UNECE

The Edible City: Why Food Trees Matter

UNITED NATIONS

UNECE

ECE/TIM/DP/99

The Edible City: Why Food Trees Matter

More than just shade: the benefits of nature-based solutions for more resilient cities

a guide for policymakers, planners and practitioners

UNITED NATIONS
Geneva, 2024

COPYRIGHT AND DISCLAIMER

© 2024 United Nations
All rights reserved worldwide

Requests to reproduce excerpts or to photocopy should be addressed to the Copyright Clearance Center at copyright.com.

All other queries on rights and licenses, including subsidiary rights, should be addressed to:

United Nations Publications,
405 East 42nd Street, S-09FW001,
New York, NY 10017, United States of America.

Email: permissions@un.org; website: https://shop.un.org.

The findings, interpretations and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the United Nations or its officials or member States.

The designations employed and the presentation of material on any map in this work do not imply the expression of any opinion whatsoever on the part of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of any firm, licensed process or commercial products does not imply endorsement by the United Nations.

Links contained in the present publication are provided for the convenience of the reader and are correct at the time of issue. The United Nations takes no responsibility for the continued accuracy of that information or for the content of any external website.

This publication is issued in English.

United Nations publication issued by the United Nations Economic Commission for Europe.

Cover photo credit: Adobe Stock.

Photo credits:
Adobe Stock: p. vii, p. viii, p. 2, p. 6, p. 7, p. 8, p.18, p. 21, p. 23, p. 24, p. 30, p. 31, p.32, p. 36, p. 40.
Beşiktaş Medya Grup: p. 39.
E. R. Guimaraes: p. 10, p. 12, p. 26.
C. Gentili: p. 22, p. 29.
A. Finger-Stich: p. 35. D. Çiftçi: p. 25, p. 38.

ECE/TIM/DP/99

UNITED NATIONS PUBLICATION

ISBN: 978-9-2-1-003282-7
eISBN: 978-92-1-106793-4
ISSN: 1020-7228
eISSN: 2412-1304
Sales No. E.24.II.E.25

Acknowledgments

The following publication was prepared under the guidance of the UNECE Forest and Bioeconomy Section and funded by the 14th tranche of the UN Development Account project "Food-Water-Energy nexus support to post-COVID-19 recovery in Eastern Europe, Western Balkans, Central Asia, the Middle East and Africa".

UNECE would like to express sincere gratitude to the two contributing authors, Ms. Andréa Finger-Stich, Ecologie & Communauté, and Ms. Erika Rocha Guimaraes. Ms. Clara Gentili assisted in the review of images and design.

UNECE would also like to acknowledge the case studies from all over the world and thank all contributors listed in the Annex.

UNECE is grateful for the collaboration with Ms. Cara Rockwell and the Florida International University Institute of Environment.

ABSTRACT

This guide offers a comprehensive approach to integrating edible fruit-bearing trees (food trees) into urban landscapes as a strategic solution to enhance food resilience. While urban trees are often prioritized for environmental benefits, the potential of food trees to strengthen local food systems is often overlooked. This guide addresses the challenges and opportunities associated with incorporating food trees into urban planning and policies. It includes successful case studies for supporting and providing practical guidance and policy recommendations. This resource aims to facilitate the development of necessary policies and regulatory frameworks to drive progress in this area and establish sustainable, resilient and food secure cities for all.

Table of Contents

List of **figures**

List of **tables**

BACKGROUND

This guide is designed to help local and national officials implement integrated nature-based solutions for enhancing food resilience in urban areas. It focuses on the strategic use of fruit-bearing trees ("food trees") as a key component of sustainable and resilient urban ecosystems and provides general recommendations. Local knowledge, conditions, laws, and regulations always need to be considered when planning a food tree project.

Key Objectives:

- Provide a methodology for advancing food resilience through integrated nature-based solutions.
- Explore policy and practical considerations for integrating fruit-bearing trees – food trees - into urban landscapes.
- Identify and share examples of existing best practices for promoting urban food resilience and security.
- Propose targeted strategies for building healthy, sustainable, and shock-resistant urban food systems.

By leveraging the potential of urban trees, this guide aims to contribute to the development of more resilient and food-secure cities.

The challenge

Our cities are grappling with a complex web of challenges, including environmental degradation, climate change, biodiversity loss, unsustainable agriculture, resource depletion, densification, poverty, food insecurity, and rising health risks.

The COVID-19 pandemic highlighted the interconnectedness of these challenges and the critical role that cities play in providing essential services like food, water, energy, and raw materials. It exposed vulnerabilities in food supply chains and underscored the need for more resilient and sustainable food systems.

Urban food deserts and unequal access to healthy food have always existed but they have been exacerbated by climate change. These issues demand comprehensive solutions that address multiple problems simultaneously. Urban food trees offer a promising nature-based approach that can contribute to:

- Food security: Providing a source of nutritious food, especially during crises.
- Climate resilience: Helping to mitigate the impacts of climate change through temperature regulation, carbon sequestration and improved water management.
- Biodiversity: Enhancing urban biodiversity by providing habitat for pollinators and other wildlife.
- Community health: Promoting physical activity and improving mental well-being.
- Economic development: Supporting local food economies and creating jobs.

By strategically incorporating food trees as nature-based solutions into urban landscapes, we can create more sustainable, resilient, and equitable cities for all.

Resilience: A cornerstone of sustainable food systems

Resilience is a key component of ensuring food security and building sustainable food systems factor (Naylor (2009) and Prosperi et al. (2014)). By addressing climate change, strengthening agriculture-forest linkages, and fostering urban-rural synergies, we can create more equitable and sustainable food availability in cities.

Building such resilient and food-secure urban food systems requires creating and maintaining urban environments that can withstand and recover from disruptions, crisis and challenges whilst ensuring a steady supply of food for all.

While targeted interventions like building more urban-rural links, planting food trees and forests, and enhancing urban agriculture are fundamental, there is a need to include more tailored and context-specific actions and policies for trees, forests, and agroforestry in cities. By adding also these elements, we can create more resilient and sustainable urban environments and food systems at the same time.

The role of food trees in addressing urban challenges

Despite the wealth of information available on agroforestry, horticulture, urban agriculture, and productive trees, there remains a significant gap in practical guidance for integrating these elements into urban environments. Additionally, supportive policy frameworks are often lacking, hindering the successful implementation of such interventions.

While urban forestry and greening initiatives often focus on environmental, social, and economic benefits, the potential of productive trees in urban spaces is frequently overlooked. These trees are often seen as more of a challenge than a solution, and this perception is reflected in urban planning and policies.

Urban planning often prioritizes ornamental trees over food-producing species. Incorporating food-bearing trees into city landscapes can enhance both local food resilience and the overall health and sustainability of urban green infrastructure.

The integration of food trees into urban environments also faces challenges related to technical aspects, governance, policy, space, ownership, maintenance, and costs. To address these issues, it is essential to establish systems and policies that support the planning, management, maintenance, and delivery of essential food and nutrition services in both rural and urban areas. Collaboration across various sectors is also crucial for successful implementation.

The practical and policy guidance provided in this guide is designed to support collaboration and planning efforts related to the integration of urban food trees. This resource is intended for policymakers, practitioners, and public and private sector entities involved in implementing advanced strategies and identifying best practices and to drive progress in this area.


Adobe Stock

Adobe Stock

INTRODUCTION: THE IMPORTANCE OF URBAN FOOD TREES

This guide encourages urban and national policymakers, planners, and gardeners to embrace the benefits of urban food trees.

Urban food trees encompass elements of agriculture, arboriculture, agroforestry, and forestry. These trees are nature-based solutions and play a vital role in addressing critical urban challenges, including food insecurity, climate change, and biodiversity loss.

After examining the role of urban food trees in urban ecosystems, the guide highlights the diverse ecosystem services they can provide, making cities more sustainable, resilient, and enjoyable places to live.

Whenever relevant, the guide will draw on examples from the case studies in the Annex.

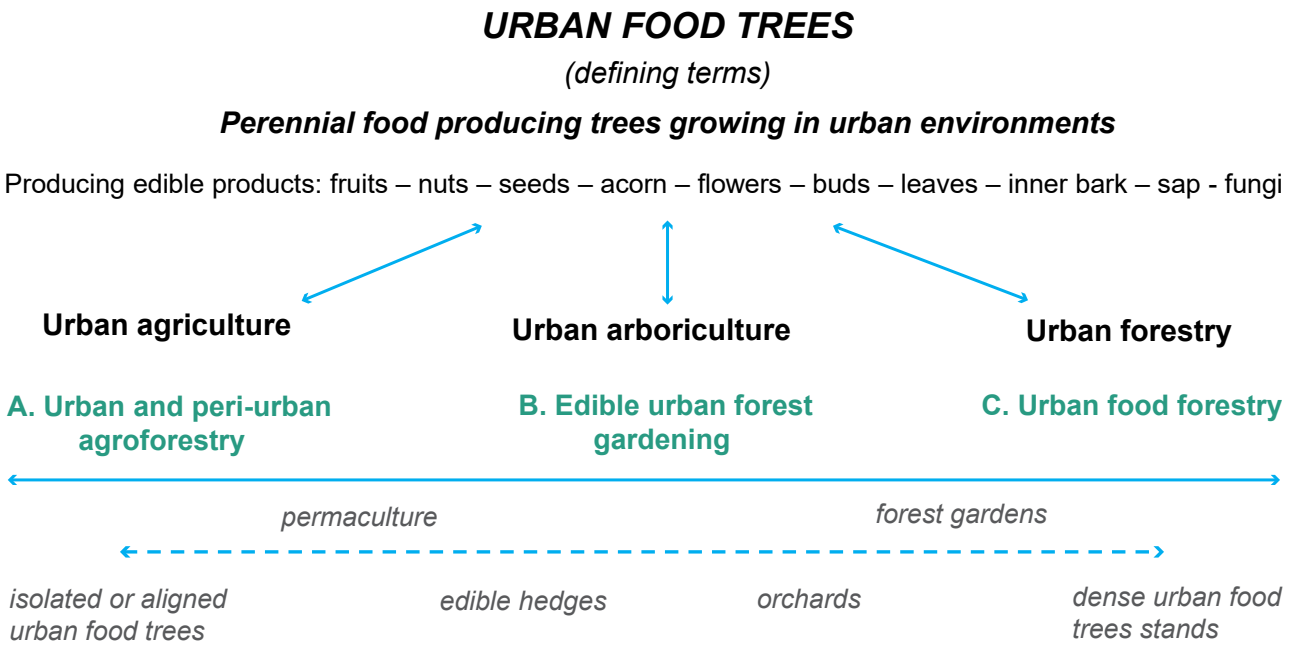
1. WHAT ARE URBAN FOOD TREES?

Urban Food Trees are perennial, woody species that produce food. Their edible products include fruits, seeds, nuts, acorns, buds, flowers, leaves, inner bark, sap, and fungi.

Urban food trees are found in various landscapes, such as urban farms, parks (both public and private), roadsides, roundabouts, green spaces near housing or schools, gardens, cultural and sports facilities, and other urban infrastructure.

In literature, urban food trees are associated with at least five related concepts of green urban land uses. These concepts cover a range of practices, from an urban agriculture approach called (1) "**urban and peri-urban agroforestry**" to the urban forestry approaches called (2) "**urban forest gardening**" and (3) "**urban food forestry**"(see Figure 1).

FIGURE 1. **Definition of urban food trees**



Source: A. Finger-Stich, 2024

A. URBAN AND PERI-URBAN AGROFORESTRY

Agroforestry integrates trees (as products of arboriculture) with crops or livestock within farming systems. This practice, rooted in long-standing traditions, encompasses a variety of land management systems. The Food and Agriculture Organization of the United Nations (FAO, 2024) estimates that agroforestry is practiced on more than 43% of the world's agricultural land.

Urban and peri-urban agroforestry refers specifically to integrating trees and other perennial crops into urban, suburban, and community spaces. These trees can be planted in urban farms, backyards, public parks, roadsides, neighbourhoods' and underutilized spaces.

Agroforestry systems often focus on one or more "flagship species" (primary woody food-producing perennials) and include additional species that provide ecological services, such as nitrogen fixation, pollination, or shade. These "flotilla species" are perennials or annuals which support the flagship species (Gassner et al., 2022).

B. EDIBLE URBAN FOREST GARDENS

Edible urban forest gardening is a form of polyculture where plants occupy different layers and play various roles. Some plants provide direct benefits, like food, while others serve as support, offering nutrients, structure, or other advantages to nearby plants (Jacke & Toensmeier, 2005).

A forest garden has been described as "*a garden modelled on the structure of young natural woodland, utilizing plants of direct and indirect benefit to people – often edible plants. It may contain large trees, small trees, shrubs, herbaceous perennials, herbs, annuals, root crops and climbers, all planted in such a way as to maximize positive interactions and minimize negative interactions, with fertility maintained largely or wholly by the plants themselves*" (Crawford, 2022).

A forest garden can be of any size. Even a small space can be transformed into a thriving forest garden. Some distinguish "forest gardens" from agroforestry systems, such as two-story food production systems (e.g., hazelnut orchards with vegetable rows), as well as from the broader term "permaculture" that means more generally "*a purposeful design of landscapes to reflect the patterns found in nature and to supply food or other useful materials*" (Lovell, 2020).

