Eventually, I started harvesting brinjals, kohlrabies, peanuts, radishes, greens, and so on. Soon, homegrown produce replaced the store-bought varieties in my kitchen. My family acknowledged the freshness, taste, and variety.

Now, we celebrate festivals with what is grown on the terrace. Flowers, seasonal fruits, vegetables, and even plantain leaves to serve food were grown at home. Our festival savings were in thousands, the quantity of products we used reduced and the quality was better. We realised the amount of waste we used to generate by buying excess flowers, fruits, and vegetables every festival season and how we could celebrate in the same spirit by going minimal.

We also composted the kitchen waste, which

removed the need for buying compost. This process initiated a kitchen-to-garden and garden-to-kitchen cycle. We no longer contributed to the city's wet waste and disposed of only non-recyclable items.

Unpredictable Challenges

Bandicoots

At one point, the tomatoes were found bitten into or half-eaten. After a few days of investigation, I realised that the culprits were bandicoots and not squirrels as I had initially assumed. I was shocked to learn that bandicoots could climb three flights of stairs to the terrace to damage my garden. Besides, the earthworms in the pots were also attracting bandicoots. I sealed all possible entry points, but the rodents still cause occasional trouble.

Pollination

My pumpkin vine was flourishing well. The leaves were huge and green and flowers were in



Figure 25.2: Harvest from Ashwini's garden Source: Ashwini Gajendran

abundance, but there were no fruits even after months. Despite adding more compost/manure, there was no change. After much research, I found out that it was due to absence of pollination. I immediately added flowering plants that attract bees and learned hand pollination for quick remedy. Seeing the first fully-grown pumpkin was sheer joy. The bee-friendly plants help my vegetables, gourds, and squashes grow easily.

Pests

As my plants grew, I started learning about pests like mealy bugs, stink bugs, aphids, whiteflies, and grubs to name a few. I realised that spraying organic pest repellents could harm even the friendly/beneficial insects, hence I reduced their usage. I experimented with companion plants and harbouring friendly insects to control pests. Ladybugs took care of aphids and dandelion weeds helped by distracting the aphids. Sweet potato plants distracted and harboured the whiteflies without compromising the potato yield. Marigolds repelled pests and also took care of nematode issues in roots. Stink bugs were eaten by tiny birds visiting the terrace.

Waterlogging

The building plan did not include drainage exits on the roof as the garden was not in the initial plans. The terrace had only one drain exit. The leaf litter often blocked it, stopping rainwater from flowing to the regeneration well. Periodic clearing of fallen leaves is, therefore, important. Planning proper drain exits can prevent this problem to a large extent. Once waterproofing and drain exits are in place, most buildings can accommodate gardens without fearing leakage or damage to the structure. Households can also use rainwater harvested from rooftops to water the plants.

Watering the plants

My work demands me to be at the office as early as 8 a.m., and my working hours extend till late evening. Watering the plants in such situations is difficult, but the use of cocopeat and high organic components like home compost has helped to a large extent by retaining water. Clustering the plants by their height and width helped control evaporation and drying of the containers. Drip irrigation could also be a reliable solution during hectic schedules.



Figure 25.3: Fresh fruits and vegetables from Ashwini Gajendran's garden—(from left) tomatoes, sweet potatoes, strawberries, and grapes **Source:** Amruth Kiran and Swarnika Sharma

Fertilising

I experimented a lot with store-bought vermicompost, but when I grew suspicious of its 'organic' purity, I moved to home compost and farm-based compost, which were considerably safer. Good soil health meant healthier plants, so I started experimenting with organic inputs like jeevamrutha (a cow-based microbial preparation beneficial for plants), homemade bio enzymes, compost leachate, kitchen wastewater and so on.

Takeaways from My Gardening Experiments

The greenery and the satisfaction of growing my own food and composting waste have changed my lifestyle. My respect for farmers has increased manifold; gardening has helped me relate to their hardships in growing food. I have since controlled and avoided wastage of food as much as possible. My health has improved with pesticide-free food, and the exposure to the sun and the soil is doing wonders to my mind and body. My husband and children also realise the

benefits of home gardening and now contribute to the garden's maintenance. My monthly expenses on flowers and vegetables have reduced significantly. We cook and eat different varieties of vegetables. The temperature in the room right below the garden has reduced considerably. Since no chemical alternatives were used for the plants, I permit my family to taste the raw produce from the garden without reservations. The herbs are always reliable for quick home remedies for minor health concerns. Composting has helped me manage waste at the source, reducing our family's contribution to the city's waste.

Gardening has also made me more active physically. It gives me a platform to connect to fellow gardeners and gardening enthusiasts. Moving forward, I feel we could work as a team and support budding gardeners by sharing seeds and saplings from our gardens, thereby creating a seed bank of sorts.

26

The Farm by Protecterra, Pune

Pooja R Bhale

In today's frenetic world, there is an urgent need to stop, think, and reflect. With rapid urbanisation and the associated stress that comes with city life, people are getting disconnected from nature and themselves. Spaces that allow for genuine connection, regeneration and rewilding are often located far away from city centres and not easily accessible. The Farm by Protecterra¹, based in Pune, offers sustainable living, learning, and leadership with respect, responsibility, and compassion. The pillars of this project are love for the self and the earth, an awareness of our surroundings and ourselves, and learning from the animals and nature.

The Initiation

Most urban dwellers lead busy lives. Though there is a yearning to slow down and be amidst nature, places they can access on short notice without the need for vacations or absences from work are rare. The Farm aims to connect people from all walks of life to nature, animals, and themselves.

Located atop a hill on a quiet road within the city limits of Pune, easy access to The Farm is key to its engagement model. The Farm, spread across 2 acres of land, is built on the founder's familial land. When they started the initiative in 2011, the area was a barren land devoid of greenery and

biodiversity. Over the years, it transformed into a green escape from the chaos and disconnect of city life. In 2015, The Farm hosted five rescued elephants, and watched wild pumpkins and cucumbers grow. With time they realised that such lush growth came from elephant dung, a natural fertiliser. Amidst many such learning experiences, The Farm planted more than 18,000 trees, herbs, and shrubs. It is also home to over 40 animals (nine dogs, 28 goats and three cats).

Keeping in line with goals to be sustainable, with minimum carbon footprint and least externalised costs, The Farm is minimalistic — nearly 80 per cent of the space is made from scrap, upcycled,



Figure 26.1 Animal shed at the Farm Source: Amruth Kiran

¹ (n.d.) *The Farm*. Protecterra Ecological Foundation. Retrieved from <https://protecterraef.org/the-farm/>

donated, and repurposed materials with minimal use of concrete. Simple cottages, open-air sitting areas and natural buildings have been made using discarded tyres, construction debris and material, household stuff, and nature itself. This has allowed The Farm to flourish and rewild, increasing its biodiversity.

The Model of Community Engagement at The Farm

The Farm is open to everyone across all ages, genders, and backgrounds. Various engagement models allow for an authentic connection between the visitor and The Farm. The primary audience consists of but is not limited to:

- People keen on connecting in a deeper, more meaningful way to nature and themselves;
- Practitioners of sustainable and conscious lifestyles;
- Families that want to engage with soil, animals, and plants;
- Other custodians of land who want to create similar projects

The Farm offers short-term and long-term experiences and opportunities to bring about environmental awareness and behavioural change among people. Each offering aims to help people rewild a part of themselves. Most short-term engagements, such as day-long visits or one-off farm experiences, are intended to spark curiosity in people to engage and immerse themselves in nature. Nearly 70 per cent of visitors either revisit or partake in long-term activities, and almost 95 per cent of visitors refer others to The Farm.



