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Urban agriculture as heritage

Learning from the past for a sustainable future

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In this issue

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Cover
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Editorial

The future of sustainable cities lies hidden in the past

Katharina Christenn, Jess Halliday, Axel Timpe, Jia Ni, Akiko Iida, Luciana Fukimoto Itikawa, Jorge Peña Díaz, Gemilang Lara Utama and Frank Lohrberg

Urban agriculture (UA) is a phenomenon as old as cities themselves. Seen by some as a curiosity and by others as a survival strategy, it is also recognized as an element of sustainable urban development. Whether driven by ecological, social or economic motivations, the resurgence of interest in UA has been supported and shaped by researchers, activists and policymakers over the last three decades. Yet one crucial dimension of UA remains largely overlooked: its cultural heritage.

This heritage matters. UA practices offer vital knowledge on local traditions, cultural identity and collective adaptability. As urban communities face rising challenges – from climate stress, to food insecurity, to shifting demographics and social fragmentation – practices that have stood the test of time can help them adapt. Exploring UA through the lens of heritage means learning from past ingenuity, recognizing the value of everyday cultural practices, and opening new pathways for more inclusive and sustainable urban futures.

While some funding schemes and recognition mechanisms for UA as heritage already exist, they mostly focus on "outstanding" or "universal" heritage that is considered of global importance. What is missing is meaningful support for ordinary living heritage, such as funding instruments and policies that value and protect it, from the city level to regional, national and global levels. Approaching urban agriculture as heritage could bridge gaps between society, planning and policy, and contribute to the transformation of cities into spaces that are participative, climate-smart and culturally vibrant.

By treating traditional UA practices not just as a memory but also as a method for democratic and shared ownership initiatives, the arena of "urban agricultural heritage" could be a very effective activator for committed citizens to engage in shaping their urban environment.

The INSUAH team at the Kalipety indigenous village with Jera Guarani leader and researcher Laura Carvalho. © Marilia Santana

Why approach urban agriculture as cultural heritage?

So far, INSUAH has identified three clear benefits of recognizing urban agriculture as heritage:

1. **UA sites with heritage value are living archives of adaptation and resilience**
   They emerged in response to urban and environmental constraints, e.g. limited space or arable land, water surplus or scarcity, unclear land rights, ... and developed smart systems along three core dimensions:
   - resource and space management
   - social organisation, culture and tradition
   - agrobiodiversity

   As living archives of customary practices and inherited knowledge, these sites offer locally embedded, climate-conscious solutions, in times of climate crisis and shrinking carbon budgets.

2. **Heritage is a driver of engagement**
   Many heritage-based UA initiatives emerged from bottom-up action. Their motivations vary, but they share a strong sense of identity, care and continuity. These initiatives often have long-lasting local impact, are deeply rooted in place, increase social stability, are themselves resilient, and contribute to changing societal conditions around them. Yet they remain financially and institutionally fragile, as stable institutional recognition is often lacking.

3. **UA as heritage fosters social equity**
   Urban agricultural heritage can contribute to addressing inequalities of gender, class, race and access to space. Considering historic UA as heritage offers potential to raise visibility and appreciation, and can be a way to make different needs heard in urban planning. For marginalized communities, such as Indigenous, ethnic or religious groups, heritage affirms identity and visibility. For others, it offers a starting point for shared practices and new forms of belonging – as communities can channel collective energy to transform heritage into new, future-oriented forms of community-based practices. Either way, approaching UA as heritage fosters participation and a sense of belonging.

The challenge is that UA still tends to be seen in polarized terms – either as democratic and deep-rooted in local realities, or as a living force that continues to evolve and adapt so that it can enable sustainability. The question addressed by this issue is, how can UA heritage be seen as both, and be harnessed as part of sustainable urban futures?

The seeds of collaboration

The Institute of Landscape Architecture at RWTH Aachen University has been researching the topic of UA for over 15 years, combining theory and transdisciplinary action research. Projects such as the COST Action on Urban Agriculture[1] and the European Forum on Urban Agriculture (EFUA)[2] highlighted the unclear role of heritage-based UA initiatives. This observation sparked focused research on the heritage dimension of UA. Together with Volkswagen Foundation, the Institute co-organized several projects, and the Herrenhausen conference in 2019, to explore the potential of cultural heritage as a UA enabler and to investigate its differing types and benefits.

The book Urban Agricultural Heritage (2022)[3] took steps towards exploring the topic in Europe. Although Frank Lohrberg and his team identified many relevant sites worldwide, their efforts to broaden the perspective revealed a limitation: their networks were largely rooted in Europe, making it difficult to access and represent the global diversity of urban agricultural heritage. So, they launched the global Integrated Study on Urban Agriculture as Heritage (INSUAH) in 2022, together with partners from Cuba, Brazil, Indonesia, and Japan, funded by the Volkswagen Foundation. This initiative is now working on uncovering how differently heritage is understood and valued around the world.

RUAF has been at the forefront of promoting and enabling urban agriculture worldwide for 25 years. However, reflections on how historical developments have shaped today's policies and practices have mostly been limited to ad hoc discussions about traditional practices and seed varieties. Recent work under the Urban Futures project, led by Hivos, has encouraged reflection on the production and consumption of healthy indigenous foods among urban youth. These efforts have highlighted important aspects, but a comprehensive framework connecting history, heritage and policy was still missing.

A meeting between Jess Halliday of RUAF and Frank Lohrberg in September 2024 sparked the idea for this joint issue of Urban Agriculture Magazine. The intention was to share INSUAH case studies with RUAF's global networks to gather additional perspectives from practitioners, researchers and policymakers worldwide. The shared aim is to bridge research and practice, moving beyond educated

guesses toward grounded insights – and draw lessons from the past for more sustainable urban futures. An editorial team was formed, uniting the RWTH Aachen Institute of Landscape Architecture, INSUAH partners, RUAF, and an UA expert from the UN Food and Agriculture Organization.

The many angles of UA as heritage

The contributions in this issue span continents, disciplines and perspectives. The diverse range of cases illustrates the many ways in which urban agriculture can be understood, practiced and valued as heritage.

The issue opens with highlighting how historical sources influence practice and pedagogy: The head gardener of French King Louis XIV has influenced biointensive market gardening techniques from the 17th century to today (Carnavalet, p. 8), and university initiatives – in Antwerp, Belgium, and Beirut, Lebanon – to educate on traditional practices and apply them in modern contexts (Soens and Bruyet, p. 12; Hamadeh and Bou Harb, p. 15).

Several articles examine sites where UA has been practiced for centuries, such as Bamberg and Rothenburg ob der Tauber, Germany (Eißing, p. 18; Nehr, p. 22), and the Mirafiori Sud district of Turin, Italy (Plebani, p. 25). The articles about agriculture in the periphery of Istanbul, Turkey (Uyanık Taş and Ünlü Yücesoy, p. 28) and around archaeological zones in Carthage, Tunisia (Bohn and Houman p. 32) call for land use and planning regulations to take UA heritage into account.

Pay Drechsel (p. 37) addresses dissemination of plant species and explains how 15th century European traders brought exotic vegetables to pre-colonial urban settlements in Ghana. Alina Marktanner (p. 39), meanwhile, makes the case for botanical gardens to reconnect plant knowledge, appropriated during colonial expansion, with native urban farming initiatives. Other initiatives focus on seed heritage, such as dissemination practices in Brazil (Knapp da Silva et al, p. 42) and the public library in Aachen, Germany, which aims to turn borrowers into citizen seed producers (Lambers and Christenn, p. 46).

While seeds and their distribution combine tangible and intangible heritage, several articles demonstrate how inherited resource management systems support circular food systems and climate adaptation – from the Satoyama landscapes within urbanized Tokyo, Japan (Iida and Yokohari, p. 48), to Milan's water meadows in Italy (Branduini, p. 52), and the historical irrigation systems in the Nuremberg Metropolitan Region, Germany (Luo, p. 56; Früh-Müller; p. 60; Arnet, p 54).

The INSUAH Team looking for the right path to visit the Cerendeu community, Bandung 2024. © INSUAH

Cultural autonomy and women's roles as stewards of heritage is reflected in cases from Assam, India (Kalita, p. 67) and São Paulo, Brazil (Carvalho and Motta, p. 69), where food practices become spaces of resistance, cultural transmission and social innovation. An initiative in Ostend, Belgium, coaches women and men from vulnerable communities in transforming surplus food into products inspired by their own cultural heritage (Verbeke, p. 72).

Grassroots community movements also play a role in heritage-making. Whether reclaiming traditional agroforestry in Bandung (Abdoellah and Utama, p. 82), retrofitting biocultural memory in Honolulu (Raj and Strubeck, p. 74), or introducing young people to food traditions of the past to inspire their own initiatives (Halliday, p. 77), these stories reveal heritage as a living, evolving force.

Heritage in practice: between preservation and transformation

UA as heritage is still a young field, but this issue offers valuable insights into its current state and reveals a diversity of attitudes, ideas and concepts of the term "heritage" and its management. Some authors emphasize rules and planning instruments; others recognize individuals as key carriers and their everyday lives and rituals in ethnic groups as heritage in themselves. Some authors advocate for the preservation of specific traditions and practices, others argue that heritage must evolve to survive, emphasizing the importance of rethinking old ideas and applying them in new ways. No single approach is sufficient on its own. What is needed is a mix of disciplines, tools and people, and an open exchange between different ways of understanding and working with heritage.

With this in mind, the process of compiling this issue has led to the following observations:

Firstly, the **effort needed to kick off heritage-based initiatives depends on the local context**. In some cases the concept of heritage is already institutionalized and heritage-based initiatives can work with established associations, archives and networks, and benefit from accumulated knowledge and an existing infrastructure. In other places, urban agricultural heritage has to be recovered due to biased or colonial documentation and the lack of systematic records. Here, civil and administrative actors, activists and researchers work at a foundational level, turning to oral histories, local practices and everyday knowledge to trace what might otherwise be lost. This work goes beyond preservation. It reclaims ownership for the people and renegotiates values and history writing, challenging dominant modern or Western narratives.

INSUAH visit to FAO. © INSUAH

Secondly, the issue shows how **heritage is approached differently depending on disciplinary backgrounds and local contexts**. The authors come from a wide range of academic and practical fields, so their contributions reflect different thoughts and understandings of what heritage means and how to engage with it. This diversity is a strength, and is needed for mutual learning, negotiation and reflection.

Thirdly, many **grassroots initiatives engage with heritage intuitively**, often without recognizing it as such. Practitioners tend to underestimate the heritage values of their work and need encouragement to share their stories. Some stories were only framed as heritage through this call for contributions.

Fourthly, there is a tendency for **top-down initiatives to instrumentalize heritage for storytelling or labelling**. Too often, heritage is treated superficially, detached from its living context or frozen in time, becoming a static burden instead of a dynamic and evolving force. The issue challenges this, and the tendency to reduce heritage to products or built structures by outlining the importance of intangible values like knowledge, practices and rituals.

Heritage as a living, local and community-driven process

This issue outlines how UA heritage is not to be frozen or preserved behind glass but is a living, evolving force, rooted in local knowledge and shaped by people's needs. It reveals how urban agricultural heritage has the power to adapt, inspire and foster inclusive practices across diverse contexts.

Returning to the question of how cultural heritage can be approached as both a deeply rooted part of local reality and as a living force, the contributions in this issue show countless ways of achieving this – provided that communities are recognized as the core of heritage.

Ultimately, cities and their communities are not only shaped by heritage; they are its makers and transformers. It is this insight that stands out across all contributions: Communities carry, reinterpret and retrofit their heritage, whether through traditional knowledge, shared practices or new experiments. Recognizing this agency is essential for cities that aim to integrate heritage-based approaches into policy and urban agriculture initiatives. Embracing locally rooted urban agriculture, together with its heritage values, brings diverse voices, perspectives and practices into conversations around planning, policy and the organization of urban agriculture initiatives. By recognizing cities and communities as key actors, we can reinforce the premise that the past offers vital lessons for shaping sustainable urban futures.

We envision a future where urban agriculture initiatives naturally integrate their heritage, engaging communities to identify and carry forward practices, tools, techniques, and resources that matter – with support from both, administration and policy actors.

This magazine is only the beginning. We hope it sparks ongoing discussions, in social media, workshops, policy forums and neighbourhood gardens worldwide.

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More information

- INSUAH - Integrated Study on Urban Agriculture as Heritage: www.insuah.info
- Urban Futures: https://hivos.org/program/urban-futures

How King Louis XIV's head gardener influenced market gardening worldwide

Christian Carnavalet

Biointensive gardening has been practised for centuries, with the core techniques of the French method recorded by the head gardener to King Louis XIV and adapted through the ages. Today it is used from smallholder farms in the Global South, to the vegetable patches of senior citizens in Europe and many more places in between. With the drive to reintroduce farmland into towns and cities, there remains scope for innovation to boost efficiency, including cooperatives to boost economies of scale.

In today's world, smallholders cultivating plots of less than 1 ha account for 72 percent of farmers.[1]

Even more successful are the horti-farmers, whom the FAO and NGOs are educating in the French method of market gardening, remodelled to suit the habits of their respective countries. They cultivate areas of 700m^2 to 1500m^2, essentially by hand, which ensures exceptional productivity.

Biointensive market gardening is a sustainable organic farming system that involves working with the basic elements necessary for plant and soil life: micro-organisms (bacteria, fungi) nourished by organic matter, water, air and sun, to achieve maximum yields, while increasing biodiversity and soil fertility.

Small-scale, biointensive market gardening is practised in urban and peri-urban areas on all five continents. Core practices were codified three centuries ago by Jean-Baptiste de la Quintinie, head gardener to King Louis XIV at the Potager du Roi in Versailles, France. His successors perfected his art, bringing it to a pinnacle of efficiency that radiated throughout Europe in the 19th century, thanks to J.G. Moreau and J.J. Daverne's *Manuel pratique de la culture maraîchère de Paris* (Practical manual for market gardening in Paris), published in 1845.[2]

Thus, an urban market gardening practice has influenced market gardening around the world for almost two centuries, as subsequent authors referenced Moreau and Daverne (see Box).

The basic techniques used by professional market gardeners remain substantially the same today as they were 200 years ago, passed on through observation, knowledge-gathering and intergenerational instruction. Today, however, scientists have given us an understanding of the phenomena hidden inside soils and plants that explain why these techniques are so successful.

Until the 1980s, these horticultural techniques formed the basis of teaching in French and European agricultural high schools. They were ousted by the next generation of horticultural entrepreneurs, who preferred the new Dutch methods with glass greenhouses, plastic pots, automatic watering, automatic seeders and potting machines.

Basic techniques of biointensive market gardening

The 400-year-old French term for market gardening, maraîchage, comes from the fact that practitioners used to seek ancient marshes (marais) to grow their vegetables. Nowadays biointensive market gardeners cultivate on strips of land 1.30m wide by 18-20m long. On these planks, 5 to 6 rows of vegetables are transplanted in staggered rows.[8]

The principles of this method are simple:

1) make an initial 0.60m deep excavation of the site;
2) add organic manure to the order of 25m^3 per 1000m^2 (250 m^3/ha);
3) carry out short vegetable rotations throughout the year;
4) mix crops on the same strip of land.

Salads, fennel, cabbage, carrots, radishes, chard, turnips, beet, etc. are grown side by side, 25cm apart, in rows on the same bed. These are the low vegetables, also known as fillers.

Seminal works since Moreau and Daverne and adaptations of their method

The French method of market gardening was disseminated in England by John Weathers, with his 1906 book, entitled French market gardening,[3] followed by Paul Aquatias' 1913 book Intensive culture of vegetables on the French system.[4]

From 1930 onwards, Rustica magazine popularized the method in France by publishing frequent, detailed articles. The gardens of today's senior citizens, with a mix of vegetables, are living testimony to this. Allotments and shared or collective gardens use the remnants of this knowledge.

In the 1960s, Alan Chadwick drew on the French method to create the Biodynamic French intensive method,[5] influenced by the biodynamic system of his family friend Rudolph Steiner. Since this combination of biodynamics and the French method, small-scale market gardening *à la française* has been revived around the world by Alan Chadwick's students.

Chadwick's teaching is perpetuated by the Center for Agroecology and Sustainable Food Systems at the University of Santa Cruz (California, USA) and brings together participants from all over the world.

Eliot Coleman[6] and John Jeavon, from 1972 onwards, popularized a technique adapted from the French method in the USA, although they dispensed with its main asset, intercropping. The Growbiointensive method[7], patented by John Jeavons for forty years, is now used in 150 countries and is taught by the FAO to small farmers to protect them from food insecurity.

The American method is also practised professionally by men and women trained in the agricultural departments of American universities (e.g. Stanford, University of Arizona, University of California Santa Cruz, Ohio State University).

The market gardening school in Cannes, France, disseminates this ancestral knowledge, modernized and adapted to the 21st century to require less plastic, fewer phytosanitary products, less physical effort, less investment and crop input costs, less water consumption for greater yields, and more profitability per hour worked, etc.

Tomatoes and beans trellised as primary plants, zucchini and lettuce as low plants. © C. Carnavalet

Six rows are transplanted in staggered rows. © C. Carnavalet

Low vegetables are small, 0.20m to 0.40m high. They cover the ground, prevent weeds and keep the soil cool.
In the middle of these low plants, the market gardener cultivates the primary, tall plants that rise to 1.50m-2m in height, such as tomatoes, trellised plants (beans, peas, melons, cucumbers), eggplants and peppers. These tall plants provide shade for the low plants.

From the point of view of a slug, a crop bed might resemble a tropical forest, with giant trees (tomatoes, eggplants), shrubs (fennel, chard) and low-growing grasses (radishes, lamb's lettuce). The natural forest syntropy is reproduced, and mycorrhizae play a crucial role, searching for nutrients and distributing them among the plants through networks of mycelia.

This makes for exceptional productivity, as the market gardener cultivates several rotations of low plants, while the high plants take several months to produce their yield. Thus, there is a faster turnover of vegetables on the ground (the horizontal axis) and a second, slower turnover of vegetables in the air (the vertical axis) on the same surface. This means the market gardener can make money continuously.

Tomatoes and all trellised plants are staked on *échalas*, small, thin stakes made of acacia, hazelnut or chestnut. The plants are watered using an efficient agricultural drip system, the T-tape.

The main food for the vegetables is manure, but all crop waste is also mechanically shredded and buried with the manure. These soil improvers nourish the soil's microorganisms – bacteria, fungi and earthworms, which break down the molecules in organic matter and release them into the soil for the plants to absorb.

The carbon provided by the organic amendments keeps the microorganisms in balance. No single species of bacterium or fungus can dominate and attack plants. Bacterial and fungal diseases are therefore exceptional. Only insects such as slugs, snails and aphids on the aerial parts of the plants can be a nuisance. These are managed with essential oils or other products authorized for organic farming.

The working techniques are simple. It is the management of sowing and transplanting throughout the year, and the technique of intermingling crops, that take longer to master. The nursery, where seedlings are sown and young plants raised, is the nerve centre of the business. It requires the most care and attention to ensure that the young plants do not suffer from lack of water, cold or too much sun.

Potential in today's context

In today's context, biointensive market gardening based on the method of Moreau and Daverne makes it possible to cultivate an area of 800m² to 1200 m² on one's own, for a turnover of €50,000 to 60,000.[9] That is ten times more profitable than mechanized market gardening.

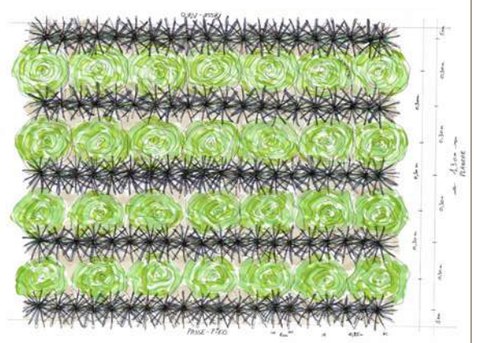
The method also enables new market gardeners to establish on small surfaces, especially in urban areas where only small agricultural plots are available for purchase or rental. Mayors encourage market gardeners to locate in their communities.

For millions of farmers, cultivating a small, human-sized area rather than a large number of plots using mechanized tools is a matter of access to land. On these small areas, the traditional French market gardening method, taught by NGOs, enables them to grow enough vegetables to eat their fill and sell at local markets.

Through his work of researching and curating the knowledge of his time, M. de la Quintinie was able to instil essential knowledge in the Potager du Roi that has enabled market gardeners to excel around the world, 150 years after his death. This magnificent empirical knowledge, now scientifically explained, and the methods modernized by American and Canadian market gardeners over the last four decades, provide 21st century farmers with ultra-efficient market gardening model that makes sound economic sense.

Small-scale market gardening is part of the drive to reintroduce farmland into the heart of towns and villages. It is up to the upcoming generation of market gardeners to innovate to make it even more efficient, and to establish cooperatives to leverage economies of scale and to increase sales for each market gardener through complementary production and accessing new markets.

Trellising high plants. © C. Carnavalet



Mixing rows of lettuce with rows of leeks. © C. Carnavalet

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More information

Institut Moreau-Daverne®: market gardening school at Cannes, France www.moreau-daverne.fr

Living heritage at Hofstad: teaching the history of urban farming with hands in the dirt

Cécile Bruyet and Tim Soens

What did everyday people grow in their backyards in the past? What sort of plants were available to a medieval gardener? What did a 17th century greenhouse look like? How did 19th century allotment farmers deal with excessive rain? What tools and practices did they use? These are not easy questions for historians. This article reflects on the on-going Hofstad project, a university "living heritage lab" in Belgium that aims to teach the history of urban farming and to improve our knowledge of urban farming in the past.

Created in 2017 at the University of Antwerp, Hofstad is an educational project where students are immersed in the history of urban farming, as part of a class on environmental history. Hofstad relies on hands-on learning methods, while drawing on research and in dialogue with researchers working on the same topic at the university.

Why was Hofstad created?

First and foremost, Hofstad was created to teach the history of urban farming to students. Instead of learning about plants, techniques or diseases in the lecture hall, the students are asked to design and establish a historical vegetable or herb garden in the courtyard of the Faculty of Arts, located in a neighbourhood with a long history of urban farming. The students select crops, varieties, tools and practices that are as historically accurate as possible. Throughout the semester, they integrate their scientific reasoning with experiences in the field. This is a rather unusual research method in historical sciences. The students are confronted with the complexity of food growing and its dependency on factors like climate, soil fertility and pest control.

Hofstad was also created to interact with on-going research on past food systems at the university. Recently, urban farming has gained in popularity in historical research, echoing societal interest. Historians delve into the history of urban gardens and horticulture to reveal the enormous variety of forms and practices, as well as the conditions that fostered or limited its past development.[1] While we know already a lot about the gardens of monasteries or palaces, some of which have even survived to this day, relatively little is known about what everyday people did in their backyards. Historically informed urban farming has enormous potential to uncover this. Practical research, as conducted in Hofstad, could fill the gaps in our knowledge by testing what plants could have been grown and with which methods, based on the best available evidence.

Finally, Hofstad is rooted in methods of applied history, which has nothing to do with cherry-picking knowledge in the past and everything to do with contextualizing knowledge collected from critically analysed historical sources. This way, the past is considered a laboratory to investigate, for example, what urban farming can be used for, or what determines if one has access to it, and what can cause changes in its form and scale over time.

Combining theory and practice

Urban farming experiments like Hofstad provide enormous learning potential for schools and universities. Few resources are needed: a plot of land (we suggest asking the institution for a vacant plot), some tools and the right type of seeds. In exchange, students acquire a wide range of interdisciplinary competencies in history, geography, plant biology and other related subjects, along with many transferable practical and soft skills.

The first step is to identify a space that is easily accessible to all students, and with which students can identify. For instance, the University of Antwerp garden of about 50m² is located in the main courtyard of the

Students gathered around Hofstad. Credit: Jonathan Ramael © University of Antwerp

History Department, in a visible space with a lot of pedestrian passersby, which motivates students and enhances their personal commitment to the project. One-off start-up funding of €1500 was provided by the university as part of a programme to enhance virtual teaching labs, but (small) yearly maintenance costs come from the educational budget.

On the theoretical side, students are supported by lectures and readings on relevant topics, including the history of agriculture, famine as a historical problem, the Columbian exchange (the deadly exchange of plant and animal species, as well as diseases, between European colonizers and indigenous populations), the history of climate and climate extremes, etc. This means that students receive knowledge that they can draw upon when taking practical decisions.

For example, they had to reflect on issues of heirloom plants, plant selection and evolving genetic material. If a 14th century source speaks of "cabbage", what kind of cabbage would that have been? Do we still have cabbage seeds that resemble the 14th century varieties? Moreover, how would the plot have been worked? Would there have been raised beds? What kind of tools did they have? Of course, plastic tools cannot be used in a 14th century context; nor can modern nets to protect the cabbages from insects, such as the notorious *Pieris Rapae* caterpillars.

In the first editions of Hofstad, students were assigned to between 10 and 12 groups of about five people each; in 2024 there were six groups of almost 30. Each group is assigned a specific plot at the beginning of the spring term (in February) and selects a specific scenario – that is, a well-defined historical context for which they will recreate an urban garden starting from historical sources. The scenario can range from an early medieval monastic garden, to the garden of an urban merchant in the Renaissance, to spaces of more common, everyday people such as allotment agriculture in the 19th century, to victory gardens during World War II.

All scenarios proposed to students lead them to recreate a food-producing garden in an urban setting, the limiting factor being the presence of reliable historical sources (for instance, medical or agricultural treaties, garden plans or kitchen recipes). The earlier the period, the less sources are available – especially those informing on the practices of common people. This is where historical research methods are fundamental, because students are trained to reflect on the sources left by a learned and rich minority, to learn about the practices and habits of the poor majority whose stories are not recorded.

Hofstad is an experiment in collective gardening; the students have to organize their activities and rely on each other for daily tasks. The university provides a shared calendar system, but students mostly communicate with each other through social media. Moreover, the different plots are adjacent and share certain facilities (tools, water access, etc.), which invites the students to reflect on the idea of commons and the strict monitoring and supervision needed to successfully share resources.

Lessons learned

In the urban setting of Antwerp, in a highly urbanized part of Western Europe, very few students typically have any link with agriculture or even gardens. Urban students are confronted with the limits of their practical gardening knowledge. Students learn that a garden requires daily care: if the garden is unattended for a few days in spring, the young plants might not survive. More than once, they relied on family knowledge or on the knowledge of peers

coming from the countryside. In developing urban farming as part of our future food system, it is crucial to take into account previous knowledge and background of the inhabitants – and to implement teaching labs similar to Hofstad in educational programmes.