C. URBAN FOOD FORESTRY

The first definitions of food trees centered around "*perennial, woody, food-producing species*", and described urban food forestry as "*a multifunctional approach combining elements of urban agriculture, urban forestry, and agroforestry.*" (Clark and Kimberly, 2013). Like forest gardens, food forests consist of multistoried arrangements of perennial woody plants and annual food-producing species. But urban food forestry applies to a larger territorial scale, integrating urban food tree projects into the broader urban green (biodiversity focused) and farming (food focused) infrastructures.

These diverse interpretations of urban food trees reflect varying cultural practices. In some cultures, for instance, food forests might be seen as some form of "primitive horticulture," largely composed of wild plants used in hunter-gatherer societies. In the tropics, where food forests are more common, hence, favoured and cultivated in urban environments (Nair et al., 2010).

Foraging for wild foods from spontaneously growing urban trees can be a valuable practice in all regions. The Johns Hopkins Center for a Livable Future defined a resilient food system as *"able to withstand and recover from disruptions in a way that ensures a sufficient supply of acceptable and accessible food for all."* Studying food systems, it found the importance of wild berries and fungi for foragers in Baltimore, including mulberries (Photo 1) and gingko fruit.

PHOTO 1. **Mulberry fruit trees**

Credits: Adobe Stock. Description: Mulberry fruits trees.

There are indeed many semi-wild trees and fruits that grow naturally, like elderberry, (*Sambucus nigra*), and little prunus trees (*Prunus spinosa, blackthorn*) that often grow spontaneously in hedges. Urban gardeners can support a natural regeneration of plants cultivated or favored by previous generations.

The **lists of edible urban food trees** can vary depending on the vegetation zone and individual experiences. Clark and Nicholas (2013), after identifying 37 urban food tree initiatives and analyzing 30 urban forestry master plans, developed a "Climate Food Tree Species Matrix." This decision-making tool includes 70 species, 30 of which are highly suitable for urban food forestry based on their hardiness, tolerance, and edibility in temperate urban environments. Research in Seattle, based on interviews on human-plant interactions, revealed a broad spectrum of users —ranging from wild food gatherers to plant tenders and cultivators—who utilized products from 486 species (Poe et al., 2013). Indeed, the definition of a "food tree" varies greatly based on the user's perspective, local knowledge, and practices. For example, the oak tree's classification as a food tree can vary across cultures. While some people are familiar with harvesting, preparing, and consuming acorns, others may not. In many modern temperate regions, oaks are not commonly considered food trees. However, historically, acorns were a significant food source, often processed to remove tannins before being roasted and milled.

While some edible urban food trees grow wild, others are cultivated varieties raised in nurseries and maintained through various gardening practices. A case study in Burlington, Vermont, for example, demonstrated that a very ambitious tree-planting scenario could potentially meet or exceed the daily recommended fruit intake for the entire city population.

The landscape structures in which urban food trees grow are shaped by geographical conditions, a city's history, urban planning contexts, and evolving social practices. The compatibility — or potential conflicts — between urban food trees and other land uses depends on all these factors. The following chapters will explore how the benefits, risks, and challenges of growing urban food trees can be managed both technically and institutionally in varying contexts.

2. WHY GROW URBAN FOOD TREES?

From ancient Egypt, Maya, Persian, and Roman civilizations to modern-day urban centers, agroforestry has played a significant role in densely populated areas across various climates. Today, urban food trees are vital nature-based solutions that address three critical urban issues: food security, biodiversity loss, and climate change.

As global food demand continues to rise with 1 of 11 people facing hunger worldwide[1], the planet's natural resources are depleting at an accelerating rate, worsened by climate change. Currently, 75% of our food supply comes from just 12 plant species, making food security and sovereignty frailer, more energy and pesticide dependent, altogether reducing significantly both wild and agricultural biodiversity and impacting global health[2].

While trees in general contribute significantly (around 50%) to our global fruit and nut consumption, urban food trees offer even greater advantages. Urban food trees can make food systems more resilient[3]. They provide a wide range of ecosystem services that can help address climate and biodiversity challenges, especially in today's densely populated urban areas. Figure 2 shows the ecosystemic functioning of urban food trees and their provision of indispensable services for future urban sustainability, as represented in Figure 3.

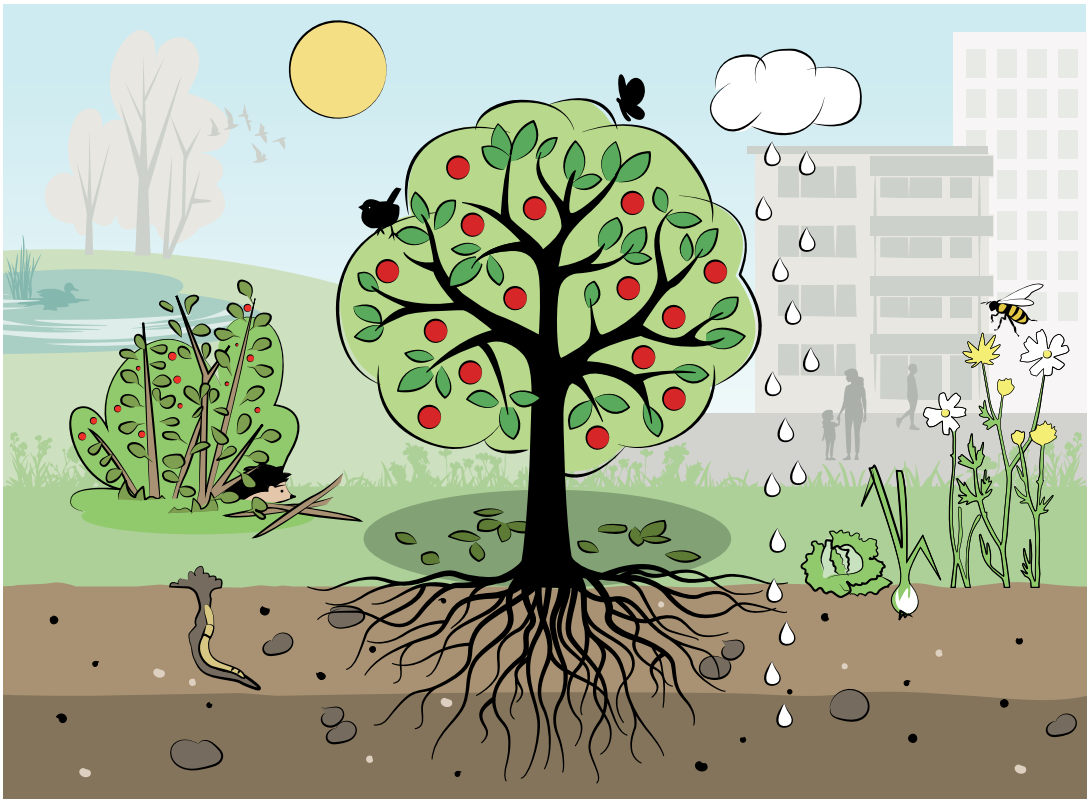
---

1 According to WHO State of Food Security and Nutrition in the World report (2023), 733 million people faced hunger in 2023 with a substantial increase since 2019.

2 World Health Organization https://www.who.int/health-topics/one-health#tab=tab_1

3 Source: https://www.baltimorebrew.com/2010/11/05/gingko/

FIGURE 2. **Urban food trees and their ecological and physiological functions**



Graphic by Christine Serex.
Source: A. Finger-Stich, 2024

3. THE BENEFITS OF URBAN FOOD TREES

Urban food trees represent a unique convergence and blend of agricultural and forestry practices, and their benefits align with the goals of both sectors.

➜ Urban food trees enhance **urban farming** potentials:

- The deep rooting pattern of agroforestry trees captures nitrates (preventing nitrates from leaching into the soil and polluting water tables).
- Carbon capture in the trees and soil (temperate agroforestry systems sequester more than 2 T/ha/yr. of carbon, substantially more than conventional agriculture).
- Food trees benefit biodiversity —in the soil, associated with their roots, in their canopy, and in their bark.
- Food trees support agricultural productivity through pollination, integrated pest management and enhanced microbial activity (Oberle et al. 2023).
- Food trees contribute to habitats and biological corridors for birds, bats, flora, insects, and fungi, making the urban green infrastructure ecologically more functional.
- Food trees help structure farmed and urban landscapes and are valued by inhabitants, walkers, cyclists, and others who use these spaces for recreation and soft-mobility transportation.
- Food trees yield not only fruit, nuts, acorns, and other products but can also produce high-quality wood.
- Food trees help moderate water and heat stresses on crops, animals, and people, through their biophysical and ecological functions (Figure 2 and 3).

➜ Urban food trees enhance **urban forestry** potentials:

- Urban food trees are often more maintenance-intensive than other urban trees, and their canopy may not grow as wide and large as wild growing trees. However, urban food trees are at least equally valuable for biodiversity and offer high values in terms of cultural services.
- The incentives of harvesting fruit and other edible products from urban food trees encourages urban residents, communities, neighbourhoods or schools to participate in planting and maintenance efforts, often much more so than with non-food trees.

- Food trees, when positioned between urban farms and forest edges, contribute to a well-structured forest edge, benefiting auxiliary species, pollinators, and birds – enhancing the support services of the urban forest.
- Urban food trees can contribute to multiple use and biodiverse ecological transitions on urban fringes at the interface between more intensive urban and agricultural land uses or between the city, the open field and the forest.

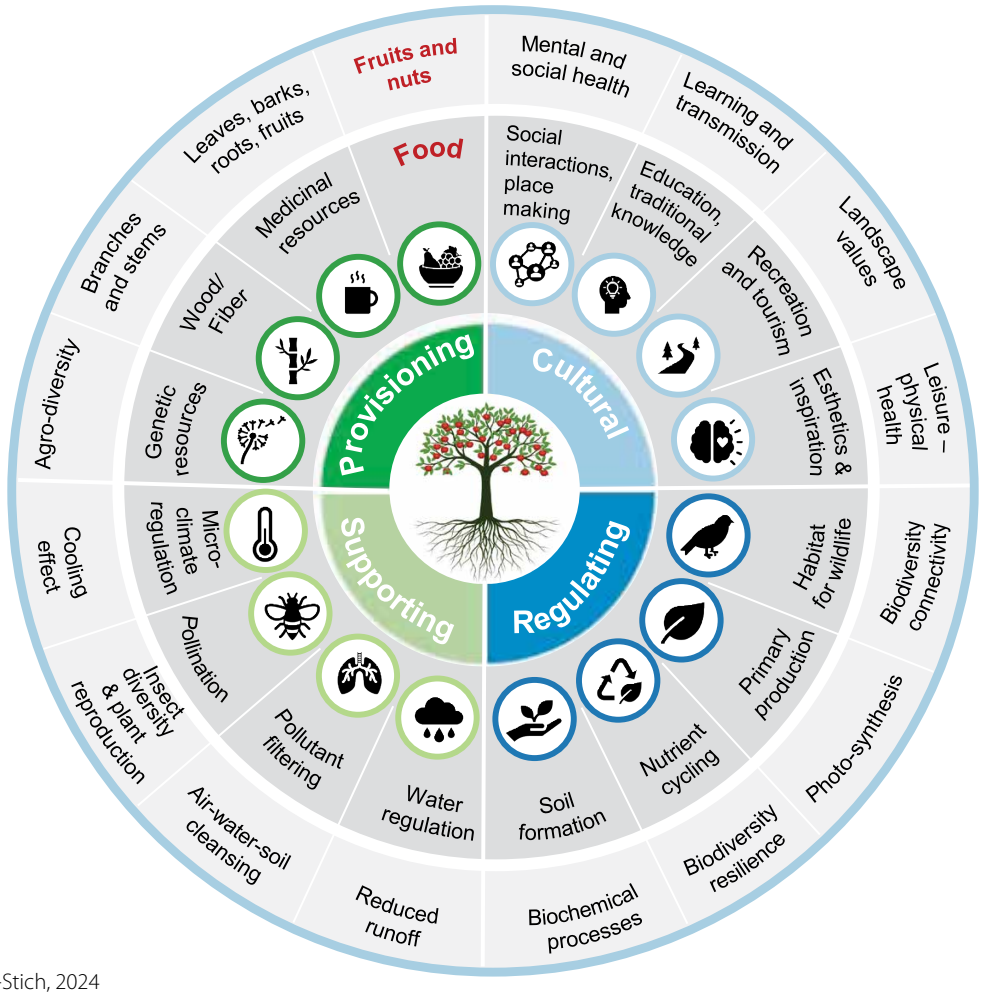
Trees play a critical role in urban ecosystems, providing essential ecosystem services that contribute to the health and resilience of cities. Their biophysical characteristics, such as their ability to absorb carbon dioxide, filter air pollutants, and provide shade, are vital for creating livable urban environments. The biophysical characteristics of trees and their interactions with the environment generate the essential ecosystem services that cities depend on for their health and resilience.

Food trees offer a wide range of ecosystem benefits, including:

- Climate adaptation and mitigation: Helping to reduce the impacts of climate change through carbon sequestration, improved water management, and shade provision.
- Biodiversity conservation and restoration: Supporting biodiversity by providing habitat for pollinators, birds, and other wildlife.
- Food production: Increasing food security and promoting equitable access to nutritious food.
- Social and cultural contributions: Enhancing the quality of life in cities through placemaking, community engagement, and cultural heritage preservation.