Figure 26.2: (top) Construction and other scrap material stored for upcycling; (middle) Growing bed made from discarded glass bottles; (bottom) Discarded tyres used for growing
Source: Amruth Kiran

Long-term Engagement

All projects under Protecterra are aimed at long-term engagement and impact. The Farm offers several immersive experiences:

Residential Community is a programme that spans from a week to a year. Volunteers usually work and receive complimentary accommodation and pay for food. They engage with all the ongoing activities on The Farm. Long-term residents pay a subsidised cost, which allows them to stay on and continue their regular professional jobs.

Young Naturalists Club (YNC) is a weekly initiative for children to engage with nature and build leadership skills and compassion.

Community-Supported Agriculture and Conscious Living Memberships (CSACL) is a 15-to-36-week engagement where members can rent 10,000 sq. ft of land to cultivate herbs and vegetables. Membership provides access to fertile land, a chance to grow their own food and engage with a like-minded community. The CSACL membership allows urbanites to work with soil, plants and animals and addresses the 'nature deficit disorder' inherent in urban landscapes.

Internships and Volunteers: The Farm has a wide network of volunteers and interns who engage with the space and its philosophy for their study requirements, capacity, and resume building.

More specifically, CSACL membership includes access to the farm six days a week from 7 a. m. to



Figure 26.3: Farming plots for Community Supported Agriculture Source: Amruth Kiran

7 p. m. In times where terrace and balcony gardens are gaining popularity in Pune city, access to open land close to home and learning to grow and farm vegetables is an attractive option for many. The members receive seeds, saplings and assistance for hands-on farming and zero-waste living on a 10,000 sq. ft of community land. They undergo two capacity-building workshops that guide them on how to plant, maintain and harvest. They get access to the eco-library and participate in potlucks and cookouts. The only commitment from members is to visit every week for at least two hours to tend to the farm and partake in community activities. CSACL memberships are open for nine months and offer various financial models catering to individuals and families.

Challenges and Impacts

Projects such as The Farm are highly dependent on a dedicated workforce. Finding long-term workers has been one of the biggest challenges. Building a sense of belonging within permanent staff and creating an equitable system has proved more complicated than imagined. The continuous turnover of on-farm staff and their capacity building resulted in several delays related to scalability and decentralisation. Energy investments, micromanagement and continuous requirements for maintenance and troubleshooting have also been challenging.

Despite these pressing challenges, the greatest agent of change has been the unwavering philosophy and ethos of the project — 'Nature first.' Engaging visitors with nature and creating meaningful dialogues that can result in long-term change has been a slow but rewarding journey. This ethos is also developing within the on-farm staff, who are beginning to speak the language of nature first.

Since 2012, there has been an increase in visiting birds, butterflies, amphibians, insects, and reptiles. Indicator species like red ants, flycatchers, and frogs have returned to the land. This is a testament to the process of rewilding the habitat. The quality of soil has improved to a flourishing



Figure 26.4: Increased biodiversity at The Farm
Source: Amruth Kiran and Swarnika Sharma

ecosystem now. The space is dotted with simple, sustainable structures, has over 40 resident animals, and is home to over 1,400 plants and trees.

The change in people's mindsets and how The Farm has touched their lives is intangible. However, continuous feedback and observing changes among people, and international recognition have allowed The Farm to reinstil faith in what it does. The Farm has been around for more than a decade and has been steadfast in its resolve. This in itself is a testament to its success.

TESTIMONIAL

"Phenomenal, it has got me close to soil," says Sonali Gera about her time at The Farm. "It's such a privilege to have access to a farm so close to the city. Being a city girl, I couldn't just pack my bags and move to a village. The Farm is a bridge to get to the soil. I have been trying to grow my own kitchen garden and The Farm has been a lot of help. I make it a point to take family and friends to The Farm to show them it's possible to live in the city and still be connected to farming. Now I don't mind touching cow dung and compost, I feel I am becoming a village girl!"

TESTIMONIAL

Kalpna and Ashok Korwar: "We fondly call it our 'play farm.' The moment we enter the Farm, the smell of fresh leaves and untouched soil is so invigorating, intoxicating. Playing around with the soil, water, worms, cats, and Oslo the dog, interacting with coworkers, have become quite an addiction for us." Ashok, a management consultant, wants to water and fertilise the plants and see the plants grow. Kalpana, an architect, likes to plant, observe, nurture and experiment - something they both learnt at the Farm. Their joy has been seeing a barren patch of land turn lush and green.

Conclusion

The Farm by Protecterra is an inspiring example of:

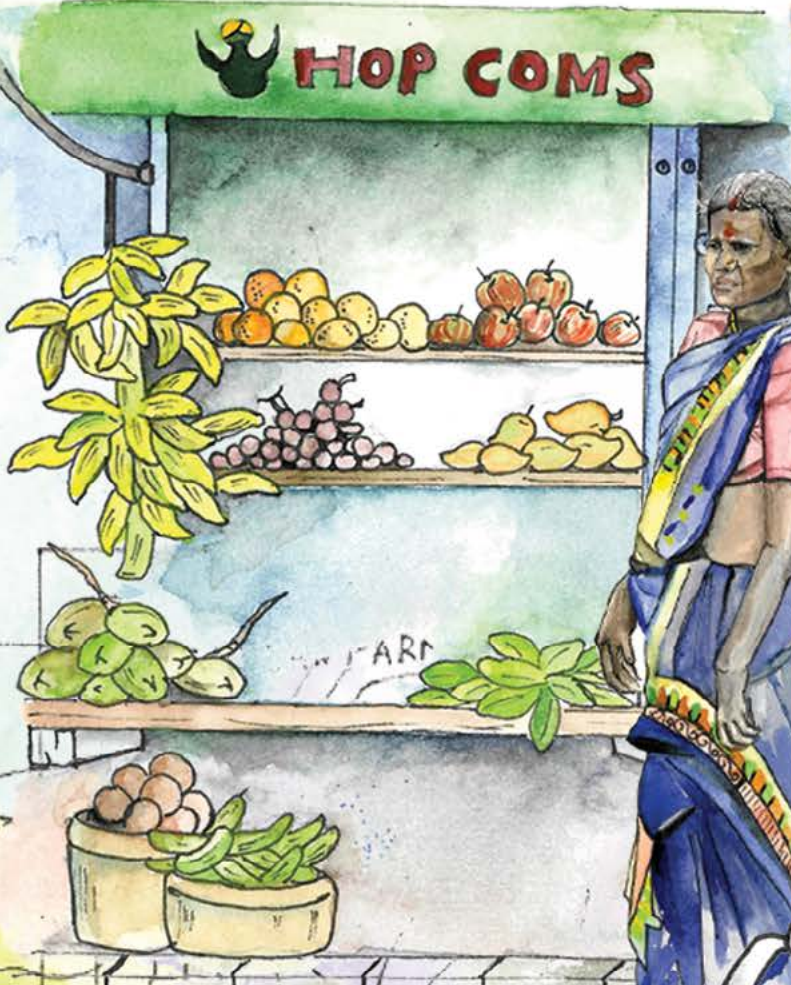
- Rewilding a peri-urban habitat and welcoming people who engage with the space;
- Return of local wild species of animals and a thriving ecosystem;
- Resident animals living free and nurturing people;
- Authentic connection leading to introspection and cultivating self-serving practices of being;
- Creating a community who appreciate the ecological and behavioural change within themselves;
- A network of empathetic and compassionate children with a strong sense of planetary well-being.

It is a space where one can feel and reconnect with nature. Amidst the urban commotion, it is a blossoming refuge for flora and fauna, steadfast in its defiance of the ever-encroaching metropolis. The Farm hopes to engage with more people in the future and help nature become an integral part of their life. Community-supported urban agriculture not only provides access to fresh and healthy local food, but also an opportunity for mindful engagement. Individual choices will influence collective consciousness towards compassion, love, awareness, and learning to live in solidarity!