Hofstad makes students aware of the rapid disappearance of traditional farming knowledge over the past decades. Some groups rely on their studies in oral history to conduct interviews with a selected population, to glean the information they need to recreate their urban garden. This method actively contributes to leaving written traces of knowledge that otherwise tends to disappear with each passing generation – and which through Hofstad becomes living heritage.

Making Hofstad a place of living heritage hence reconnects townspeople to local traditions of food production, an important part of shaping sustainable urban food systems. Moreover, Hofstad strengthens the presence of gardens in the townscape, showcasing their long history and the documented traces they left on paper – as well as under our feet.

Cécile Bruyet giving instructions to the students. © Tim Soens

Tim Soens giving feedback to the students. © Cécile Bruyet

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More information
University of Antwerp's Hofstad website
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Futurizing traditional urban agriculture sites: preserving food heritage through innovation

Shady Hamadeh and Christelle Bou Harb

In Lebanon, as in many countries, agricultural heritage is increasingly threatened by economic collapse, rapid urbanization and the erosion of intergenerational knowledge. Addressing this decline calls for innovative frameworks that view tradition not as a relic of the past, but as a dynamic resource for modern societies. This article introduces the Urban Oasis (UO), a physical living lab developed by the Environment and Sustainable Development Unit (ESDU) at the American University of Beirut (AUB) as a replicable model for integrating ancestral agricultural practices in modern settings. It argues that when traditional knowledge is combined with contemporary practices, heritage becomes more appealing to younger and urban populations.

ESDU, located within the Faculty of Agricultural and Food Sciences (FAFS), is a research and development unit at the AUB. It has long prioritized the preservation of traditional agricultural systems as a strategy to strengthen cultural identity and foster rural resilience. Its work includes documenting indigenous knowledge, supporting small-scale farmers and integrating agroecological methods rooted in Lebanese heritage.

The Lebanese context: heritage at risk

Lebanon's agricultural heritage is facing extinction.[1] Essential traditions such as terrace cultivation, wild herb foraging, seasonal food preservation (*mouneh*) and the saving of heirloom seeds are disappearing from everyday life. The increasing disconnection of knowledge between urban consumers and rural producers, coupled with the commodification of food, has further marginalized these practices.[2] In Lebanon's fragile socio-economic context, these trends have not only accelerated the loss of traditional practices but also increased the vulnerability of rural communities and weakened local economies.

Moreover, as sustainability transitions take shape globally, heritage-based approaches are often overlooked in favour of new technological solutions.[3] Lebanon lacks models that effectively integrate traditional knowledge within

The main façade of the Urban Oasis at AUB, combining natural materials and contemporary design to create an inviting space for environmental education and community engagement.

Architectural plan of the Urban Oasis layout, illustrating the integration of green infrastructure, educational zones and interactive spaces within a compact urban footprint. © 2025 Environment and Sustainable Development Unit. All rights reserved.

innovation ecosystems.[4] The UO was designed to address this gap, serving as a context-specific living lab (LL) that makes agricultural heritage visible, valuable and viable within contemporary environments.

The Urban Oasis: a heritage-informed response

Established in February 2024 through the transformation of a deteriorating animal house on the Beirut AUB campus, the UO serves as an engagement centre for conserving agricultural heritage in urban agricultural settings. Funded by the Khalifa International Award for Date Palm and Agricultural Innovation, the UO uses a systems-based, interdisciplinary response to the decline of traditional agricultural knowledge and practices in Lebanon.

The project integrates heritage in multiple ways. Agriculturally, ESDU has prioritized the planting and cultivation of traditional and indigenous plant varieties, selected for their historical significance and adaptive qualities. Architecturally, the site's renovation maintained and incorporated functional design elements, including the use of a reconstructed mud wall that echoes traditional building techniques suited to Lebanon's climate and sustainable construction principles.

Beyond infrastructure and planting, heritage preservation is also embedded in the UO's educational and market activities. Training programmes emphasize ancestral methods of land stewardship, irrigation and ecological farming, targeting AUB students and community members. In addition, mouneh products are sold on site, reconnecting consumers with local food traditions.

The Living Lab: merging heritage and innovation

The UO was built following the LL approach. LLs are dynamic, real-world educational spaces where community members actively collaborate to develop sustainable solutions. Unlike traditional demonstration sites that only showcase best practices, LLs foster hands-on engagement among users, encouraging them to co-design, test and refine innovative approaches.[5]

The LL concept was implemented in four successive phases. The initial phase focused on creating a blueprint for the site through participatory planning. The aim was to gather feedback on how the space should be configured to teach the future end users (the AUB community) how to adopt heritage agricultural practices in their everyday lives. Hence, a design competition was launched at the university to gather feedback from the community. This resulted in three winning concepts that were ultimately integrated into the final design. The process revealed a shared preference for a space that combines cultural authenticity with technological sophistication.

The second phase involved the physical rehabilitation of the chosen site – the old FAFS animal house – into a sound structure that could embody the created blueprint. This was achieved by restoring elements of traditional architecture, such as the mud wall, while integrating features that reflect technological sustainability practices, including smart irrigation systems, energy-efficient infrastructure and principles aligned with the circular economy.

Agricultural rehabilitation defined the third phase, during which heritage plant varieties, usually found in rural areas of Lebanon, were reintroduced and cultivated using traditional practices suited to Beirut's urban conditions. Soil health was restored through natural methods such as organic compost, while digital infrastructure was embedded through the installation of environmental sensors. These sensors provide real-time data on factors such as soil moisture, temperature and air quality. The collected data is processed using artificial intelligence tools that generate predictive insights, supporting timely decisions on irrigation, planting cycles and site management. This intelligent integration of technology enables users to sustain the site efficiently while honouring traditional methods.

The final phase focused on activating the space through community engagement and knowledge transfer. A wide range of activities – including community events and applied workshops – invited the AUB community to become caretakers of the space. The selling of heritage-based products available on-site further reinforced the integration and accessibility of heritage in modern settings.

Interior of the Urban Oasis smart hub featuring a traditionally crafted mud wall with built-in lighting niches, blending sustainability with cultural expression. © 2025 Environment and Sustainable Development Unit. All rights reserved.

Impact: reviving and sustaining agricultural traditions

Since its establishment, the project has encouraged a shift in how traditional agricultural systems are perceived and engaged with. Over 500 visits were recorded in the first six months of operation, with a significant number of repeat participants suggesting sustained engagement and interest. Structured educational programmes trained over 100 individuals on the use of the UO, and informal outreach activities have reached hundreds more through community awareness events that informed the public about the UO. These interactions have reinforced a sense of pride in local traditions and recorded a growing willingness among students and campus residents to integrate traditional agricultural systems into their personal and professional lives.

Scalability and replication potential

The UO offers a compelling model for reimagining traditional urban agriculture sites as modern spaces that merge cultural heritage with innovation. Its rests on two key pillars that can be replicated elsewhere: firstly, participatory design; and secondly, the blending of ancestral agricultural knowledge with modern sustainability tools. These principles make the model highly transferable to other urban, peri-urban and even rural settings where heritage is at risk.

Institutions like universities, municipalities and cultural foundations can play a pivotal role in replicating and scaling such models by providing support, visibility and coordination. Universities can stimulate replication by offering spaces for experimentation, engaging students and faculty in transdisciplinary research, and communicating project outcomes through academic networks. Municipalities contribute by allocating public spaces – such as parks, rooftops, or repurposed buildings – for adaptation, while cultural foundations can offer funding, advocacy and partnerships that elevate local models to broader audiences.

Conclusion

The Urban Oasis integrates agricultural heritage practices into urban spaces and makes them appealing to the community through capacity building and awareness raising. Based on its success, it serves as a blueprint worth replicating in settings where the disconnection between heritage and modern societies is amplifying.

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The Gardeners' and Vintners' Museum and inner-city horticulture at the Bamberg World Heritage Site

Stephanie Eißing

The Gardeners' and Vintners' Museum portrays the unique traditions of urban vegetable growing in Bamburg from the medieval period to the present day. Bamberg is a unique case showing how active associations can preserve traditional horticulture, food culture and religious customs, and adapt them for modern times.

The UNESCO World Heritage Site of Bamberg

The UNESCO World Heritage Site of Bamberg comprises three urban districts formed by branches of the River Regnitz: the *Bergstadt* (Hill district) with the cathedral and former monasteries; the bourgeois *Inselstadt* (Island District); and the *Gärtnerstadt* (Market Gardeners' District) with the inner-city gardeners' estates. Horticulture has taken place here continuously since the late Middle Ages, and the site is characterized by the market gardener's houses with horticultural fields behind them.

In 1993 the town of Bamberg – including the *Untere Gärtnerstadt* (lower Market Gardener's District) – became a UNESCO World Heritage Site. In 2016, the still active inner-city commercial horticulture practice in Bamberg, with its unique cultural traditions, craftsmanship, religious customs, clothing and language, was included in the nationwide list of intangible cultural heritage in Germany.

Photo 1: Kale in the North Corridor. © Stephanie Eißing, Bamberg

The *Untere Gärtnerei* (lower market garden)

The Gärtnerstadt's limited cultivation areas behind the houses of the individual market gardeners were supplemented by additional fields on the outskirts of the city in the *Nord-* and *Südflur* (North and South corridor, see photo 1). The centuries-old inner city horticultural tradition evolved into richly developed commercial horticulture of open-field and specialty crops. In addition to vegetables and herbs, the cultivation of licorice (*Glycyrrhiza glabra*) was economically very important for the town and unique north of the Alps. The licorice root was exported in dried form to many parts of Europe to be used as a sweetener or for the production of confectionery and medicine. Moreover, the trade in high-quality seeds, which reached as far as England, led to the Bamberg gardeners becoming very well known.

The Gardeners' and Vintners' Museum

The museum was founded in 1979 by the *Verein Gärtner- und Häckermuseum e. V.* (Gardeners' and Vintners' Museum Association), whose members originally came only from families of gardeners and winegrowers. Häcker is the Franconian term for winegrowers, but they no longer exist as a profession today because winegrowing had to be abandoned in the 19th century due to problems with the weather, phylloxera and a lack of wine sales after secularization in 1803.

The small open-air museum consists of a typical 18th century gardener's house (photo 2) and the inner-city market field to the rear (photo 3). It is the only gardening museum in Germany and recreates the living and working

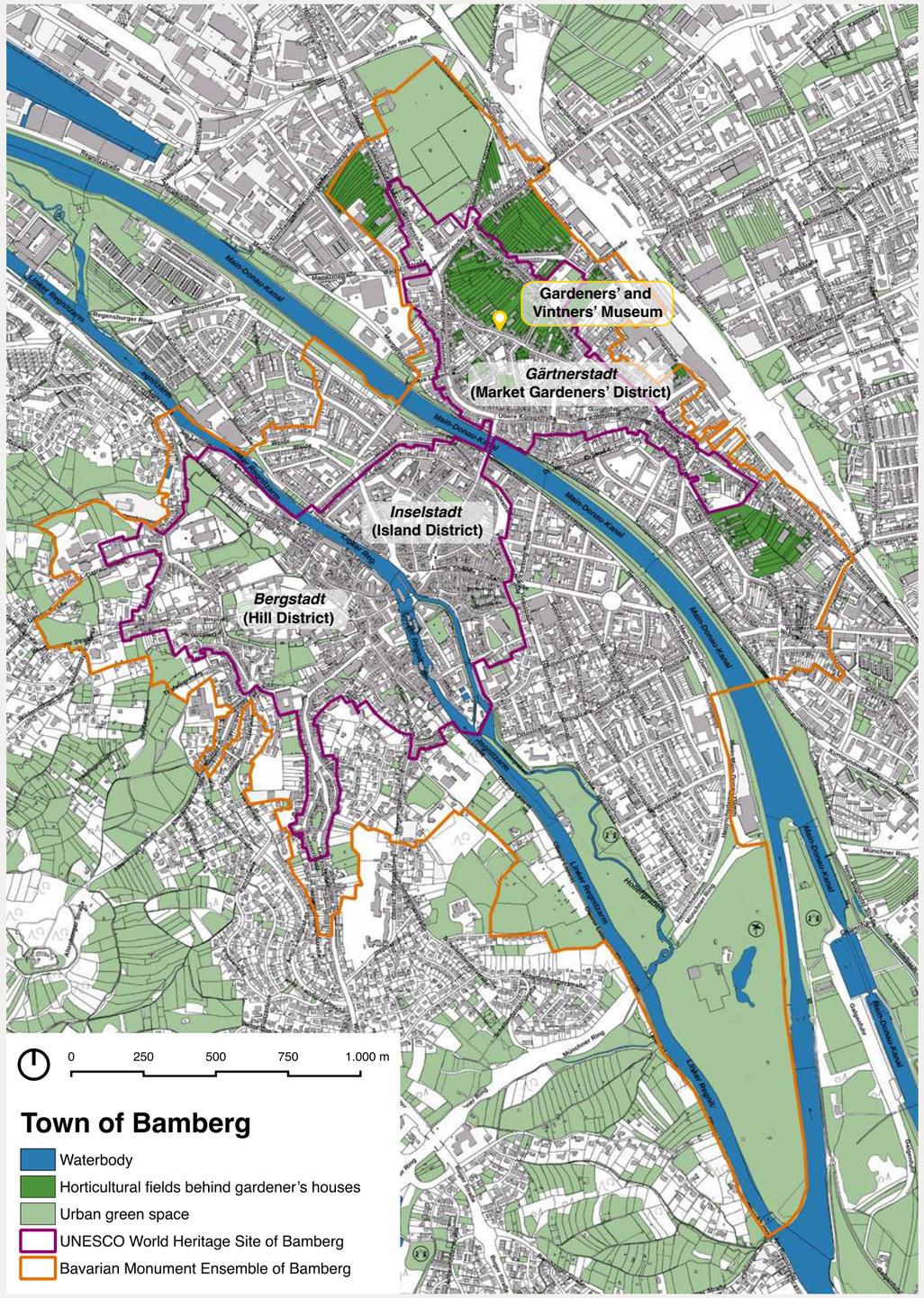

Figure 1: Town of Bamburg. © Yuxia Luo. Data: ATKIS®Basis-DLM Bayern, ALKIS® Bayern, Bayerischer Denkmal-Atlas

environment of a gardener family around 1900. Various aspects of everyday gardening, historical tools and cultivation methods are on display, as well as exhibits related to some gardeners' specialism in seed cultivation. The historic home garden grows special regional vegetable varieties such as the Bamberg onion, the Bamberg pointed savoy cabbage and the Bamberg Hörnla potato variety, as well as spices, medicinal herbs, liquorice and wine.

The *Sortengarten* (heritage variety garden)

In the neighbouring *Sortengarten*, historical and newer vegetable and herb varieties are grown for seed production. The Sortengarten e. V. association, which manages this area, thus also preserves the gardeners' botanical heritage.

Religious customs

The museum also includes exhibits on the social and religious integration of gardeners into urban society. The gardeners' guild existed from 1693 until 1863 and was responsible for the organization of the craft sector in the city, the training of apprentices and master craftsmen and the quality assurance of the products. The religious brotherhoods of gardeners, which had existed since the Middle Ages, served to provide for the community's afterlife. Both the guild and the brotherhoods shaped the religious customs of processions, blessing the fields in spring and donations for church services, which are still practiced by the two gardeners' associations today. The exhibition shows the processional figures and the customs, and brings them to life through film screenings and media stations.

The gardening culture is not only presented in a museum setting but is also practiced on site. The association members still plant and cultivate the museum garden themselves each spring. The existing horticultural businesses carry the history of their craft into the future by cultivating herbs and vegetables, as well as flowers and perennials.

In recent years, horticultural initiatives such as solidarity agriculture and self-harvest gardens have emerged in the city. New organizational forms are being added to the gardening tradition, and some of the traditions are being adapted to modern times. This is important because the UNESCO label can, in some instances, restrict change.

Photo 2: View of Otto Church. © Stephanie Eißing, Bamberg

Photo 3: Museum garden. © Stephanie Eißing, Bamberg

With many areas in the gardening city dedicated exclusively to horticulture and with the number of market gardeners gradually decreasing, there has been a pressing need to introduce new ways of maintaining the local horticultural tradition. Bamberg residents showed their creativity by combining their horticultural heritage with contemporary forms of urban agriculture. As a result, numerous initiatives by young gardeners can now be found on the sites, perpetuating the horticultural heritage in a new, community-based form.

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More information
Gardeners' and Vintners' Museum, Bamberg www.ghm-bamberg.de

Rothenburg's gardens: heritage protection in a medieval urban setting

Robert Nehr and Florian Huggenberger

The small Bavarian town of Rothenburg ob der Tauber used to be one of the most important imperial cities along the trade routes north of the Alps. Citizens who lived in the old quarter produced vegetables in gardens and town farms, thereby securing their own supply. Today these garden areas are used as recreational areas of the private houses and are an example of a sustainable use of medieval town structures.

Rothenburg ob der Tauber is a town of 11 0000 inhabitants in the Northwest of Bavaria, Germany. It is well known for its authentic medieval town centre surrounded by a Gothic wall, and is a popular tourist attraction with 1.8 million visitors per year. The main sight is the old quarter with 46 medieval towers, the walkable town wall, cobble-stone alleys and cultural treasures in churches and museums.

The old quarter is also home to 2500 residents, and boasts a rich and (in many parts) original landscape of private and public gardens. In the 14th century, 20 percent of the old quarter was green. Newer garden areas for apple and pear trees were established on the former moat just outside the city wall.

The local historian Ludwig Schnurrer describes the use of the gardens back in 15th and 16th century in the local magazine *Linde*: "While the wealthy were able to use their garden areas as a place to retreat, for leisure and for worshiping nature, the working middle class used the gardens primarily for the production of staple foods."[1] According to Schnurrer these gardens were used to grow "fruit and vegetables, including cabbage and beets".

As large parts of Rothenburg ob der Tauber remained intact and Rothenburg's old quarter now is protected by German heritage laws, these garden areas still exist today. They are a good example of how historical structures can keep their value for modern-day residents.

A retreat for today's residents

Historical garden structures from medieval times have survived in Rothenburg ob der Tauber. Against the trend of increased population density in many German cities after World War II these areas were not used for housing. They now help to keep Rothenburg attractive for tourists – and liveable for permanent residents.

Garden of a *Patrizierhaus* (noble family) within the old quarter of Rothenburg ob der Tauber, ca. 1940. Source: Town Archive Rothenburg ob der Tauber, Diasammlung August Müller, Gelbe Box 19. Copyright free

"This was a farm within the town when I moved in here in the 1970s. My husband's parents still grew potatoes, and we kept on doing that for quite a time. This is my small retreat within the old quarter, just one minute away from the main touristic route of Rothenburg, Schmiedgasse – and I hear almost nothing in my garden!"

Hilde Kistenfeger

Hilde Kistenfeger, who lives in a house in Rothenburg's Wenggasse. Nowadays the retired teacher uses the space in the heart of Rothenburg for salads, small herbs and tomatoes, but mainly as a large recreation area with a lawn, beds for various kinds of roses and chrysanthemums.

Hilde Kistenfeger in her garden in the old quarter. © Robert Nehr

Social structure of Rothenburg's gardens

The size and the location of the gardens in Rothenburg depended on the social status of the family. The wealthy families cherished their gardens near the Patrician Houses in Herrngasse, connecting the former castle of Rothenburg with the commercial centre of the town in the Market Square. This area, which had the most impressive compounds from the 14th century, is now mainly made up of hotels; the garden areas serve as restaurant terraces. Some houses are inhabited by local residents, and sometimes several parties live within one house in different rental apartments.

"We use the former garden of a merchant family as a contemporary open air gallery of art. Statues of German artists are spread all over our garden area."

Mr. Martin Sinn, who lives in one of the garden areas

Dangerous gardens of the 30 Years' War

In contrast to the gardens of the wealthy patricians, the less well-off residents of Rothenburg had to rent small garden areas just outside the town wall. It is typical of medieval European towns for the area just outside the defences to be surrounded by small gardens. Their existence is even mentioned in the text of the historical play Meistertrunk by local poet Adam Hörber, which commemorates Rothenburg's part in the 30 Years' War (1618-1648): the enemy is said to be hiding in den Gärten buschig grün – in the bushy green gardens. These areas still exist today to some extent, as private gardens or Schrebergärten (allotments).

Rothenburg as an agricultural area

The meaning and the importance of the gardens in medieval times is evident in documents held in the town archive: there is evidence of legal cases concerning the distribution of the gardens in 1327[2], and those who rented private gardens had to deal with bureaucracy. Schnurrer discovered that "not just the planting of flowers, trees, bushes and vegetables like chard and parsnips were regulated within the gardens but even the use of dung and manure".

An overview of gardening parcels from the year 1460 lists 218 garden compounds in Rothenburg, the smallest covering 8m² and the largest garden 77m². While we do not know how the gardens of Rothenburg were used during the next couple of centuries, we do know that they were in use due to tax records of the town archive. We also know that large parts were used for agricultural purposes (both vegetable and livestock) up to the middle of the 20th century, at a time when other cities were undergoing industrialisation. The area around Rothenburg remains quite rural today.

The seeds of Rothenburg

The development of the garden areas and their style depended on the introduction and availability of new plants and seeds. According to Schnurrer, the trade of seeds was a privilege and was strictly controlled. He quotes the request of gardener Conrad Zenker for a concession to trade seeds in 1705[3]. Gardener Zopf from the nearby town of Mainbernheim made the same request, with a note that he was able to *tractieren* (treat) trees. In 1796, gardeners Achatius Zucker and Michael Pfeiffer made a complaint about foreign seed traders, stating that "a lot of damage has been done to us by illegal trade and sale of seeds".[4] This is very different from today's Rothenburg, where seeds and plants are actively traded in the library without any commercial interest.

Cadastral Map of Rothenburg ob der Tauber, ca. 1827. Red areas indicate residential buildings, grey public and commercial buildings. Green areas are garden and agricultural areas. Source: *Bayerisches Landesamt für Digitalisierung, Breitband und Vermessung*). Copyright free.

An example for urban development

Rothenburg ob der Tauber means Rothenburg above the river Tauber. The views into the Tauber valley below what is today a vineyard are perceived as the epitome of a picturesque "English" landscape garden because there are no modern structures within that area. Rothenburg's layout and charms were not only reminiscent of Hampstead Garden Suburb in North London, UK, but also of Germany's first Garden City, Hellerau near Dresden.

In 2025 Rothenburg's green townscape – from the early modern era to the present day – is showcased in an permanent exhibition on the Rothenburg Way at Rothenburg Museum. Rothenburg is presented as a case for not destroying or quickly re-planning ancient structures that have lost their original commercial purpose. The town farms of Rothenburg, as well as the vineyards, became a recreational area for residents after a (sometimes very long) period of decay. For urban town planners in regions with massive structural changes of the economy, and a therefore high percentage of unused areas, Rothenburg is an example of a sustainable town development.

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Orti Generali: a grassroot regeneration model inspired by local heritage

Bianca Plebani

Orti Generali is an urban agriculture initiative covering five hectares in the Mirafiori Sud district of Turin, Italy. It is an innovative model of heritage-based urban regeneration, focused on valuing landscape resources and social inclusion through organic horticulture. This article traces its history from the 16th century, through the post-war period, to the present day.

Orti Generali evolved from MiraOrti, a participatory design project launched in 2010 by The Mirafiori Foundation, a non-profit organization that aims to improve the environmental and social quality of the neighbourhood. MiraOrti aimed to regenerate abandoned spaces that were once occupied by illegal gardens, using a relational approach to engage residents, schools and associations. MiraOrti laid the foundation for transforming these areas into a large regulated urban garden park.[1]

In 2018 the City of Turin conceded three hectares of land, prompting its evolution into Orti Generali, a social enterprise that manages the area under the legal form of a limited liability company. Today Orti Generali is composed of 270 rentable garden plots, a farm, a pasture with three Scottish cows, a collective garden, a garden dedicated to school activities and a kiosk that offers food and beverages from local producers.

The design integrates the historical agricultural landscape of the neighbourhood, drawing inspiration both from the 17th century agricultural layout of Mirafiori Sud and from the informal gardens that emerged during the economic boom of the 1960s.

The urban trajectory

The Mirafiori Sud district has a long agricultural tradition that originates around Villa La Pellegrina, located along the Sangone river. The villa was gifted to Catherine of Habsburg by Duke Charles Emmanuel I in 1585 on the occasion of their marriage. In honour of his Spanish wife, the villa was named *Miraflores* (look at the flowers). The district developed around it and remained predominantly agricultural until World War II.[2]

In 1939, the establishment of the FIAT car plant led to rapid construction to house the many workers that

Biodiversity at Orti Generali. © Giuseppe Moccia

An overview of Orti Generali. © Giuseppe Moccia

The unauthorized gardens established along the Sangone river and on polluted and abandoned lands since the 1960s symbolized "the recent history of Italy, migrations, the economic-boom, and the need for many workers to escape the factory apartment routine."

Stefano Olivari, one of the founders of Orti Generali

migrated from rural areas, especially from Southern Italy. This period of development ended in the early 1970s, having profoundly altered the urban character and social composition of the district, and changed its identity from one based on agriculture to one tied to the factory and its workers.

From informal gardens to regeneration

The need to maintain a connection to the land led many former peasants to create gardens, mostly along the Sangone river and even on polluted and abandoned lands. These unauthorized gardens, made using precarious and illegal infrastructures, rapidly became an identity feature of the Mirafiori Sud. They symbolize "the recent history of Italy, migrations, the economic-boom and the need for many workers to escape the factory-apartment routine," according to Stefano Olivari, one of the founders of Orti Generali.[3]

With the decline of automotive production in the 1990s, regeneration of Mirafiori Sud began. In this context, the MiraOrti project was launched through a bottom-up, participatory initiative. The project was co-designed with the citizens; existing illegal gardens were mapped so that they could be regulated, creating a collective place for the community.

Local gardeners, many of whom had cultivated these plots for decades, were invited to co-design the site's future. The association proposed a trade-off: it established a set of rules for the gardeners to adhere to, in return for a secure, legal and regulated plot of land, thus preventing thefts and unauthorized use. The gardeners helped to clean and reorganize the land and contributed their knowledge to the planning of the new gardens.

The inclusion of schools has promoted an intergenerational exchange between elderly gardeners who shared their farming knowledge, and children who have a chance to learn about urban horticulture and its role in the identity of the area.