Figure 3 highlights the wide range of these services, including food production. In fact, an urban system's ability to produce food over the medium and long term depends on its capacity to support other ecosystem services as well. The same can be said for other essential services provided by urban ecosystems.

FIGURE 3. **Urban food trees and their ecosystem services**



Source: A. Finger-Stich, 2024

All ecosystem services are theoretically of equal importance, and urban food trees can contribute to all of them, albeit to varying degrees. While each urban food tree project has its unique strengths and weaknesses, the ability of these trees to provide ecosystem services (both qualitatively and quantitatively) can vary significantly based on various factors:

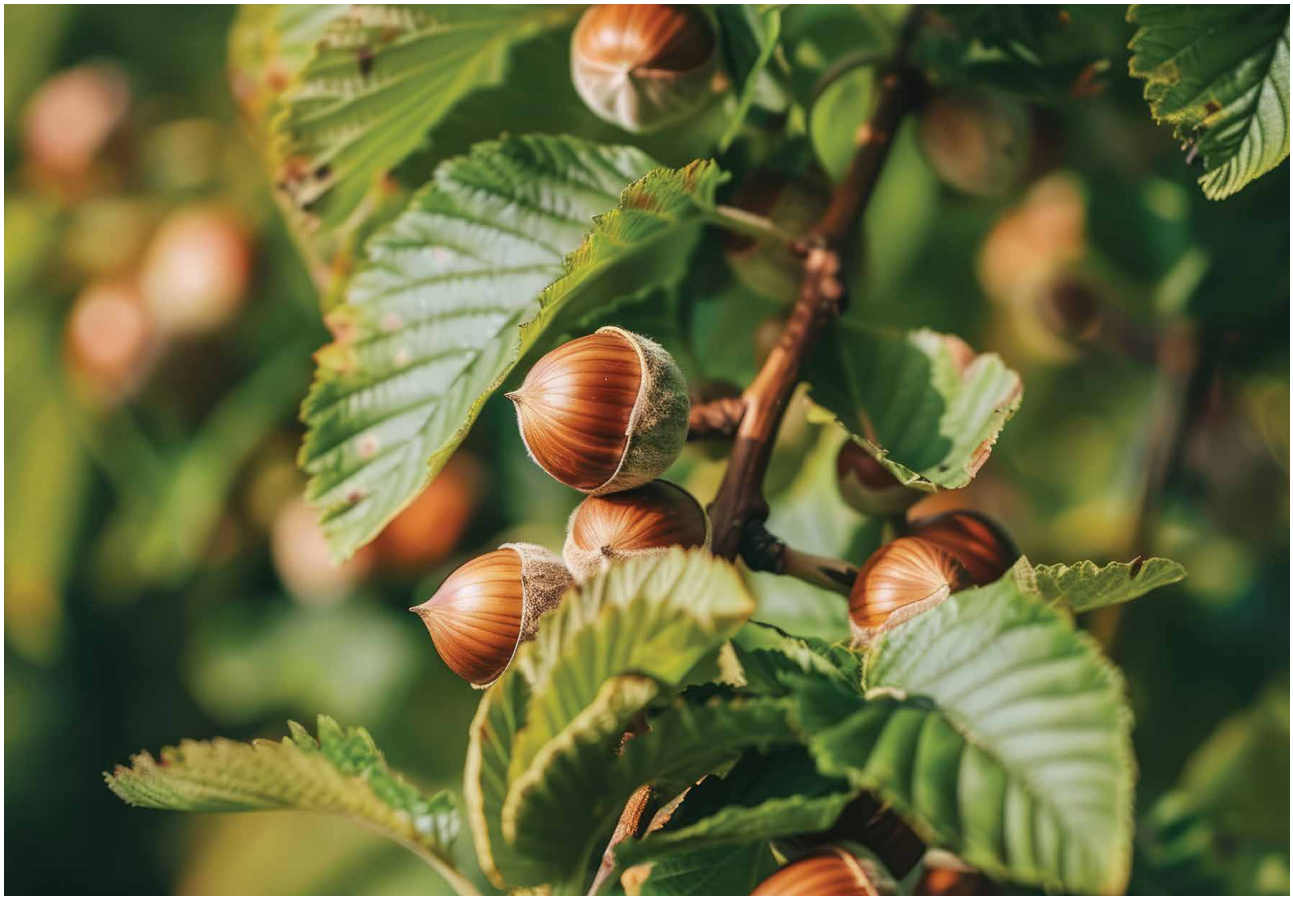
1. Climate, soil (quantity and quality), light, water availability, and topography
2. Species and variety, their genetics, the quality of the rootstock and seedlings
3. Age and development stage of the plants
4. Planting and maintenance of the trees
5. Integration into landscapes (in relation to other plants and land uses)
6. Urban stress factors (pollution, soil compaction, inappropriate usage)
7. Local preferences, uses, and governance.

In conditions where soil and water are scarce, arborization strategies that prioritize urban food trees will optimize the ecosystem services trees can offer. Urban food forests can further enhance the ability of urban food trees to provide ecosystem services by incorporating multiple layers of vegetation with complementary roles and synergistic effects.

To summarize: While urban food trees and food forests (Photo 2) have been recognized as nature-based solutions with direct benefits for cities and helping to reduce pressure on the natural resources of peri-urban and rural areas, their actual and potential food production capacity is often underestimated (Oncini et al., 2024; Castro et al., 2018).

This guide equips policymakers, urban planners, and professionals in forestry, agriculture, and environmental fields with the arguments and tools necessary to champion urban food tree project. This aligns with the broader goal of making "*cities and human settlements inclusive, safe, resilient, and sustainable*" (SDG 11).

PHOTO 2. **Hazelnuts**



Credit: Adobe Stock.

Adobe Stock

Adobe Stock

CHAPTER 1: GROWING A GREENER FUTURE: A GUIDE TO URBAN FOOD TREE PROJECTS

Urban food tree projects offer a multifaceted approach to improving city landscapes and addressing social, environmental, and economic needs. These projects provide not only fresh, locally sourced produce but also significant ecological benefits.

This chapter explores comprehensive strategies for successfully implementing and managing urban food tree projects. It delves into effective management practices to ensure their successful integration into urban settings, methods for maximizing the benefits these trees provide, and solutions to common challenges faced in sustaining these projects.

1.1. IMPLEMENTING AND MANAGING URBAN FOOD TREES PROJECTS

Implementing and managing urban food tree projects requires a comprehensive approach to ensure their success and sustainability in urban environments. Key steps of a project include:

- Site selection: Carefully choosing suitable locations for planting.
- Stakeholder engagement: Involving and defining roles for various stakeholders to coordinate efforts and share responsibilities throughout the project's lifecycle.
- Design: Integrating food trees harmoniously into the urban landscape, considering the unique characteristics of each community and environment
- Installation and maintenance: Providing ongoing care to support tree growth and productivity.
- Education: Fostering community involvement and long-term impact through educational initiatives.

A. SITE SELECTION AND ASSESSMENT

Land availability

Trees need space to grow deep roots and a balanced canopy. With the low availability of green spaces in urban areas, food trees should be incorporated into existing landscapes as isolated trees in sidewalk cutouts, in hedges, in orchards, or more intricately combined with other plant layers such as vines, groundcover, herbs, and shrubs in food forests.

Local regulations and land use permissions

Urban food trees can be planted on public, private or community land, respecting zoning designations and legal requirements. For individuals or community groups planning to plant and maintain food trees in public areas, such as municipal parks, permission is typically required; collaborating with local authorities is essential.

Site assessment

Adequate space is essential for trees to grow without posing risks to both above-ground structures, like power lines, and below-ground structures, like pipe or power lines or building foundations. The mature size of the tree should be considered when designing the urban food tree project. Besides space, food trees need healthy fertile soil, without contamination or debris, enough sunlight exposure according to the plant species, and water availability, especially during the early stages of installation.

Social assessment

Public food tree projects should prioritize areas that are considered urban food deserts, low-income, or have limited tree cover. When assessing potential locations, factors such as the number of potential beneficiaries, the proximity of volunteers' residences, and the desires of the local community should be considered. Urban food trees can be installed in a variety of green spaces, including backyards, sidewalks (Photo 3), community gardens, municipal parks, and around schools, universities, public buildings, or museums.

PHOTO 3. **Example of urban food tree installation**

Credits: E. R. Guimaraes. Description: Example of urban food tree installation between a sidewalk and a building, Florida, USA.

B. STAKEHOLDER INVOLVEMENT AND RESPONSIBILITIES

Urban food tree projects offer long-term benefits but require sustained commitment, as they typically take several years to mature and start producing fruit. Engaging the community, setting shared goals, co-designing, and assigning detailed responsibilities to each participant foster a sense of place in, and connection to the community and community involvement. Although these projects can be costly, seeking grants and creating partnerships can help reduce expenses. Nurseries, local farms, and landscaping companies, for example may be willing to donate mulch, compost, manure, seeds, plants, and other supplies to support urban food tree projects.

C. DESIGN AND INTEGRATION WITH THE EXISTING URBAN LANDSCAPE

Type of installation

The first step in the design process is to determine the possible and desired type of installation based on space availability, local characteristics, and goals. Integrating other plant layers, such as shrubs and vines, with urban food trees can enhance biodiversity, improve pest management, and provide privacy. In this design stage it is very important to consider how this integration may affect traffic views and public safety.

Integration with urban landscape and local conditions

To optimize rainwater management in urban food tree projects, it is important to consider incorporating berms and swales, taking into account local climatic conditions. These features can help direct rainwater to plants that require more moisture. In areas where strong winds are frequent, more resistant plants can serve as windbreaks for other plants or urban structures. In areas prone to salt intrusion (where saltwater infiltrates freshwater aquifers), salt-resistant plants can be planted in lower areas while sensitive plants can be placed on berms. Furthermore, the design should include accessible pathways, clearly defined planted areas, and leveled trails to ensure ease of movement and safety.

Careful consideration must be given to the compatibility of the tree's installation and the use of the space, for example, avoiding the planting of fruit trees that produce large fruits (e.g., jackfruit - *Artocarpus heterophyllus*) near pathways, playgrounds or parking lots to prevent risks from falling fruits. Similarly, avoid planting low-canopy trees (e.g., cherry - *Prunus avium*) close to roads where taller vehicles may damage their crowns, and trees with slippery fruits (e.g., mango - *Mangifera indica*) near bike lanes to prevent accidents.

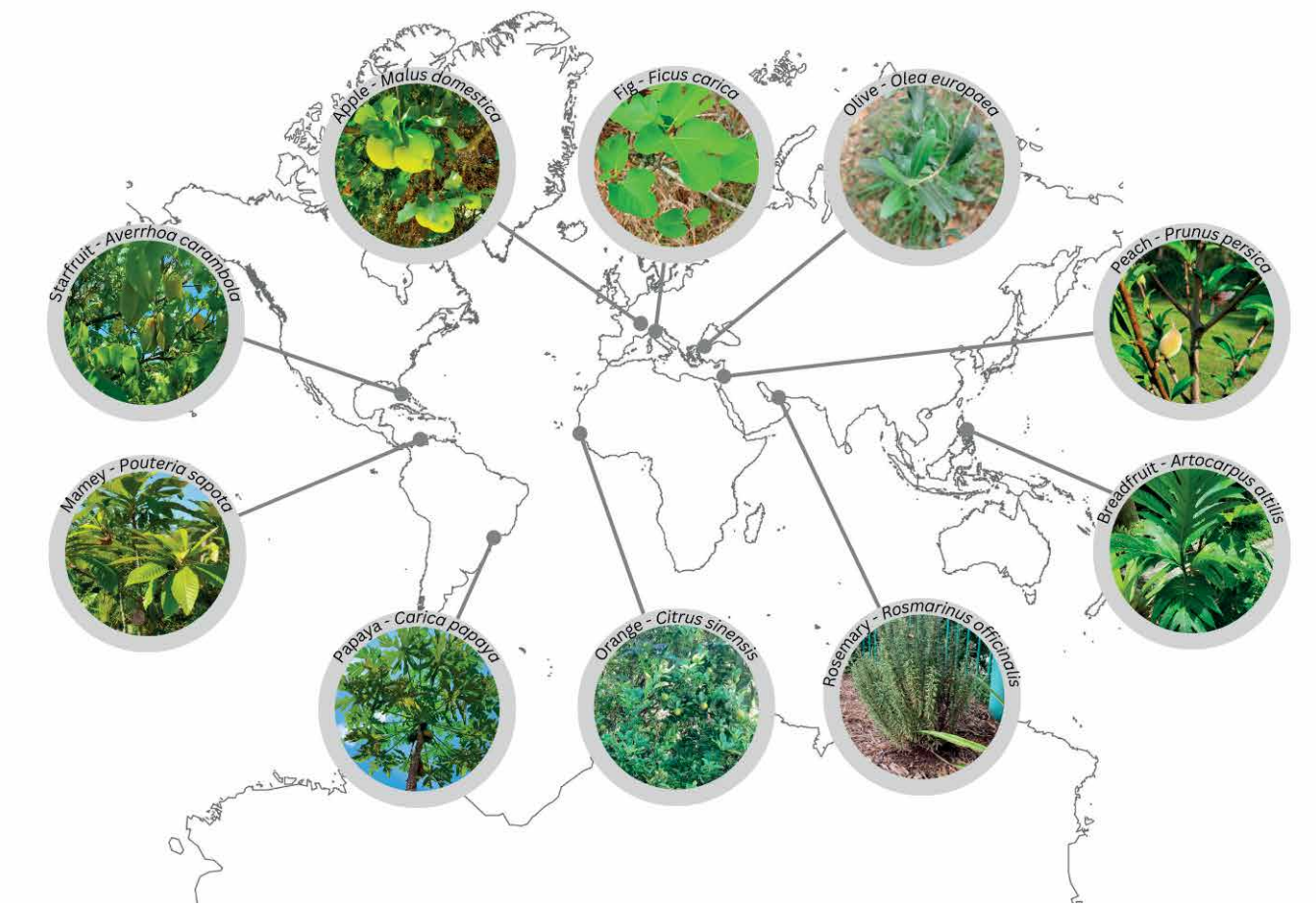
Choosing the plant species

Urban food tree projects should be tailored to the unique characteristics of each community and environment (Figure 4).