 HOP COMS

CITY PLAN





4

Urban Planning and Policy

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27

Farming on the Floodplains in Patna

Archana Singh and Debapriya Chanda

Introduction

Diaras are riverine islands formed between the natural levees of rivers due to silt deposition. Their size, location, and boundaries change with every flood cycle. The lower and middle courses of the Ganga are lined with several such *diaras*. The temporary ones are used solely for agriculture, while several villages inhabit the permanent ones. The city of Patna has many *diaras* in its vicinity, one prominent example being the Dinapur-Cum-Khagaul block, also known as Danapur. While Patna is one of India's smart city, making rapid strides towards infrastructure development, the Ganga *diaras*, located not very far from the city, portray a very different picture of systemic neglect. Although they play an integral role in fulfilling the everyday food requirements of the urban population, their fundamental needs in terms of support for agricultural practices do not receive adequate attention, because of which they are lagging behind in social, economic, and infrastructural development.

Socio-economic Conditions

The *diara* region in the Dinapur-Cum-Khagaul block consists of 18 villages, with a total area of 7,096 hectares and a population of 66,207 as per the Census of 2011. The literacy rate stands low

at 45.9 per cent. They are largely disconnected from the city due to the poor condition of road and rail infrastructure. They do not receive power supply from the government for agricultural, commercial, or residential usage. Basic services like primary education, healthcare, and water supply are also not available. With the exception of Madhopur and Hetanpur, the villages do not have Primary Health Centres, Maternity and Child Welfare Centres, hospitals, or dispensaries. Access to safe drinking water is a major problem, as the villagers still rely on hand pumps for daily water supply. Studies have also found high levels of arsenic contamination in water, affecting around 10 million people in Bihar.¹ The rural population does not have access to higher education or industrial training, which further perpetuates unemployment and poverty in the region. Pervasive corruption disrupts the functioning of government welfare programmes and schemes.

Due to their geographical location and form, *diaras* are vulnerable to natural calamities like floods, loss of land by erosion, and obstructed accessibility from the mainland. Regressive colonial laws like the Alluvion and Diluvion Regulation of 1825, the Embankment Act of 1873, and the Permanent Settlements Act of 1793 focused solely on land revenue generation at the cost of socio-economic development, pushing

¹ Kumar, A., Ali, M., Kumar, R., Kumar, M., Sagar, P., Pandey, R. K., and Ghosh, A. K. (2021). Arsenic exposure in Indo Gangetic plains of Bihar causing increased cancer risk. *Scientific Reports*, 11(1), 1-16. <https://doi.org/10.1038/s41598-021-81579-9>



Figure 27.1 Many mega projects have been planned on the Ganga floodplains in Patna, including the much highlighted riverfront development and Ganga Pathway project **Source:** Archana Singh

the inhabitants of the *dias* into poverty. Although Bihar has achieved several milestones in terms of socio-economic and infrastructure development since Independence, the latest example being the metro rail under construction in Patna, the condition of the *dias* has not improved much. Recent large-scale infrastructure projects aimed towards improving urban mobility in and around Patna have bypassed the *dias*. Although the *dias* fall within the range of the ongoing Outer Ring Road project, which encircles the Patna Metropolitan Region, the request of the inhabitants of the *dias* for better connectivity has been ignored. A bridge planned across the Ganga connecting Sherpur and Dhigwara would pass through the

dias. An access point could provide them a permanent means of connectivity with the city, especially during floods when the region becomes entirely isolated. However, these needs have been overlooked by urban planners and authorities even as the state has acquired fertile farmlands for the project.

Farming on the Floodplains: Opportunities and Challenges

Agriculture is the primary economic activity in the *dias*, with 47 per cent land area under cultivation and 73 per cent of the population employed in agriculture and allied activities. The highly fertile soil guarantees good yield with little

to no input requirements, making it naturally conducive to agricultural activities. Due to the abundant grazing land, animal husbandry and livestock farming accompany cultivation. These activities have ensured self-sufficiency in terms of food security in the *diaras*.

Sustaining agriculture, however, comes with its distinct challenges. Since land remains flooded for half the year, from July to December, it can only be cultivated in the *rabi* season. Early floods damage the existing crops. Most farmers prefer growing vegetables like pumpkins, eggplants, tomatoes, pointed gourds, peas, and okra in February–March, so that they can be harvested before the arrival of the monsoons. Lack of transportation facilities and poor connectivity is another significant barrier to marketing agricultural produce. Two pontoon bridges at Panapur Ghat and Pahleza Ghat remain out of service for six months in a year due to heavy floods. With boats as the only mode of transportation for the better part of the year, transporting perishable food like milk and vegetables to markets in nearby cities becomes challenging and expensive. The lack of provisions for local *mandis* (markets) in the *diaras* worsens the problem. The Primary Agricultural Credit Society (PACS), established recently to remedy the situation, has provided loans to farmers. However, it failed to provide marketing facilities at the local level, forcing farmers to sell their produce to middlemen at throwaway prices. These middlemen make an immense profit by selling the same produce to consumers at much higher prices. Although the Yadav community, the majority caste in the state, owns most of the agricultural land, there is a lack of security as authorities have stopped generating tax receipts and suspended new land registrations. There is a risk that the ownership of the land will eventually be transferred to the state. This was demonstrated two years ago when power transmission lines were laid in the region, and displaced farmers only received compensation for crops and not for the land, implying that their ownership rights were not recognised.

Impact on Marginalised Groups

Although women make up almost 20 per cent of the total agricultural workforce as per the Census 2011, with actual numbers being much higher, they are overworked and undervalued. Alongside their contribution to farming, especially in harvesting, distribution and animal-rearing, the additional burden of domestic work falls squarely on their shoulders. Women predominantly manage livestock within the household. Their involvement in animal rearing and dairy activities contributes significantly to the family income and food security. Women labourers are the most exploited, as they are often paid in kind, unlike male labourers who earn INR 300 per day. This is especially prevalent during the harvesting season when women barter their labour for a small fraction of harvested crops, often as low as 15 kg of wheat or 5 kg of potatoes for a day's labour. For higher-value crops, they are paid a minimum amount of INR 150 for 10–12 hours of labour per day.

The twin problems of landlessness and low returns have forced those engaged in agriculture to explore other livelihood opportunities like ferrying, sand mining, and informal labour in the city. However, these options are not very lucrative either. The dominant Yadav community owns most of the boats, leaving limited opportunities for other groups. Ferries often operate at a loss as high diesel prices, annual maintenance charges, and payments to local police officers raise costs. Boatmen are often compelled to overload the ferries with extra passengers, violating safety norms to cover these additional expenses and earn some profit. Sand mining provides a permanent source of income and is relatively more profitable, but the nexus between local authorities and contractors creates an unequal playing field due to personal biases in handing out contracts. An increasing number of people from the *diaras* are migrating to nearby cities like Patna and Danapur to work in the informal sector as construction labourers, restaurant staff, and other low-paying and highly insecure jobs.

The Way Forward

The *diaras* are an integral part of Bihar's food system, and it is imperative to recognise their contribution to the ecology and economy of the state. Despite their importance, only negligible efforts to mainstream them have been made so far. Adequate interventions and investment in education, healthcare, mobility, and infrastructure development would be a starting point for the inclusion of *diaras* in the development trajectory of the state. It would also address the problem of social marginalisation of the people whose lives and livelihoods depend on the *diaras*, putting them on a path to progress. Policy interventions that support agricultural practices, such as improving the ease of procurement of inputs, providing training and capacity-building workshops oriented towards sustainable agricultural practices, and strengthening transport networks to facilitate marketing and distribution of the produce in urban markets, would greatly benefit the population.