In 2012, a comprehensive feasibility study for the MiraOrti project was carried out by MiraOrti project to assess the potential for the regularization and participatory regeneration of the spontaneous gardens in Mirafiori Sud.[4] The study revealed the gardeners' strong attachment to the place, as well as their self-management abilities and horticultural knowledge. It showed that 70 percent of the informal gardeners in Mirafiori Sud had joined the project, indicating strong local engagement and interest in the initiative.

Pre-industrial, agroecological and technological practices

Orti Generali was inspired by the pre-industrial agricultural landscape and used elements that were typical of the 17th century in the area: the Po Valley tree-lined system called *piantata padana* (the traditional tree farming system where grapes are grown on elms) and the recovery of the 17th century irrigations canals (*bealere*) that once watered the gardens of the Mirafiori Villa. Today the *piantata padana* system is used to grow rows of mulberry trees, while the *bealere*, no longer functioning as irrigation channels, are used to cultivate a variety of plant species, thus creating biodiversity corridors.

Agricultural practices like intercropping, crop rotation and agroforestry are highly valued. Specifically, the Urban Agroforestry System project, led by Orti Generali in collaboration with Urban Lab Association and Kairos Community-Cascina Falchera (an urban agriculture project in Turin), has implemented a series of agroforestry solutions to improve the ecological and landscape conditions of peri-urban areas of Turin, in a bid to increase biodiversity and enhance the green belt. This project is part of the broader framework of the City of Turin's Strategic Green Infrastructure Plan and is aligned with the sustainability goals of Agenda 2030.

At Orti Generali, innovation plays a key role. A weather station has been installed in the centre of the gardens that controls automatic irrigation. Using an Arduino-based system, it senses when the soil moisture level drops below a set threshold and connects to the internet to check the weather forecast. If there is less than 85 percent chance of rain, irrigation is triggered. This smart agriculture enhances efficiency and stability, minimizing water waste.

EU recognition

In 2023, Orti Generali was awarded the National Landscape Award and represented Italy at the 8th edition of the Council of Europe Landscape Award[5]. The award recognized its capacity to recover and manage the structure of pre-industrial agrarian landscape, its promotion of technological innovation, and its ability to communicate and share the values of the landscape through education, thus reinforcing a sense of identity within the community.

Knowledge sharing

Orti Generali was built in collaboration with the gardeners of previously illegal garden plots, who have been essential for the foundation of the project. The transmission of knowledge has been a core aspect of Orti Generali. It offers courses on organic and traditional horticulture to children and adults, to keep nature-based practices alive. The use of chemicals, pesticides and synthetic fertilizers is strictly prohibited; gardeners are encouraged to adopt sustainable farming techniques such as cover cropping, mulching and crop rotation, while deepening their understanding of ecological responsibility.

Social inclusion

The project offers garden plots to disadvantaged people in return for a few hours of work in the collective garden. It also offers internships and job opportunities for individuals with intellectual disabilities. Orti Generali cooperates with Mirafiori Foundation to support families in need in the neighbourhood, giving them fruits and vegetables from the collective garden, promoting food security, self-consumption and reduced food waste.

Take home message

Orti Generali has restored an agricultural landscape that had been degraded by industrialization and construction, integrating the knowledge of urban gardeners while engaging local residents. This initiative preserves the urban gardens, which are part of the district's identity, and at the same time recovers 17th century landscape elements. Heritage informs both the design and social practices of Orti Generali, bridging the memory of past landscapes with an innovative model of community agriculture.

Orti Generali demonstrates how the heritage is not only a static legacy to be preserved, but also a dynamic resource to be activated. Its strength lies in its ability to transform a complex identity into a driver of innovation, contributing to the creation of a fairer, more inclusive and more sustainable urban future.

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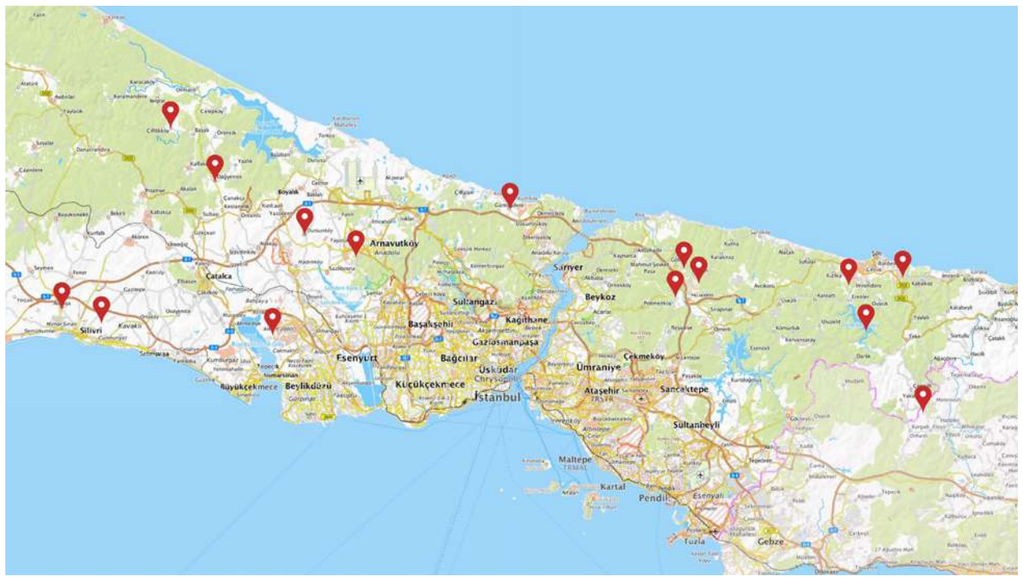
Agricultural heritage as commons in Istanbul's periphery

Burcu Uyanık Taş and Eda Ünlü Yücesoy

Despite its key role in supporting the city's food supply, agricultural heritage in Istanbul's peri-urban areas faces growing threats from land use policy and development. This article draws on the findings of a recent study of the practices of small-scale peri-urban food producers to make the case for agricultural heritage as commons, to be recognized and supported through agricultural and food policies.

Heritage results from a dynamic process that is continually reconstructed through the practices of communities, not merely as a legacy of the past but as something constantly reproduced and reinterpreted in the present.[1] Defining heritage in this way allows it to be conceptualized as a commons, with the capacity to be collectively managed and reproduced. Yet the commons-based nature of heritage is under constant threat of enclosure. The term enclosure originally referred to physical walling off of previously common land in 16th century England but has since been extended to the reduction of other shared resources into forms of property that can be owned, recorded, or controlled by a limited set of actors through state or private interventions, often leading to exclusion and limited access for others.[2]

The threat of enclosure applies to both tangible resources, such as local seeds and intangible resources such as traditional agricultural knowledge (TAK). Unlike other commons that are scarce or exhaustible goods, these resources gain value as they are shared and socially circulated. The more they are reproduced and exchanged, the more they become part of a heritage that functions as a commons, accessible to all potential users.



From field to map: locations of producers in the study. © Burcu Uyanık Taş

In the case of Istanbul, the Seed Law No. 5553, land-use regulations such as the Urban Transformation Law (No. 6306) and the Metropolitan Municipality Law (No. 6360) contribute to the enclosure of agricultural heritage as commons, both directly and indirectly. This not only results in the loss of agricultural lands, but also disrupts the communities and their collective practices, such as seed or TAK sharing. Yet, local seeds or TAK only become heritage when there are actors who culturally recognize, define and share them.

The small-scale qualitative study, conducted between 2023 and 2024 in Istanbul's peripheries, focused on the production practices of small-scale producers who are vital to the city's food supply.[3] The findings support the view that local seeds and TAK play a key role both in maintaining agricultural heritage and in sustaining local food production.

The fieldwork drew on participant observations in cooperatives, associations and food networks, and semi-structured interviews conducted with 19 small-scale producers in Istanbul's peripheral districts, including Arnavutköy, Beykoz, Büyükçekmece, Çatalca, Silivri, Sarıyer and Şile. The producers, all of whom practiced small-scale commercial crop production, home-based gardening, or community-based and other shared gardening, were asked about the challenges they face during production and the strategies they develop to cope with these challenges.

Among the responses, practices grounded in local seeds and TAK emerged as particularly significant. This is because seed and TAK-related practices differ from challenges like land tenure insecurity, where producers have limited room for action. In contrast, these practices are still sustained through community-based relations, independently of the state or private sector. This shows that producers can actively develop their own solutions, reinforcing the commons-based nature of agricultural heritage and supporting local food production.

Main challenges in Istanbul's peri-urban areas

Interviewed small-scale producers frequently referred to similar challenges and enclosures. Although these enclosures primarily concentrate on land, they are inevitably closely related to the enclosure of local seeds and TAK, because this is the land where food is produced and social relations take shape. These threats emerge through overlapping legal, political and ecological processes.

Large-scale projects – such as the Northern Marmara highway, Third Bridge, Istanbul Airport and the Canal Istanbul project – led to the loss of farmland, pastures and forests, especially in peripheral districts such as Arnavutköy, Çatalca and Silivri. After COVID-19 and the 2023 earthquake, land pressure increased in peri-urban areas like Beykoz and Şile as a result of luxury housing projects.

In addition, the Urban Transformation Law (No. 6306) allows farmland to be designated as risky and opened for development. Moreover, the Metropolitan Municipality Law (No. 6360) reclassified villages as urban neighbourhoods, thereby removing farmers' access to rural development programmes and transferring communal lands to municipalities, which can then sell or develop them.

> *"After the airport was built, many of my neighbours sold their land. These were people I had known for years, but when they could no longer earn enough from farming, they gave up."*
>
> A producer from Arnavutköy

Alongside these land pressures, the Seed Law No. 5553 imposes restrictions on the exchange of local seeds. While the sale of uncertified seeds is prohibited, production and commercial distribution are only allowed if seeds are registered with institutions under the Ministry of Agriculture and Forestry. For small-scale producers the requirement to use certified seeds in order to access state support creates a major barrier. This regulation does not entirely exclude local seeds but the complexity of the certification process and limited access conditions pose significant barriers for smallholders.

For instance, some new producers who had relocated to the region wanted to access local seeds, but initially struggled due to a lack of local connections. With no support from the municipality, they obtained seeds through informal, technically illegal, channels. Over time,

> *"Most of the land here has been sold, much like in Şile, turning agricultural areas into valuable assets for investors."*
>
> A producer from Gümüşdere in Sarıyer

they accessed more varieties through neighbourly ties, informal groups and cooperatives.

Producers' practices for overcoming challenges

Producers' practices operate across various levels, from small informal groups and neighbourhood initiatives to broader community and institutional efforts.

Firstly, TAK and local seeds are frequently exchanged during casual encounters in local markets, adjacent fields, neighbourhoods and home visits. Producers share knowledge about local seeds, planting techniques, natural pest control, chemical-free cultivation and (micro) climate adaptation. Local seeds circulate informally via spontaneous conversations, peer recommendations at markets and direct sharing between farmers.

"People sometimes give me heirloom seeds like century-old chickpeas or a couple of black beans. I grow and return them, or multiply and share. I believe this kind of exchange is important and meaningful."

A producer from Çayırbaşı in Şile

Secondly, surplus products grown from local seeds using traditional methods are often exchanged informally among neighbours, relatives or producers. Beyond their economic value, these goods embody agricultural heritage. Furthermore, producers turn local seeds and TAK-based products into traditional foods like jams, preserves, and dried vegetables. These exchanges help to pass on recipes and techniques through the generations,

Luxury villas built on agricultural land in Şile. © Burcu Uyanık Taş

Home-based gardening in Arnavutköy. © Burcu Uyanık Taş

helping to preserve agricultural heritage.

Thirdly, seed exchange events, often organized by communities or associations, offer physical spaces for producers to share local seed varieties, exchange experiences and build relationships of trust. While several municipalities such as Kadıköy, Çatalca and Büyükçekmece have since organized their own seed exchange events, many of these initiatives were inspired by an earlier, community-led event in Şile.

The first seed swap in Ovacık was initiated in 2012 by a former white-collar worker who had relocated from Istanbul. Lacking institutional support, she recalls: "I said I wanted to do organic farming, and they told me: 'Then you need to find organic seedlings and local seeds.' I asked where to find them. They said: 'We don't know, you have to find them yourself.'"

During this period, she attended a seed exchange festival in İzmir and was inspired to organize a similar event in her village. Initially met with scepticism from locals and authorities, the event unexpectedly attracted nearly 3000 people. "I just wanted to share seeds, but it turned into something much bigger," she recalls.

This grassroots initiative paved the way for broader engagement, including the establishment of a women's association, the renovation of a village school and eventually a Slow Food-recognized Earth Market with support from the United Nations Development Programme. Additionally, women producers play a crucial role in transmitting agricultural heritage through knowledge sharing on seed saving, food processing and preservation techniques. For example, the "A Day in Ovacık Village" project in Şile enabled the women to connect their practices with broader groups of actors.

Finally, producers use social media platforms such as WhatsApp and Facebook groups, and networks such as those connected to Postane İstanbul, a civic hub that

A Day in Ovacık Village project. © Fatma Cam Denizci

facilitates producer-consumer ties through its rooftop garden, fair trade initiatives and active messaging groups. Within this ecosystem, the Adil Gıda Topluluğu supports local production and knowledge-sharing through community-based digital engagement. These digital spaces enable new forms of connection and collaboration among producers, which we can interpret as digital commons.

Recommendations

The findings support the argument that local seeds and TAK are not merely inherited, but are also commons that are collectively used, shared and reproduced by producers. The study shows that producers actively contribute to local food production by continually reshaping these commons in response to current needs, while simultaneously preserving and drawing upon agricultural heritage.

These practices contribute to local food production by utilizing local seeds and TAK that have adapted to local conditions over generations. This reduces dependence on external inputs such as pesticides, chemical fertilizers and commercial seeds. By relying on these resilient seed varieties and determining their own cultivation methods, producers help build more sustainable local food production rooted in food sovereignty.

This case also reveals two particularly noteworthy takeaways. First, as the Şile case illustrates, community-initiated practices such as seed festivals can evolve into broader, institutionalized models when supported by local governments. This shows how municipal support can help transform community practices into lasting models, reinforcing their collective nature and ensuring their continuity. Second, digital platforms such as WhatsApp and Facebook groups function as digital commons by enabling the circulation of seeds and knowledge beyond physical boundaries. In an increasingly fragmented peri-urban landscape like Istanbul, these digital commons serve as crucial tools to sustain and scale community-based agricultural heritage practices.

Food and agricultural policies must recognize local seeds and TAK as commons maintained through producers' collective efforts. These practices can extend beyond small informal circles and scale through tools like digital platforms. A supportive policy framework is essential for sustaining alternative practices that evolve from deeply rooted traditions in response to new challenges.

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Urban (agri-)cultural pasts and futures in Carthage, Tunisia

Katrin Bohn and Boubaker Houman

Carthage has a rich history of urban agriculture dating back more than 2000 years, yet modern-day heritage regulations undervalue this legacy and hinder the implementation of an integrated approach to urban planning. By addressing current paradoxes, we argue for a renewed focus on Carthage's agricultural heritage to support local food security and environmental management, with residents engaged in participatory design and implementation of urban agriculture.

Established in 814 BC in north-eastern Tunisia, Carthage has a long and profound agricultural history. For many centuries, food system activities enabled inhabitants of Carthage to live on what they produced. This system only collapsed after Rome's destruction of Carthage in 146 BC, but its agricultural legacy later influenced the granary economy of Roman North Africa.

The city of Carthage enjoys connections to the Mediterranean sea whilst being located in the metropolitan area of Grand Tunis. © University of Brighton and City Team Carthage 2021

Mago, one of the few Carthaginian writers known to us for recording agriculture, testified to the advanced agricultural knowledge that flourished in the region since at least around the year 400BC. This included strategic land management techniques, sophisticated methods of breeding and pruning and innovative approaches to food preservation. Mago's famed treatise on agriculture emphasized the importance of committed farm management. His topics included how to select the best bullocks, situate vineyards and prune vines, plant olives and rear horses and mules.

Palaeobotanical research carried out by a Dutch team in the early 1980s has revealed an astonishing assortment of cultivated plants, including wheat, barley, lentils and peas, figs, olives, pomegranates, vines and prunes.[1] Amphoras were used to transport foodstuffs across the region, and archaeological analyses by Pardo Barrionuevo found that meat was preserved in oil, wine or vinegar and sometimes seasoned with nuts, such as pine or hazelnuts. In some cases, a smoking process of the meat prior to its packaging could be deduced.[2]

The number and diversity of Ancient Carthage's surviving Roman mosaics bear witness to the importance of food system activities. Copyright free

Examples of existing urban food system activities in Carthage: Amilcar (community) Garden on privately-owned land (left), a tolerated wheat field below Byrsa Hill (right). © City Team Carthage 2020

Modern Carthage

Today Carthage is a small town of around 20 000 inhabitants. In recent years it has experienced a socio-economic recession linked to the fall in income from cultural tourists, compounded by the lack of a sustainability plan for adapting to climate change.[3] While cereal growing, olive cultivation, chicken rearing and beekeeping are practised locally, residents mainly depend on external food supplies, and some are food insecure. Plant and animal production is the weak link in the local food system, and nutrient recycling through composting of organic waste is poorly developed.[4]

Over the last 10 to 15 years, a new generation of innovative farmers, food producers and retailers has emerged in Carthage, mirroring urban agriculture uptake elsewhere in the world. There are now a few artisan or community food stores, community gardens, individual food sellers and two "edible streets". These food actors find support in the local population that buys their products, but their livelihoods are constrained by rigid regulations and an institutional context with an unusually large number of decision makers.

This disconnect between Carthage's rich agricultural past, its current urban realities and its aspirations for the future is manifested in three interconnected paradoxes: the heritage paradox; the urban planning paradox; and the governance paradox.

The heritage paradox

In 1979, Carthage was included on the UNESCO World Cultural Heritage list. This came with a number of requirements on land management, including the introduction of a non-constructible archaeological zone on about 60 percent of its open land.

Both UNESCO and national authorities have prioritized the preservation of Carthage's monumental architecture and archaeological sites.[5] This emphasis on tangible heritage, while crucial, has led to a neglect of the intangible heritage embedded in agricultural traditions and knowledge. Therefore, despite its importance for the city's cultural history, Carthage's agricultural heritage has not been utilized. Despite the lack of alternative usages for the protected territory, urban agriculture has not been considered. This paradox represents a missed opportunity.

While proud of their millennial cultural past, Carthaginians also express their concern about the future of their city, given that the archaeological heritage is scattered over so much of its territory. It remains an unusable historical archipelago in an increasingly dense urban space. This concern, expressed locally as "frozen land", exacerbates social tensions and land speculation. On the one hand poor people break the law by building on the archaeological sites, while on the other speculators treat large areas as property reserves.

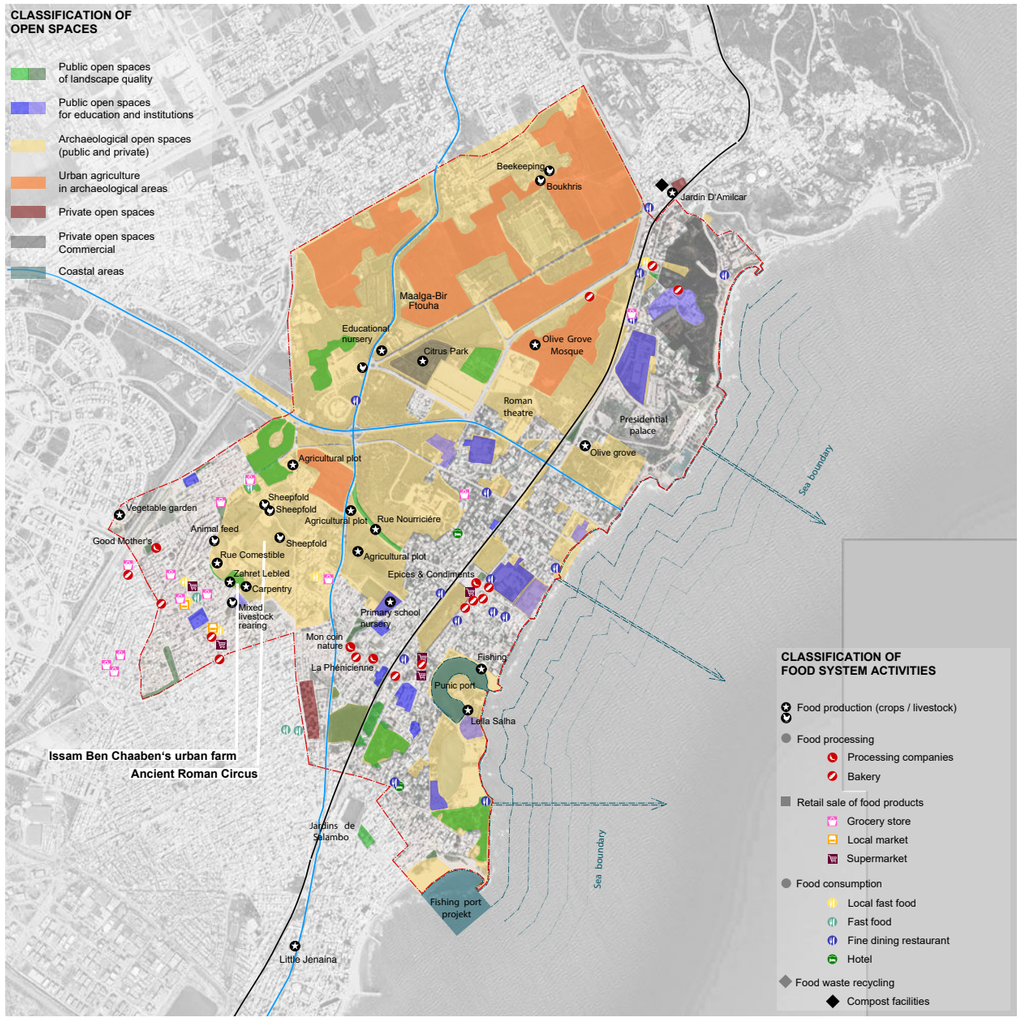
The urban planning paradox

The COVID-19 pandemic showed up the poor resilience of Carthage's food system. There was great need of municipal intervention to meet the food needs of deprived residents, given the lack of self-sufficient local agricultural production and the heavy reliance on the Tunisian conurbation for food security. During this time, however, some urban farmers exploited non-constructible plots of land (i.e. that were subject to regulatory restrictions), thereby covering their fresh produce needs and those of their neighbours.

Both permitted and clandestine urban agriculture initiatives have highlighted that certain open archaeological areas have very fertile soil. Such initiatives testify to the desire of the local population for more responsive land management that would allow them to use land for farming.

The paradox between a predominantly top-down, centralized approach to urban planning, a growing national emphasis on inclusive and sustainable

The former Roman Circus, a component of the 'non-aedificandi' zone, is characterised by tolerated urban agriculture and unmanaged waste disposal. ©City Team Carthage 2022



This food map, collectively drawn during the Horizon 2020 EdiCitNet project, shows in yellow and orange the UNESCO-protected site as well as the diversity of existing food spaces and food system activities. ©University of Brighton and City Team Carthage 2021

Issam's market garden

A number of years ago, Issam Ben Chaaben, an unemployed former telecommunication technician, started growing vegetables on land owned by his family on the fringes of the remains of the ancient Roman Circus of Carthage. As he produced more than enough to feed his family, he turned his subsistence activities into a source of income during COVID-19. From a modest start in 2020, Issam now sells fresh vegetables and herbs directly to residents of his neighbourhood, local traders and restaurants in neighbouring towns, and employs two young people to help distribute the produce.

Recently he sought and secured the support of heritage managers and the local authority to safeguard his fields, legalize his work and gain technical and financial support in order to ensure the continuation of his project. The project also has a tangible environmental impact by reducing the amount of rubbish in the area and providing more greenery in the neighbourhood.

Issam has ambitious plans for the future: *"I would like to find private partners or public organisations interested in financing the market garden project so that I can create new projects, e.g. a green educational oasis for schoolchildren in a neighbouring school".*[6]

Issam Ben Chaaben's farm in Southwest Carthage. ©City Team Carthage 2022

development and yet an ignorance towards local desires still results in plans that do not adequately address local needs. This disconnect is particularly problematic in the context of Carthage's complicated governance situation.

The governance paradox

Carthage's governance structure is characterized by complexity and fragmentation. Despite covering a relatively small area of about 6.4 km^2, several power centres coexist: UNESCO (focused on World Heritage preservation); the national government of Tunisia (whose presidential palace occupies a significant portion – 0.25 km^2 – of the city); the regional governorate of Tunis; and the Municipality of Carthage. These overlapping authorities often hinder coordinated decision-making.

For example, the Municipality of Carthage has virtually no effective powers over 60 percent of its territory, which fall under the responsibility of central authorities due to the UNESCO heritage status. With the resulting limited reach of their planning policies, the local authority is paralyzed in the face of increasing demand for land for food growing, especially from residents of working-class neighbourhoods.

The use of so-called "heritage plots" (agricultural sites in the non-constructible zone) during the COVID-19 crisis highlights several points in favour of urban agriculture:

- The initiative of residents of Southwest Carthage demonstrates their adaptability and willingness to find local solutions to food supply problems.
- The tolerance of local authorities towards these spontaneous urban agriculture initiatives demonstrates an implicit recognition of the potential of these practices.
- The example of urban farmer Issam Ben Chaaben demonstrates the potential of urban agriculture to supply fresh food while enhancing certain protected areas (see Box).

It is too early to describe what consequences this new approach has had on use of land for food growing in Carthage.

Recommendations

The resurgence of urban agriculture in Carthage is not a nostalgic return to the past but can be a strategic re-integration of agricultural practices into the urban fabric as part of a coherent urban planning scheme that both respects the integrity of the archaeological site and enables sustainable food system activities. The following recommendations address all actors in the urban food system, but especially planners and policy makers:

- Integrating a local heritage approach focusing on values and benefits for Carthaginians with UNESCO's universal heritage approach.
- Engaging local communities in the participatory design, implementation and management of urban agriculture initiatives to ensure they meet local needs.
- Connecting urban agriculture with other urban systems, such as waste management (composting), water management (rainwater harvesting) and energy production (solar).

The future of Carthage hinges on its ability to reconcile its rich past with the challenges and opportunities of the 21st century. By embracing its agricultural heritage, addressing the inherent paradoxes and innovating for the future, the vision for Carthage is a heritage site that is inclusive, resilient and sustainable.

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This article is dedicated to Marielle Dubbeling, late director of RUAF.

Dear Marielle, sleep peacefully. Your deep spirituality and your unique "Heart2Heart" approach are still highlighting our path toward an urban agriculture rooted in history and founded on values of humanity. The scientific rigour, the proximity work with inhabitants and the flexible attitude with policy-makers – shared, for example, from 2007 to 2015 in Tunisia – are the fundamental and guiding principles of this modest article we dedicate to you.