- When choosing the plant species for food production, it is important to consider the community's culinary preferences, traditional knowledge, and the harvesting seasons. This approach maximizes the utility of the plants for the group and ensures the supply of harvestable products throughout the year.
- Using species that are suited to the local environment - including soil type, climate, water needs, light demand, and shade tolerance - can reduce maintenance requirements.

- Prioritizing native food trees is essential to conserve local biodiversity and preserve local knowledge and expertise, with the option to complement them with non-native food tree species, provided that harmful invasives, toxic plants (e.g., poison ivy, *Toxicodendron spp*.), and species with negative allelopathic effects (i.e., the release of chemicals by a plant that negatively impact the development neighboring plants) are avoided.
- Incorporating flotilla species — secondary plants that offer supporting ecological functions — can further support flagship species — the primary or focal plants in the ecosystem — by providing essential services such as nitrogen fixation, pollinator attraction, food and habitat for local fauna, shading, windbreaking, and companion planting.
- Sourcing healthy plants from reliable or dedicated nurseries for the project can enhance success rates.

FIGURE 4. **Examples of suitable plant species included in the case studies (Annex)**



Source: Map (ArcGIS Pro). Elaboration by Erika R. Guimaraes, 2024.

When designing urban food tree projects, carefully select the best location for each plant, considering factors such as the species' lifespan, growth rate, root and crown characteristics, and deciduousness.

- Tree lifespans vary significantly, ranging from a decade to several millennia. For short-lived tree species, succession planning, and rotation are essential to ensure efficient land use.
- Growth rates should also be carefully evaluated and considered when designing the pattern, density and location of tree planting, especially in urban areas where crown expansion and root development may be limited by infrastructure like power cables and underground constructions.
- Deciduous species, i.e., plants that seasonally shed leaves, can be useful in regions with distinct seasons. Most deciduous trees have their full crowns during summer, providing shade and cooling, while in winter, their leafless state allows for more sunlight to reach the ground.

Co-design

Incorporating the participation of local authorities, residents, scientific and technical experts during the design phase can maximize the potential use of the chosen planting area and adapt it to local specificities. This collaborative approach ensures that diverse perspectives are considered, leading to more informed decisions and solutions, while also promoting a stronger sense of community cohesion and support for the initiative (see Chapter 2).

D. INSTALLATION

Preparing the area

Before the planting phase, it is essential to research the history of land use, test the soil for contamination, remove all debris and trash from the area, and implement appropriate soil remediation to ensure that the food produced will be safe for planting and consumption. Some of the available urban areas could have been used previously as dumping grounds for trash and debris. In addition to these visible challenges, the soil in these areas can be contaminated with pesticides, heavy metals, hydrocarbons, and other pollutants.

Another common challenge in preparing the area for planting are invasive weeds. Invasive plants are non-native species that can harm or are likely to harm the new habitat where they are introduced, whether economically, environmentally, or in terms of human health. Effective weed management options that avoid herbicides include manual removal, tillage, solarization (covering the affected area with clear plastic for several weeks), mulching, and using grazing animals.

PHOTO 4. **Soil rich in organic matter, covered with mulch**

Credits: E. R. Guimaraes. Description: Soil rich in organic matter, covered with mulch.

Improving soil conditions

Enhancing soil conditions (see Photo 4) is crucial for successful urban food tree planting. Mulching is an effective technique for suppressing weeds, conserving moisture, increasing organic matter through decomposition, and improving soil structure. Adding compost, which is rich in organic matter and nutrients from food scraps and leaves, can also significantly enrich the soil and promote a healthy microbial community.

The chop-and-drop method, which involves cutting plant material and leaving it on the ground to decompose, also contributes to soil health by adding nutrients and organic matter. For instance, Mexican sunflower (*Tithonia diversifolia*) is a fast-growing plant that can be used for chop-and-dropping as a green fertilizer. Additionally, it attracts pollinators and acts as a mosquito repellent.

Integrating nitrogen-fixing plants, like those in the *Fabaceae* family (beans and peas), can naturally enhance soil fertility by converting atmospheric nitrogen into a usable form for plants. Advanced methods like the "Hügelkultur", which involves creating raised beds filled with decaying wood, enhance water retention and soil fertility, while also creating berms.

Microsymbionts, i.e. mycorrhizal fungi, are microorganisms that form beneficial relationships with plant roots, enhancing nutrient uptake. Decomposers help break down organic matter, while elemental transformers play a crucial role in the nutrient cycle, facilitating nutrient availability. Additionally, soil engineers, like earthworms, move soil and create lumps, improving soil aeration.

Proper planting techniques

Trees can be planted from seeds, seedlings, or saplings, and each method has its own applications. Planting trees from seeds is more affordable than the other methods and offers greater potential for genetic diversity and adaptability. However, it takes longer for trees grown from seeds to reach maturity. Seedlings represent a middle ground between seeds and saplings. While more expensive than seeds, seedlings require less time to mature, but they do not offer the same potential for genetic diversity. Saplings are already more mature and reach the productivity stage more quickly, but they come at a higher cost.

When planting seeds, it is essential to determine if the species exhibits seed dormancy and, if so, to understand the appropriate methods for breaking dormancy. For seedlings and saplings, the planting method is very similar. Begin by making a hole in the ground larger than the original container. Plant with the roots straight down, ensuring they are not curled. Remove the tree from the original container, place it in the center of the hole, fill the hole with loose soil and apply some pressure with your hands or foot to remove air pockets. Level the soil with the root ball, being careful not to cover the trunk, as this can encourage rot and diseases. Finally, water the newly planted seed, seedling, or sapling, and cover the area with mulch to retain moisture, again avoiding covering parts of the trunk.

E. MAINTENANCE

Watering

Watering trees is crucial, especially in the first days after planting. To conserve water, it is advisable to water only, when necessary, avoid watering on rainy days, and do so preferably at night to reduce evaporation. Additionally, covering the soil with mulch helps retain moisture by minimizing evaporation. Choosing tree species that are well-adapted to the environment can also help reduce water consumption, as these plants are more suited to the local climate and conditions. Collecting rainwater near plants can reduce public water consumption, minimize flooding impacts, and provide a nearby water source for the plants.

Pruning

Proper pruning offers several benefits, including:

- Promoting new growth: Encouraging the development of healthy new branches.
- Increasing fruit production: Particularly effective when done during the winter months.
- Improving light penetration: Allowing more sunlight to reach lower plant layers.
- Enhancing safety: Removing dead or infected branches to reduce the risk of hazards.
- Improving tree structure: Maintaining balance and preventing future problems (when done correctly).

It is important to exercise caution, since pruning can create entry points for fungi and bacteria, and overpruning (removing more than 30% of the tree) can cause permanent damage by depleting the tree's nutrient reserves. Additionally, unbalanced pruning can increase the risk of the tree falling during strong winds and cyclones.

Pest management

The occurrence and intensity of disease in plants result from the combination of three factors: environmental conditions, the susceptibility of the host plant, and the presence of a pathogen. All of these factors are necessary for the disease to occur. Therefore, measures for preventing and treating diseases should target at least one of these factors. Integrated Pest Management (IPM) principles should be employed to reduce the unnecessary use of pesticides. The IPM principles include identifying pests and monitoring their progress, setting action thresholds, preventing and controlling pests. Planting certain species and creating habitats to attract beneficial insects can also be a useful tool to prevent and control pests, e.g. planting Queen Anne's lace (*Daucus carota*) to attract lacewings to control aphids, mites and other small insects.

F. HARVESTING

Harvesting products from urban food trees can be strategically planned and advertised to the community. Organizing volunteer harvesting days and maintaining an online map of available produce are effective ways to encourage community participation in urban food tree

projects. Harvested products can be taken home by project participants (for example volunteers, residents, visitors) or donated to local food banks and community events. To minimize waste, various food preservation methods can be utilized, such as freezing pulps, drying fruits, making jams, and drying herbal leaves. Additionally, after fruit harvesting, seeds can be saved for replanting, donated, or exchanged with other producers to enhance the genetic diversity of the plantings.

G. EDUCATION

Urban food trees offer a rich educational resource, covering topics like gardening, arts, ecology, nutrition, and more. The space where an urban food tree project is established can serve as a classroom setting for various community groups, different generations, and cultural backgrounds, providing an interesting opportunity for building connections with schools, universities or other organizations. Volunteer days, guided tours, culinary classes, and social media content about the project are examples of educational methods. Using labels with information about plant identification, benefits, and uses is a passive yet effective way to educate passersby.

1.2. EFFECTIVE MANAGEMENT FOR ENHANCED ECOSYSTEM SERVICES

Maximizing ecosystem services

The following table outlines strategies to enhance the ecosystem services provided by urban food tree projects, categorized into provisioning, regulating, supporting, and cultural services.

TABLE 1. **Strategies to enhance ecosystem services provided by urban food tree projects**

Provisioning	 Food	**Food diversity:** Plant a variety of species of food trees to increase diversity of food and harvesting seasons. **Dioecious Trees:** For dioecious trees, such as persimmon (*Diospyros virginiana*), plant both male and female trees close to each other to ensure food production.
	 Medicinal resources	**Herb Gardens:** Include medicinal plants and herbs within the project design. **Educational Programmes:** Offer workshops and informational signs about the uses and benefits of various plants.
	 Wood / Fiber	**Sustainable Harvesting:** Include plants suitable for sustainable wood and/or fiber supply, e.g., walnut (*Juglans spp.*) and bamboo (subfamily *Bambusoideae*). **Educational Programmes:** Offer workshops about the uses of various plants in crafts.
	 Genetic resources	**Biodiversity:** Plant a wide range of native species and cultivars to preserve genetic diversity, avoiding invasive species. **Seed Banks:** Collaborate with local seed banks to preserve and exchange genetic material.

Supporting	 Microclimate regulation	**Canopy Design:** Create layered canopies to provide shade and reduce the urban heat island effect. **Green Infrastructure:** Integrate green roofs, green walls, and other structures to enhance cooling effects.
	 Pollination	**Pollinator Habitats:** Plant a variety of flowering plants that bloom throughout the year to attract and support pollinators. **Bee Hives:** Install bee hives and other pollinator nesting sites.
	 Pollutant filtering	**Phytoremediation Plants:** Use non-edible plants that absorb and neutralize pollutants, and ensure they are carefully managed. **Buffer Zones:** Establish green buffer zones along roadsides and industrial areas.
	 Water regulation	**Rain Gardens:** Design rain gardens to capture and filter runoff. **Permeable Surfaces:** Use permeable paving and other methods to increase infiltration and reduce runoff.

Regulating	 Soil formation - carbon sink	**Composting:** Implement community composting programmes to enrich soil. **No-Till Practices:** Use no-till and low-till agricultural practices to enhance soil structure and carbon sequestration.
	 Nutrient cycling	**Integrated Planting:** Use companion planting and crop rotation to enhance nutrient cycling. **Organic Amendments:** Regularly apply organic matter such as compost and mulch.
	 Primary production	**Maximize Photosynthesis:** Ensure optimal light exposure by carefully planning tree placement. **Efficient Water Use:** Adjust irrigation to meet the specific needs of each species and the current weather or season and cover the soil with mulch to reduce evaporation.
	 Habitat for wildlife	**Habitat Diversity and Connectivity:** Create a variety of habitats, including ponds, nesting sites, and brush piles, and connect new sites to the existing ones to maximize connectivity for animals. **Native Plants:** Prioritize native plant species to support local wildlife.

Cultural	 Social interactions - place making	**Community Spaces:** Include seating areas for community gatherings and events, e.g., shaded picnic tables. **Collaborative Projects:** Encourage community involvement in the design, installation and maintenance of the project, stimulate volunteering events and create social media pages.
	 Education - traditional knowledge	**Educational Programmes:** Offer workshops and guided tours to educate about sustainable practices. Engage the community to share their knowledge. **Interpretive Signage:** Install informational signs about the plants, their uses, and how to be a volunteer.
	 Recreation - tourism	**Scenic Paths:** Design walking paths, seating areas and playgrounds to encourage recreational use. **Events:** Host festivals and events to attract visitors.
	 Esthetics - inspiration	**Artistic Elements:** Incorporate art installations, murals, and sculptures of local artists. **Design Esthetics:** Use attractive landscaping techniques to create visually appealing spaces.

Source: Authors

1.3. CHALLENGES AND SOLUTIONS FOR THE SUSTAINABLE MANAGEMENT OF URBAN FOOD TREE PROJECTS

The table below presents common challenges encountered during the installation and maintenance of urban food trees, along with potential solutions to prevent, minimize, or mitigate their effects.