28

Chennai Urban Horticulture Initiative: A Flagship Project of the Chennai Resilience Centre

Parama Roy and Akshaya Ayyangar

The Journey So Far

In 2019, the Chennai Resilience Centre (CRC) team, funded by the Rockefeller Foundation’s 100 Resilient Cities programme, prepared the Chennai Resilience Strategy in consultation with multiple city stakeholders. The strategy identified the need for an urban horticulture initiative that simultaneously addressed multiple issues, from greening and cooling the city, offering nutritious food to its citizens, and supporting waste management, to helping

the city contribute positively to various UN Sustainable Development Goals (SDGs) (such as SDG 2 on No Hunger, and SDG 8 on Decent Work and Economic Growth). CRC conceptualised the Chennai Urban Horticulture Initiative (CUHI) as a programme with four components: greener schools, greener and cooler cities, gift a garden, and green livelihoods.

The COVID-19 pandemic, however, restricted the focus of the programme to the distribution of Mobile Vegetable Garden Kits (MVGK) under

	<p>Greener Schools School Kitchen Gardens to provide access to safe and nutritious food and build environmental awareness among children from vulnerable communities.</p>	<p>Greener & Cooler Cities Patchaimadi Thottams to take urban farming to city rooftops intending to cool the city, better manage rain/stormwater, increase local food production and provide livelihood opportunities to the urban poor.</p>
<p>Gift a Garden to include fundraising and the provisioning of mobile vegetable garden kits for vulnerable families in need.</p>	<p>Green Livelihoods Makkal Thottams to develop community urban farms in unutilized or underutilized public land which will create jobs for women and youth from low-income communities</p>	

Figure 28.1: Conceptualising Chennai Urban Horticulture Initiative Source: Parama Roy and Akshaya Ayyangar

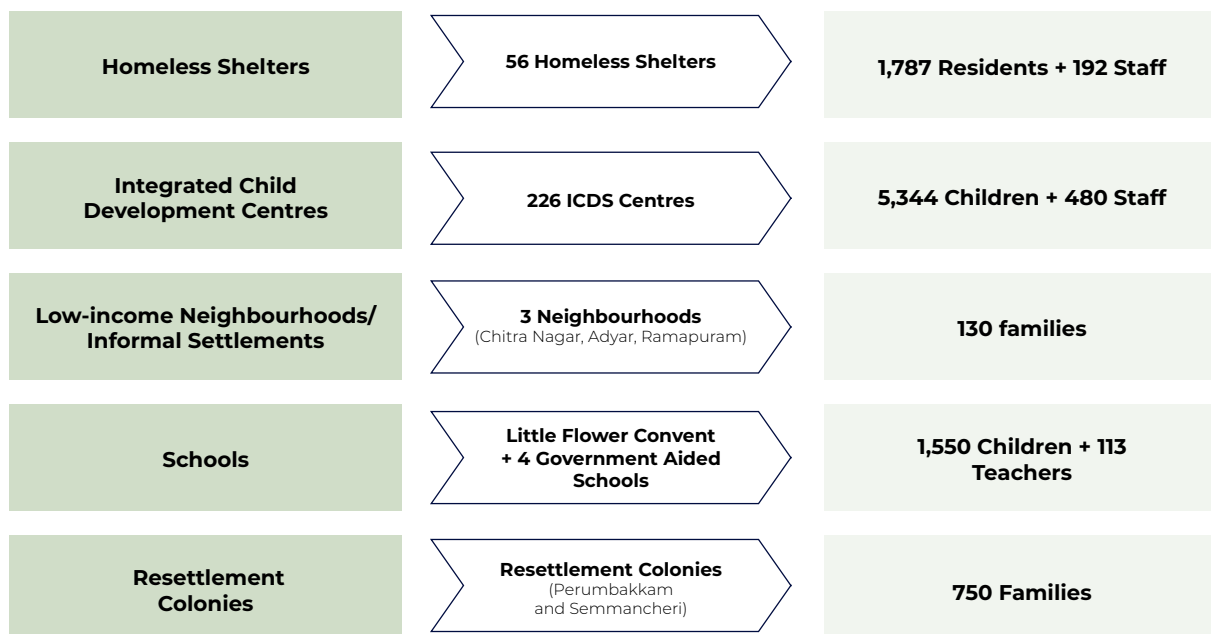
Table 28.1: Items in a Mobile Vegetable Garden Kit (MVGK) **Source:** Chennai Resilience Centre

S. No.	Item	Quantity
1	Grow bags	5 (3 for greens, 2 for vegetables)
2	Pot mixture	40 kg
3	Vermicompost	10 kg
4	Neem oil and soap mix	50 g
5a	Seeds (greens)	5 varieties (spleen amaranth, <i>Amaranthus campestris</i> , purslane, spinach, and <i>Amaranthus blitum</i>)
5b	Seeds (vegetables)	6 varieties (tomato, okra, cowpea, cluster beans, broad beans, and radish)

the 'Gift a Garden' component, funded by the Adrienne Arsht-Rockefeller Foundation Resilience Centre (Arsht-Rock). CRC considers this a medium-term COVID relief effort that encourages communities to grow their own food and ensures some degree of access to food even during disruptions like the pandemic-related lockdown.

Chennai Mobile Vegetable Garden Kits: The Model

Under the Chennai Urban Horticulture Initiative or CUHI, the CRC distributes vegetable garden kits that include grow bags, organic soil, vermicompost, vegetable and greens seeds, and neem oil and soap mix (see Table 28.1).

**Figure 28.2:** Beneficiaries of Mobile Vegetable Garden Kits (MVGK) **Source:** Chennai Resilience Centre (CRC)

The programme supports Integrated Child Development Services (ICDS) centres or Anganwadis, Greater Chennai Corporation's homeless shelters, low-income families living in informal settlements, resettlement colonies, and a few schools (see Figure 28.2). Each homeless shelter and Anganwadi received five or more kits, schools received about 20 kits each, and families received one kit each.

CRC works closely with government agencies and NGOs to run this program. For example, it works with the Greater Chennai Corporation for setting up the gardens in homeless shelters, coordinates with the ICDS Chennai district office to maintain the gardens in the Anganwadis, gets Sempulam Sustainable Solutions to provide the MVGK kits, and takes help from organisations like Pudiyador and Information and Resource Centre for Deprived Urban Communities (IRCDUC), which work with low-income families across the city to spread urban gardening within this group. In addition to offering garden kits, all beneficiaries are provided with virtual and in-person training on setting up and maintaining their vegetable gardens (see Figure 28.3). CRC also engages with the beneficiaries daily through WhatsApp and field visits.

Some of the well-performing centres and shelters are provided with further support. They are given maintenance kits comprising organic soil, vermicompost, seeds, neem oil



Figure 28.3: Training session conducted with Integrated Child Development Services (ICDS) staff and shelter coordinators
Source: Chennai Resilience Centre (CRC)

and soap mix, and *panchakavya* concentrate (organic fertiliser made of cow dung and urine).

Programme Outcome and Impact

CRC developed a detailed monitoring and evaluation (M & E) plan to assess the programme's impact. This plan included surveys, site visits, monitoring through WhatsApp, and focus group discussions (FGDs). These methods revealed interesting results, including key differences between the beneficiary groups and the values they attach to urban gardening.

In the case of homeless shelters, the coordinators learnt that gardening improved mental and physical well-being and increased interaction among residents and staff. Around 77 per cent of residents reported that gardening had improved their mental well-being. This was echoed by the staff, as 58 per cent reported that gardening had reduced mental stress (see Figure 28.4). The difference between the two groups could be a reflection of the high responsibility of the coordinators' jobs.