The former Roman Circus, a component of the 'non-aedificandi' zone, is characterised by tolerated urban agriculture and unmanaged waste disposal. ©City Team Carthage 2022

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The interlinked history of exotic vegetables production and urban farming in Ghana

Pay Drechsel

The Ghanaian diet features a mixture of indigenous and "exotic" fruits and vegetables first cultivated by pre-colonial settlers in the 15th century. This article explains how exotic urban vegetable farming took root to satisfy the tastes of traders, and led to strong European influence in Ghana's modern day food culture.

The cultivation of non-indigenous, so called "exotic" vegetables and other crops from foreign countries blossomed in Ghana with the arrival of European trading companies at the end of the 15th century, who set up permanent trading camps, forts and castles along Ghana's Gold Coast with the permission of the local community leaders. Several of the trading posts set up by the Portuguese, Swedes, Dutch, Danish, British and Germans were within or near existing towns. Some started to function as small towns in their own right, with quickly developing markets, housing areas in- and outside the forts, quarters for soldiers, craftsmen and workers, and well-defended warehouses for the traded commodities. The Europeans were interested in gold, ivory, pepper, salt and mahogany, while they offered the local populations textiles, iron bars, knives, weapons, mirrors, tobacco, spirits and exotic crops. Later, slaves replaced gold as the major object of commerce, with storerooms converted into dungeons.

Many of these pre-colonial urban settlements supported gardens which provided fresh fruits and vegetables to the European settlers, as well as crews from incoming ships. European vegetables were preferred by the settlers, and it usually took newcomers several months before they started to cherish local dishes. The cultivation of exotic vegetables was often confined to the residences of European civil servants and merchants.

The castle in the town of Elmina was the first trading post built on the Gulf of Guinea by the Portuguese in 1482. Competition for trade between rival European powers brought changes to these settlements. In 1637 the Elmina castle was conquered by the Dutch, and two centuries later ceded to the British in 1872. The hill slopes opposite the castle were used under the Dutch as cattle pasture, had vegetable, herb and fruit gardens, and served as a place for relaxation. When the smaller Fort St Jago was established in 1660 (Figure 1), the Dutch population could walk under coconut palms, lemon and orange trees (Figure 2) to avoid the increasingly busy town. More farms were established by the Dutch West India Company behind Fort St Jago (Figure 3).

The demand for exotic vegetables continued over the centuries and became a good business in colonial times. For example, in the 19th century farms were established

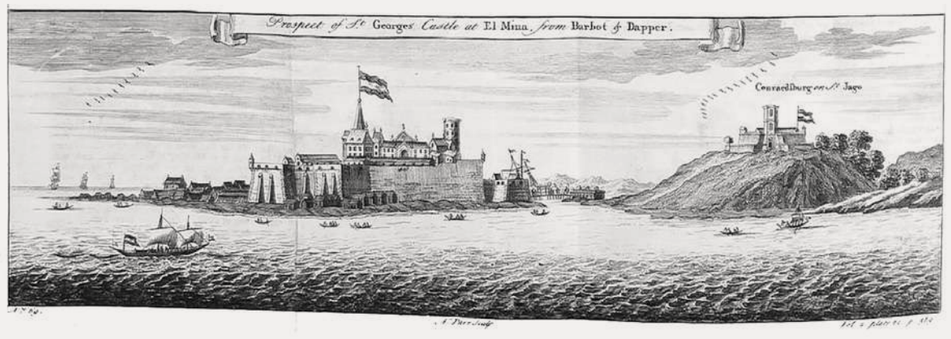

Figure 1: Elmina castle (left) and Fort St Jago (right) at Ghana's Gold Coast. Public domain

by Rev. Thomas Birch Freeman near Cape Coast and Accra, which produced beans, carrots, cabbage, peas, onions and other exotic crops. With a background in gardening and botany, the well-known missionary Freeman also established agricultural schools that produced both local and exotic fruits and vegetables for the slowly growing urban population.

The wish to cultivate familiar vegetables of European heritage within these first urban settlements could be considered as the start of exotic urban vegetable farming in Ghana. Moreover, the European influence strongly impacted modern Ghana's food and nutritional culture – even if, despite this globalization, several indigenous food crops remain very prominent in present-day Ghana, such as yam, okra, millet and palm oil. In particular, cassava and maize from the Americas became very popular, alongside sweet potato, groundnut and pineapple, oriental rice, plantain, banana and coconut from Asia, and lemons and oranges from the Mediterranean region.

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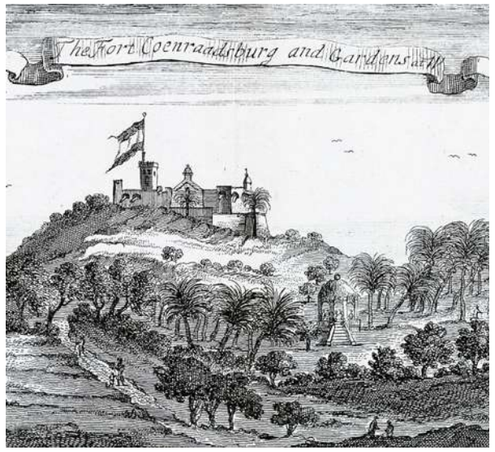

Figure 2: Gardens at the slopes of the St Jago Fort (Fort Coenraadsburg). Public domain

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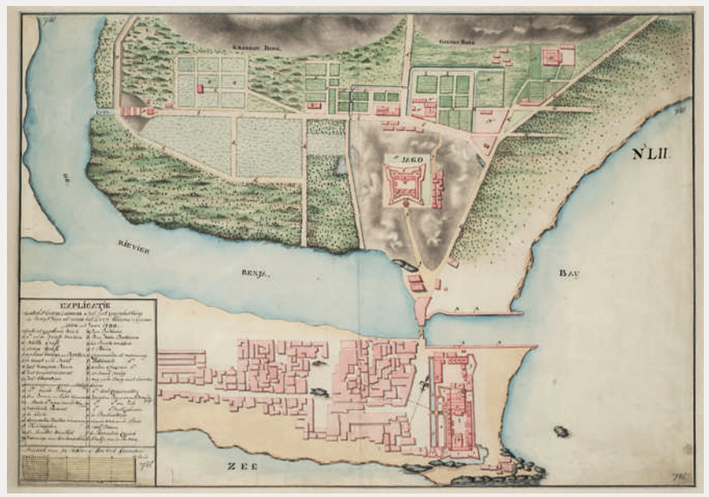

Figure 3: Plantations and gardens behind Fort St. Jago (Fort Coenraadsburg). Public domain

Decolonizing botanical gardens: potential for urban agriculture

Alina Marktanner

Botanical gardens worldwide are confronting their colonial pasts and exploring how to restitute plant heritage to benefit local communities. By reconnecting displaced plant knowledge with urban farming initiatives, botanical institutions can help revitalize traditional agricultural techniques proven effective since the pre-colonial era. This article examines how botanical gardens can transform from colonial knowledge extractors to partners in sustainable urban agriculture through practical, community-centred approaches to plant heritage restitution.

Botanical gardens emerged alongside European colonial expansion, functioning as critical nodes in imperial agricultural networks. Botanists and collectors, hired by these institutions, gathered plants from across the globe, catalogued them according to European scientific frameworks and tested their commercial viability. The knowledge gained through these activities directly supported the plantation economy – monocultural agricultural systems designed to extract maximum profit from colonized lands using standardized European methods. Meanwhile, indigenous agricultural knowledge was systematically marginalized, despite often being better adapted to local conditions.

Colonial agricultural legacies

The connection between botanical gardens and colonial agriculture is illustrated in the history of cocoa cultivation in West Africa. As historian Corey Ross shows, colonial agricultural departments persistently promoted European plantation techniques based on Caribbean models, despite African farmers developing highly efficient cocoa growing methods. Indigenous farmers integrated cocoa into traditional forest fallow systems, achieving higher yields with fewer inputs than European methods. Yet colonial officials dismissed these practices as primitive, imposing what Ross calls a "plantation paradigm" that reflected cultural assumptions about European superiority rather than agricultural effectiveness.[1]

Botanical institutions became repositories of plants displaced from their origin communities, along with fragmented knowledge of their uses. Traditional polyculture techniques, which combined multiple crops in complementary relationships, were replaced by monocultures that required greater inputs and often degraded local ecosystems. The botanical gardens that catalogued this diversity simultaneously participated in dismantling the knowledge systems that had developed these plants over generations.

Today, traditional growing methods offer valuable solutions for urban agriculture challenges. Polyculture techniques optimize limited space in urban environments while enhancing soil health and pest resistance naturally. What is more, traditional companion planting approaches – once dismissed by colonial agronomists – can significantly reduce the need for chemical inputs while increasing overall productivity from small plots.

Cocoa and coffee field in the Etolower experimental garden in Cameroon in 1923.
© P. Pascalet.

Practical restitution approaches

Restituting plant heritage means more than simply acknowledging historical wrongs. It involves actively returning plants and knowledge to communities of origin while supporting new applications in contemporary settings. Several botanical gardens have begun this process with promising results for urban agriculture.

In 2023, the German Association of Botanical Gardens (*Verband Botanischer Gärten*) published a position paper that examines botanical gardens' colonial connections. The paper acknowledges how botanical gardens participated in colonial exploitation through the systematic exchange of plants between colonies and the promotion of plantation cultures worldwide. Besides, it advocates for establishing infrastructure at botanical gardens in the Global South and creating partnerships where indigenous names and knowledge systems are respected rather than erased or appropriated.[2]

The Royal Botanical Gardens at Kew, too, has launched collaborative projects with global partners that connect historical botanical knowledge with contemporary needs. In Ethiopia, they investigate the potential for *enset* (the "false banana") to address food security challenges. In Madagascar, they promote sustainable cultivation of wild yams for improved nutrition and livelihoods. These initiatives demonstrate how botanical knowledge, when properly recontextualized, can support resilient food systems.[3]

Person stepping out of a glasshouse in Kew Gardens. © Eleanor Brooke

The botanical garden in Zanzibar offers another instructive example. Originally established during the colonial era, the garden is being revitalized through a climate partnership with Potsdam's botanical garden. Rather than imposing external models, botanist John Otieno Ndege is collecting seeds and cuttings from rare plants in remaining coastal forests to preserve indigenous biodiversity.

Significantly, this project prioritizes local needs and knowledge. Ndege emphasizes reconnecting Tanzanians with locally growing edible plants, noting that "the locals often do not know the edible plants native to the area and spend a lot of money at markets on imported fruits and vegetables". By showcasing native plants like the Bungo vine, which produces a flavourful juice, the garden helps communities reduce dependence on imported foods while preserving botanical heritage.[4]

Action steps for botanical gardens

Botanical gardens can take the following concrete actions to support urban agriculture through knowledge restitution:

- Establish direct collaborations with urban farming communities, particularly those with cultural connections to plants in collections.
- Develop community-managed seed libraries focused on culturally significant and locally adapted crop varieties, supporting food sovereignty in urban areas.
- Create knowledge exchange platforms where traditional agricultural techniques can be shared and adapted for urban contexts, with botanical experts and community practitioners as equal participants.
- Collaborate with educational institutions to integrate traditional growing methods into urban farming training programmes, emphasizing both techniques and their cultural contexts.
- Complement digital catalogue efforts with physical access and participatory programmes that allow communities to directly engage with plant collections.

Sign of Kew's Children's Garden © Rumman Amin.

Challenges and opportunities

Beware: The path toward meaningful decolonization does not come without significant obstacles. Kew Gardens' experience demonstrates that institutional change can provoke backlash, with conservative critics dismissing the efforts as "woke" or threatening to withhold funding. Despite publishing a 10-year manifesto for change, developments at Kew have been slow, with the institution modifying its language from "decolonize" to "re-examine collections" under pressure.[5]

Nevertheless, the potential benefits of decolonizing plant heritage for urban agriculture remain substantial. Traditional agricultural techniques offer proven solutions to contemporary challenges of limited space, soil health and climate resilience. By reconnecting these knowledge systems with the communities that can benefit from them, botanical gardens can help create more productive, culturally appropriate urban food systems.

For urban agriculture practitioners, botanical gardens represent untapped resources of knowledge about climate-appropriate plants and growing methods developed over centuries. As climate change disrupts conventional growing patterns, traditional techniques preserved in botanical collections offer tested strategies for resilience. By transforming from colonial institutions to collaborative partners, botanical gardens can fulfil their potential not only as preservers of biodiversity but as active contributors to sustainable urban futures.

Although the process of decolonization may be neither simple nor linear, the intersection of botanical heritage and urban agriculture offers a promising path forward. When botanical knowledge flows back to communities in ways that respect their agency and priorities, both historical tensions and contemporary challenges can be addressed simultaneously. Ultimately, the future of urban food systems can benefit from our ability to reclaim and recontextualize the plant heritage that botanical gardens have preserved, even as they participated in disrupting the knowledge systems that created it.

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Organic networks: how sharing seeds and knowledge can reshape urban food systems in Southeast Brazil

Tania Knapp da Silva, Laura Pappalardo and Beatrice Perracini Padovan

This article presents four experiences of sharing circuits among 27 different communities that actively contribute to environmental conservation and the circulation of native species, Creole seeds and mutual aid supply chains. As part of living, diverse and grounded agri-food systems, these experiences strengthen food sovereignty and offer alternative systems to the current urban-centred agri-food model.

Agricultural production relies on seeds and improved varieties. Traditional systems accomplish this by safeguarding and exchanging Creole seeds (traditional crops that communities have cultivated and produced for over three crop cycles) through broad organic networks. In this article we use the term 'organic knowledge' as proposed by the *quilombola* thinker Antonio Bispo.[1] Their common practices — which we call 'sharing circuits and planting cycles' (Figure 1) — are rooted in the land and the people who live on it. These practices sustain community life and can inform public policy on seed conservation, cultural heritage, and decentralized supply chains.

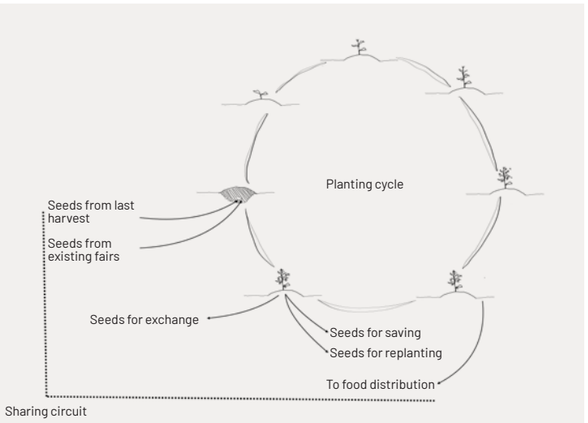

Figure 1: Diagram illustrating the cyclical relationship between seed exchange circuits and planting cycles, emphasizing the temporal dimension of crop development. Based on empirical observation of the "birdwoman" method. Source: Tania Knapp da Silva.

The following stories demonstrate how these networks' connections hold potential to make urban food systems[2] more inclusive.[3] They convey the authors' individual relations with the Guarani Mbya indigenous communities between São Paulo and the Ribeira Valley, the Ribeira Valley's *quilombola* communities, and peri-urban farmers in the São Paulo metropolitan region.

The birdwoman method

Creole seeds are exchanged through multiple methods, often arising spontaneously within close-knit communities. The "birdwoman" method, as we call it, is an informal, relational practice for preserving and spreading seeds. Like birds dispersing seeds in nature, birdwomen travel between communities, ensuring that seeds reach new places while preserving the values of solidarity, resistance and care. In doing so, the birdwoman connects territories through shared cultivation practices and cultural exchange.

Though not a formal programme, this method involves a birdwoman exchanging seedlings and seeds, growing them in a yard, reserving some for replanting, storing part as a safeguard and circulating the rest at gatherings. These gatherings, often organized by communities or institutions, are key to keeping Creole varieties.

Between 2023 and 2024 Karina, a Pataxó Indigenous woman living in a peri-urban community in southern São Paulo, took part in at least six seed fairs, connecting eight communities – from Indigenous villages to urban farms – and expanding her exchanges beyond her own people.

Karina also led and participated in workshops and organized exchange fairs. There, she shared her knowledge by demonstrating planting techniques, telling seed origin stories, and sharing culinary and cultural uses. Her exchanges are shaped by trust, as well as political commitments to land rights, Creole seed protection and ecological justice.

During the year, Karina's journeys spanned nearly 2000 kilometres across the Atlantic Forest biome – from the Ribeira Valley in São Paulo State to southern Bahia (Figure 2). She helped connect crops important to Afro-Brazilian and Indigenous cultures – like okra, cassava, peanut and corn – with urban farmers and landless settlers (Figure 3).

While powerful, the method depends on each birdwoman's energy and resources. Travel costs, yard maintenance burdens or life changes may affect its continuity, potentially weakening the networks.

Passing down knowledge about cultivating plants – and their medicinal, nutritional and spiritual uses – has traditionally happened orally and through shared practices among Indigenous and traditional peoples. These ancestral traditions have long moved across time and space with seeds themselves, weaving ecological and cultural ties over generations.

As a *quilombola* expression says, "Creole seeds only exist if there is guaranteed territory for them to be planted and

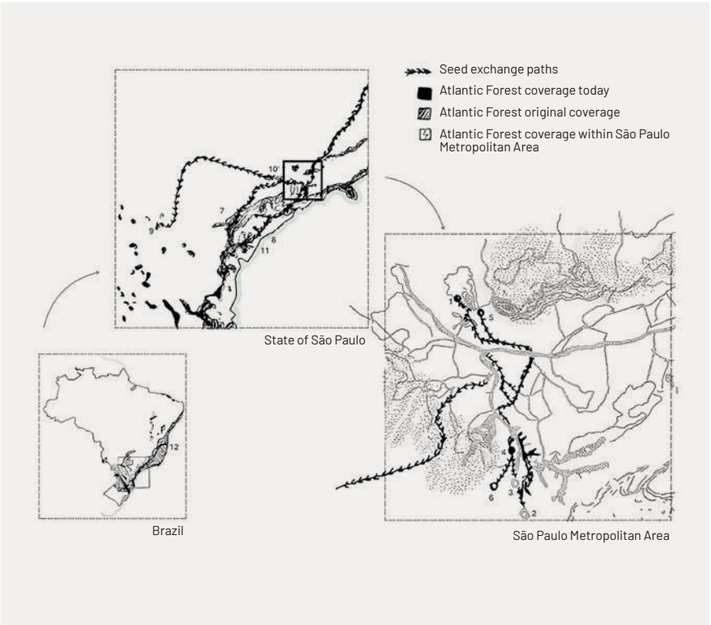

Figure 2: Cartographic representation of seed exchange routes linking diverse regions and actors – Indigenous villages, *quilombola* communities, agroecological sites and seed fairs – across multiple territorial scales.

1. Guarani Village Tekoa Ka'guy Mirim;
2. Guarani Villages Tekoa Kuaray Oua and Kalipety;
3. Plenitude Small Shared Urban Farm;
4. Agroecological School of Parelheiros;
5. Landless Community Comuna Irmã Alberta;
6. Karina's Backyard (Grajaú);
7. Ribeira Valley Quilombola Seeds Fair;
8. Quilombola Community Porto Velho;
9. Quilombola Community Barra do Turvo;
10. São Paulo's Agroecological Meeting Seeds Fair São Roque;
11. Guarani Land Peguaoty;
12. Pataxó Village Caramuru.

Source: authors

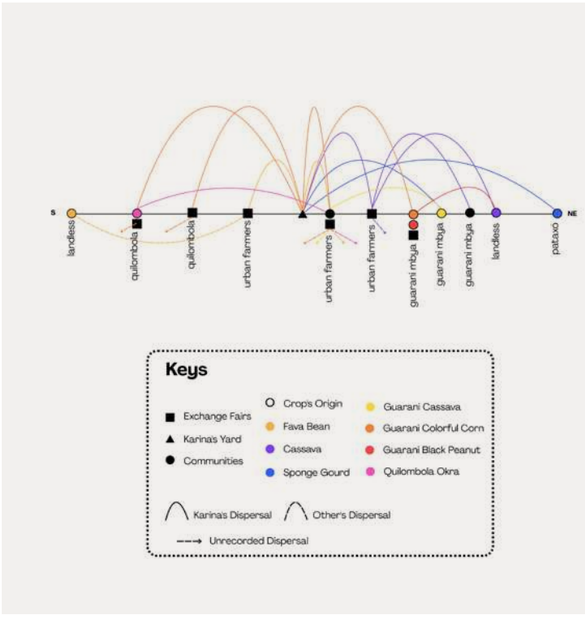

Figure 3: Arc diagram of seed dispersal by Karina through the birdwoman method, connecting her yard with communities and exchange spaces. Source: Tania Knapp da Silva

multiplied." This reminds us that domesticated seeds, people and land are deeply interdependent. The birdwoman method continues this legacy in contemporary contexts, helping to protect biodiversity, cultural memory and community bonds.

From the *Quilombo* to the *favelas*

In the Ribeira Valley, within the southeast of São Paulo state, 19 *quilombola* communities preserve their traditional territories within the Atlantic forest biome. Created in 2012, the Vale do Ribeira Quilombola Farmers' Cooperative (*Cooperquivale*) now sells over 70 varieties of crops.[4] *Cooperquivale* is one outcome of the Traditional Seed and Seedling Exchange Fair, organized by these *quilombola* communities; it is celebrating its 16th edition in 2025.

The fair arose from the communities' need to maintain agricultural diversity and defend the right to farm in their territories. Both the fair and *Cooperquivale*, as non-governmental initiatives, contribute to safeguarding the Traditional Quilombola Agricultural System of the Ribeira Valley, registered as an intangible cultural heritage by Brazil's National Historical and Artistic Heritage Institute (IPHAN) in 2018.

Crops cultivated in *quilombola* territories – such as sweet potatoes, rice and beans – are essential for food security. During the COVID-19 pandemic, public food security programmes, including state purchases of family farming products, were paused. In response, C*ooperquivale* set up an emergency distribution network to deliver food supplies to families in vulnerable situations. Between May 2020 to February 2022, *Cooperquivale* distributed around 330 tons of food from the protected system through mutual aid baskets to around 45 thousand people, including Guarani villages, other quilombos, neighbouring municipalities and *favela*s across the city of São Paulo.

Figure 4: Seedlings around the seed house from the Quilombola Seed Network of the Ribeira Valley in the Quilombo Nhungara. © Laura Pappalardo

Quilombola territories

In the Brazilian context, especially within Indigenous, *quilombola* and rural communities, territory means not only a physical area but also a space of lived experience, cultural identity and social relations, shaped by a group's ancestral and present occupation and use of that space. Unlike land, which can be measured and valued in economic terms, territory includes rooted memories and ways of life. Quilombola territories are not only autonomous political units but socially and culturally defined spaces shaped by long-term occupation, which sometimes coincide with land recognition by the State. Traditional territories are spaces where culturally distinct groups, such as Indigenous peoples and traditional communities, carry out their daily activities, keep their culture and sustain their livelihoods.

This mutual aid network, rooted in existing community infrastructures and the agrobiodiversity of *quilombola* territories, extended access to food security into urban areas neglected by public services. This shows the resilience of organic networks in adversity.

The initiative highlights another important aspect of this heritage system: building alternative forms of urban agri-food production and consumption. São Paulo's current agri-food system deepens social inequalities. The organic networks built during the pandemic relied on a heritage system, which used urban and rural infrastructure in a more inclusive way.

Seeds making kin

Yvyrupa is a Guarani word that has no simple translation but can be understood as "earth bed". It refers to the entire terrestrial platform that sustains the Guarani way of life. *Yvyrupa*, the Guarani territory, is structured through extensive networks of relationships, exchanges of knowledge and travelling. Today, Yvyrupa is cut by the nation-state borders of Paraguay, Brazil, Bolivia and Argentina. Despite the violence of land expropriation and destruction of the Atlantic forest, traditionally inhabited and cared for by the Guarani, these wide and diverse relational networks resist and stand firm every day.

The practice of walking between Guarani villages comes with the practice of exchanging seeds. Para Poty is a Guarani woman living in the Jaraguá Indigenous Land, located on the outskirts of São Paulo city, a territory facing growing pressure from urban sprawl. In the extreme opposite of the city, is the Tenondé Porã Indigenous Land, where Para's father lives. Her father cultivates a large diversity of native seedlings in his yard. All over *Yvyrupa*, seedlings are exchanged. On a recent visit to a Guarani village in the Ribeira Valley, Para brought a guavira seedling, a native species, from her father's backyard as a gift to his father's childhood friend, Luiz. Both Para's father and Luiz are today *xamoi*s, the elders of their villages, important leaders. By gifting her father's guavira to Luiz, Para keeps seed-knowledge flowing between Guarani *xamois*. The gift also extends their knowledge to younger leaders like Para herself. These cycles of exchange sustain biodiversity through kinship. The guavira from Para father's backyard, now planted in one of the Guarani villages in the Ribeira Valley, is one among the thousands of seedlings cultivated and kept through kinship networks between Guarani villages across the Yvyrupa.

The *jety* dispersal

Odete and Sidnei, from Quilombo Porto Velho in the Ribeira Valley, have been members of Cooperquivale since 2022. They began exchanging seedlings with Guarani communities after visiting the Kalipety village in 2023. The meeting, held in the Indigenous territory of Tenondé Porã in the far south city of São Paulo, was organized by the Integrated Study on Urban Agriculture as Heritage Project (INSUAH). There, Sidnei and Odete received a sweet potato – *jety* in Guarani – from the Guarani leader Jerá, and later named the seedlings after her.

As in many exchanges, they shared memories and knowledge, such as healing practices passed down from Odete's mother, Leonor Pereira. By recognizing cultural affinities using native medicinal plants, they affirmed their roles as allies in defending traditional crops and territories. By planting jerá-potato among *quilombola* communities, they created a new sharing circuit linking Guarani and *quilombola* lands. The *jety* dispersal became both a gesture of inter-community solidarity and a strategy for crop conservation.

Jety holds symbolic value in Kalipety village, where its cultivation was reintroduced in the early 2000s during the broader Indigenous struggle for land demarcation, when Jerá visited other territories and brought it back. Thus, the *jety*'s dispersal across multiple communities functions as a living seed library. These diverse planting sites act as potential recovery points, safeguarding the crop's genetic and cultural heritage should reintroduction be needed in the future.