TABLE 2. **Common challenges and solutions for the installation and maintenance of urban food trees**

Issue	Challenges	Possible solutions
Space Constraints	• Limited available space for planting • Competition with existing infrastructure such as buildings, roads, and utilities. • Zoning laws and land-use regulations.	• Utilize vertical gardening techniques and espalier fruit trees. • Plant in unconventional spaces such as rooftops, balconies, and walls. • Advocate for policy changes to allow for more green space in urban planning. • Collaborate with local authorities to identify underutilized public spaces for planting.
Soil Quality Issues	• Urban soils may be contaminated with pollutants. • Poor soil structure and low fertility. • Soil compaction due to heavy foot traffic or construction activities.	• Conduct soil testing to identify and address contamination. • Use raised beds and imported soil to create suitable growing conditions. • Apply organic amendments such as compost and mulch to improve soil health. • Implement phytoremediation plants to absorb and break down pollutants.
Water Management	• Limited access to water sources. • Inefficient water use leading to wastage. • Drought conditions or inconsistent rainfall patterns.	• Install efficient irrigation systems such as drip or deep irrigation. • Harvest rainwater and use it for irrigation. • Use mulch to retain soil moisture and reduce evaporation. • Select drought-tolerant and native plant species.
Funding Limitations	• High initial costs for installation and long-term maintenance. • Limited access to grants and financial support.	• Seek grants and funding from government agencies, nonprofits, and private donors. • Partner with local businesses and community organizations for sponsorship and support. • Explore crowdfunding and other innovative fundraising strategies.
Community Engagement and Management Plans	• Lack of awareness and interest from the local community. • Potential conflicts over land use and project goals. • Long-term maintenance requires consistent effort and resources. • Lack of clear responsibilities can lead to neglected trees.	• Conduct community outreach and education programmes to raise awareness. • Involve community members in all phases of the project, including planning and decision-making, to foster a sense of ownership. • Develop detailed maintenance plans outlining tasks and schedules.

Pest and Disease Management	• Urban environments can harbor pests and diseases that affect plant health. • Limited knowledge and resources for organic pest control.	• Implement integrated pest management (IPM) practices, monitoring plant health and addressing issues promptly. • Encourage biodiversity to attract beneficial insects and natural predators. • Use organic pest control methods and resistant plant varieties.
Regulatory and Policy Barriers	• Navigating complex regulations and obtaining necessary permits. • Lack of supportive policies for urban agriculture and food forests.	• Work with local governments to streamline permitting processes. • Advocate for policy changes to support urban agroforestry initiatives. • Foster citizen engagement to promote urban food tree projects and policy changes with decision-makers (see Chapter 2).
Disease and Vectors	• Fruits can attract animals, increasing the risk of spreading diseases and pests. • Managing vectors like rodents and insects.	• Implement regular monitoring and control measures. • Use physical barriers and natural repellents to manage pests. • Educate the community on proper handling and disposal of fallen fruit.
Preventing Overuse and Vandalism	• In dense urban areas they can be overly visited and cause biodiversity loss • Urban food trees can be targets for vandalism and theft.	• Engage the community in protecting and valuing the project. • Use protective barriers and surveillance where necessary. • Foster a sense of responsibility, ownership and pride among residents.
Risk to Power Lines	• Trees growing too close to power lines can pose safety hazards.	• Select tree species with growth habits suitable for the location. • Regularly prune trees to maintain safe distances from power lines. • Coordinate with utility companies for proper maintenance.
Risk of Fruits Falling on People or Property	• Falling fruits can pose a hazard to pedestrians and damage property.	• Choose tree species with manageable fruit size. • Install catchment systems or establish regular harvesting schedules to prevent accumulation. • Place trees away from sensitive areas (e.g., bike lanes or parking lots).
Technical Support	• Lack of access to expert advice and technical support for urban food tree projects.	• Partner with local universities, agricultural extension services, and horticultural experts. • Establish a network of knowledgeable volunteers and professionals. • Provide training programs and resources for community members involved in the project.
Climate Change	• Plants that used to be suitable for a location might no longer thrive due to changes in temperatures and precipitation patterns. • Sea level rise can increase salt intrusion in coastal areas, threatening salt-intolerant plants. • Climate changes may affect some pollinators, potentially reducing their presence.	• Plant species adapted to a broad range of climates or those more resilient to new climate patterns and increase biodiversity to reduce the risk of widespread failure. • Incorporate infrastructure to create favorable microclimates, such as windbreaks and shade structures. • Plant salt-tolerant species in lower elevations susceptible to salt intrusion and create berms to accommodate less tolerant species. • Plant native flowers and install bee boxes to support pollinators.

Adobe Stock

CHAPTER 2: URBAN FOOD TREE PROJECTS: ENGAGING COMMUNITIES AND DECISIONMAKERS

2.1. DESIGNING PARTICIPATORY URBAN FOOD TREE PROJECTS

Developing participatory urban food tree projects that meet the needs and preferences of diverse urban communities is a key challenge and opportunity. Cultural diversity is prevalent within the city and between urban, peri-urban, and rural area. However, food trees, as living beings, can serve as a powerful tool for bridging these cultural divides.

The initiation of urban food tree projects lies usually with the users closest to the concerned place and trees. They are the most essential actors to involve, the ones who will see when the tree needs maintenance or protection, when the fruit is ripe to be harvested and consumed. In addition, municipalities, a foundation, or private owners will also be important to engage to defend the land where the tree grows over the medium and long term. Other project-external organizations, private or public partners may consolidate the institutional arrangement for providing financial resources, professional expertise (gardeners and researchers), and other local associations organizing community members to collaborate and share the products. Seldom an actor alone can provide all of this over the lifetime of a tree – and state actors also need third parties (users and professionals, local-national or international associative organizations) for successful and sustainable urban food trees' projects.

The case studies (see Annex) demonstrate that urban food tree projects can involve **a diverse range of stakeholders,** including residents, associations (environmental or community-based), schools, universities, and enterprises. Understanding the motivations of these stakeholders and their perceptions of the value of food trees is crucial for evaluating their potential engagement, anticipating conflicts, and addressing organizational and resource constraints. Participatory processes that recognize the rights of local people to control their own wild and cultivated food systems also contribute to place-making, community and native ecosystem memory building.

The level of participation in urban tree projects can vary significantly based on factors like the interest, availability, and competency of involved actors, the history of the place, and the presence of facilitating agents. Key questions to consider include:

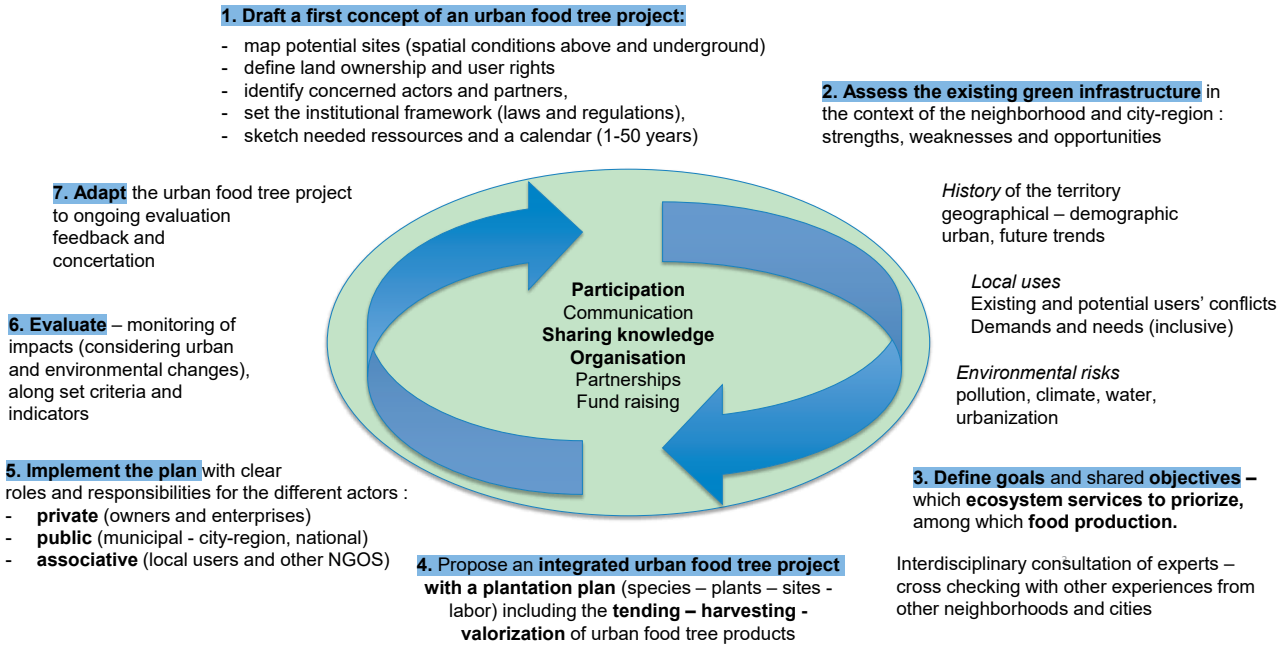
- Who is the main project initiator?
- Who else is involved and supports the process?
- How and to what extent do different actors participate?

The minimal or primary level of participation involves *sharing information* between the main agent and other interested actors. This may progress to more in-depth *consultation*, where participants share their preferences, and further develop into *concertation* for co-designing and co-managing the project. This can further be consolidated into *partnerships* involving co-decision-making and co-investment, or even an ultimate level which entails the *delegation* of the project to user-led *self-mobilization*, where users make decisions and implement actions[4]. The concertation degree allows the development of more creative and interactive urban food tree projects, enhancing users' engagement and ownership of the project.

Designing urban tree projects involves a diverse range of actors, as shown in the following seven steps (see Figure 5). This can help gain a long-term perspective, essential for the lifespan of an urban food tree project:

[4] Based on Arnstein Sherry (1969). A Ladder of Citizen Participation. Journal of the American Institute of Planners. Vol. 35.

FIGURE 5. **Planning an integrated and participatory urban food tree project**



Source: A. Finger, Ecologie & Communauté, 2024

This cycle may evolve at different speeds and repeat several times over the 20–80-year lifespan of an urban food tree, or even longer for some species like mulberry trees (100-150 years). As the project is reassessed and adapted to changing conditions related to trees, people, places, and the local and global environment, this cycle will continue.

Building and sustaining engagement over time is crucial for sustaining projects that maximize benefits for both nature and people. When launching integrated (cross-sectoral) and participatory urban food tree projects, a prior social and demographic assessment helps identify primary stakeholders, prioritize inhabitants with limited access to fresh food, and understand their potential interest, social and cultural barriers in participating[5]and[6]. Public stakeholders can leverage tree inventories, biodiversity assessments, and mapping of the city's green infrastructure in relation to grey infrastructure (including underground networks) to gain a better understanding of current and future urban dynamics (trends in urban expansion, densification, and fragmentation). This information can help identify potential land use changes and opportunities for urban food tree projects.

A particular challenge for the participatory process is maintaining the interest of the initial planters of urban food trees over several years until the trees bear fruit. This can take 5-10 years or longer, depending on the species, variety, and local conditions (see Photo 5). Given that urban residents often do not stay in the same neighbourhood for extended periods, the importance and challenge of collective action for sustaining urban food tree projects become even greater. The involvement of volunteers is crucial for empowering communities and expanding these initiatives. The *Greening of Detroit* foundation and *Keep Growing Detroit* association engage thousands of volunteers, including many low-income African American residents, who learn how to plant and grow fruit-bearing trees and shrubs and eventually become professionals in the field.[7] Involving municipal actors and experts, on the other hand can help guarantee ongoing technical support, maximizing the benefits of urban

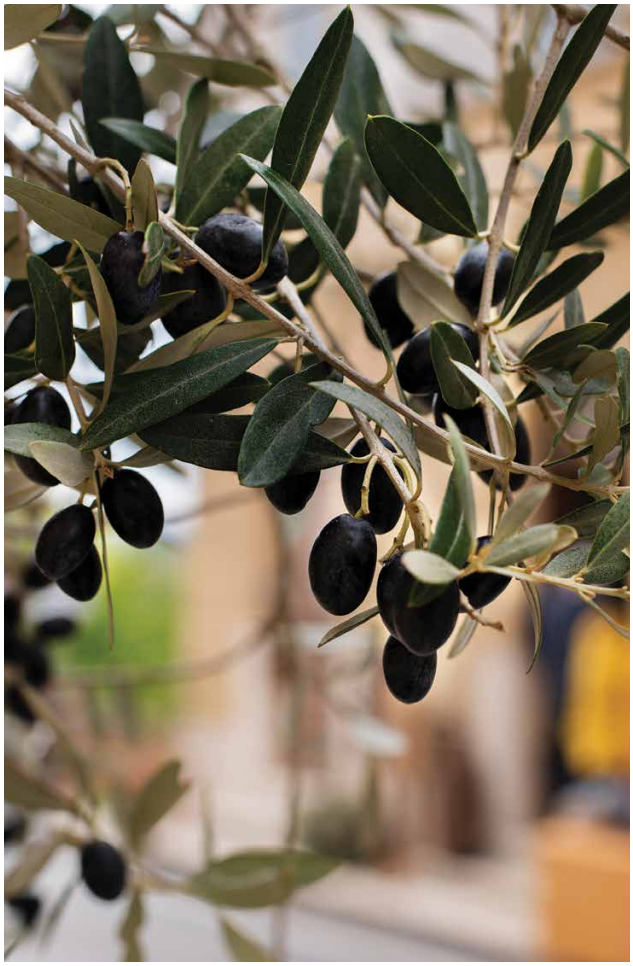
[5] For example, in regions where they are not native, few people are aware that the gingko is also a food tree, highly resilient in urban conditions thriving in diverse and harsh climates and producing fruits and nuts.