Through in-person interactions and surveys, we found that gardening was a great stress-buster, especially during the intense lockdown between May and July 2021. One staff member at a men's shelter in Madhavaram said, "*Gardening helps in dealing with depression and frustration. It also helps us work with the residents and gives us an opportunity to learn new things.*" Further, an Anganwadi teacher from Kasimedu noted, "*There is definitely happiness at the mental level and joy in experiencing the benefits of growing plants.*"

The gardens at shelters for men, women, and children with psycho-social disabilities seem to be better maintained than those for men and women. This could be because in the case of the latter, the residents go out for work and do not have time for gardening. To encourage gardening among the children in shelters, the

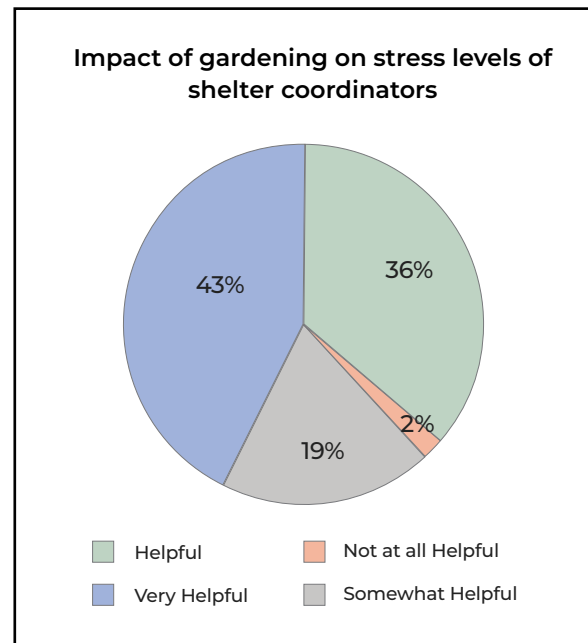
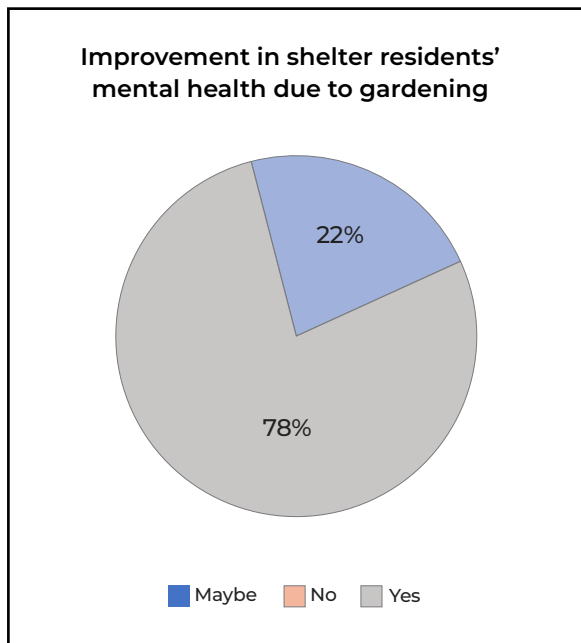


Figure 28.4: Impact of gardening on the mental health of shelter residents (left) and shelter coordinators (right) from 49 respondents
Source: Parama Roy and Akshaya Ayyangar

coordinators introduced a friendly competition by allotting plants to maintain and rewarding residents with the best-kept plants.

The gardens directly feed into the Midday Meal Scheme at the Anganwadi centres. They have also emerged as important sites of environmental education for children (see Figure 28.5) and as places that help build community cohesion. Mothers of the children at the Anganwadi centres were motivated to contribute to the gardens at the centres or start gardening in their homes. An Anganwadi teacher from Ashok Nagar said, *“I’m glad to have this project and I enjoy it thoroughly. The project is amazing and helps us to improve our environment in this pandemic. Children, especially, gain a good understanding of how plants grow and how we harvest vegetables. The parents are welcoming this project with full support. We are planning to cook the harvested vegetables and serve hot meals to children in my centre. I thank the people who gave us this opportunity.”* Another teacher at an Anganwadi in Perambur said, *“The plants are growing well. We are very*

happy to use the vegetables for cooking meals.”

Chitra Nagar, a low-income settlement along the Adyar river, presented interesting results. Due to the lack of space outdoors and in individual houses, the families organised themselves into groups to set up community terrace gardens. Focus group discussions with the families revealed that the primary reason they wanted to engage



Figure 28.5: An Anganwadi teacher teaching children about nature while tending to the garden
Source: Chennai Resilience Centre



Figure 28.6: (From left to right) Focus group discussion with children at Chitra Nagar; Children's drawings of their gardens
Source: Chennai Resilience Centre

in the programme was to access fresh and chemical-free vegetables and greens that were expensive in the market. Garden maintenance duties were shared among themselves and the children were closely involved in watering the plants, checking growth, and harvesting (see Figure 28.6). Interestingly, there were no quarrels over sharing harvests; whoever wanted it could take it.

The harvests were not large across the beneficiary groups. On average, they harvested 5 kg or less of vegetables and greens over a period of six months (see Figure 28.7). This is partly due to the limited number of plants included in the MVGK. Some centres, shelters, and families that had previous gardening experience or followed the training instructions had better harvests. Most beneficiaries could harvest greens more easily than vegetables.

The harvests are used in-house and, in some cases, distributed to others for free. In shelters, the harvests were used on-site to prepare meals. Until the Anganwadi centres opened in November 2021, the harvests from these centres were distributed to the children, when they came to the centre every fortnight to collect nutrition supplements, and among the staff. After the centres reopened, the harvests fed into the midday meal scheme.

Despite the limited harvest, most beneficiary groups seemed to appreciate that they are accessing fresh and nutritious food that they have grown. *"I usually don't like greens. When my mother cooks greens, I ask why she is serving me food that only cows and goats eat. But when I ate the greens that we harvested, I really liked it,"* said one child resident from Chitra Nagar. Another resident from the settlement said, *"When they grow vegetables [in villages] ... what they do is add a lot of chemicals to make the plants grow faster. Instead, I thought, we can grow our own vegetables and eat fresh."*

The limited harvest from the programme is a concern. Through months of interaction with the beneficiaries, both virtually and in person, CRC has learnt that they require constant hand-holding and support to nurture and maintain their gardens. Most importantly, for the gardening activities to succeed and sustain itself, there needs to be an 'anchor'—a staff member, resident, or a family member who is dedicated and interested in maintaining the garden. The beneficiaries also face other challenges in maintaining the gardens—mainly rat and pest attacks, water shortage during summers (among low-income families), and excessive damage during heavy rains (like the monsoons in 2021).



Figure 28.7: Harvests from an Anganwadi centre in December 2021 (left) and a homeless shelter in September 2021 (right)
Source: Chennai Resilience Centre

Going forward, CRC plans to build model farms in centres and shelters that have done well, by providing them with more kits and devising a hands-on support plan for the ‘anchor’, who can act as the garden champion.

Influencing Policy and Planning

The CUHI/MVGK programme is aligned with several national, state, and local policies (see Figure 28.8). For example, the School Nutrition (Kitchen) Gardens Guidelines (2019) recommend that all public schools set up kitchen gardens to feed into the midday meal schemes for children (at schools and ICDS centres).

The National Urban Livelihoods Mission (NULM) and the recently launched Tamil Nadu Urban Employment Scheme (TNUES) aim to alleviate poverty through self-employment opportunities, skill development, job creation, and guaranteed work. These schemes can easily incorporate a programme like CUHI for employment generation and skilling. Urban farms in shelters, ICDS centres and schools can provide ‘green livelihoods’ for the urban poor, many of whom have previous experience of farming. CRC is in conversation with government organisations to bring policy-level recognition to CUHI.

City-level programmes like Singara Chennai 2.0 also highlight the importance of greening

the city and ecological wellbeing. There is significant scope for positioning urban farms as multifunctional green infrastructure in Chennai, which can simultaneously align itself with several national- and state-level policy priorities. Without public support and policy change, the impact of CUHI and similar efforts in urban agriculture will not reach its full potential.