Odete and Sidnei continue to spread the jerá-potato for its high yield; a single tuber weighed five kilos. This quality boosted the sharing circuits, expanded seedling dispersal at the Quilombola Exchange Fair and supported the Solidarity Kitchens Programme (a former civil society initiative that is now part of national policies to combat hunger) through public purchasing via Cooperquivale. A Creole crop, cultivated in *quilombola* and Guarani territories, reaches the tables of children and adults in situations of food insecurity in cities.

Seed lessons to take away

Tons of food, vast lands, small backyards and tiny seeds are interconnected through organic networks – relational webs nourished by sharing circuits. These are not isolated stories: Karina, Odete, Sidnei, Jerá, Para and the Cooperquivale members together form a living network of resistance and care, one that reimagines how food, culture and traditional species spatially circulate.

Resilient agri-food systems must address food inequality. Indigenous, *quilombola* and traditional territories sustain both native biomes and the cultures that preserve them. There, food is cultivated to feed communities often neglected by the urban supply model.

These stories remind us to protect seeds and the people who cultivate them, and that their territories must be cared for. Cultural heritage, territorial land rights and Creole and native seedling conservation are inseparable. Each seed matters, as part of a rooted web of exchanges, to reimagine the urban food system grounded in territories where seed knowledge circulates and communities grow stronger together.

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Knowledge grows: the seed library of Aachen

Ingrid Lambers and Katharina Christenn

The seed library within the Public Library of Aachen is dedicated to encouraging citizens to learn about and practice seed production using straightforward, accessible methods, while simultaneously re-establishing heritage varieties.

Located in the city centre, Aachen's public library is a modern media, information and educational hub with more than 460 000 resources, as well as research facilities and events for children, young people and adults. The central library's offering is supplemented by two district libraries, four branch libraries and a book van.

The library also has a Library of Things, where tools and other everyday items can be borrowed. In 2023, three employees set out to augment the offering by forming a working group to develop a seed library.

The seed library was launched the following year, and members can now borrow seeds for beans, peas, lettuce, garden greens and tomatoes free of charge, to grow in their own gardens. In addition, seed library users receive emails from seed experts containing hands-on guidance. The users can also turn to these experts for advice.

With a programme of educational information, skills development and opportunities for exchange, the seed library introduces gardeners to traditional horticultural practices, including seed production – that is, the cultivation of plants specifically to harvest their seeds – and enables them to feel part of an action.

In the autumn, the new "cultural heritage practitioners" return seeds from the plants they have grown, in bags that are provided with each seed packet. The aim is to encourage library users to use seeds consciously and to learn about the practice of seed production and seed management. If, however, seed production does not work out, gardeners need not worry; there are no consequences for not returning the seeds.

Library system: seed selection sorted by vegetable variety. © Stadtbibliothek Aachen

Interest in the initiative is growing, as many people are excited about the opportunity to learn about and practice sustainable cultivation methods for their own use, regardless of their experience or cultural background. People come together to learn from each other and share their skills. The project promotes the sharing of knowledge and plants, strengthens local biodiversity, and provides an opportunity to play an active role in safeguarding a cultural heritage that extends well beyond gardening.

The threat to seed heritage

The seeds in the Aachen seed library are sourced from *Verein zur Erhaltung der Nutzpflanzen* (VEN, the Association for the Preservation of Useful Plants). Founded in 1986, VEN now collaborates with 110 libraries in Germany, including Aachen, in the *Saatgut leihen - Vielfalt ernten* (Borrowing Seeds – Harvesting Diversity) project, providing only non-hybrid, seed-saving varieties.

As seeds adapt to the location and to gardeners' habits and pass on the "learned" characteristics to the next season's seeds, over the years the gardener will benefit from plants that are more robust and require less energy. Seeds are often the result of centuries of breeding and adaptation to local conditions and, as such, are part of the cultural heritage passed down through the generations.

This valuable seed heritage is under threat, however. Crop diversity is being eroded by the increasing prevalence of hybrid varieties and the monopolization of the seed market. Non-hybrid varieties, also known as open-pollinated or heirloom, produce seeds that can be used to grow fruit-producing plants year-on-year. This is not the case with hybrid plants, the seeds of which produce offspring that may be less vigorous or do not produce fruit. Consequently, farmers must buy new hybrid seeds each year, instead of saving their own seeds for re-use, thereby increasing their costs and causing them to miss out on the advantages of traditional forms of horticulture.

Harvest your own tomatoes - with robust varieties from the library.
© Stadtbibliothek Aachen

At a time when hybrid seeds and genetically modified varieties dominate the agricultural sector, seed choice also has a political dimension. Beside keeping traditional varieties of domestic crops in use, a major aim of VEN is the disruption of global dominance of global agricultural corporations.

The agroeconomic and biodiversity-related disadvantages of hybrid varieties make it urgent to promote local, sustainable varieties, and to raise awareness of the importance of seeds as cultural heritage. This awareness raising can serve as an impetus for counter-movements towards sustainable and ecological solutions.

Activating a heritage community

In a nutshell, a central aspect of the seed library project is activating a heritage community – that is, bringing people together through seeds and the stories associated with them, while encouraging them to learn about the culturally significant practice of seed production. Learning the background of the species' history is a major component of the programme's success; storytelling about seeds and the cultural significance of planting, harvesting, producing and managing them motivates people to get involved. They realize that by participating in the seed library they are part of something bigger.

Overcoming challenges

As with any initiative, the seed library faces challenges. Ensuring the quality and origin of the seeds, and managing the logistics of seed exchange, are ongoing tasks that require careful organisation. Publishing a monthly newsletter means the library staff deal with unfamiliar topics and questions from users on a regular basis. However, they also learn new things in the process.

Impacts to date

The first year of the initiative was a great success and there has been considerably more demand for participation in year two. Despite challenging weather conditions and an exceptionally high snail infestation that characterized the 2024 season, the return of the seeds was very good. Thanks to the support of the Friends of the Public Library, the library was able to increase its seed bag purchases from VEN from 600 in 2024 to 900 in 2025 to meet the increased demand. A key focus for the project's future is the ongoing expansion and securing of resources to ensure its long-term sustainability.

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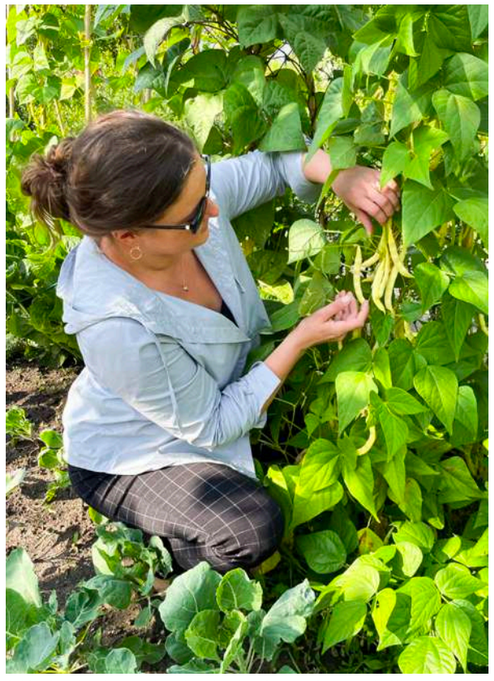


Cultivation of the borrowed seeds and exchanging experiences at the Hangeweiher garden club. © Jürgen Graf

Urban *satoyama*: evolving circular food systems in Tokyo

Akiko Iida and Makoto Yokohari

Urban-rural mixed landscapes in Tokyo offer a rare and inspiring example of how a dense metropolis can sustain its agricultural heritage. Once dismissed as a consequence of unplanned urban sprawl during the postwar period, these landscapes are now recognized as a sustainable urban form. This article introduces the concept of "urban *satoyama*" – a contemporary interpretation of traditional satoyama landscapes within the urban context – and draws on historical transitions and current practices to examine how it supports evolving circular food systems.

Urban agriculture in Tokyo, Japan, has a history spanning over 400 years. In 1603, when Tokugawa Shogun established Edo (present-day Tokyo) as the new capital, agricultural villages developed in the peri-urban and rural areas to supply fresh food and fuel to the growing city.

Even after the fall of the Edo Shogunate and Japan's subsequent opening to the outside world in 1867, the landscapes of peri-urban and rural areas remained largely unchanged. However, following World War II Tokyo experienced rapid urban sprawl, leading to widespread urbanization and a significant reduction in farmland and woodlands.

In response, the Productive Green Land Act was revised in 1991 to help conserve urban farmland (see Box). According to the census in 2020, approximately 10 000 farming households and 6530 hectares of farmland remain in Tokyo, accounting for 0.1 percent of all households and 3 percent of the city's land, respectively. It contributes to Tokyo's distinctive urban–rural mixed landscape.

These mixed-use urban areas were formed as a result of the interaction between two opposing forces: agricultural stakeholders who aimed to preserve farmland and urban planners who sought to promote urbanization in response to housing shortages. From the perspective of those advocating urbanization, the lack of a clear boundary between urban and rural areas, as well as the presence of urban farmlands within high-dense urban areas, was sometime regarded as a failure of urban planning.

However, as Japan entered an era of population decline in 2008, a major shift in perspective occurred. In 2015, the Basic Act on the Promotion of Urban Agriculture was enacted, marking a significant turning point in national policy. In 2017, the City Planning Act was also amended, introducing a new land-use zone called Garden Residential Zone (*Den'en Jūkyo Chiiki*), specifically intended to preserve farmland within residential areas. Today, even from urban planners' standpoint, urban farmland is recognized as an integral and valuable land use within cities.

Drone image of a typical suburban landscape characterized by urban–rural mixed landscapes. © Center for Research and Development of Higher Education, The University of Tokyo

The origins of *satoyama*

In the Kanto Plain, where Tokyo is located, much of the soil is Kanto Loam. Formed from volcanic ash, it holds water well but tends to drain poorly and is typically low in nutrients. To improve soil quality, agricultural woodlands were developed as a traditional form of land use during the Edo period. Farmers collected leaf litter to produce organic compost and improve soil fertility. They also used various types of organic waste – including grass ash, animal manure and human night soil – as fertilizers. By the early 18th century, Edo had grown into a metropolis of over one million people, supported by circular agricultural practices.

At that time, rural villages were composed not only of rice paddies and vegetable fields, but also of diverse landscape elements that formed unique socio-ecological productive landscapes known as *satoyama*.[1] These included homestead woodlands (*yashikirin*) that surrounded farmhouses, coppice forests (*zoukibayashi)* used to collect leaf litter and firewood, agricultural irrigation channels, drinking water channels, and rivers.

Over time, however, these *satoyama* landscapes became fragmented due to urban sprawl. Contaminated water led to the termination of rice paddies, while the widespread use of chemical fertilizers and gas diminished the need for coppice forests. Many fields were also converted into residential areas. What remains today are urban farmlands maintained by farming households, the homestead woodlands (*yashikirin*), water channels with recycled water from sewage treatment plants and rivers that have been entirely concreted.

Evolution in urban context

Although these transformed landscapes may seem to have lost the beauty and integrity of traditional *satoyama*, the underlying systems of resource use have not disappeared. They have evolved and adapted to urban realities.[2]

For example, rather than collecting leaves from coppice forests, today's farmers gather leaf litter from shared green spaces within the urban fabric, such as urban parks, schoolyards, roadside trees and shrines. Some urban farmers also utilize food waste such as rice bran or buckwheat husks from nearby stores, and even manure or bedding straw from zoos.

In many cases, such practices have been carried out based on farmers' own decisions rather than as the result of institutional support from local governments. The farmers cite economic reasons, such as the lower cost of producing their own fertilizer from freely available organic waste instead of purchasing chemical fertilizers, and operational reasons such as the need for organic compost to create high-quality soil.[2]

This evolving system could be described as a modernized "urban *satoyama*", a contemporary form of socio-ecological landscape that reinterprets traditional resource circulation within the urban context. Unlike traditional *satoyama*, urban *satoyama* landscapes incorporate green waste from urban parks and organic waste generated by urban residents to support circular agricultural practices.

Tax incentive system for urban farmlands: Productive Green Land Act in Japan

The Productive Green Land Act was established in 1974 and significantly revised in 1991 to introduce tax incentives for landowners. It is a land-use designation system aimed at preserving urban farmland by designating certain farmlands within urbanization promotion areas as productive green lands (*seisan ryokuchi*). In 1992, urban farmlands were categorized based on the landowners' intent as either Productive Green Lands to be maintained for agricultural use for 30 years, or residential-conversion farmlands (*takuchi-ka nouchi)* that were expected to be developed in the future.

For those designated as productive green lands, landowners receive benefits such as reduced property and city planning taxes, as well as deferred inheritance tax payments, in return for maintaining the agricultural use. However, once the designation is lifted – typically after 30 years or under specific conditions, including landowners' death – the land becomes eligible for urban development.

The year 2022 marked a critical turning point, as many urban farmlands reached the 30-year designation limit. In response, the national government amended the Productive Green Land Act in 2017 to introduce the Specified Productive Green Land system, which allows landowners to extend the designation in 10-year increments, based on their intent to continue urban agriculture. As a result, in Tokyo, 93.7 percent of farmlands designated in 1992 as productive green lands opted for an extension.

Thanks to the Productive Green Land Act, urban farmland has been preserved in major Japanese cities. However, the conservation framework is dependent on the intent of landowners and their heirs – specifically, whether they choose to maintain the designation of productive green lands. It does not guarantee the long-term permanence of urban farmland. In particular, when landowners pass away and inheritance occurs, it is common for heirs to sell part of the farmland to pay inheritance taxes on other types of real estate, including their residences and rental apartments, which are not subject to the same tax incentives as agricultural land. This has become one of the leading causes of farmland loss. As the farming population continues to age and inheritance becomes more frequent among farm households, the long-term outlook for urban farmland remains uncertain.

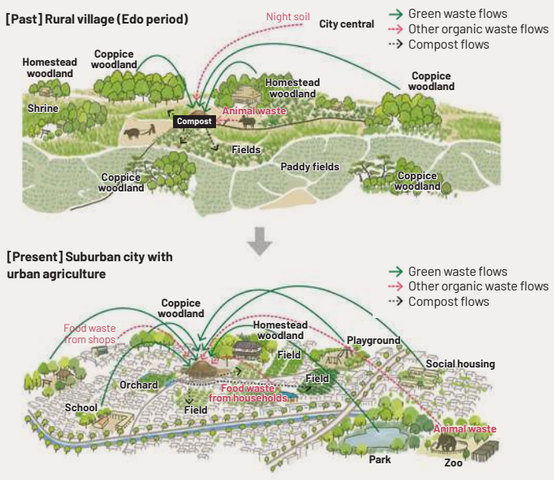
Urban farmland designated as productive green land. The sign says "Tokyo City Planning, productive green land". © Akiko Iida

Collecting fallen leaves for composting. © Akiko Iida

Of course, not all urban farmers follow these traditional practices; many have shifted entirely to chemical fertilizers. However, in addition to older generations, younger urban farmers with a strong environmental consciousness are increasingly adopting organic farming method inspired by the traditional circular practices of *satoyama* agriculture, including leaf compost farming.

Urban circular food systems

Today, farmers are leveraging their proximity to residential areas to operate their agricultural businesses in various ways. One such approach is direct-to-consumer sales at farm stands, in which more than 70 percent of Tokyo's urban farmers engage. Others supply produce for school lunches, or lease plots for allotments and community gardening. These diverse strategies take advantage of the urban-rural mixed landscape and represent a distinctly urban characteristic. They differ from rural farming, which primarily focuses on wholesale market distribution.



Landscape and organic resource flow changes over 400 years.[2] ©Elsevier, reproduced for non-commercial use under CC BY-NC-ND license

This proximity allows Tokyo's urban farmers to keep the distance between production and consumption remarkably short. Residents can enjoy locally grown produce while passing by the very fields where it was cultivated. This proved to be a significant advantage during the COVID-19 pandemic. In addition to restrictions on movement, global supply chain disruptions drew increased attention to local food sources such as farm stands and allotments. Recent research found that urban residents in Tokyo who used farm stands or allotments had significantly lower levels of concern about current and future food insecurity than those who did not.[3] This underscores the critical role of local urban food systems in ensuring food security and community resilience in times of disruption.

Moreover, Tokyo's local food system involves not only production and consumption but also the reuse of organic waste through composting. This small-scale, closed-loop model supports urban sustainability by reducing waste, conserving resources and reintegrating nutrient cycles within the city.

Traditional Edo-Tokyo vegetables

In Tokyo, the main agricultural products include vegetables such as komatsuna (Japanese mustard spinach), cabbage, daikon radish, spinach, edamame and tomatoes, and fruit such as grapes, Japanese pears and *ume* (plums). While the

Local residents come to buy produce from farmlands adjacent to farmland on foot or by bicycle. Because theft is relatively uncommon in Japan, many farm stands operate without staff. © Akiko Iida

Farmers who run farm stands often grow a variety of crops in small quantities, allowing them to offer seasonal produce throughout the year. © Akiko Iida

Allotment gardens known as *taiken nouen* ("experience farms"), where farmers teach urban residents how to grow crops. © Akiko Iida

A dish made with Edo-Tokyo Vegetables. © Akiko Iida

production volume of these is relatively high, traditional heirloom crops are also cultivated, albeit in smaller quantities.

The traditional vegetables originated in the Edo period, when agricultural crops from various regions were brought to Edo capital and gradually adapted to its local climate and conditions. Over time, new varieties emerged that differed in form and flavour from the standard varieties commonly distributed today. A unique feature of these crops is that many bear the name of the locality in which they are grown.

For example, *Kichijoji udo* refers to a cultivated variety of udo (*Aralia cordata*), a native Japanese wild plant grown in the Kichijoji area. Another example is *Waseda myoga. Myoga (Zingiber mioga)* is a traditional vegetable indigenous to East Asia that has been cultivated in Japan since at least the 3rd century. The *myoga* grown in Waseda areas was particularly valued for its size and vibrant colour, and was even served at the Shogun's table. Although the distribution of these traditional vegetables is limited nowadays, some Tokyo restaurants offer them as part of their seasonal or local cuisine.

Today such heirloom crops are known as "Edo-Tokyo vegetables", and a certification system is managed by the Tokyo's central branch of the Japan Agricultural Cooperatives. Currently, 52 varieties are registered.[4] The system identifies and verifies crops that have been quietly cultivated over generations and supports efforts to expand their production and preserve their seeds. The preservation of these traditional crops is also important in terms of agro-biodiversity conservation.

Tangible and intangible heritage

The urban-rural mixed landscapes of urban *satoyama* in Tokyo represent a form of tangible cultural heritage that is continuously evolving. Equally important is the continuity of intangible heritage, including traditional farming practices such as leaf composting and the knowledge of cultivating heirloom crops. These tangible and intangible forms of urban *satoyama* have been shaped through the collaborative efforts of individual farmers, agricultural cooperatives and government bodies responsible for creating supportive policies.

Going forward, it will be essential to further evolve tangible and intangible heritage by actively engaging citizens in this process. This would not only support the ageing population of urban farmers, but also provide urban residents with a meaningful way to reconnect the wisdom of satoyama with urban life. Such engagement could inspire shifts toward more circular lifestyles among citizens. This, in turn, embodies the contemporary value of urban *satoyama* as a living heritage.

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More information:
UTokyo MOOC: Contemporary Garden City Concept from Asia
https://www.coursera.org/learn/contemporary-garden-city-concept-from-asia

The social and environmental benefits of water meadow heritage in Milan

Paola Branduini

The historical irrigation system of water meadows (*marcite*) in Milan provides a compelling case study for addressing contemporary environmental and social challenges. Far beyond their agricultural function, the *marcite* represent a resilient cultural landscape shaped by intergenerational knowledge, ecological equilibrium and community-based management practices. This article examines their historical development and recent restoration efforts, highlighting how such systems contribute to climate change adaptation, the enhancement of biodiversity and the reinforcement of urban–rural linkages. They offer a model that could be adapted to other territorial contexts.

The urban agricultural heritage of contemporary cities offers significant benefits to both society and the environment. Within and around urban areas, clear signs of agrarian landscape heritage persist, a notable example of which are the *marcite* (water meadows) of Milan, situated in Italy's Po Plain.

Marcite are meadows irrigated by a thin layer of spring water. Their peculiarity is that the water flows continuously over the grass in winter, preventing it from freezing and enabling grass to be cut earlier. The technique capitalizes on the characteristics of the land, particularly the abundance of surface and groundwater, to enhance fodder and cheese production.

This irrigation system received its initial impetus from the reclamation efforts of Cistercian monks in the 11th century. It was expanded during the Renaissance through noble interventions and achieved high efficiency in the 19th century. As early as the 18th century, it was admired by agronomists from other regions. European writers like Arthur Young (1794), Scipione Breislack (1822), Baird Smith (1855) and the Washington Congress (1861), along with Italians such as Domenico Berra (1822), Carlo Cattaneo (1844) and Giuseppe Soresi (1914), documented the exceptional productivity of this system.[1]

The *marcite* established a long-standing interdependence with the city of Milan and its surrounding areas by supplying fodder for horses, the city's mode of transport. However, since the mid-20th century the practice (referred to as *marcita*) has partially declined due to a combination of factors, including a shift in cattle feed from fresh grass

A water meadow in winter. © Paola Branduini

to silage maize, reduced transmission of traditional techniques, production limits under EU milk quotas, a precedence for large machinery over manual skills, and a consumer preference for white milk from silage feeding over the yellow milk produced from *marcite*. The main result has been the conversion of meadows into corn fields; this has led to a loss of biodiversity, winter water table recharge and technical ability in managing gravity water.

Recovery of the *marcite* and the community

Today, there is renewed interest in water meadows, not so much due to the amount of fodder they could produce for the city but rather thanks to their dual role in mitigating

- The marcite are privately or publicly (Milan municipality) owed.
- Key actors are threefold: farmers (owners and renters); Milan municipality; and NGOs – local cultural or environmental citizens associations and well as cultural and environmental national NGOs (Legambiente, Fondo Ambiente Italiano and Italia Nostra).
- The actions are carried out through 4P partnership: people, private, public, partnership.[6]

the effects of climate change in contemporary urban contexts and in promoting social integration.

Approximately 1000 hectares of *marcite* remain, primarily in the South Milan, Adda and Ticino regional parks, thanks to landscape protection as cultural heritage under Article 142 of the Code of Cultural Heritage and Landscape, 2004. Without this recognition, these meadows might have disappeared. Studies have demonstrated increased biodiversity in water meadows compared to irrigated meadows.[1] Moreover, farmers maintaining *marcite* and practicing winter flooding of rice fields experienced positive outcomes during the 2022 drought and 2023 floods, as the soil maintained a good water balance and high watertable levels.

Over the past decade, several initiatives have promoted social integration through the revival of water meadows in the Milan metropolitan area. Projects funded by the EU Life programme, Lombardy Region and Cariplo Foundation have engaged both seasoned and new farmers, as well as individuals facing challenges like unemployment, incarceration and social disorders in restoring this ancient landscape. Knowledge has been transferred over two editions of a four-lesson course, comprising both theory and practice. During this time, several kilometres of ditches and associated structures (canal banks and gates) have been repaired, and traditional water management skills have been passed down to a new generation of water managers (*campari*).[2] Furthermore, approximately 1000 students, from primary to high school level, have been involved in practical restoration activities.

Since 2022, during the final water submersion period the heritage community "Friends of Marcite (comprising farmers, citizens and local authorities) has organized an event called "Taste of Marcita". The aim of the event is to highlight the circular economy model based on harvesting fresh mixed grass, direct animal feeding, milk production and healthy cheese tasting.

The restoration of traditional systems also facilitates social recovery. Intergenerational teaching has fostered social cohesion and reinforced a sense of belonging. Students have taken pride in caring for this "ordinary" heritage within their neighbourhoods, recognizing it as a resource

17th century map with showing the water meadows in green, with the thin lines. Source: Ospedale Maggiore Archive. Copyright free

Primary pupils learning the art of regulating water. © Paola Branduini

Old and new *campari* sharing knowledge. © Paola Branduini

High school students repairing hydraulic artifacts. © Paola Branduini

for sustainable living and quality landscapes. Consequently, the municipality is considering incorporating educational visits to water meadows into the standard curriculum for all students.

The benefits are multifunctional; quantitative assessments of ecological, hydrological and socio-cultural advantages are ongoing at the Politecnico di Milano's Echoes-Marcita Lab (Polisocial Award).

Sustainable resource management

The *marcita* method of managing surface- and groundwater, soil and vegetation serves as an example of integrated water management and nature- and culture-based solutions. Abandoning such water management systems would result in an irreparable cultural and environmental loss. From a resource management perspective, these systems are both sustainable and resilient, and provide extensive ecosystem services. The *marcite* have created socio-ecosystems of cultural, social, economic and environmental value, warranting various forms of protection and international recognition.[3]

Until the last century, the landscape around Milan was strongly characterized by water meadows. The ongoing restoration process allows for the re-establishment of the historical interdependence between city and countryside, fostering mutual benefits beyond mere physical proximity: the countryside supplies products and well-being, offering ecosystem services to the city – which in turn seeks healthy food products and services. Traditional agricultural knowledge and techniques are intangible heritage integrated into landscape management. They present opportunities to implement sustainable practices with lower environmental impact and higher biodiversity. These practices contribute to unconventional scientific, technical and mechanical advancements by reusing and updating ancient technical knowledge.

Fostering community resilience and circular economy

In 2013, the UNESCO Hangzou Declaration established that cultural heritage based on empirical knowledge enhances community resilience: "The adequate conservation of the historic environment, including cultural landscapes, and the safeguarding of relevant traditional knowledge, values and practices, in synergy with other scientific knowledge, increases communities' resilience to disasters and climate change".

Heritage community resilience is founded on the capacity of communities to innovate using their cultural and natural heritage, through proactive processes aimed at preventing, addressing and recovering from disturbances and disasters. Such resilience stimulates a circular economy by reinforcing cohesion, reducing urban decay, initiating urban regeneration and offering employment opportunities.

Bearing this in mind, the *marcite* possess agroecological properties that should be preserved and revitalized through new projects or technologies without causing environmental harm. Historical agricultural systems are productive, resource-conserving, socially equitable and economically sustainable.[4]

Replicability of the urban agricultural system

The ancient *marcita* system is adaptable to contemporary needs. The ingenuity of the past lay in mitigating harsh winter conditions through continuous water flow, keeping grass alive to boost forage production. Although the demand for green fodder has diminished, the underlying principles of water meadows can be employed to regulate water flow during floods and recharge aquifers to prevent droughts. Learning from the *marcita* practice can enhance irrigation and winter flooding practices in rice fields.