[6] Backyard forager 2018. A guide to ginko nuts.

[7] Keep Growing Detroit, Guide for Planting Perennial Fruit Trees and Plants, August 2024

food trees and ensuring their sustainability even as volunteer engagement may fluctuate.

PHOTO 5. **Olives**



Credit: Adobe Stock.

2.2. GUIDING THE GROWTH: THE ROLE OF EXPERTS IN URBAN FOOD TREE PROJECTS

Growing urban food trees in constrained urban contexts requires a comprehensive understanding of urban food tree species, their biophysical and ecological needs, as well as the specific social, cultural, political, and institutional conditions within which urban food tree projects operate. Combining the knowledge and experience of both professionals and amateurs can greatly enhance the success of urban food tree projects. Professional supervision, including arboriculture expertise, is particularly valuable in ensuring proper maintenance, pruning, watering, and addressing plant health issues. This is especially important in urban arboriculture, where extreme climatic and environmental conditions can challenge the growth of urban trees.

The investment and capacity needed for successful cultivation often necessitate collaboration among multiple actors involved in planning, managing, investing in land and other resources, and utilizing the trees, their products, and the land they occupy. These actors can include public, private, and community entities. A scoping exercise including a social assessment can help identify potential partners—such as associations, landowners, enterprises, foundations, and municipal or metropolitan public agencies who could take part in co-designing a project that includes urban food trees.

2.3. ASSESSING, MONITORING AND SUSTAINING FOOD TREE PROJECTS

Assessing and monitoring urban food tree projects and their results is essential for fostering long-term sustainability and adaptability to changing environmental and social conditions. These assessments have several layers including for example assessing biodiversity and carbon sequestration which requires an initial baseline assessment of the planting site, vegetation, and soil conditions to help determine the existing habitat for local biodiversity and potential benefits to people. By comparing the site to others with similar conditions, its ecological and social potential can be estimated and inform the conceptualizing of planned urban food tree projects, their ecosystem services and sustainability. A second essential layer involves ongoing monitoring of food condition, maturity, harvest readiness, food safety, and quality to ensure the production of healthy products. This is not only public health imperative but helps build local, short supply chains and transparency on origin and growing of the product. Consumers want assurance that urban food is healthy, which is why urban food production often leans towards organic practices.

This can even lead to such with local production, certification can increase consumer willingness to pay a premium[8]. For example, in Geneva, Switzerland, the initiative "*Ferme du Quartier des Vergers*" certifies its fruit (fresh and processed) with the Bio Suisse label[9]. Such certification can enhance

[8] For example, in Europe, urban agroforestry products can be certified for sale at farmers' markets through a Certified Producer Certificate (CPC) issued by local authorities or organizations like the European Agroforestry Federation, August 2024 https://euraf.net

[9] https://www.bio-suisse.ch/fr/notre-attitude/questions-frequentes/labels-et-controle.html

PHOTO 6. **Urban apple tree, Ivoire, France**

Credits: C. Gentili. Description: Urban apple tree, Ivoire, France.

the market value of urban food products when sold in formal markets. However, for smaller projects run by public entities and volunteers where food is distributed locally to neighbours and families involved in urban food tree initiatives, certification may not be cost-effective and may not add any value.

Monitoring the quality of food produced includes testing for pollutants that may contaminate it from the soil or air. Evaluating the potential toxicity of food derived from urban trees for public consumption is a critical concern, particularly for public authorities promoting their planting. While fruits from urban trees (Photo 6) are less exposed to soil-derived pollutants compared to vegetables, air pollution remains a potential issue. In some heavily contaminated sites in Detroit, Michigan (USA), the *Greening of Detroit* foundation prioritizes planting brownfield remediation trees instead of food trees. Even the wood products from these trees are carefully controlled and handled to limit public exposure.

A possible example of monitoring food tree projects might be derived from the recommendation by the Swiss centre of excellence for agricultural research, AGROSCOPE, i.e. a protocol for agroforestry systems that includes an initial audit followed by annual assessments for five years, and then regular assessments every 2-5 years. The evaluation criteria proposed include:

- Biomass and carbon (in both the biomass and soil)
- Vegetation, multiple structures from upper to lower story
- Birds and bats (focusing on flagship species, flotilla species, and possibly keystone species, as well as protected and threatened species)
- Pollinators (presence and activity of nests identified along transects)
- Soil activity (microorganisms' capacity to fix nutrients, transform and decompose organic matter)
- Habitat quality and connections with surrounding landscape structures, with the green and blue infrastructures (Roberti et al., 2023; Finger 2022).

The social impacts of urban food tree projects need to be measured as part of a sustainability analysis. This includes assessing the quantity, diversity, and quality of food produced, as well as the impact on a population's access to food and improved health. Evaluating the impact on well-being is particularly important in "urban fresh food deserts." People may have restricted access to nutritious food for economic reasons, natural disasters, or other environmental and socio-political crises. A social and health assessment can identify the causes of malnutrition, inform the community's dietary needs and help select the most appropriate food trees and shrubs to grow. It can lead to urban food tree projects becoming resources of fresh fruit also for those not directly involved with the project. The Urban Orchard at Sara Sims Park in South Florida is an example of a project that provides products to food banks, helping to avoid waste and meet the needs of the most vulnerable.

The socio-economic sustainability of urban food tree projects can be assessed by identifying:

- Who is involved in decision-making and resource allocation.
- How costs and benefits are distributed.
- Who is excluded and why.

To evaluate the long-term community-building capacity of urban food tree projects, assessing the extent of collective action and its impact on solidarity, social integration, and learning can help. An example is Burlington, Vermont (USA), for which Clark et al. (2013) highlighted the benefits of urban food forests in providing nutrient-dense foods that can significantly help populations with limited access to healthy fresh food. Additionally, urban food forests can diversify diets with nutritious and unusual fruits and nuts that are often neglected in traditional gardens, such as saskatoon, honeyberry, and sea buckthorn, which are increasingly popular with the public. Urban food trees can also provide food stability through polyculture systems that spread the harvest over a 7 to 8 months period and, with proper preservation techniques, supply food year-round.

Adobe Stock

Adobe Stock

CHAPTER 3: A GREENER CITY: INTEGRATING FOOD TREES INTO URBAN LANDSCAPES

Who decides to plant and cultivate urban food trees, and who benefits from their products? Conversely, why do some individuals choose not to plant urban food trees or consume their produce?

To understand the factors influencing the adoption and utilization of urban food trees, we must explore the following questions:

- Barriers to adoption: What obstacles prevent more widespread adoption of urban food tree initiatives?
- Consumer preferences: What factors influence individuals' decisions to consume urban food tree products?

By addressing these questions, we can gain valuable insights into the potential for expanding urban food tree projects and increasing their impact.

Even though food trees typically represent not more than 5% to 10% of the planted trees in cities, expanding urban food tree projects requires more than just favourable environmental conditions. It also depends on supportive institutional arrangements. While there is significant potential for developing urban food trees in most cities, there are also considerable challenges.

The following chapter outlines five governance-related challenges that cities might have to address to develop place-based solutions:

- Cross-sectoral integration of urban food trees in overall urban strategies
- Food trees in urban landscapes
- Urban food trees and their links with landscapes outside cities
- Integration into urban and national planning

3.1. CROSS-SECTORAL INTEGRATION OF URBAN FOOD TREES IN OVERALL URBAN STRATEGIES

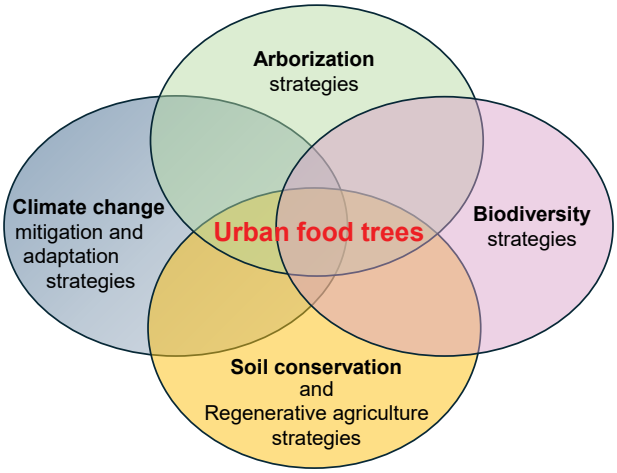
Organizational, social, and cultural factors can pose significant barriers to considering the food-producing potential of urban trees. Sectoral divisions between agriculture, environment, and forestry departments, as well as between these sectors and urban planning departments, can hinder collaboration even more. To fully leverage the benefits of urban food trees, cross-sectoral collaboration between all four sectors is essential. Sectoral divisions may lead to the neglect of urban food trees in urban greening and arborization strategies or their consideration as marginal options, depending on individual preferences and choices.

Integrating urban food trees into climate, biodiversity, and food strategies (see Figure 6) helps address environmental justice and enhances the overall quality of urban landscapes. In doing so, urban food trees become key contributors to urban health and resilience (Oncini et al., 2024).

PHOTO 7. **Urban landscapes and food trees, Park Beşiktaş, Istanbul, Türkiye**

Credits: Diler Çiftçi. Description: Playground, Park Beşiktaş, Istanbul, Türkiye.

FIGURE 6. **Urban food trees - Strategies for more liveable and resilient cities**



Source: A. Finger-Stich, 2024

While many cities and metropolitan areas have established climate policies and intersectoral arborization strategies often even integrated into urban planning, the potential of urban food trees is often overlooked by urban forestry, or agricultural agencies. While agroforestry is increasingly recognized as a tool for climate mitigation and adaptation, and sustainable land use, its application is primarily focused on rural and peri-urban areas, with limited recognition in urban settings.

3.2. FOOD TREES IN URBAN LANDSCAPES

Urban food trees can be a valuable addition to or alternative to traditional city landscapes particularly urban farming projects. Due to the space beneath their canopy, trees can be used for multifunctional purposes such as pasturing, growing crops or vegetables, and recreational activities. However, it is essential to ensure that these activities do not harm the tree or its roots, particularly through soil compaction. Fruit produced on trees is less exposed to contaminated soils compared to vegetables grown in or on the ground. Trees can also help to decontaminate and fertilize soil. Additionally, urban food trees provide a wider range of habitats and food sources for fauna and flora, sequester more carbon (both in the biomass and in the soil) than cultivated soil and lawns, and produce high-quality wood in urban and peri-urban areas for various uses such as cabinetmaking and carpentry.

Urban food trees are compatible with a variety of other land uses, depending on their location and integration within the urban landscape. Table 3 distinguishes four major types of urban landscapes (parks, gardens, farms, and urban fringes) where food trees can coexist with agriculture, recreation, education, energy, and other urban infrastructures (see Photo 8). The table below illustrates the extent to which urban food trees can be compatible with these main categories of land uses in each landscape type. The compatibility of urban food trees with multiple land uses depends on various factors, including the specific uses, user knowledge and behavior, governance, planning and management strategies, and local conditions (geographical, climatic, ecological, and urban history). In each context, it is important to consider these factors and explore solutions for maximizing compatibility through discussions with urban food tree managers and respective users.

PHOTO 8. **Example of food trees coexisting with urban infrastructure, Florida, USA**

Credits: E.R. Guimaraes. Description: Example of food trees in streets, Florida, USA.

TABLE 3. **Food trees in urban landscapes: potential (in)compatibility with multiple urban areas**

Food trees in urban landscapes:
Potential (in) compatibility with multiple urban land uses

very compatible | +/– compatible | not compatible

UFT landscapes/ Uses	Agriculture	Recreation, sports and leisure	Education and cultural uses and manifestations	Energy-water and mobility uses
Food trees in **city parks**	Food trees in orchards, urban farms and in domestic vegetable gardens provide besides food, shade, reduce erosion and host biodiversity.	Lawn for relaxation and visual amenity. Sports facilitate considering risks of fallen fruit on running routes or playing fields. Fruit trees planted in palisades to separate spaces, along paths or walls. Low stem trees can help people gather fruit while relaxing (example of draft mulberry in Istanbul).	Heritage, symbolic and aesthetic values for cultural places contributing to a city's attractiveness and identity. In parks and gardens near hospitals urban food trees serve for embellishment, for experiencing a variety of fresh food, for place making, contributing to relaxation and mental, physical and social health restoration. Diverse food cultures can meet around urban food trees – providing opportunities for collaborative, intercultural and transgenerational, learning.	Contribution to wood-energy. Contribution to surface water management (improved infiltration capacity of soils). There may be competition for space between soft mobility paths and urban food trees. Fruit falling on the paths may cause untidiness and risk of sliding.
Food trees in **urban gardens**	Urban food trees are often a central element in private gardens, and to some extent also in public gardens when they leave place to local associations for food production. Within vegetable gardens urban food trees may shade out crop and vegetable growth.	Urban food trees in private gardens for shade (climate comfort) and multisensorial experience.	Urban gardens can be found in school yards, near public, private and cooperative buildings and their urban food trees are an extra opportunity for experience-based education about food and nature.	In small urban gardens the compatibility of urban food trees with energy production (solar panels) may be limited but possible with careful planning and maintenance.
Food trees in **urban farms**	Urban food trees near farms also foster food security when planted in association with vegetable gardens and crops, serving as windbreak and hosting pollinators and other insects beneficial for pest management. They fix nitrogen and provide composting material. Urban food trees provide additional food sources valued in the informal or formal economy.	Urban food trees provide amenity – beautification and resting places integrated in the urban farm, for people, farmers and visitors, as well as animals' well being.	Urban food trees in urban farms provide multiple occasions for public and youth sensibilization, education opportunities about linkages between food security and biodiversity and other ecosystems services provided by urban food trees.	Food trees provide firewood – besides quality for cabinetmaker.