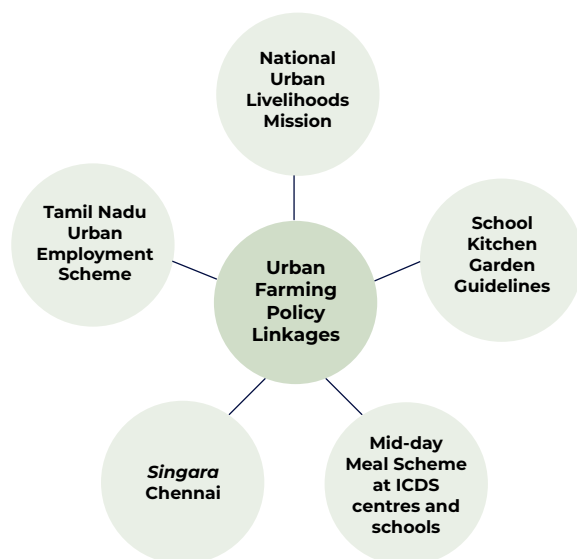


Figure 28.8: Policy linkages of Chennai Urban Horticulture Initiative and Mobile Vegetable Garden Kits
Source: Parama Roy and Akshaya Ayyangar

Policy Interventions for Strengthening Urban Home Gardens in Kerala: Exploring the Case of Thiruvananthapuram Corporation

Anita Pinheiro

Home Garden Vegetable Production in the Government Agenda

Kerala state has high population density and high urban population (47.70 per cent of the total population) in India. Kerala's urbanisation is distinct from other states, with blurring between rural and urban areas. Kerala's spatial form can be called 'rurban' because of the high rural density within an urban unit and big villages with a high population.¹

Food production is limited to 10 per cent of the total cropped area² in the state, and food dependency has made Kerala vulnerable to many challenges, including food quality concerns, higher food prices, and unexpected supply cuts. Commercial vegetable production is highly concentrated in a few districts, and until the end of the 11th Five Year Plan (FYP), there was considerably less budget support for vegetable cultivation. The 12th FYP bolstered vegetable production through enhanced budget support.

One innovative measure to overcome land

scarcity has been promoting vegetable cultivation in unused spaces, including in rural and urban home gardens. Health concerns related to high pesticide residue (including banned pesticides) in commercially available vegetables have accelerated the process of mainstreaming urban home gardening.

Policy Interventions for Strengthening Urban Home Gardening in Kerala

The tradition of home gardening in Kerala, which was declining over the years,³ is seeing revival with the government's support and people's enthusiasm. The Vegetable Development Programme (VDP), launched in 2012, aims to achieve self-sufficiency in safe-to-eat vegetable production by extending agriculture from farms to gardens and other available spaces. These initiatives for home-grown vegetable production have also given a cultural dimension by linking them with the traditional harvest festivals of Onam and Vishu. This is mainly done through the component of the VDP named '*Onathinu Oru Muram Pachakkari*' (A Winnowful of

¹ Kerala State Planning Board. (2020). *Economic Review 2020*. Retrieved from <https://spb.kerala.gov.in/economic-review/ER2020/>

² Gangopadhyay, K., and Balooni, K. (2012). Technological infusion and the change in private, urban green spaces. *Urban Forestry and Urban Greening* 11(2): 205–210.

³ García-Sempere, A. Morales, H., Hidalgo, M., Ferguson, B. G., Rosset, P., and Nazar-Beutelspacher, A. (2019). Food sovereignty in the city?: A methodological proposal for evaluating food sovereignty in urban settings. *Agroecology and Sustainable Food Systems* 43 (10), 1–29.

Table 29.1: Fund allocation for 'promotion of urban clusters' under the Vegetable Development Programme (VDP) (INR in lakhs)
Source: Working instructions and administrative sanctions of the Vegetable Development Programme (VDP) for various years

Year	Allocation for 'promotion of urban clusters'	Total allocation for VDP
2012-13	400	4,400
2013-14	470	3,846
2014-15	525	4,111
2015-16	525	5,695
2016-17	750	7,430
2017-18	850	7,900
2018-19	813.53	6,177.34
2019-20	850	6,390
2020-21	850	6,947
2021-22	850	6,348.25
TOTAL	6833.3	59,244.59

Vegetables for Onam), a drive that aims at mass home garden vegetable cultivation to ensure a safe-to-eat feast during Onam festival. In 2020, this drive was also extended to a 470-day programme called 'Jeevani' to ensure adequate home garden vegetable production in multiple seasons and culminated at the time of Vishu festival in April 2021.

As urban home gardens require innovative technologies and practices to address space scarcity, nearly 10 per cent of the annual budget of the VDP is allocated under the category of 'promotion of urban clusters', primarily to expand urban home gardening (see Table 29.1). In addition, other categories under VDP also promote some aspects of urban home gardening. For instance, under '*Onathinu Oru Muram Pachakkari*', vegetable seeds and seedlings are freely distributed to promote home gardening in rural and urban households in Kerala. Another component is the 'Family Drip Irrigation System', which intends to promote low-cost drip irrigation units, especially in urban households.

Safe-to-eat production is emphasised to keep in line with the Kerala State Organic Farming Policy, Strategy and Action Plan 2010 and to address concerns related to detecting high pesticide levels in vegetables. Since 2013, the quarterly reports on pesticide analysis have been regularly uploaded on the websites of the Kerala Government and the Kerala Agricultural University (KAU) to raise awareness, and has received significant media attention.

The first step of the scheme involved enabling people to set up an urban home garden at a cost as low as INR 500. Towards this, 25 growbags (1 unit) planted with various vegetable seedlings are distributed at 75 per cent subsidy. Additionally, gardening inputs such as seeds, seedlings, bio-control agents, and organic pesticides are distributed annually for free or at subsidised rates to make home gardening a continuous practice. Efforts are being made to incentivise resource efficiency in urban home gardening through subsidised supply of water-saving technologies (like drip and wick irrigation units) and domestic waste management units

(such as pipe composts and portable biogas plants). Integrating vegetable cultivation with household waste management helps in reducing the dependence on external inputs, thereby reducing the cost while circularising household waste.

Various government research and development institutions, including Kerala Agriculture University, are developing new technologies and practices for urban home gardening. Some of these technologies include wick irrigation, mini polyhouse⁴, and rain shelter. Other support systems include strong extension services through Krishi Bhavans, training, and establishing urban agro-service centres for easy access to gardening inputs and technologies at a reasonable price.

Recently, VDP has extended marketing support to urban vegetable producers, including home growers. It also provides financial support for institutionalisation of urban vegetable cultivation by forming registered Haritha Groups (Green Groups) by federating clusters of 3–5 urban resident associations at the ward level in corporation areas. These groups are expected to act as technical and marketing support systems through the engagement of self-employed local volunteers called Haritha Mitras (members of Green Groups).

The Department of Agriculture Development and Farmers' Welfare coordinates activities under VDP with the support of other government agencies (such as KAU, Vegetable and Fruit Promotion Council Kerala, State Horticulture Mission, and Agricultural Technology Management Agency), and implements urban

home gardening interventions with the support of residents' associations.

Urban Home Gardening in Thiruvananthapuram Corporation

The city of Thiruvananthapuram has been the pilot site for urban home gardening interventions by the state and central governments in the past. Such localised government interventions before the launch of the VDP have been instrumental in establishing the foundation of urban home garden culture in Thiruvananthapuram. The initial intervention (2003–2005), was a programme named '*Nagarathil Oru Naattinpuram*' (A Village in the City) by the Agriculture Department of Kerala. In 2011, the Vegetable Initiative for Urban Clusters (VIUC) of the Government of India, implemented by the State Horticulture Mission (SHM), also promoted urban home gardening in the city.