Historically, *marcite* spanned metropolitan territories and could potentially be reconverted into permanent meadows and *marcite* areas at a metropolitan level, considering that the water system is regulated on such a scale. Main canals and ditches often remain functional, while smaller canals can be identified beneath cover crops and restored.

The recovery process in Milan is a successful example that could be applied in other geographical and cultural contexts, promoting sustainable and resilient solutions based on historical socio-ecological systems and local ecological knowledge and practices. It exemplifies resilience and adaptation to climate change that could potentially be replicable in other irrigated plains experiencing semi-arid or flooding conditions due to climate change. Winter flooding techniques could be extended to other meadows or arable lands with similar irrigation systems, such as French *prés irrigués* or *German wassermaten* or English water meadows.[5]

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From tradition to adaptation: urban agriculture in regional water management

Yuxia Luo

The history of urban agriculture sites in the European Metropolitan Region of Nuremberg (EMN) dates back to the Middle Ages.[1] In addition to supplying food to urban areas over the centuries, these sites have also contributed to regional water management by mitigating floods and recharging groundwater. Uncovering the local knowledge embedded in these practices – and understanding how they have survived, especially during rapid urbanization since the 1950s – can provide valuable insights for the sustainable development of urban agriculture elsewhere.

The case studies introduced in this article are Knoblauchsland Vegetable Cultivation Area; Aischgrund Carp Ponds Area; and the Bamberg Gardeners' District, including the water meadow sites along the Regnitz, Rednitz and Wiesent river valleys. Since the 1950s, urbanization challenges including land-use conflicts and market competition have threatened urban agriculture in the region. In response, these sites have adopted various strategies, including collaborating with city government, emphasizing the ecological value and forming new heritage communities. As a result, the water resource management methods in urban agriculture across the EMN have been preserved.

Urban agriculture and water management through the ages

In the Middle Ages, multiple demands in urban areas, such as food security and religious needs, led to the emergence of various forms of urban agriculture in the region around Nuremberg. However, the limited annual rainfall, averaging 600mm per year[2], has posed significant challenges for agricultural production. In response, a range of water management practices were developed to adapt to this constraint.

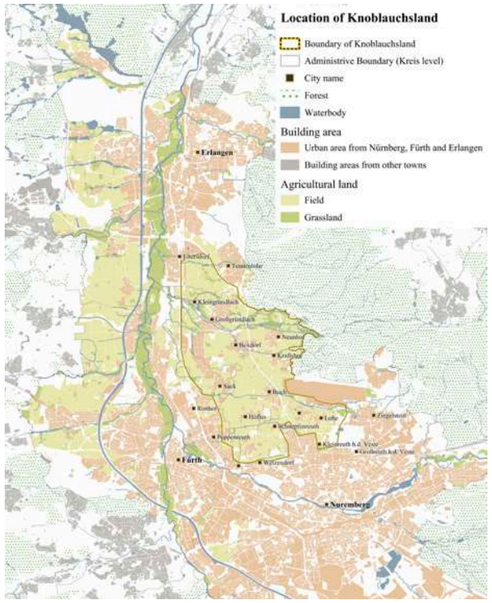
In Aischgrund, rainwater ponds known as *Himmelssteich* (open-air pond) were constructed in low-lying areas to collect rainwater for carp farming. In the river valleys of the EMN, farmers built dams and ditches to divert river water onto nearby meadows during dry periods, adding soil moisture and increasing grass yields for livestock. Additionally, in areas with high groundwater levels farmers were able to cultivate vegetables on naturally moist soils, despite the overall dry climate.

While individual urban agriculture sites applied their own local knowledge of water management, they also collectively contributed to regional water resources. Carp ponds in Aischgrund serve as retention basins, helping to reduce flood risks in downstream urban areas in spring flood season. Meanwhile, they also contribute to groundwater recharge like water meadows. Nearby urban agriculture sites such as Bamberg Gardeners' District and Knoblauchsland benefit from this recharge process, enabling the use of groundwater for vegetable cultivation.

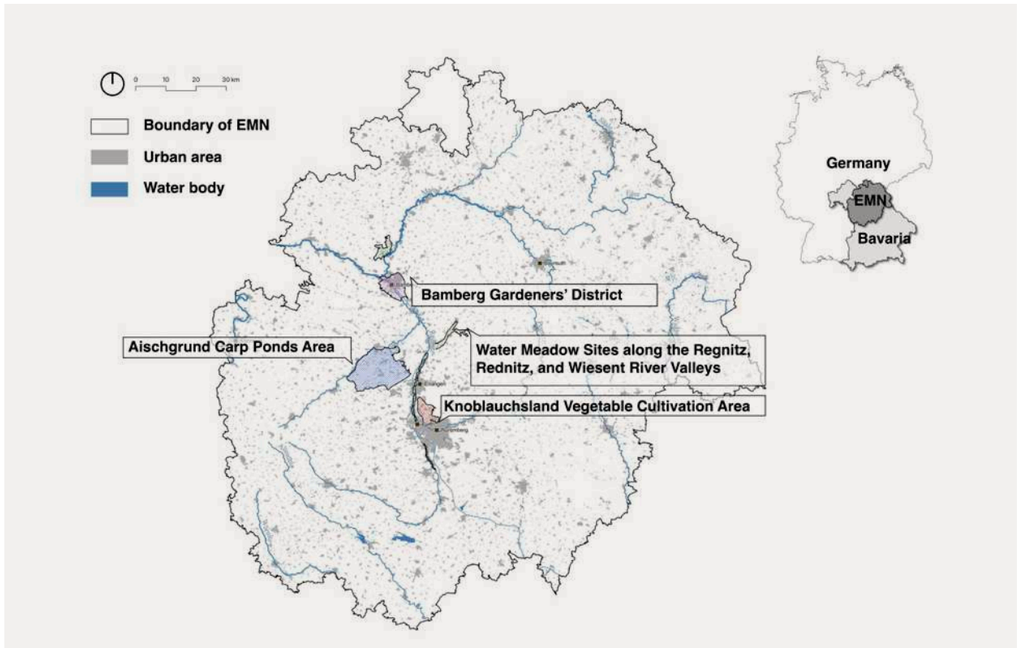
Urban agriculture benefits from the convenience of the urban market and its transportation infrastructure. However, urbanization also brings land conflicts and market competition with external agricultural production in local markets. Since the 1950s, these challenges have posed a serious threat to urban agriculture sites in EMN. In response to rapid urbanization, some sites developed successful adaptation strategies.

Knoblauchsland: collaborative groundwater management

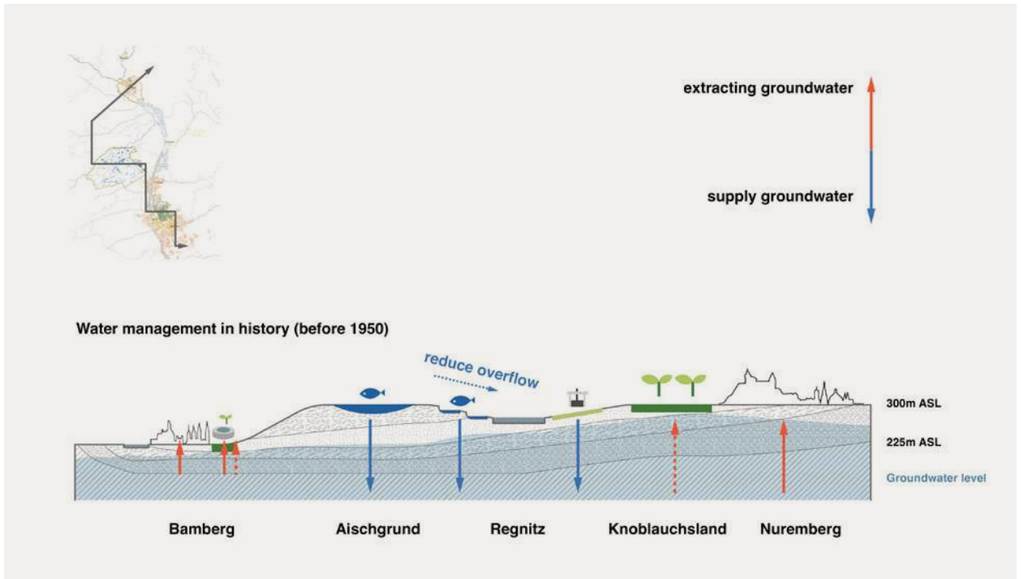
One major impact of market competition was the groundwater conflict between Knoblauchsland and Nuremberg. In the 1950s, with the arrival of high-quality vegetable from outside, Knoblauchsland farmers recognized the need to establish their first irrigation



Location of Knoblauchsland © Yuxia Luo. Data source: ATKIS®Basis-DLM Bayern



Spatial distribution of study cases in EMN. © Yuxia Luo. Data source: ATKIS®Basis-DLM Bayern



Co-management of regional water resources in history. © Yuxia Luo

systems to withstand fluctuations in vegetable quality caused by drought, thereby maintaining their local market competitiveness. Over the next decade, farmers in Knoblauchsland drilled 96 illegal wells to extract groundwater for irrigation, significantly undermining groundwater security in the Nuremberg region[3].

In the 1960s, after negotiations, Knoblauchsland farmers and the Nuremberg government reached an agreement: the government reorganized fragmented land parcels into contiguous plots so that the farmers could build modern public irrigation systems to improve efficiency of groundwater use. It also provided 50 percent financial support for this construction. In return, the farmers transferred part of their land to the government for infrastructure development during the process[4]. In 2005, further cooperation upgraded the system to use riverbank filtrate instead of groundwater for irrigation.

Thus, the cooperation in irrigation modernization has not only further strengthened regional groundwater security but also improved the quality and market competitiveness of agricultural products from Knoblauchsland, thereby providing strong support for the continued existence of this historic urban agricultural area.

Aischgrund: emphasizing ecological value

For centuries, carp farming has been practiced in Aischgrund region in the state of Bavaria, Germany, using an extensive method: rainwater flows through agricultural land and brings nutrients into carp ponds, and farmers add grain to the ponds as feed for the carp to increase yield. This traditional farming method allows ponds and nearby wet meadows to function as wetlands, making a significant contribution to ecosystem biodiversity. However, by the 1970s carp farming in Aischgrund was showing weak economic performance due to the impact of large-scale, industrialized carp farming operations from countries such as the Czech Republic and Poland.

While the government provides agricultural subsidies to support this high ecological value practice, in 2005 carp farmers also registered the carp produced as EU Protected Geographical Indication through *Teichgenossenschaft Aischgrund* (Aischgrund Carp Ponds Cooperative), thereby enhancing its influence in consumer markets. Efforts to obtain organic certification to improve their economic circumstances are also underway. In 2021, traditional carp farming in Bavaria was designated as Intangible Cultural Heritage by the German Commission of UNESCO.

Bamberg and water meadows: local groups in action

Historically, vegetable cultivation in Bamberg followed two distinct water management methods. In backyard gardens of houses, groundwater was drawn from private wells to irrigate seedlings. These seedlings were later transplanted to market gardens on the city's edge, where the soil has been drained by farmers to achieve optimal moisture levels suitable for crop growth.

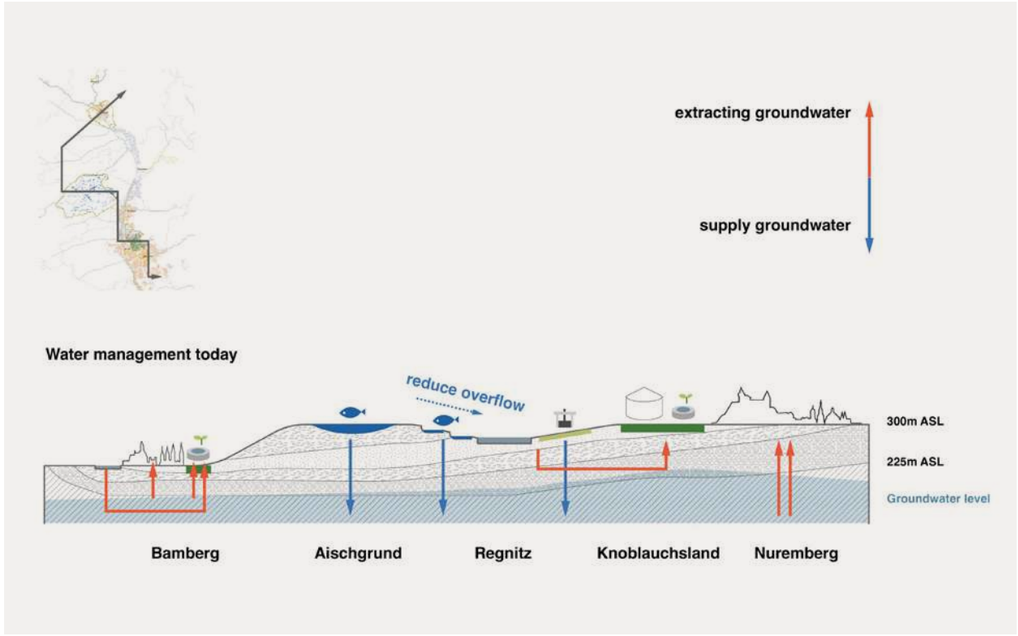
Although since the 1950s urbanization has challenged traditional cultivation through farmland loss and increased market competition, some farmers remain committed to preserving their practices. In house gardens, manual groundwater irrigation remains the primary method, while in the relocated market gardens, where soil and drainage conditions are not as ideal as before, farmers have re-drained the land and built irrigation systems to improve vegetable quality.

Following the designation of the town of Bamberg as a UNESCO World Heritage in 1993, planning laws were introduced to designate the house gardens for agricultural use, preventing the further land loss. Since 2011, various organisations formed by interested citizen groups and gardeners – such as *SelbstErnteGarten* (self-harvest gardens) and *Bamberger Sortengarten* (Bamberg seed garden) – have continued the traditional urban agriculture practice. As a result, the water management pattern has been preserved. (For more information, see the article by Stephanie Eißing on p. 18).

The situation is similar for water meadows. Although most of the water meadows were abandoned in the 1970s, the irrigation associations in the Regnitz, Rednitz and Wiesent Valley continue to irrigate these meadows independently. With the support of local government, their meadows sites were designated as Intangible Cultural Heritage in Germany in 2021 by the German Commission of UNESCO. (For more information, see the article by Pauline Arnet on p. 64).

Lessons learned

According to the definition in Council of Europe's Faro Brochure, heritage community consists of "people who value specific aspects of cultural heritage which they wish, within the framework of public action, to sustain and transmit to future generations."[5] In the preservation of urban agricultural heritage in the above cases, local groups – including local government, farmer cooperatives and citizen organizations – have played an active role and serve as key local heritage communities. Thanks to their efforts, the water resource management methods across urban agriculture sites in the EMN have been preserved, despite the reduction in the scale and number of these sites.



Co-management of regional water resources today. © Yuxia Luo

Three key strategies have been employed by these communities:

1. collaboration with municipal governments to co-manage regional water resources.
2. emphasizing the ecological value of traditional production methods to gain subsidies and attract public attention.
3. forming new heritage communities to continue traditional practices and preserve living heritage.

In recent years, the German Commission of UNESCO has identified some of the cases studied in this article as best practices or outstanding heritage sites. Such heritage labels bring increased public attention and external financial support for their protection.

However, many living heritage sites remain unrecognized and lack external support. In these cases, the engagement of local heritage communities is essential for preservation and the transmission of local knowledge. Supporting existing heritage communities, and encouraging the formation of new ones, will be vital for sustaining historical urban agriculture sites in the future.

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Historical foundations and sustainable innovations in the Nuremberg Metropolitan Region

Andrea Früh-Müller

The diverse agricultural heritage and cultural landscape of the Nuremberg Metropolitan Region (NMR) enhances quality of life by providing regional products and preserving habitats for flora and fauna. However, urban expansion and land-use conflicts threaten agricultural land, requiring strong governance to balance development with sustainability. The region's efforts to strengthen local food production, secure farmland and promote organic practices aim to protect its agricultural heritage while fostering resilience.

Nuremberg Metropolitan Region: a traditional, diverse cultural landscape

Cultural landscapes are rural areas that have been shaped or altered by humans and are characterized by a combination of landscape structure, management intensity and the values and meanings people attach to them.[1] The Nuremberg Metropolitan Region (NMR) has a remarkable diversity of Central European cultural landscapes, shaped by the complex interaction of natural and human factors over a long period of time. The natural diversity of the area is defined by biophysical factors such as topography, climate and soil composition, which have fostered a variety of land-use practices over centuries. Furthermore, Nuremberg's historical position at the crossroads of major European trade routes has strengthened economic and cultural connections between rural and urban areas, facilitating the exchange of knowledge, technologies and agricultural techniques.

These factors form the basis of the region's agricultural system, which must balance social, cultural and economic functions. The region's agricultural practices are influenced by different biophysical factors such as soil quality and water availability, and socio-economic parameters. The practices range from intensive vegetable cultivation to low-intensity orchard meadows and grasslands traditionally grazed by sheep. Other significant agricultural activities include carp breeding in extensive pond systems and the cultivation of cereals and hops for the global market, further contributing to the diversity of the regional agro-heritage system.

Cultural identity and regional specialities

The diversity of the landscape and agricultural systems is reflected in the variety of regional traditional specialities. Through the production and processing of agricultural products, local specialities are deeply rooted in the cultural history of the region. Notable examples include asparagus, beer, orchard-based products such as juices and spirits, potato dumplings and the famous Nuremberg bratwurst (a small, grilled pork sausage). Beyond their culinary significance, these regional products are closely tied to local traditions and social practices. They contribute not only to economic value creation but also to sustainable, locally embedded food systems.

Strong rural-urban interconnections

The NMR is a voluntary association comprising 23 administrative districts and 11 independent cities that engages stakeholders from business, science, culture and regional marketing. With its organizational structure and strong interconnections between urban and rural areas, the region serves as a model for large-scale urban-rural partnerships in Europe. The regional economic cycles, particularly in the food sector, are a focus of these interconnections. A campaign called "Original Regional" coordinates a network of 31 regional initiatives, representing approximately 1500 suppliers and producers, many of whom operate as direct marketers. It fosters strong economic and social ties between rural producers and urban consumers, reinforcing local value chains and promoting sustainable food systems.

Beyond economic collaboration between stakeholders, the region actively cultivates its identity as a *Genussregion* (a region of gourmet delights). Public engagement initiatives, including joint promotional efforts, regional speciality competitions and strategic public relations campaigns further enhance its visibility. Notably, the city of Nuremberg's designation as an organic metropolis and the establishment of seven model regions for organic production (known as *Öko-Modellregionen*) underscore the area's commitment to environmentally responsible food production and high-quality regional products.

Orchard meadows have a centuries-old tradition, shape landscapes and provide numerous ecosystem services. © Streuobstwiesenliebe

Pressure on agricultural land: the impact of residential development on regional food production

Ongoing discussions on urban resilience have highlighted the ecological footprint of food consumption, the role of self-sufficiency in food security and the benefits of regionalizing food systems to shorten supply chains. With approximately 2600 m² of agricultural land available per capita in 2021[2], the NMR possesses the theoretical capacity to meet a significant proportion of local food demand through regional production, fostering a high degree of self-sufficiency. However, this potential is increasingly threatened by the daily loss of approximately four hectares of agricultural land due to urban expansion and other forms of land consumption.[2] As development progresses, remaining cultural landscapes face growing pressure, leading to a polarization in land-use dynamics.[3]

On the one hand, highly productive agricultural areas experience intensification, as farmers adopt more intensive practices to compensate for the decreasing availability of arable land. On the other hand less fertile areas, which are less suited to intensive agriculture, are increasingly abandoned. Unfavourable conditions and economic inefficiencies lead to declining cultivation efforts, resulting in the gradual loss of traditional land-use practices and, in some cases, ecological degradation. This dual trend and the constant decline of agricultural land underscores the urgency of implementing sustainable land management policies that safeguard agricultural capacity while balancing urban development needs.

Action plan for a sustainable regional agriculture and food system

The NMR has adopted a comprehensive approach to strengthening regional agriculture and food systems by facilitating expert discussions and hosting workshops with key stakeholders. Beside representatives of the administrative districts, stakeholders from farmers' associations, regional initiatives, land care associations (LCA), rural development agencies and other entities were included. Through collaborative consultation, the region has identified measures to enhance the sustainability and resilience of its agricultural and food economy. To support regional agriculture and the food sector, the concept of "A home for regional products" was developed, focusing on three core areas: enhancing the added value of regional products; securing agricultural land against urban expansion; and promoting organic and agroecological practices to foster environmental sustainability. Implementing this concept in an action plan will drive the transformation of agriculture and food production in the NMR establishing a resilient and sustainable regional food economy that safeguards food security while strengthening biodiversity and local economic stability.

Several projects within the action plan directly support this transition. The umbrella brand *Streuobstwiesenliebe* (love of orchard meadows) unites various orchard meadow initiatives, strengthening their market presence and consumer awareness. Guidelines for sustainable municipal land management provide local authorities with strategies to prioritize agricultural conservation in urban planning.

Opening of "A Home for Regional Products", June 2023, © Metropolregion Nürnberg

Additionally, a hybrid cherry educational trail visually represents value-added processes across all stages of the food production chain, offering an interactive way to educate consumers and stakeholders. Using innovative teaching methods, the digital content of the trail offers site-specific insights into the cherry value chain through infographics, photos and short videos.

To support agricultural production and the resilience of local supply chains NMR, together with local food councils, is leveraging regional food public procurement, facilitating connections between local producers and public and private canteens.

The procurement initiative will drive the transformation of agriculture and food production in the NMR, aiming to establish a resilient and sustainable regional food economy that safeguards local food security while promoting multifunctional cultural landscapes.

Prospects for a resilient and sustainable regional food system

The NMR is committed to safeguarding the diversity of its cultural landscapes and strengthening resilient food systems. As part of this effort, the region is pursuing recognition as a Globally Important Agricultural Heritage System (GIAHS) from the Food and Agriculture Organization of the United Nations, underscoring its dedication to establishing sustainable regional agro-food systems. Agricultural diversity and strong rural-urban interconnections play a crucial role in fostering resilience, ensuring that local production remains viable while meeting the needs of both urban and rural communities.

To achieve these goals, the region prioritizes policies that enhance local food production and strengthen urban-rural linkages. This approach positions Nuremberg as a valuable model for addressing broader challenges in global food systems. Through sustained political commitment, NMR integrates regional agriculture as a fundamental pillar of its metropolitan agenda, demonstrating its dedication to long-term action planning and the allocation of human and economic resources necessary to drive transformation.

The historically evolved, diverse cultural landscape of the Nuremberg Metropolitan Region lies at the heart of its sustainability efforts, reinforcing ecological resilience while preserving agricultural traditions. Moving forward,

Opening of "A Home for Regional Products", June 2023, © Metropolregion Nürnberg

integrated strategies must address land-use conflicts, promote multifunctional landscapes and support adaptive agricultural practices that ensure the long-term viability of regional food systems. A partial success in safeguarding agricultural land for food production was achieved with the 2022 update of the Bavarian State Development Program, which introduced the designation of "priority and reserved areas for agriculture".

By embracing these forward-thinking solutions, Nuremberg can set a precedent for sustainable food systems globally, demonstrating how localized, well-managed agricultural networks can drive long-term resilience.

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- Ernährungsrat Oberfranken: https://www.ernaehrungsrat-oberfranken.de/

The art of watering in the Forchheim district

Pauline Arnet

In the countryside around Forchheim, in the Franconia region of Germany, centuries-old irrigation techniques have shaped the landscape and provided a pathway towards climate-resilient farming. Today, traditional meadow irrigation demonstrates how farming, biodiversity and climate adaptation can go hand in hand. As climate extremes intensify, these practices offer real solutions – yet their continued success depends on collective engagement, local knowledge and strong community structures.

The Franconian people have employed meadow irrigation (*Wässerwiesen*) since the Middle Ages, due to climatic factors.[1] The climate of the valley floors of the Franconian Basin and the Alb foreland is mild and continental, with relatively low rainfall. In dry years water deficits can occur, especially in the grasslands. Fifty percent of the annual precipitation falls in summer, but regular dry periods occur in spring and mid-summer. Sandier soils in the floodplains tend to lose moisture quickly.

Farmers recognized the potential of the Wiesent and Regnitz rivers and developed an intricate irrigation system that both improved the fertility of the meadows and created significant wetlands in one of Bavaria's largest dry regions. The fundamental principles of traditional irrigation are found worldwide, often adapted regionally to suit local natural conditions. The most widespread method in the Wiesent valley is diverting water from the river via a weir (sluice) into a main or supply ditch. From there, lateral ditches branch off, which further subdivide into smaller distribution channels. At each branching point, smaller control structures are installed, allowing water to be stored in the ditch. When the water level rises, it flows over the ditch edges and irrigates the adjacent meadows with just a few centimetres of water.

Transformation and persistence

Due to industrialization, this system gradually gave way mainly to synthetic, inexpensive fertilizers that reduced the dependence on natural soil fertility – even if they did not make irrigation obsolete, as fertilizers addressed nutrient deficiency rather than water scarcity. Simultaneously, rural-to-urban migration accelerated as industrial centres offered more lucrative opportunities, while mechanization enabled cultivation of larger areas with fewer workers. Traditional irrigation ditches became obstacles for increasingly large machinery. Many irrigation structures fell into neglect. The labour and capital required to maintain and refurbish the irrigation systems became too much for dwindling numbers of individual farmers.

Facing these challenges, farmers formed water cooperatives (*Wässergenossenschaften*) for the joint management of their meadows.[2] Traditional irrigation requires a profound understanding of the natural landscape, water flow and weather conditions, as well as close cooperation among those responsible for water distribution. To manage water competition, including rivalry with industrial users, they created formal institutional frameworks with detailed regulations that remain legally binding. Today, this knowledge is typically passed down informally through observation and training by experienced cooperative members. In December 2023, UNESCO declared the traditional irrigation practices to be an Intangible Cultural Heritage of Humanity.

Despite increasing urbanization pressures, these meadows still extend to the outskirts of Forchheim. As climate conditions remain variable and intensify with increasingly scarce water, this time-tested irrigation method is valuable for climate adaptation. Currently there are ten active *Wässergenossenschaften* in the Forchheim region and urban fringe areas that operate the ditches, small sluices and large weirs across approximately 340 hectares of land. The size of the *Wässerkulissen* (the areas managed by each community) varies greatly from less than three hectares to 100 hectares.