UFT landscapes/ Uses	Agriculture	Recreation, sports and leisure	Education and cultural uses and manifestations	Energy-water and mobility uses
Food trees in **urban fringes**	Urban food trees in rows or hedges can separate built from unbuilt spaces, provide shade and aesthetic amenities, along paths for pedestrians, and consolidate the urban and peri-urban green infrastructure connected with agricultural land.	Urban food trees on urban fringes enhance the qualities of the landscape enjoyed by inhabitants for recreation and to connect with nature and the city-regions' rural heritage.	Next to schools, urban food trees provide shade, food, biodiversity, education opportunities. Children learn to respect food and the trees, to harvest and enjoy in season, to share and to avoid waste.	Food trees along sidewalks and roads, need to be at some distance. The degree of compatibility with solar energy production is limited, less so with windmills running above the canopy (on urban edges).

3.3. BEYOND THE CITY LIMITS: CONNECTING URBAN FOOD TREES TO RURAL LANDSCAPES

Urban food trees serve as a crucial link between urban and rural strategies for sustainable land use, offering nature-based and culturally adapted solutions. In addition to boosting the productivity and sustainability of food production, agroforestry enhances the quality of life at the urban fringe by fostering landscape, ecological, and cultural values that improve relationships between urban and rural territories. Policies promoting agroforestry can help connect urban areas with their surrounding rural regions and ensure the permeability of the ecological corridors, by integrating food trees into both *green infrastructure planning* (Mosquera et al., 2018) and continuous *productive urban landscapes* (Viljoen and Bohn, 2005), on a metropolitan and wider city-region scale. While this type of integrated planning is often implemented at the local agroecology project level, applying it on a larger city-region scale can help achieve both urban food and biodiversity goals, contributing to more climate-resilient cities and landscapes.

Agroforestry has long been recognized for its multiple benefits in various regions worldwide. In the EU, agroforestry currently accounts for approximately 8.8% of utilized agricultural area, or around 3.6% of the total territorial area. Over 90% of the EU land used in agroforestry combines food trees with livestock farming. While these figures highlight the prevalence of agroforestry in rural contexts, they do not accurately reflect the extent of urban agroforestry, which is likely to be minimal in terms of area devoted to urban food trees.

Despite limited public subsidies from national or international agencies, many cities are actively promoting urban and peri-urban agroforestry. For example, the Greater Geneva region, in its Transboundary Vision for 2050, aims to achieve carbon neutrality and promotes agroforestry in urban fringes and peri-urban rural areas to adapt to climate change (including temperature and precipitation changes), improve landscape quality (for both social amenities and biodiversity), and support local farmers' food production. This vision encourages urban planning that prioritizes, protects, valorises, and revitalizes unbuilt areas, fostering socio-ecological networks that span urban, peri-urban, and rural territories. Agroforestry projects have significant potential to regenerate peri-urban landscapes prone to fragmentation and degradation. Additionally, a robust urban food system integrating urban food tree projects can generate paid and voluntary employment opportunities throughout the food chain, from tree planting and maintenance to processing and distributing food products. A survey of 897 buyers across six Swiss cities explored urban consumers' attitudes toward - and demand for - different types of edible mushrooms, berries, honey, pharmaceutical and wellness products, greenery, and twigs from forests. These products were recognized as being environmentally friendly and of good quality, often certified.

BOX 1. **Lisbon's edible green infrastructure**

Lisbon's edible green infrastructure

To best address biodiversity conservation, climate change adaptation, and food security, Lisbon, at the scale of its city-region (21 municipalities), has sought to integrate urban green infrastructure planning with agricultural land use planning. The main objective was to propose an "edible green infrastructure." In their mapping process, Cardoso and Domingos (2023) considered trends in land use changes due to urbanization, rising demands for food and other ecosystem services, agricultural land abandonment and expansion, and the increasing pressure on natural resources, including water and fertile soils, along with the development of new policies impacting land use.

Another example is the University of Padova's "incredible forest initiative" which identified Mediterranean non-wood forest products, including many edibles (see Alessandro Leonardi, https://incredibleforest.net).

Peri-urban agroforestry (see Photo 9) can successfully reconnect cities with their surrounding rural regions, embedding them within a wider context. The Milano Porta Verde project is a prime example, regenerating fragmented landscapes and communities through large-scale agroforestry initiatives involving around 2,000 people in 40 participatory processes (Dal Borgo et al., 2023). Another project in Rosario, Argentina, has received the Milan urban food Award in 2022. In the context of Argentina's economic crisis of 2001, Rosario (a metropolitan area of 1.3 million) initiated agroecological urban gardens to reduce food imports and dependency – starting with 30 hectares. The Proyecto Cinturon Verde Rosario (CVR) – Rosario Green Belt Project engages public and private partners with small farmers, universities and research centers, NGOs, and municipalities of the metropolitan area. Over 3,000 families now produce their own food, with plans to expand the project to 1,300 hectares by 2030 with 60 producers. 65 per cent of Rosario farmers are women. The project features trees and fruit trees that have been successfully cultivated in arid conditions with minimal irrigation. "*COVID-19 has shown us what our essential needs are. Food and health care are more important than ever. The climate crisis emphasizes that any solutions we create must be in harmony with nature* (Avampato, 2021)." In Rio de Janeiro grassroots agroforestry sustains communities and biodiversity, including birds and bees (Araujo, 2024).

PHOTO 9. **Example of peri-urban agroforestry, Urbino, Italy**

Credits: C. Gentili. Description: Example of peri-urban agroforestry in Urbino, Italy.

BOX 2: **The European Union and home gardens**

The European Union and home gardens

The EU's Common Agricultural Policy (CAP) monitors areas allocated to agroforestry as part of efforts to promote *carbon farming* and the transition to sustainable and resilient food systems and forestry. In this context, the EU CAP differentiates five agroforestry types: silvopasture, silvoarable, riparian buffer strips (including hedgerows), forest farming, and homegardens. An analysis of European policies (2013-2020) promoting agroforestry shows that most support is directed towards silvopastoral lands, which represent 10 per cent of Europe's grassland areas, a proportion that is significantly higher than in the USA. Urban agroforestry (classified under "homegardens") is not assessed by countries participating in the EU CAP, and other forms of urban agroforestry, aside from homegardens, are not mentioned. The significance of homegardens in some region's cities is significant. Mosquera et al. (2018) estimate that *"homegardens that comprise the multilayer vegetation that surrounds households, that supply fruits but also vegetables to owners"* are more frequently found in Central and Eastern Europe (Czech Republic, Poland, Slovakia, and Romania), as well as closer to the Atlantic in England (United Kingdom), Asturias, and Galicia (Spain). Most Spanish regions and, to a lesser extent, in Central and Northern Europe also feature home gardens. According to this study, *"homegardens are considered in the circular economy and the bioeconomy as a key tool to mitigate climate change. Activities linked to the increase of fruit trees and horticultural crop production in the surrounding areas of the cities will reduce the need of purchasing food from other countries and therefore the associated transport fuel expenditure, improving the balance of the greenhouse emissions."* (Mosquera et. al, 2018; Kusek, 2023).

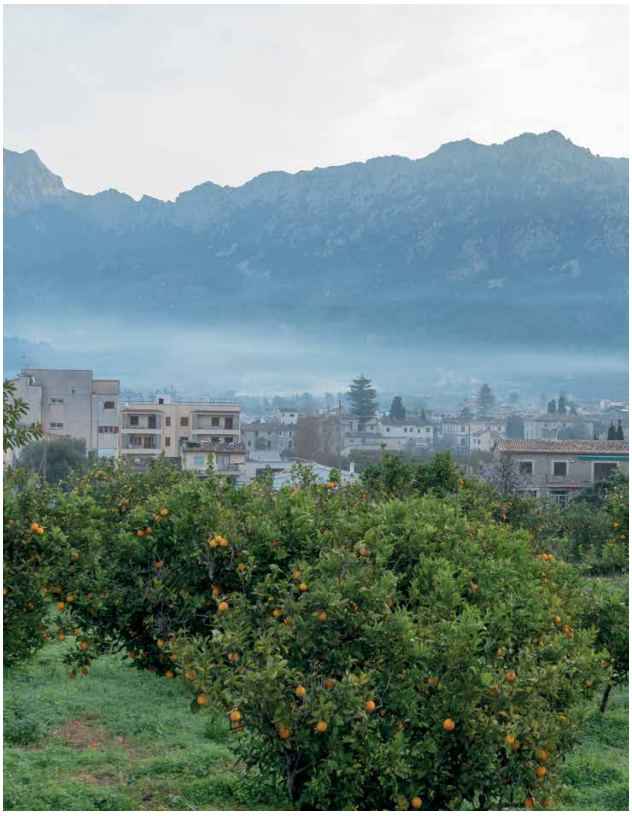
3.4. POLICY FRAMEWORKS FOR URBAN FOOD TREES: INTEGRATION INTO URBAN AND NATIONAL PLANNING

While the case studies collected from various continents illustrate excellent examples of food tree projects, these projects are often not proactively incorporated into city-level and national policies and planning to enhance urban green infrastructure. As stated in one example, "The policies of Parma Municipality have not yet adequately incorporated the successful practices demonstrated by the "Picasso Food Forest."

The opportunities and challenges of public food forest initiatives have been analyzed by Coffey et al. (2021) for small municipalities with populations under 25,000. In a survey of 176 mayors in Virginia, USA, long-term maintenance was identified as the greatest barrier. Mayors emphasized in this respect said that *"providing sociocultural programs and education rather than food access is the most compelling aspect of a public food forest."*

In municipal land use plans, urban food trees, orchards, and forests often hold a special conservation status owing to their cultural heritage value and connection to traditional and rural land use practices (see Photo 10). Fruit trees and related landscapes contribute significantly to the identity of towns and neighbourhoods and are often associated with culture and traditions.

PHOTO 10. **Description: Urban orange trees in Soller, Spain**



Credit: Adobe Stock. Description: Urban orange trees in Soller, Spain

Adobe Stock

Adobe Stock

CHAPTER 4: NAVIGATING THE LEGAL LANDSCAPE: LAND RIGHTS, OWNERSHIP AND URBAN FOOD TREE PROJECTS

Scarce open land is in high demand, leading to competition and potential conflicts between different interests. State institutions play a role in regulating land use and mitigating these conflicts. Zoning laws, for example, designate areas that must remain agricultural land or forest, protecting them from urbanization. Understanding and adhering to relevant national and local laws and regulations governing a chosen parcel is crucial before initiating an urban food tree project. Unclear or changing land-use regulations can pose risks to planted trees. While rare, there may be instances where planting trees is used as a strategy to claim or secure land. Additionally, public, private, and community actors may undertake tree-planting initiatives for land and soil conservation in rapidly urbanizing areas, sometimes without formal land rights.

The shorter lifespan of food trees (often 50 years compared to over 100 years for some ornamentals), ability to be pruned into smaller forms, and production of flowers and fruits can make food trees a relatively accepted way to preserve urban green spaces. This includes fallow land or wasteland that might otherwise be claimed for new development.

4.1. OWNERSHIP, LAND, AND TREE-USE RIGHTS

Ownership, land, and tree use rights can be complex and involve both rights and obligations. These rights may be formal, customary, informal, or partially regulated by public institutions. They govern access to the tree and its products, defining who is the legitimate owner, manager, caretaker, or user and under what conditions they can exercise these rights and obligations. These rights might stipulate how products can be used, transformed, consumed, distributed, commercialized, or disposed of. Depending on the food tree project, they might be embedded in sociocultural practices with users expected to be informed about their rights and obligations and to respect them.

While not always regulated by public authorities, establishing, and understanding rules, rights and regulations is crucial for successful urban food trees projects and ensures their alignment with the specific context of the project. Organizing a community of users and engaging in co-design and management can facilitate the development of effective project-specific sets of rules with and for all urban tree users. A robust regulatory system should emerge from a community that understands the resource, its limitations, the potential impacts of overuse or depredation, and the common interests of all users. Users can take the initiative to organize themselves, potentially in an association to help institutionalize such a "robust" (resilient) system that ensures the sustainable use of the resource (Ostrom et. al, 2009).

The 13 case studies included in the Guide's Annex demonstrate that many urban food trees projects involve local user associations, which often differ from the primary agents, owners, and resource providers. In many cases, users are primarily responsible for growing the trees, although they may receive assistance from municipal or city agents, such as professional gardeners. Ensuring that the produce is harvested and utilized effectively requires some form of user organization with the legitimate power to regulate a range of rights including access to the tree; use of its products; management of the resource system; exclusion of certain users (with defined criteria); right or prohibition to alienate the urban food trees, i.e. Cutting them down. These rights are crucial for ensuring the sustainable use and survival of urban food trees (Agarval and Ostrom, 2001).