Characteristics of Urban Home Gardens in Thiruvananthapuram

A field study of 50 lower-middle-class and middle-class households of Thiruvananthapuram Corporation during 2015–16 found that people have been engaged in home garden production of vegetables and a few fruit trees, primarily for self-consumption. These home gardens represent low budget, building-integrated production spaces (see Figure 29.1) with a few exceptions where greenhouse technologies contribute to higher cost.

Government interventions (like subsidised supply of inputs and technologies, setting up of agro-service centres) and people's efforts (such

⁴ Mini polyhouse is a modified form of greenhouse that are relatively smaller in size and costs less than the commercial scale polyhouses being used in India. Mini polyhouse is small in size, ranging from 10–30 sq. m and are designed to grow around 150–350 plants in multi-tier containers. These are portable and are developed particularly for kitchen gardening in rural and urban household with limited space availability. Mini polyhouses are developed by Hi-tech Research and Training Unit of Kerala Agricultural University, Thrissur.

Mini Muringatheri. (July, 2016). *Hi-tech farming gaining momentum in State*. The Hindu. Retrieved from <https://www.thehindu.com/news/national/kerala/Hi-tech-farming-gaining-momentum-in-State/article14479216.ece>

as saving seeds, use of local resources, recycled kitchen wastes and developing other garden inputs, gifting and exchange of garden inputs) have equally contributed to reducing gardening expenses. People's networking through some Facebook agriculture groups (operated in Malayalam) also facilitated diffusion of cost-effective home gardening methods and sharing of gardening inputs. These factors helped keep the annual recurring expenditure under INR 5,000 for most gardens visited during the study period.

Multiple examples showed that households effectively utilised all available spaces, including rooftops, front and backyards, setback spaces, and parapet walls for vegetable cultivation. The health concerns related to chemical pesticides were a major motivating factor for home gardening, further evident from the wide adoption of agroecological practices.

Urban home gardening has been a long-term activity in some households since the 1990s,

and many households have started gardening after 2010. Some long-term gardeners are also beneficiaries of the 'A Village in the City' programme. They have continued gardening even after the government discontinued the programme. Governmental interventions since 2011 have influenced many newcomers.

Contributions of Urban Home Gardening in Thiruvananthapuram

Urban home gardens in Thiruvananthapuram make vital contributions to household vegetable supplies, conservation of local agrobiodiversity, household waste management, urban greening, social cohesion, and utilises unused spaces for production.

The household survey shows that home gardens supply more than 50 per cent of vegetable consumption in many families. A few households depend on their garden for almost all the vegetables they consume. Although gardening is individual practice, it enhances social cohesion



Figure 29.1: A rooftop vegetable garden in Thiruvananthapuram Corporation **Source:** Anita Pinheiro



Figure 29.2: Pipe compost unit in a household in Thiruvananthapuram **Source:** Anita Pinheiro

through gifting surplus produce, inputs, and knowledge exchange. Many respondents are keen to cultivate local and traditional vegetable crops, usually unavailable in common markets. Many respondents effectively manage their kitchen wastes by composting or using portable biogas plants, some of these sourced through from government subsidy programmes

and massive production to 'feed the masses'. One key area that needs further attention is replacing plastic grow bags with more eco-friendly options. Secondly, there is a need to have a holistic database on home gardens (including those with and without government support) and track their performance for adequate planning of future interventions.

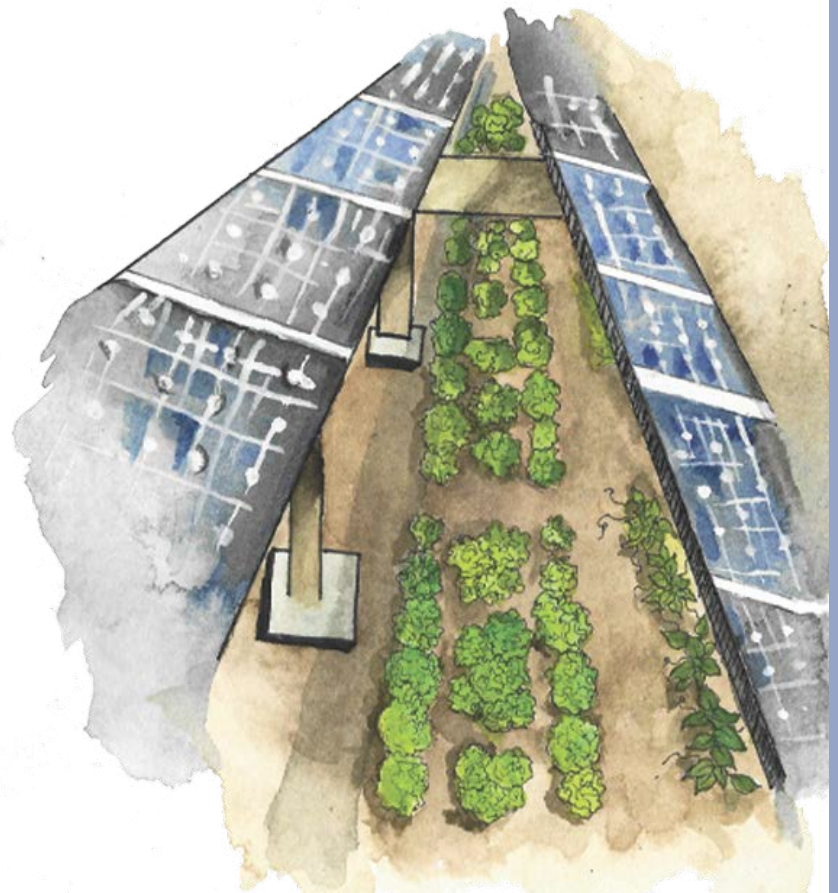
Key Lessons and the Way Forward

Earlier, home gardens in Kerala did not receive much policy attention as they did not fit with macroeconomic growth and the 'scale' notion of a productivist agri-food regime. Much of the total cropped area is dedicated for cultivation of cash crops that contribute to economic growth rather than food crops. Among food crops, attention was given to commercial cultivation and therefore, home gardens that are primarily intended for self-supply received seldom attention from the government. Extending vegetable production from farms to gardens offers a transformative change in the present-day concept of intensive

Without government interventions, urban home gardening in Kerala would not have become a widespread practice. Government interventions played a key role in making urban home gardening an affordable practice across all sections of society. The government's role was to mainstream home garden cultivation by establishing a strong support system. In the absence of these support systems, urban home gardening would have been limited to the upper economic class of society. However, combined efforts from the government and people are key to the success of any intervention. In Kerala, interventions from the government and

grassroots actors (Facebook agriculture groups and others) to promote urban home gardening are mutually reinforcing rather than taking different pathways.

It is also important that people be made aware of the impacts of the prevailing food system and the importance of protecting the traditions of the region⁵ to ensure a sustainable food system, like in the case presented here. The case emphasises the adoption of locally-embedded measures to address the challenges of conventional food systems. Home gardening is a traditional practice in India and can be replicated in other urban areas with local modification.



Contributors



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Akshaya is a senior researcher at the Chennai Resilience Centre and at Okapi Research and Advisory. She is interested in understanding the linkages between urbanisation, society, and the environment from an equity and justice perspective, especially in the areas of urban water and food systems.



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Akshita has been working with the People's Resource Centre (PRC) on issues of urbanisation, mainly urban farming,

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Anita Pinheiro

Anita is in the final stage of her PhD from the Centre for Studies in Science Policy, Jawaharlal Nehru University. In her PhD, she explores urban kitchen gardening in Kerala in connection with sustainability. Her broad research interests include urban and agri-food system transitions, nature-based solutions, and human-nature connectedness.