Ecological benefits

Over time, meadow irrigation has enabled and promoted the development of ecologically valuable, species-rich wet meadows. Centuries of adaptation to extensive mowing and a life between water and land have fostered well-established ecosystems. Vegetation along the ditches often includes specific wetland and marsh plants. The ditches also serve as nurseries for newts, frogs and toads. Where the meadows are moist, various insects thrive, such as dragonflies, cicadas, grasshoppers and butterflies. This biodiversity is particularly beneficial to ground-nesting birds that use the variable wet-meadow habitats for feeding and resting. White storks also enjoy these meadows, especially during and after watering when drowned mice and frogs come to the surface. Maintaining this complex ecosystem of the Wiesent floodplains contributes significantly to protecting endangered species. While a water meadow cannot match the productivity of modern agriculture, it helps preserve a diverse and ecologically valuable landscape without hindering good agricultural yields.[3]

Fortunately, local municipalities increasingly recognize the following advantages of this sustainable and resource-efficient land use:

- The channels can be used as a flood prevention for spring floods and heavy rainfall events.
- Regular infiltration over large areas promotes raising the groundwater level.
- As the river water passes through the layers of soil, surface water is filtered, thereby contributing to increased supply of clean drinking water.
- River water carries suspended solids that contribute to soil and humus formation, reducing the need for fertilizers while maintaining soil fertility.
- Keeping the meadows moist ensures the soil remains receptive to rainfall, counteracting surface runoff and preventing erosion and silting of watercourses.
- On hot days, the large-scale evaporation of water has a cooling effect, as it attracts moisture from the surrounding area into the town. Since such grassland is a significant carbon sink and emits almost no greenhouse gases, it makes a substantial and sustainable contribution to climate protection.

As a result of this recognition, the picturesque landscape of the Wiesent Valley remains intact, preserving the cultural landscape and its function as a recreational space for residents and tourists.

Innovative management and future strategies

Since 2017, the *Wässerwiesen* Project, carried by Forchheim district and co-funded by the Bayerischer Naturschutzfonds and Oberfrankenstiftung, has aimed to protect and sustain traditional irrigation and its ecosystem services. Its main goal is to safeguard ageing irrigation infrastructure. The project advises and supports water cooperative farmers in maintaining and renewing ditches and water structures. These efforts have helped preserve water meadows and their habitats, ensuring their long-term functionality and ecological value.

Ecological Grassland Programme

Structures for maintaining and reactivating irrigation systems are fundamentally important to ensure sustainable management of large-scale grasslands. However, it is only through nature conservation-oriented land within the meadows and waterways that habitat conditions (especially critical for meadow-nesting populations) can be improved in the Wiesent valley.

Irrigation of the Mühl- and Auerberg meadows near Kirchehrenbach. In the background, the Ehrenbürg in the foreland of the Franconian Alb.
© Landratsamt Forchheim

Storks in the Steinbühl meadow on the outskirts of Forchheim. © Roland Lindacher (Landratsamt Forchheim)

The Ecological Grassland Programme was developed as part of the *Wässerwiesen* Project to enable environmentally sustainable use of the meadows, while complementing existing conservation programmes. In agreement with conservation authorities, the programme is implemented through:

- financial compensation for the labour-intensive watering process, based on the machinery ring rates (€17.85),
- payments of up to €245/ha for cultivation rest periods during the breeding season of meadow-nesting birds.

Within this framework, an extensive grazing management system is being established to enhance ecological structures and promote biodiversity. Financial incentives will supplement agro-environmental measures for cooperating farmers. The programme also addresses challenges like ageing farmers and rural decline, by developing strategies to valorize the meadows beyond farmers' self-sufficiency through regional value chains, where services and products directly connected to the meadow irrigation could form the basis of a *Wässerwiesen* brand. Securing income from ecological services and products would improve farm viability and enable succession to the next generation. The project management has until the end of 2027 to develop this concept, as the project period ends then.

The irrigator opens a sluice for irrigation of the Hofäcker near Gosberg. © Roland Lindacher (Landratsamt Forchheim)

Learning from the past

The evidence supports traditional irrigation as a suitable method for managing the reconciliation of agricultural productivity, quality and nature conservation. These methods evolved in harmony with local conditions. Building on this heritage, the German Association for Landscape Conservation's (DVL) project Climate-Adapted Water Management (KliWa) – Learning from Traditional Practices for the Future aims to adapt natural water retention methods in Germany to address modern challenges.[4]

However, meadow irrigation in Forchheim depends on collective action by water associations. A broader contemporary trend in Germany, where socio-structural changes have led to the decline in cooperative activities, results in burdens increasingly shifting to individuals. Traditional irrigation shows that old cultivation techniques can adapt to climate- and biodiversity-related challenges, but this depends on sustained community cooperation, knowledge transfer and innovative governance. Supporting cooperatives secures valuable ecosystem services and resilient agricultural landscapes. Integrating traditional methods with modern water management offers a path to sustainable, climate resilient farming.

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- Deutscher Verband für Landschaftspflege www.waesserwiesen.dvl.org

Our *tholuwa* heritage: women and their knowledge of urban agriculture in Assam, India

Pooja Kalita

The word *tholuwa* in the Assamese language is broadly translated as "indigenous". This article gives a glimpse of how women in urban Assam in India act as agents for preserving and passing on *tholuwa* food knowledge amid rapid urban transformations. It makes the case for decolonizing knowledge itself, rather than prioritizing Eurocentric ways of knowing that dismiss indigenous, local and non-western knowledge systems practiced by women as inferior. Thus, women's voices must be centred in government policies, school curriculum, community-led spaces. Urban agriculture is a domain that relies heavily on the knowledge and practices of women, and hence cannot be overlooked as mundane or insignificant.

The knowledge of *tholuwa* manifests in practices ranging from having little kitchen/balcony gardens, to cooking, sharing recipes, practicing age old wisdoms, and interpreting mythologies and disseminating oral histories that include both the human and the non-human world. One example is a phrase politely uttered to plants if one must pluck its fruits after sunset – *Sur nohoi grihosto* (Not a thief but the householder). The heritage of Indigenous communities is based on the belief that every living species rests after sunset and if there is an urgent need to pluck any fruit, vegetable or herb, the plant or the tree must be told.

Being a woman researcher from Guwahati, I have grown up watching my mother and many other women following these rituals diligently. There is no doubt that with the coming of the Liberalization, Privatization, Globalization project in India in the 1990s, which sought to increase foreign investment and effect a shift towards the service economy, the ideas related to *tholuwa* knowledge about food and agriculture were impacted by the larger framework of urban transformation. Yet although modified, *tholuwa* has not been completely lost due to the active role played primarily by women, including inside individual households.

Making the most of small spaces

Urban Assam has been impacted by recent waves of neo-liberal globalization, migration, market structure

Spinach, tomato, chilli and other plans in a balcony garden in Assam. © Geetika Kalita

modernization and development. Yet, it would not be too uncommon to see tulsi (basil) plants being planted and worshipped inside apartments. Tulsi has a religious significance in Hindu mythology, as its presence is believed to bring peace, health and spiritual well-being. Earthen lamps are lit in front of the tulsi plant during the festival of Kati Bihu in Assam to ward off negative energies and insects that might harm the crops.

Mint leaves in an apartment balcony © Geetika Kalita

However, with the decrease of open spaces, unequal land and property rights and relentless urbanization fuelled by the neo-liberal market system, women in Assam who wish to practice urban agriculture often have to manage with any small space that is available. While men are not completely lacking the penchant for preserving *tholuwa* knowledge through urban agriculture, women are generally seen as more knowledgeable and equipped when it comes to cultivating in small spaces. It is not unusual for men to refer to, and put to use, the knowledge of their mothers and grandmothers.

However, being able to practice urban agriculture is not as rosy as Instagram posts might look like, and it is not a luxury available to everyone. For instance, some women many be at risk of eviction from their homes because of a natural calamity like flooding or government policies.

Tomatoes growing on the floor amidst water supply pipes © Geetika Kalita

Women who work as domestic helpers do not always have access to space to grow their own plants but are generous enough to help their employers to grow fruits and vegetables for the latter's consumption. Therefore, urban agriculture is practiced, nurtured and sustained with different kind of hands through various *tholuwa* knowledge systems in tiny pots, amidst concrete floors, underneath and around water pipes, and in other small available spaces.

Take away messages

As women's histories and experiences are easily forgotten and unacknowledged, the take-away messages of this article are twofold.

Firstly, there is an urgent need to decolonize the meaning of the term "knowledge" so that women's practices that were once seen as mundane are valorized for their cultural and environmental contributions. Women's voices must be centred in government policies and school curricula, and in the creation of women-led community spaces.

Secondly, in *tholuwa* knowledge systems preserved and transmitted by women, the non-human world is considered as important as the human world. However, some women are discriminated against on the basis of caste, religion, class etc. Often, they do not often have equal opportunity to practice urban agriculture. Addressing this requires a larger societal change – from legal provisions against discriminations, to creating accessible urban agricultural garden spaces for all sections of society.

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Black Mothers' Backyards and Kitchens: reclaiming Afro-Brazilian heritage through food and urban agriculture

Laura Martins de Carvalho and Vivian Delfino Motta

In a context of deep racial and food inequalities that shape life in Brazilian cities, the Black Mothers' Backyards and Kitchens project is a powerful initiative to reclaim Afro-Brazilian heritage, advance food sovereignty and shape inclusive public policy through urban agriculture. Led by Black women in Carapicuíba, São Paulo, the project is a dynamic and ongoing process of collective action, where kitchens and backyards are transformed into vibrant spaces of cultural affirmation, healing, resistance and learning.

The project began in 2022 as a collaboration between the Unified Black Movement (*Movimento Negro Unificado*, MNU) of Carapicuíba and the Centre for Gender, Race and Agroecology Studies (Núcleo de Estudos em Gênero, Raça e Agrocologias, NEGRASs): at the Federal Institute of São Paulo, São Roque campus. Carapicuíba, part of the Metropolitan region of São Paulo, has long been a place of reception for Afro-Brazilian migrants. Today it is considered by many residents to be an urban *quilombo*, a term that initially referred to communities founded by runaway enslaved African people but which is now used to refer to spaces of Black collective cultural resistance and autonomy.

Agri-food as living memory

The primary goal of the project is to document, promote and protect the agri-food knowledge of Black women who maintain ancestral practices of planting, cooking and healing. These practices, passed down by word of mouth through generations, are part of everyday life in home backyards. The main activities involve cultivating vegetables and medicinal herbs, raising chickens, preparing traditional dishes and organizing gatherings centred around food, storytelling and spirituality.

A key part of the project was a series of interviews with 20 Black women participants, selected for their active involvement in collective food practices. Most are women heads of households, aged between 40 and 70 years, with deep roots in rural traditions and urban struggles. The interviews explored the women's daily food practices, the types of plants they cultivate and their uses, as well as the cultural and emotional significance of shared meals. These conversations helped to map out how food is used as a form of autonomy, resilience and memory.

Black orality – memories, backyards and lived narratives. © Marcos da Silva

From a methodological perspective, the project combined oral history, participatory observation and a feminist approach rooted in the recognition of lived experiences as valid and valuable sources of knowledge. Oral history allowed participants to narrate their trajectories in their own words, emphasizing memory, identity and intergenerational transmission of knowledge. Participatory observation enabled the researchers to

engage directly in daily activities, such as planting, cooking and participating in healing rituals, thereby generating insights that could not have been obtained through interviews alone.

The feminist intersectional lens ensured that power relations between researchers and participants were continuously questioned and that the voices of Black women were treated not as anecdotal but as central to theory-building and policy relevance. The result is not only a collection of deeply textured life stories but also a framework for rethinking urban agriculture as a site of political action and cultural affirmation. These methodological choices contributed to a broader proposal for how public policies on food, land and urban development can be shaped by the realities and contributions of historically marginalized communities, particularly Black women.

Cooking and Black collective memory. © Marcos da Silva

Urban agriculture and food as politics

Urban agriculture, in this case, is not a hobby or a technocratic solution to issues such as food insecurity, urban food deserts, environmental degradation or public health concerns. Such framing risks depoliticizing and oversimplifying its significance.

Here, urban agriculture is asserted as a political act – that is, a claim to the right to food, land and dignity. It foregrounds the leadership of Black women who, despite systemic marginalization within formal economic structures, emerge as central agents of sustenance and care in their communities. Beyond producing food, it reaffirms their agency, reconnects them to land, memory and ancestral knowledge, and challenges the structural inequities underlying urban marginalization.

A typical activity in the project involves women gathering to cook and talk, often around a traditional cornmeal cake called *ôidimuim*, accompanied by coffee. These moments are not just social. They are pedagogical and political. They facilitate the transmission of history by word of mouth and help rebuild bonds across generations. The food prepared during these gatherings, such as yam dishes, medicinal teas and Afro-Brazilian stews, carries more than just nutrients; it is filled with stories, memories and symbolic healing.

Black collective care

The process of Black people coming together to cook and share meals and stories in Brazil is known as *aquilombamento*: the intentional creation of spaces of collectivity, care and resistance, inspired by the historical legacy of *quilombos*. In contemporary urban settings, *aquilombamento* reclaims this legacy by forging bonds of solidarity and mutual support among Black women who have long been excluded from formal structures of power. It brings together the individual and the collective in a shared effort to resist the fragmentation, invisibility and isolation imposed by systemic racism and urban inequality.

As a counterpoint to the dominant logic of urban segregation, where the periphery is often portrayed as


Ancestral food and word-of-mouth traditions from Minas Gerais. © Marcos da Silva

dangerous, violent and disorganized, the women involved in this project construct an experience of abundance of ancestral knowledge, emotional support and creativity. There is also a profound aesthetic dimension to this work. These women cultivate beauty, harmony and sensory richness. They plant flowers alongside vegetables, arrange their yards with intentionality and care, and prepare herbal infusions for physical well-being and spiritual balance.

Their bodies, homes and gardens become extensions of their identities, serving as a form of personal resistance. The use of medicinal herbs for body care, the preparation of sacred foods and the maintenance of decorated altars are all expressions of a worldview in which well-being and beauty are acts of resistance and survival. These aesthetic practices challenge colonial and Eurocentric notions of beauty, values and cleanliness. They affirm the right to be seen and celebrated on one's own terms, reclaiming visibility in a society that too often seeks to erase or marginalize Black women's contributions and presence.

The personal is political

The Black Mothers' Backyards and Kitchens function as micro-territories of resistance. These are not institutional gardens or plots run by NGOs. They are backyards owned and maintained by Black families, many of whom have resisted eviction, disinvestment and racism to remain in place. In these spaces, food sovereignty is deeply intertwined with territorial permanence and cultural affirmation.

Understanding the project also requires an understanding of the broader Black Movement in Carapicuíba. Since the 1980s, organisations like MNU have advocated for land rights, healthcare, education and cultural policies to address the historical injustices suffered by Afro-Brazilian populations. In this sense, the Black Mothers' project is a continuation of the *quilombo* legacy, focusing on the intimate scale of the home, kitchen and yard, demonstrating how the personal is political.

The project challenges dominant narratives in food and urban policy that often ignore the contributions and needs of Black populations. It advocates that urban agriculture cannot be de-racialized or de-politicized. Any policy aimed at promoting sustainable food systems must consider the intersection of race, gender and historical inequality. It must recognize the value of traditional knowledge and the leadership of those who have been historically excluded.

While this article opens with stories of planting and cooking, its central message concerns public policy. To build more inclusive and equitable cities, we must reimagine urban planning, food systems and sustainability strategies through the lens of projects like the Black Mothers of Carapicuíba. Their everyday practices offer concrete and transformative insights into how to reclaim Afro-Brazilian heritage, ensure food sovereignty and influence public policy through urban agriculture, transforming domestic spaces into sites of cultural resistance, care and political action.

Take-home messages

- Black women's agri-food knowledge is essential for urban sustainability, food justice and cultural resilience.
- Backyard agriculture can be a form of policy innovation, rooted in everyday life and ancestral memory.
- Public policies should be built not only for marginalized communities but with them, recognizing their leadership.
- Supporting urban *quilombos* means investing in food sovereignty, cultural expression and collective autonomy of Black people.

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Rich diversity of food heritage at the core of innovative product development

Katrien Verbeke

How can a heritage-based initiative empower vulnerable communities, and fight food waste at the same time? In Ostend, Belgium, the POT Up and POTvis projects show how urban agriculture and culinary traditions can activate communities and have positive social and economic impacts. This article explores how food storytelling and local collaborations strengthen communities and economic opportunities for marginalized groups.

The POT Up and POTvis projects are run by the City of Ostend through its social grocery store Antenne, and in partnership with, and with co-funding from, EIT Food, a Knowledge and Innovation Community within the European Institute of Innovation and Technology, and De Grote Post, the cultural centre of Ostend.

The projects have creatively combined urban agriculture, food surplus valorization and community building through providing coaching to vulnerable citizens to develop and commercialize new products from surplus food, inspired by their own cultural heritage. By tapping into personal stories, forgotten recipes and local ingredients, the projects not only reduce food waste but also reinforce cultural identity and foster social cohesion.

Food and memory in a jar

Under POT Up, in 2023 and 2024 twenty Ostend residents, many from migrant backgrounds, created innovative products using surplus foods, each with its own story. With the guidance of professional chefs and workshops, they developed chutneys, jams, pickles and sauces rooted in family traditions from Morocco, Afghanistan, Syria, Belgium and beyond.

Participants visited local urban agriculture projects to get to know local seasonal products that they could integrate into their recipes. The project turned surplus food (mainly from the Ostend Foodsavers initiative that collects surplus from retailers, farmers and food industry companies) into sustainable products, providing a stepping stone for participants towards entrepreneurship and financial empowerment. Finally, artists turned the individual stories into a cultural performance and a fairy tale.

For Habibi, an Afghan woman separated from her children, a tomato tapenade became her way to process

Mo and Taghrid presenting their products. © Jules de Bruycker / De Grote Post

grief and feel close to home again: “Cooking is how I express love and make memories tangible.”

Others, like Martha, connected ingredients across continents: “My rhubarb-orange jam blends Morocco and Flanders. My mother always used rhubarb in jams. Orange reminds me of home.” Meanwhile, Ali’s coriander chutney reflects resilience: after a bomb injury limited his energy, he found purpose in sharing food with his Ostend community. Each product represents more than taste; it captures migration journeys, generational wisdom and a desire to belong.

Food as social innovation

The strength of POT Up lies in its circular ethos: food surplus becomes opportunity. Participants used rescued produce from local shops and farms, combining it with traditional techniques like fermentation, pickling and slow cooking. Each participant brought his or her knowledge to the table, and together with some workshops on specific techniques they started applying them to new recipes. The recipe development happened in the community kitchen where they test and revise their products and give feedback and support to one another.

Johan and Danitcia presenting their products. © Jules de Bruycker / De Grote Post

Pot up products. © Hans Lenvain / De Grote Post

These low-cost methods and use of community kitchen space kept costs manageable and ensured quality and safety.

The result was more than preserved food. The group formed a community of practice and support. Makers like Yordano, who dreams of starting a small factory for healthy food, or Fiona, whose plum spread with speculoos spices was inspired by zero-waste values, now have a network, identity and visibility they lacked before.

Growing from community to economy

POT Up aims to provide economic opportunities by supporting the participants in moving swiftly from training, to product development, to commercialization. Participants were able to present and sell their creations at professional events, attracting interest from local buyers and retailers. Costs were kept low by using existing local partnerships and surplus logistic platforms, rather than having to establish distribution channels from scratch. This helped ensure economic viability. POT Up also demonstrates how creative valorization of leftovers can lead to real business opportunities.

From land to sea: POTvis

Building on POT Up’s success, Ostend launched POTvis in early 2025, focusing on the local fishery sector. POTvis brings together fishermen, artists, newcomers and culinary experts to explore preserving lesser-known fish species through fermentation, pickling and traditional recipes. This project not only promotes sustainable fishing practices by boosting the value of bycatch but also strengthens community bonds. Meanwhile, employment agencies will support vulnerable groups to access training and jobs linked to the fish sector.

Lessons learned and impact

One key success factor of POT Up and POTvis has been the co-creative approach where chefs and trainers combine their expertise with the creativity, cultural background and culinary knowledge of participants. Trust, empowerment and professional coaching were essential.

From an operational point of view, having access to infrastructure and supplies are crucial. Challenges included bridging gaps between traditional techniques and market demands, and ensuring products meet food safety regulations. However, these were addressed through partnerships with local food experts and structured support systems, such as research laboratories.

The project also ran into legal barriers over how far a local authority can be involved in the commercialization process. Moving from an intensely supported project to an independent, scalable and market-ready startup is still work in progress. The projects showed that heritage is not static; it evolves through dialogue, resilience and innovation.

Take-home messages

- Food storytelling is a powerful tool to activate heritage communities and promote inclusion.
- Combining urban agriculture with food surplus valorization can create social, cultural and economic value.
- Small-scale, low-cost projects can grow into resilient networks that support local economies.
- Cultural diversity can strengthen local food traditions and open new market opportunities.
- Artistic collaboration helps preserve and share community knowledge in accessible ways.

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More information:

- EIT Food – POT Up project: https://www.eitfood.eu/news/local-citizens-in-ostend-create-local-food-products-that-combat-food-waste
- Stad Oostende – POT up: https://www.oostende.be/potup
- Stad Oostende – POTvis: https://www.oostende.be/potvis

Re-imagining community gardens: a biocultural view of restoring urban spaces in Honolulu, Hawai'i

Subhashni Raj and Adam Strubeck

Hawai'i's urban community gardens present an opportunity to create socio-ecological spaces that foster socialization and health benefits, and to supplement household food supply with culturally significant foods. Planners and conservationists should work with local community experts who hold Indigenous and ancestral knowledge and use the Biocultural Urban Garden (BUG) framework to design spaces to better meet the community's needs.

Building connections between humans and nature is critical in cities where colonial and industrial forces have carved out a built environment that is vastly different to the original natural environment, to heal both native ecosystems and cultural rifts.

In the pre-contact era, Hawai'ians developed and applied biocultural resource management approaches that sustained an abundance of resources for more than a millennium and fed a million people.[1] These approaches include several social-ecological systems, such as flooding fields in riparian areas, fishponds in estuaries and agroforestry systems in dryland fields.[1]

With the illegal overthrow of the Hawai'ian Kingdom in 1893 and subsequent usurpation of Hawai'ian land and water rights, these biocultural practices were erased.[1] In 1959, Hawai'i officially became a US state. Thus began the influx of tourists, with numbers reaching a pre-pandemic height of 10 million annually. While Indigenous knowledge, language and practices have been adversely affected through the American occupation, a revival and revitalization effort has been underway since the 1970s and carriers of Indigenous and ancestral knowledge remain embedded in the community.

A kukui nut tree provides shade by the toolshed of the Makiki Community Garden. © Adam Strubeck

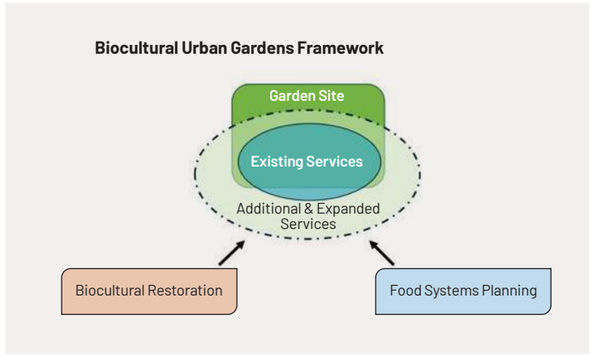

Figure 1: A conceptualization of the bio-cultural urban garden framework. Source: authors

Figure 2: A conceptualization of the BUG framework applied to Makiki Community Garden. Source: authors

An urban conceptualization of biocultural restoration

The team from the University of Hawai'i conceptualized a new framework called the Biocultural Urban Garden (BUG), which integrates food systems planning and biocultural restoration principles to reimagine and improve community gardens (see Figure 1). The BUG framework is based on the concept of *kīpuka*, a pocket of forest that survives lava flows on all sides, thus creating an "island" that provides refuge. Specific urban sites are considered as cultural *kīpuka* that are refuges for indigenous lifeways, native species and biodiversity.[2] Given that Honolulu has some of the most densely populated areas in the country, few green spaces and very little urban land on which to grow food, community gardens can serve as urban *kīpuka* if they are intentionally designed as such.

Applying the BUG framework

The City and County of Honolulu provides access to long term spaces for food production on public lands in the form of community garden plots. The plots are located across 11 gardens, mostly in the heart of the city.

A recent study showed that the gardens uphold multiple important aspects of biocultural restoration, including producing an abundance of food and connecting people to nature. Over 70 percent of the 398 community gardeners surveyed reported eating more traditional and culturally significant foods, and the majority of the respondents agreed that their food security had improved as a result of gardening.[4] Similarly, many respondents appreciated having access to green space in the city and valued "tranquillity from the rush of life" and "a garden setting for people who live in apartments/high rises a place to garden".[4] The study also highlighted that Native Hawai'ians are least represented among community gardeners. Most gardeners – and over 50 percent of respondents – identified as Asian. The existence of these gardens is in itself an act of *kīpuka*, as practiced 125 years ago; if they were more intentionally designed they could also facilitate biocultural restoration.

The team used the BUG framework to propose enhancements to one such garden – the Makiki Community Garden in urban Honolulu – which has 160 individual plots (see Figure 2).

The following issues were identified in the community garden's current set-up:

- Connection to place. There are limited educational resources that tell the story of the site's history and significance to the area. Visitors to the garden may be unaware of the culturally significant plants and ecosystems of the area.
- Biodiversity. The allotment style garden design emphasizes individual use of the garden versus communal use, which limits both the plants that can be grown and the variety of organisms that can be sustained. Trees are permissible only if they are planted with a barrier underneath and kept under five feet in height, due to safety concerns (e.g. risk of falling branches, risk of roots damaging pipes, safety concerns stemming from reduced visibility).
- Socio-ecosystems. The benefits of the garden are mostly realized by the 160 plot-holders; there is currently a three-year waiting list for plots. The garden provides limited services to the overall socio-ecosystem, such as traditional ecosystem services and food production.

The team suggested that modifications to the garden's form and function would allow it to better serve the community's needs, including accessibility improvements, biocultural restoration elements (including adding keystone species) and expanded communal spaces. They imagined the following additions:

The **access garden** would provide gardening opportunities for community members who are differently abled. The proximity to an existing paved path, as well as raised beds, would facilitate participation by wheelchair users.

The ***kīpuka* garden** would include small trees, shrubs and ground cover native to Hawai'i. This area would be used for biocultural restoration and to showcase important resources. Community members could harvest culturally significant foods, medicine, flowers, seeds and building materials.