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Archana is an MPhil research scholar at the Department of Geography, Delhi School of Economics, University of Delhi. She is interested in the gendered politics of resource appropriation and feminist geographies.



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Ashwini is an entrepreneur, homemaker, urban terrace gardener, and a mother of two teenagers. She has a Bachelor's degree in Science and a Master's in Business Administration. She has been gardening

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Bala Panchanathan

Bala is a public policy graduate from the National Law School of India University, Bengaluru. With a keen interest in urban policy and sustainability, she is always on the lookout for arriving at inclusive and innovative solutions to our developmental challenges. She is the co-founder of LokalNiti, a youth-led initiative that seeks to demystify urban policy matters for young persons. She is presently a Consultant at the Directorate General of Foreign Trade, Department of Commerce, Government of India.





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Chandni is Senior Researcher at the School of Environment and Sustainability, in the Indian Institute for Human Settlements. She works at the intersection of climate change and development, examining how people are impacted by and responding to a changing climate. Chandni is a Lead Author for the Intergovernmental Panel on Climate Change (IPCC) and is a published poet.



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A Member of the Royal Institute of Chartered Surveyors, a Scrum Master and AGILE coach, and a certified Lead Auditor for ISO 45001, Dwaipayan has 16 years of experience in diverse sectors. At IIHS, he manages the overall administration of the campus, looking at key facilities, refurbishment projects, and agroforestry initiatives. He has experience of working on the Himalayan landscapes before moving into the field of campus administration and health, safety and environment (HSE).



Gayatri Naik

Gayatri is a postgraduate in economics with a specialisation in Development Studies from Symbiosis International Institute, Pune. Currently, a master's student at the Institute of Development Studies, Sussex, UK, Gayatri is an ardent follower of the public participation and community engagement verticals. She has worked extensively across diverse domains pertaining to the assessment of the degrees of vulnerability for marginalised communities in the informal sector. She has a penchant for documenting community perspectives and enjoys music at leisure.



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Geetanjali is a freelance journalist, researcher, and documentary filmmaker. She has a Master's degree in Peace and Conflict Studies from the Tata Institute of Social Sciences, Guwahati. Also an activist, Geetanjali enjoys reading, writing poetry and prose, photography, and having conversations on conflict, gender, sexuality and menstrual health.





Jayashree

Jayashree is a social activist, educationist and organic farmer based in Indore. She is interested in understanding the situation of farmers through sustainable farming practices and connecting them to urban consumers to bridge the urban-rural divide. She co-founded Adharshila Shikshan Kendra as a counter-narrative to government schooling by presenting new avenues for learning.



K Pooja Vasanth

Pooja has over 18 years of experience in start-ups to multinationals to educational institutions and the elite Indian Army. A trained mountaineer, she was selected for the first Indian Army Women's Officers' expedition to Mount

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Maitreyi is a researcher with the School of Environment and Sustainability at the Indian Institute for Human Settlements (IIHS). Her work is situated at the intersection of climate change adaptation, water, and gender studies. She also serves as the President of Water Youth Network, a Netherlands-based voluntary organisation that aims to connect young water professionals across the globe and work towards improving the world's water situation.



Manoj Singh

Manoj is a reporter and journalist based in Ranchi. He has been a Chief Reporter at Prabhat Khabar and has previously worked with Hindustan for nearly a decade. His interest lies in issues of agriculture, environment, and labour. For more than two decades, he has been reporting on coal companies and the struggles of trade unions.



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Pallavi is faculty at the School of Development, Azim Premji University. She teaches courses that are about radical futuristic alternatives aligned with Gandhi-Tagore visions. She is also the co-author of The Gandhi Notebook, a reader for young adults. Pallavi's activism around food includes a workshop-based course called Food and Identity, coordinating a national network of educators who teach through food, and coordinating a millet-based farming project in an urban school called The Ragi Project.





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Parama is an urban geographer with a PhD from the University of Wisconsin-Milwaukee. She is an Executive Director of Okapi Research and Advisory and an Adjunct Faculty at the Indian Institute of Technology Madras. Her research examines urban transformations in the sectors of food, solid waste, and water, through the lens of socio-environmental justice and resilience.



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Prabhakar Rao

Prabhakar has been a seed keeper for over 25 years, collecting indigenous native vegetable seeds that are on the brink of extinction. He has successfully saved over 500 rare indigenous vegetable varieties. He promotes sustainable chemical-free natural farming technologies across the country and trains farmers on climate-resilient agriculture (CRA).



Pragati Khabiya

Pragati is passionate about using her skills in advocacy and communications to work in the development sector. Her recent work engagements focus on campaign design on engaging the youth on gender mainstreaming and climate change in South Asia and developing impact communication collateral for grassroots organisations. Currently, she is working as an independent writer to spread awareness on women's health rights at Women First Digital.



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especially in urban and peri-urban geographies, and what might be the ways in which we can best respond to them in a sustainable and resilient manner.



Pooja R Bhale

Pooja is a conservation biologist and spiritual ecologist. She currently heads Protecterra Ecological Foundation (PEF), a non-profit that aims to bring about an ecological behavioural change amongst people by building empathy and compassion for planetary well-being through awareness, education, and outreach. PEF works in the field of spiritual and integrative ecology and conservation education.





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Radheshyam has been associated with social movements for more than three decades in various capacities. He is a researcher, writer, and editor who has worked on issues of sustainable urban mobility and urban agriculture in many parts of India.



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Rajendra is the current programme coordinator of People's Resource Centre. He has been conducting research on the intersection of urban politics and sustainability for more than three decades.



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Rosamma is a senior journalist based in Pune. She contributes regularly to leading media platforms including The Hindu, Mongabay, Newsclick, Countercurrents, and so forth, on issues ranging from agriculture to international relations.



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Savita Hiremath

Savita is a Bengaluru-based independent journalist, activist, eco entrepreneur, and author of *Endlessly Green: Solid Waste Management for Everyone* published by Simon and Schuster and Yoda Press. She has spent the past decade discussing the fascinating science and the gratifying art of composting with

fellow enthusiasts and establishing self-sustaining communities.



Sheetal Patil

Sheetal is Research Consultant at the School of Environment and Sustainability at the Indian Institute for Human Settlements (IIHS). With sustainability as a pivotal lens, she focuses on research related to food and agriculture systems in ever-evolving urban and peri-urban landscapes. She seeks empirical answers to questions related to natural resource management; food, nutrition, and livelihood security; ecological intensification; social networks and traditional knowledge in diverse agrarian landscapes.





Soma KP

With more than three-and-a-half decades of experience, Soma is a specialist at the intersections of gender, poverty alleviation, environmental justice, and sustainable livelihoods. She has worked with the Government of India to engender development initiatives in agriculture, dairying, forestry, and livelihoods sectors as Deputy Director, Women and Child Development; initiated the process of gender training for policy makers, facilitated gender-inclusive policy and programme development; formulation of the National Perspective Plan for Women and several other policy initiatives.



Suchismita Pai

In addition to applying an environmental lens to the issue of urban waste management, Suchismita is actively involved in multiple collaborations to initiate sustainable behaviour and work with local community partners to facilitate this. She moonlights as a freelance journalist and is particularly interested in highlighting interesting social projects.



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This compendium is a collection of 29 such innovative UPA practices from across the different cities in the country. These diverse case studies are loosely categorized into four themes: environment and sustainability; food, nutrition and livelihood; gender, equity and well-being; and urban policy and planning. Written mostly by practitioners themselves, the case studies collectively recognise and celebrate UPA innovations and practices, serving as a repository of lessons for peer-to-peer learning, and demonstrating how UPA can be one of the many solutions towards sustainable, liveable Indian cities.

To know more about the project, visit www.upagri.net

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