Expanding the **communally managed perimeter beds** would allow for more participation from those who do not currently have their own plot, and for plot-holders to work collaboratively. Plants grown in these beds would provide habitats for local species, supporting biodiversity. The beds could also be used to produce seeds, green mulch, building materials and flowers.

Increased **educational signage** would teach visitors about the history of the site, the biocultural resources present and ways to get involved.

The **community food forest** would expand the number and types of plants that can be grown and introduce keystone species that are culturally significant food sources, such as breadfruit and fruiting coconuts, to the urban environment. A food forest grows across many layers: the root zone, ground cover, shrub layer, lower canopy and upper canopy, and integrates native Hawai'ian multi-strata agroforestry systems that have historically played a critical role in food production.[5]

The **learning garden**, located close to the existing playground, is a "living classroom" that would provide opportunities for environmental education.

Walking paths through the expanded garden would promote physical activity, and help to keep walkers away from the growing areas.

The Makiki Community Garden was founded in 1975, and contains 160 individual garden plots. © Adam Strubeck

Community gardens are held in high esteem among food system planning scholars.[3] While recognizing that the gardens are not a panacea for our failing food system, they present an opportunity to create socio-ecological spaces that foster socialization, health benefits and an opportunity to supplement household food supply with culturally significant foods.[3]

The team recommends that planners and conservationists work with native Hawai'ians who are holders of Indigenous and ancestral knowledge systems, to incorporate keystone species that are culturally significant food sources, such as breadfruit. They argue for a more integrated approach to urban planning that recognizes the value of community gardens not only for food production but as essential components of sustainable urban ecosystems.

The team has shared the conceptualization and design material with the Department of Parks and Recreation. Unfortunately, the Department concluded that the degree of soil contamination at the Makiki Community Garden means many of the proposals cannot be implemented. Nonetheless, it pledged to consider the BUG framework in planning for new gardens and other food planting projects.

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Youth revival of traditional urban agriculture practices under Urban Futures

Jess Halliday

Urban Futures initiatives in three countries show that exposing youth to indigenous foods can have a trickle-down effect within their communities, generating market demand for resilient, locally adapted varieties. Young people are discovering that traditional farming methods are underscored by sound ecological values and scientific explanations.

The Urban Futures programme is led by Hivos, with RUAF and Humanis as global partners. Funded by Botnar Foundation, the programme works at the intersection of urban food systems, youth well-being and climate action in ten intermediary cities, in five countries. It supports local partners and young people to create more inclusive, climate-resilient cities and urban food systems.

In many countries, city dwellers tend not to have much contact with agriculture and have lost touch with the traditional food culture of their parents and grandparents, and indigenous foods are expensive and hard to find. Experiences in Ecuador and Zimbabwe have shown that inviting urban youth into the countryside to take part in events where they can take part in the foodways of their forebears can ignite a powerful interest in traditional farming and indigenous crops.

In Choco Andino, Ecuador, youth were invited to take part in collaborative "*Minga*" workshops to establish new food plots on degraded farmland, featuring indigenous plants (see Box Involving youth in collaborative *Minga* workshops). Similarly, a group of youth champions from Bulawayo, Zimbabwe, visited the nearby Amagugu International Heritage Centre to learn about traditional food practices – including production, processing and consumption – through talks, art and song (See Box A visit to Amagugu International Heritage Centre).

In both cases, the participants have shared their experiences with their communities and on social media, and some of the youth champions are incorporating their new knowledge into their own activities.

In Choco Andino, a few young people are actively seeking to build a market to support the farmers, such as Daniela Andagoya and Johana from the Andean Choco Youth Network, who sell agroecological coffee and panela

Youth posing with traditional woven plates and clay drinking pots. © Nobubelo Malinga

(unrefined cane sugar) in the Chala community store. Two chefs, Jimmy Momposita and Alfredo Guamaní, meanwhile, are inventing new recipes using the leaves, fruits, flowers and roots of non-conventional plants, introducing their unique flavours to consumers.

In Bulawayo, youth are including indigenous materials in modern goods, such as skincare products, herbal teas and confectionery. One young woman who works for the Ministry of Agriculture, Land and Fisheries is recommending that agritech companies and the Ministry encourage farmers to grow indigenous small grains such as sorghum and millet, in the interests of boosting climate resilience.

The young people are not just retaining information, but they are using their own media platforms and asking, "how can I, in addition to the entire city, influence

The communal garden is one of Seni Tani's regular activities, involving CSA members and volunteers. ©Ady Nura

Bulawayo and the wider region to be more indigenous and more strategic about climate change?", said Nobubelo Malinga, project communications officer at Hivos. The youth champions are also participating in regional and national policy platforms to ensure incorporation of youth voices within broader urban agriculture conversations and legislation.

Future farmers?

In the Urban Futures countries, farming tends to be perceived by young people as a dirty, difficult and financially risky occupation. According to Galih Raditya, one of the team members of Seni Tani in Indonesia, the risk is due to the conventional food system under which farmers cannot set their own prices and are reliant on middlemen. For farming to be attractive there is need for an alternative, fairer food system model, such as community-supported agriculture. (see Box Reviving Sundanese techniques for community-supported agriculture).

When it comes to the techniques that Seni Tani is using, however, he added that it is not so much about the traditional aspect itself, as the values behind the traditional. In particular, the emphasis on natural, organic, ecological methods and the sense of community that comes with it is attractive to young farmers.

"There are many young people today becoming more aware about how climate change is affecting their daily lives. They're looking for a way to live more sustainably, and growing food in a natural, low-impact way feels like a practical step in that direction," said Gilang Agustiar, a member of Seni Tani.

"It's not about going back in time, but about reconnecting with more mindful and ecological practices, sustainable practices. It feels empowering in a world where so many systems feel out of our control."

In Bulawayo, only a few of the Urban Futures youth champions are currently farming indigenous crops, but this is a key area where Urban Futures aims to build capacity.

"We realized that they were not [farming indigenous crops] because they are not aware of the health benefits and the market that is there for those foods," said Khaliphani Ndlovu, project coordinator of The Unemployed and Vulnerable Foundation Trust, a partner in the Bulawayo Urban Futures consortium. "Because of lack of supply, indigenous foods are quite expensive. This means young people tend to go with fast foods because they are more affordable and easily available."

As for livestock, indigenous breeds tend to be hardier and more climate adaptive than exotic breeds, and can be sold for better prices. "It is more expensive but the market is there, so [farmers who raise indigenous breeds] are making a better income for themselves," said Ndlovu.

She added that indigenous breeds can make for more effective closed loop systems. There is evidence that manure from local goats works better; and tilapia fish, which are well adapted to the climate around Bulawayo, can be fed with chicken manure.

***Jess Halliday** is chief executive of RUAF, a global partner in the Urban Futures programme.*

More information:

- https://hivos.org/program/urban-futures
- www.senitani.org
- https://fundacion-imaymana.org/en/
- https://www.facebook.com/amaguguinternationalheritagecentre

Involving youth in collaborative *Minga* workshops

Fundación Imaymana has facilitated the participation of youth from urban areas in Quito, Ecuador, in collaborative "*Minga*" workshops in peripheral rural parishes of the Chocó Andino to establish plots for growing diverse food crops on degraded farmland – and, at the same time, introduce them to a host of unconventional edible plants.

In 2020, Fundación Imaymana began working with local farmers to establish small plots using the syntropic method to regenerate the soil, increase diversity and build food sovereignty and economic opportunities for farmers.

Twenty plots have been established to date, each through the same *Minga* workshop process in which people of all ages work towards a common goal, both learning about the techniques and putting them into practice. Up to 500 plants are sown at the same time, paying attention to how well they grow together, time to harvest to ensure continuous supply, and the money they will bring in throughout the year.

More than 450 species of non-conventional edible plants grow in the Choco Andino, including both traditional native plants and foreign species that have been introduced to the region. These include yacón, mountain papaya, poroton, lleren and miso, to name but a few. Many of these species are easy to grow, and they can provide producers with a valuable source of additional income. Due to their hardiness and adaptability, these species are also a key for climate change adaptation, as they allow food production to continue even under challenging environmental conditions.

While locals may have eaten some species as children, a lot are new to them – even though they may grow wild on their land. Other varieties have fallen out of favour, such amaranth, which was relegated to animal feed during colonial times but is highly nutritious, cheap, easy to grow and resilient.

In our era of climate change, resilience is key. "When we have a drought, we cannot produce lettuce but we can produce many other plants in this group of unconventional edible plants," explained Nina Duarte, researcher at Fundación Imaymana.

We sow the future with ancestral roots and new ideas. Young people cultivating hope, technology and food sovereignty from the ground up—merging agroecology with innovation to transform food systems from their territories. © Imaymana Foundation

In the Chocó Andino, the community drives the transformation of food systems through collective workshops and syntropic agriculture, regenerating both the land and the social fabric. © Imaymana Foundation

A visit to Amagugu International Heritage Centre

A delegation of 52 youth champions visited the Amagugu International Heritage Centre, a community-based cultural centre in Matobo District, 60km from Bulawayo, to learn first-hand about Ngebele households and food culture – from indigenous production, to processing and preparation, to sharing meals and educational storytelling in the home.

The Ndebele settled in the Matobo District when they moved into Zimbabwe in the early 19th century. After observing a significant loss of Ndebele culture in recent times, the late historian and cultural expert Phathisa Nyathi founded the Amagugu International Heritage Centre in 2010. Khaliphani Ndlovu from the Unemployed and Vulnerable Foundation Trust (a partner in the Bulawayo Urban Futures consortium) organized for the group of youth food champions to visit the centre to give them practical experience of an African home. Some of the participants were enrolled in a wider Green Schools course, while others are entrepreneurs with whom Urban Futures is working in the community.

The group learned about traditional farming methods and their benefits for the environment, as well as food preparation methods – including grinding grains for porridge and *Isitshwala* (made from maize), and making peanut butter using traditional machinery. They held discussions on indigenous food, and why the indigenous groups including the AmaNdebele did not get the chronic non-communicable diseases that plague communities today.

"We wanted them not only to see but also to understand how we used storytelling as a way of communicating," explained Ndlovu. "In our African culture, dinner was served around 5pm. After we had finished eating and cleaning up, we would all sit around the fire in the kitchen and our grandmother would tell us educational folktales."

"At Amagugu, we had lessons on cooking because we are not just focusing on agricultural production. We are also encouraging young people to consume indigenous foods," Ndlovu said. "We also had an artist drawing a picture showing how we would want to merge the indigenous knowledge systems and the modern food systems, and the benefits for Mother Nature."

Youth posing with traditional spear and shield in front of traditional wall art. © Nobubelo Malinga

Reviving Sundanese techniques for community-supported agriculture

Youth-led grassroots movement Seni Tani is seeking to revive the traditional Sundanese agricultural practices in Bandung City, West Java, Indonesia, based on values that promote ecology and closeness to nature – but which can be similar to agroecological practices in other countries.

Seni Tani is part of Urban Futures' PUPA Consortium in Bandung. Seni Tani was founded in 2020 by five young people with the objective of re-building local people's connection with nature and their food sources. The business model has three pillars: community-supported agriculture (CSA); a communal garden for CSA members and the surrounding community; and workshops for farmers to learn regenerative agriculture and food sovereignty.

From 2021-2024, Seni Tani involved 14 small scale farmers and farming groups, mostly older people, who between them grew and distributed a total of 3.5 tons of produce to 20-35 monthly CSA members – including cucumbers and radishes, leafy greens like spinach, pak choy, chai sim, lettuce, kale and water spinach, and herbs including basil, coriander and pandan. They processed a total of 13.5 tons of organic waste from kitchen and household yards, producing 6.7 tons of compost.

This year, Seni Tani has been able to bring an additional 15 young farmers to the movement under the Urban Futures project.

The farmers grow on two types of land: land that is beneath power lines; and land in residential areas. Until 2024, the community garden was on 900m2 of former paddy field within a residential area of Bandung. After the landowner decided to sell the plot, Seni Tani was offered an alternative plot of abandoned land by the friend of a member of the CSA, for which they signed a memorandum of understanding in January 2025. The new plot is presently undergoing regeneration.

Seni Tani implements traditional agricultural techniques used by the Sundanese tribes of Java Island – and in particular those included in a book they found called *Sundanese Agroecosystem*. Where necessary, Seni Tani adapts the book's principles and practices to urban conditions. For instance, traditional Sundanese composting relies on materials such as manure, wood ash, greenery, grass clippings and dry leaves. While these materials are still commonly used in some rural West Javanese villages, Seni Tani creatively substitutes them with used coffee grounds from local cafés and dried urban leaf litter. Though the substances differ, the underlying agroecological principles remain the same: working with natural decomposition processes, maintaining soil fertility through organic inputs and integrating waste as a resource.

In addition, Seni Tani has sought out stories and practices from the traditional villages in West Java. It is not easy, however, because most modern Sundanese farmers have forgotten about these practices since the Green Revolution of the 1980s. Because the practices are orally transmitted, the knowledge and the underlying values are lost when old people pass away.

Being digitally savvy, the youth involved in Seni Tani have also sought information on how to better connect with nature from online sources of non-Indonesian knowledge. They have found that many non-Indonesian practices have an Indonesian equivalent, and that the traditional values have scientific rationale.

For example, Sundanese villages adhere to a practice called *hutan larangan* (forbidden forest) that no one is allowed to enter. The concept is the same as that of Zone 5 in permaculture, except that while *hutan larangan* may be explained by the presence of a ghost, permaculture explains that it is a self-sustaining water source.

Similarly, the notion of *kebun talun* (productive forest) is very similar to agroforestry practices; and the *tumpang sari* method of growing several plants together has its equivalence in companion planting to reduce the risk of pest attacks on the main plant.

Another member of Seni Tani, Fathan Abdillah, explained that they are most interested in finding out why these practices have developed, because that is the key to practices that are in turn with nature.

For instance, the common "banana circle" practice of cutting the banana leaves after harvest and laying them around new trees is explained by the moist soil helping to break down organic matter.

"If we want to learn scientifically, we can learn from other places' knowledge. But if we want to learn the values, we have to see the traditional knowledge," said Abdillah.

Working in the Seni Tani communal garden. © Ady Nura

Bandung urban agriculture heritage: where tradition meets the future

Oekan Soekotjo Abdoellah, Mega Nurul Aini, Mahardhika Puspa Arum Suraloka and Gemilang Lara Utama

With rapid expansion of built environments and shifting socio-economic conditions in Bandung, Indonesia, the need to balance development with ecological integrity has never been more pressing. Bandung's ambition to be a future-ready metropolis must be informed not only by new technologies and policies but also by cultural roots and historical land stewardship. Two seemingly peripheral areas – the *kampung adat* (traditional village) of Cirendeu and the Upper Citarum watershed – offer powerful lessons in ecological resilience and cultural continuity.

Landscape of the Upper Citarum watershed. © Mega Nurul Aini

Both Cirendeu and the upland Citarum represent more than marginal landscapes; they are storied territories where heritage, agroecology and cosmological principles shape how communities interact with nature. Cultural-spiritual beliefs guide how people understand and steward the landscape and are often reflected in rituals, ancestral relationships, land-use timing and living belief systems that guide how people manage land, treat non-human beings, and maintain balance between the material and non-material realms.

These practices do not belong to a bygone era, but provide working models of sustainable living in the face of climate change, food insecurity and land degradation. Cirendeu and the upland Citarum each provides unique insight into how Bandung's green future can be inclusive of its indigenous past.

Together, these sites offer more than inspiration; they provide strategic frameworks for sustainable urban planning. Cirendeu's cultural stewardship and adaptive agroforestry present a living example of urban sustainability rooted in indigenous ethics. The Upper Citarum's agroecological systems, meanwhile, show how water security, food systems and climate adaptation are intricately tied to social and ecological memory. As Bandung grows it must do so wisely, looking not only forward, but also backwards to traditions and practices that sustain both land and life.

Cassava rice, known as rasi. © Mega Nurul Aini

Kampung adat Cirendeu: adaptive heritage at the edge of the city

Nestled in Cimahi region on the peri-urban of Bandung, *kampung adat* Cirendeu stands as a cultural and ecological counter-current to urban sprawl. Since 1918, this traditional Sundanese community has upheld a resilient and adaptive way of life through agroforestry, food sovereignty and spiritual stewardship of land and water.

Cirendeu's land use system is ecologically intricate. Sacred forest (*leuweung larangan*), reforestation zones (*leuweung tutupan*) and agricultural forest (*leuweung baladahan*) form a living mosaic grounded in cosmology and communal rules.[1] Despite the loss of six hectares to real estate development since 2018, the community retains a deliberate and dynamic spatial organization that resists commodification.

Central to this resistance is cassava, a crop that symbolizes food sovereignty and post-colonial autonomy. The community's choice to replace rice with cassava as staple food is both ecological and political. It is a rejection of the colonial rice hegemony and an assertion of indigenous nutritional identity. Cassava is a locally sourced ingredient that represents not just sustenance but also territorial identity and assertion of autonomy in the face of urbanization.

Farmers plan a sequential rotation of crops so that they have more than one harvest of cassava and other crops each year. During the cassava crop's growth stage (usually around three months after planting), the farmers intercrop multiple crops that will complement the cassava on the same plot, such as peanuts, scallion, ginger and turmeric. Intercropping optimizes land use and increases soil fertility through natural cycles of nutrients.

The application of this traditional knowledge creates a regenerative farm system that uses close to zero external inputs – and promotes biodiversity both above and below ground. Cassava plant intercropped with adlay millet (known locally as *hanjeli*), corn, coffee and peanuts creates a resilient local economy that is decoupled from volatile global markets. Cassava-based products like *rasi* (cassava rice) also reinforce dietary traditions and cultural values.

Food production governance in Cirendeu extends beyond the farm. The community adheres to *pakem*, customary codes that mandate each household to maintain food-cultivating land. The participatory land governance system promotes shared stewardship, and the evolving water infrastructure (gravity-fed systems upgraded from bamboo to plastic pipe) reflects a blend of tradition and technical ingenuity.

Cassava mixed cropping. © Gemilang Lara Utama.

Importantly, Cirendeu does not reject adaptation. The introduction of coffee cultivation for economic value demonstrates how heritage is not frozen but responsive. Youth in the community are trained as eco-cultural ambassadors, preparing Cirendeu for a role in eco-tourism that aligns with its values. Sacred forests remain untouched, not from neglect but as an act of reverence, challenging the colonial spatial logic that separates the productive from the sacred.

Upper Citarum watershed: agrobiodiversity in the uplands

On the southeastern flank of Bandung lies the Upper Citarum watershed, where Sundanese smallholders cultivate steep slopes using inherited systems of agroforestry that are deeply rooted in Sundanese traditions and generational knowledge: *kebon talun* (a rotational agroforestry system combining annual crops, perennial trees and fallow periods), *kebon tatangkalan* (a mixed garden of fruit trees, vegetables, and herbs with layered canopies) and *pekarangan* (a home garden system that integrates food crops, medicinal plants and livestock, maximizing small spaces for household food supply).

These practices create resilient food production landscapes that serve as critical provisioning zones for Bandung, West Java's largest urban centre. The connection operates along a dynamic peri-urban – urban continuum rather than discrete separated systems. Approximately 35 percent of fresh vegetables in Bandung's markets originate from small-scale agroecological farms in the Upper Citarum watershed, via food supply chains that enhance urban food security.

Thus, far from being obsolete these practices combine ecological resilience with cultural continuity, offering a powerful model for agro-biocultural adaptation[2].

The upland communities around Cisanti Lake, the source of the Citarum river, manage landscapes that both cool the city and feed it. Their agroforestry techniques regulate microclimates, reduce erosion and recharge groundwater. Yet the true value of these techniques lies in systems thinking. The systems embody cyclical logic: *kebon talun* rotates cassava, vegetables and timber crops in succession with forest regrowth; *kebon tatangkalan* stacks fruit trees, vegetables and herbs in multi-layered canopies that mimic forest ecosystems; and *pekarangan* transforms backyards into micro-agroecosystems, blending medicinal plants, chickens and food crops.

Cisanti Lake, the source of the Citarum river. © Gemilang Lara Utama

These practices are not merely economic. They are spiritual and social. The ethic of *silih asah, silih asih, silih asuh* (mutual learning, loving, and nurturing) binds communities through intergenerational care, ecological ethics and a sense of land-based belonging. Agroforestry cooperatives double as platforms for youth engagement and climate adaptation, where seed-saving, mulching and predator balancing are taught alongside advocacy for land rights.

Historically, these upland areas were marginalized under colonial and post-colonial development narratives, viewed as resource peripheries. Colonial infrastructure remains (such as Dutch-era irrigation canals) but communities have repurposed them with rain-harvesting and bamboo-based distribution systems. While government agencies promote standardized reforestation with commercial and monoculture species like pine and eucalyptus, local farmers maintain diverse *kebon talun* systems that integrate fruit trees, timber species and understory crops based on inherited of traditional ecological knowledge. This reassertion of autonomy challenges dominant urban planning paradigms that favour top-down and techno-centric solutions.

Rather than reject modernity, Upper Citarum communities blend traditional methods with contemporary needs, creating "glocal" heritage futures. For example, *kebon talun* addresses global food insecurity while enhancing local biodiversity. *Pekarangan* counters supermarket-driven dietary homogenization with dietary diversity and place-based nutrition. These are not backward-looking practices; they are strategic, relevant and scalable.

For Bandung, the Upper Citarum represents an unrecognized frontline of climate resilience and food security. Policy shifts are needed to embed agroecological heritage into urban spatial planning, not as nostalgic traditions but as design principles. Investment in educational programmes, cooperative-led learning centres and biocultural zoning could transform upland communities from afterthoughts to essential partners in urban sustainability.

Coffee introduction as adaptation. © Gemilang Lara Utama.

Weaving the urban future with threads from the past

Cirendeu and the Upper Citarum are more than case studies. They are living arguments for a different kind of city. Both landscapes challenge Bandung to recognize that its ecological infrastructure includes not just trees and rivers but also rituals, diets, stories and systems of care. In Cirendeu, cassava is not just food but memory and resistance. In Citarum, terraces are not just topographies but archives of adaptation.

As Bandung faces the compound crises of climate change, land scarcity and food insecurity, it must look to these margins for guidance. These communities reveal that heritage is not static but generative. When protected, supported and integrated, heritage can offer not only memory but also momentum.

By linking traditional land-based knowledge systems with municipal governance, educational innovation and participatory planning, Bandung can become both a green city and a wise one. The path forward may very well begin where the rivers flow and the traditional agroforestry grows.

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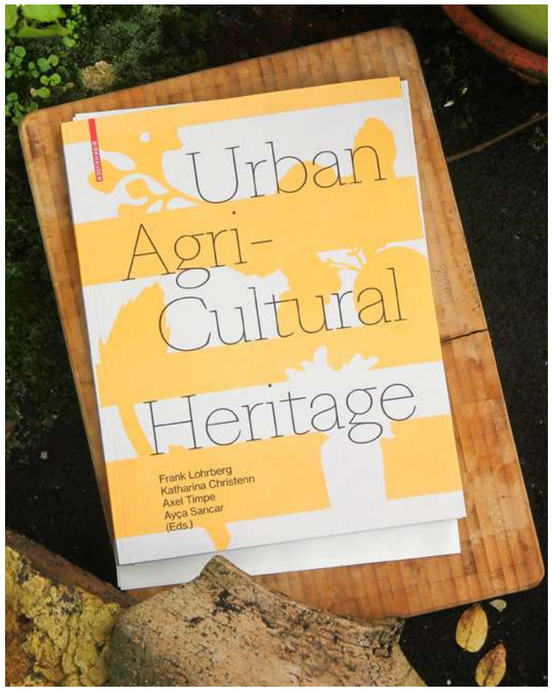
Should your case have been in this issue? Or do you know of an interesting case of UA as Heritage somewhere in the world?

Add your case to the INSUAH network's interactive atlas and help fill the world map to provide a broad basis for investigating the benefits of UA as Heritage. Visit the atlas at https://insuah.info/atlas

© Theresa Hofbauer. Data: Open Street Map



Want to learn more about urban agriculture as heritage? Please have a look at our first edited volume on the topic:

Urban Agricultural Heritage
Frank Lohrberg, Katharina Christenn, Axel Timpe and Ayça Sancar (eds.)

Urban gardening and agriculture have become important elements of sustainable urban planning in the context of persistent urbanization amid limited resources, but consideration of the cultural-historical dimension has been lacking. Urban Agricultural Heritage is the first book to present a comprehensive outline of traditional forms of food production in cities to help preserve this valuable knowledge. Based on their research findings, the editors develop new perspectives and guidelines for recognizing traditional food production systems as an aspect of cultural heritage and for dealing with urban agriculture worldwide.

For more information and to obtain your copy, visit https://birkhauser.com/en/book/9783035622522

Join us in shaping the global urban agriculture movement to 2050

First published in 2000, Urban Agriculture Magazine is now 25 years old.

Each of the 42 thematic issues to date has been published by RUAF with one or more partner – from universities and research institutes, to UN agencies, NGOs and philanthropic foundations. We have tracked the surging interest in urban agriculture all around the world and have made cutting edge research and practice available to a wide readership. You can see all the themes we have tackled at www.ruaf.org.

As we look ahead to the next quarter century, one that will be marked by dramatic climate change and shifting global agendas, it is clear that urban agriculture will become ever more important – not just for food security but for the whole raft of multifunctional social, environmental and economic benefits it brings.

To help us continue to support and inform the movement, RUAF is seeking funding partners and is open to ideas for future themes. If your organization would like to join us on the next stage of our journey, please contact Jess Halliday j.halliday@ruaf.org.

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Urban Agriculture Magazine (UA Magazine) is produced by the Secretariat of the RUAF Global Partnership on Sustainable Urban Agriculture and Food Systems, in collaboration with strategic partners.

UA Magazine is a vehicle for sharing information on urban agriculture and urban food systems. It publishes good practices and impact stories.

UA Magazine welcomes contributions on new initiatives at individual, neighbourhood, city and national levels. Attention is given to technical, socioeconomic, institutional and policy aspects of sustainable urban and peri-urban food production, marketing, processing and distribution systems. Although articles on any related issue are welcome and considered for publication, each UA Magazine focuses on a selected theme (for previous issues, visit www.ruaf.org).

Editors, No. 42
This edition was compiled by Katharina Christenn, Jess Halliday, Akiko Iida, Luciana Fukimoto Itikawa, Frank Lohrberg, Jia Ni, Jorge Peña Díaz, Axel Timpe and Gemilang Lara Utama. Proof reading assistance by Carlotta Milone.

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