The case studies in the Guide's Annex also demonstrate that even for private trees grown in private gardens, self-mobilized homeowners (like those in the Backyard Forest Project in Florida, USA) value sharing experiences, food, and goals with others. While these homeowners often use their own resources, they may still benefit from community engagement. However, the regulation of access, use, exclusion, and alienation of urban food trees in private gardens remains primarily the responsibility of the individual landowner. If the food forest is protected under a city plan, landowners may have restrictions on cutting down trees.

4.2. A LEGAL FRAMEWORK FOR URBAN FOOD TREES: INSTITUTIONALIZING RIGHTS AND OBLIGATIONS

Without a strong protection status to safeguard trees and land from future construction, urban food trees may not survive in urban settings. **A well-defined framework for land and tree tenure** is essential for maximizing the potential of urban and peri-urban agroforestry in any location. Engaging local people, who are closest to the resource, will strongly depend on clear definitions of rights, obligations, and responsibilities. Otherwise, local communities or individuals may be hesitant to invest in planting and maintaining trees if they lack guaranteed access, management, and use rights for the soil and tree products,

whether as owners or leaseholders. These rights should be clearly defined and granted to e.g. private owners, leaseholders (through farmers' contracts), or user associations for a specified time. Even the right to cut trees (withdrawal right) or change land use (alienation right) should be clarified.

There are various ways to **institutionalize rights and obligations for urban food tree projects**, depending on the stakeholders involved, their land claims, and their willingness and capacity to invest.

- **Public land:** The alienation right often remains with the public agency. Many urban food tree projects on public land allow open access to the forest garden and urban food tree plots, while some may restrict use and grant co-management rights to members of a local community association. This choice is justified when the association volunteers to maintain and protect the orchards and ensures fair distribution of urban food tree products.
- **Individual owners**: They may choose to plant food trees with the option to cut them down later to accommodate other crops, without an obligation to replace them.

For food trees, it is crucial to **specify management and use rights** to prevent degradation and ensure the proper utilization of fruit. A fair distribution and effective use of food produced by urban food trees are key indicators of successful projects. As demonstrated in the South Florida (USA) cases, community greening associations can play a vital role in serving underprivileged communities, including food deserts and neighbourhoods with low tree canopy.

Use rights associated with food products but also timber from urban food trees, as well as the use of resources like soil, water, and compost, can be formal or informal. Developing rights and rules that are tailored to food trees in different sociocultural and environmental contexts is crucial for the long-term success of any urban food tree projects. This helps maintain stakeholder engagement and prevent conflicts among users.

When developing collective **management principles**, owners can advise one another on staying informed about public regulations. This includes understanding how to avoid and manage introduces and invasive species, as well as identifying the locations of public infrastructures like underground pipes and wires before planting trees.

For example, the Picasso Food Forest, which is part of the Fruttorti initiative (see Annex) and was initiated by an informal group of citizens on municipal land, became the legitimate manager of the urban food trees through a contract with the municipality of Parma and an association called Parma Sostenibile. This contract likely defines the rules governing the Fruttorti and prevents the exclusion of users or the alienation of trees or gardens, effectively making the food forest a public good.

4.3. MINIMIZING LAND USE CONFLICTS IN URBAN FOOD TREE PROJECTS

Land use conflicts can arise due to the pressure of urban growth, including densification strategies. In such contexts, it is especially important to clearly establish all forms of rights related to urban food trees. Rights concerning urban food trees are often collective, as trees tend to outlive multiple generations of owners and caretakers. Robust urban food trees governance systems can help sustain trees by preventing, mitigating, and resolving conflicts over resources, and by adapting management practices to changing social and environmental conditions.

Ostrom (et al., 2009) identified several criteria that contribute to making a collective natural resource management system robust. These criteria are analysed across three systems:

- **Resources**: the extent and limits of the resources; the relative scarcity of the resource; and a shared understanding of the goods and related benefits of the resource.
- **Users**: the size of the user group; the clarity of eligibility to be part of the user community; reciprocal trust and shared norms; common interest among beneficiaries (regardless of wealth) in maintaining the resources; organizational capacity (leadership, know-how, etc.); and technology used
- **Institutions**: clearly defined, simple-to-apply rules; accepted processes for monitoring and sanctioning.

The interactions among these three systems (social, ecological, and institutional) influence the overall performance of the socio-ecological system (SES), such as an orchard, and its relationships with other SES, like a public park. These interactions regulate harvesting levels, information exchanges, decision-making processes, conflict resolution, investment and lobbying activities, self-organization, and networking.

4.4. GOVERNANCE MODELS

Governance models for urban food trees projects can vary widely, from full self-governance by users to public governance by state or municipal agents. Mixed governance systems, with varying degrees of participation and collaboration among public, private, and community actors, are also common. These interactions may involve citizens' associations, private entities

PHOTO 11. **Ecoquartier Les Vergers, Meyrin, Geneva, Switzerland**

Credits: A. Finger-Stich. Description: Ecoquartier Les Vergers, Meyrin, Geneva, Switzerland.

(individuals, families, and enterprises), and governmental institutions (municipalities, metropolitan government agencies, universities, and research centers).

For example, in the case of the ecoquartier of Les Vergers Meyrin, Geneva (see Photo 11 and Annex), the farm responsible for managing the neighborhood's green spaces operates on both private and public land. While the land is owned by cooperatives, foundations, and the town of Meyrin, it is managed as a common area with contractual agreements granting specific rights and responsibilities to each party involved.

Residents and the public have free access to the land, with usage subject to certain regulations. Members of the vegetable garden association are the only ones permitted to harvest produce. While access to the food trees and urban garden is restricted to users and caretakers, the public and nearby residents can enjoy the view on green spaces and benefit from other ecosystem services, such as a healthy soil, habitat, and food for pollinators and birds.

Adobe Stock

CHAPTER 5: BEYOND THE HARVEST: THE SOCIAL, CULTURAL AND EDUCATIONAL BENEFITS OF URBAN FOOD TREES

Urban food trees and gardens offer attractive spaces for community gatherings and nature exploration. These spaces allow people to discover and taste foods, providing a connection to the origins and growth of these foods. In the Naga City Ecology Park in the Philippines (Camarines Sur), gardeners have observed families and organizations using the space for gatherings and nature exploration and knowing that *"some of these fruits are not even readily available in the market and with the increasing prices of these commodities, it becomes a pleasure to know that these fruits are a pick away from the trees in the park."* The park itself holds significant cultural heritage, cultivating a variety of indigenous tree species in partnership with the Isarog Garden Society Foundation and the City Government of Naga. The Isarog Agta, among the Philippines' earliest inhabitants, are connected to this heritage, and the city of Naga is named after the Narra tree (Pterocarpus indicus) in the local indigenous Bikol language.

Beşiktaş' Ulus Meyve Bahçesi Municipal Park serves as a poignant reminder of Istanbul's once-thriving agricultural heritage. This once-vibrant hub, renowned for its diverse farming practices, including mulberry gardens, has been significantly impacted by rapid urbanization. Aerial photos reveal the dramatic transformation of the landscape, with the municipal park and gardens now representing only a fraction of its original size.

Despite this rapid urbanization (see Figure 7), a portion of the original agricultural land remains preserved in the Ulus Meyve Bahçesi Municipal Park. Spanning approximately 2.5 hectares, the park boasts a diverse collection of 1,300 fruit trees, including pomegranates, oranges, lemons, figs, mulberries, cherries, apples, pears, plums, quince, almonds, and olive trees (Photo 12). In addition to its rich agricultural heritage, the park offers recreational amenities such as pedestrian walks, a café, and artwork.

FIGURE 7. **Rapid urbanization around the Beşiktaş food tree park, Istanbul - Aero spatial view**

Source: Google Earth, "historical imagery", years 2002, 2008, 2010, 2024. Elaboration by Diler Çiftçi, 2024.

The park's direct accessibility from nearby housing developments through private gates has contributed to increased property values in the surrounding area.

Urban residents often are unfamiliar with agricultural and forestry knowledge and trees as living organisms. Therefore, urban food tree projects require public education to encourage citizens to engage effectively and sustainably in growing and caring for urban food trees and their products. Without public education and clear regulations governing access to urban parks and fruit picking, degradation may occur. In the case of the Beşiktaş (Istanbul) food tree park, social media influencers promoting "free fruit" led to an influx of visitors during harvest time, resulting in looting, broken branches, environmental pollution and even biodiversity loss.

PHOTO 12. **Olive picking in Beşiktaş, Istanbul, Türkiye**

Credits: Diler Çiftçi. Description: Olive picking in Beşiktaş, Istanbul, Türkiye.

Urban food trees are often heritage trees, representing a genetic resource cultivated over millennia and carrying diverse cultural meanings. Preserving these trees requires a long-term commitment spanning generations. Urban food tree projects offer a unique opportunity to rediscover often-overlooked native tree species and their products. These projects can also foster innovative gardening practices, encouraging experimentation and creativity.

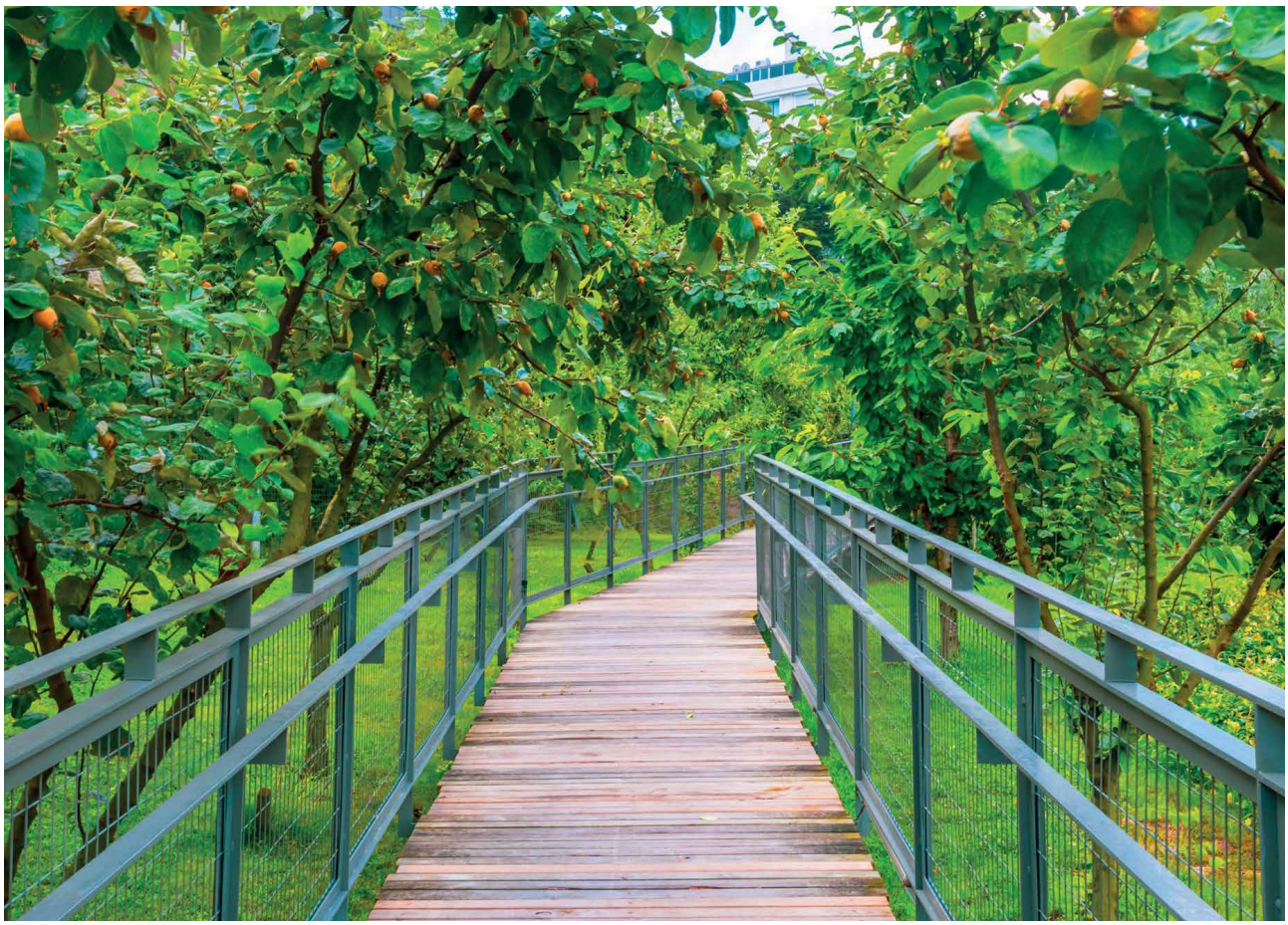
The production of knowledge and conservation of this living heritage demand collective effort, reconnecting people with the land. In São Paulo, for example, school forest gardens aim to revive species and knowledge from the native Atlantic forest and promote traditional tree products that are traditionally part of Brazilian diets. Members of the association Formigas-de Embauba (supported by international NGOs and the private sector) have planted three school gardens, each about 600 m^2, with dense micro forests (around 435 trees and more than 600 shrubs). All these projects were accompanied by a comprehensive six-month educational programme which significantly increased their impact.

Private property owners and volunteers involved in urban food tree projects often describe how they collaboratively learn and evolve in their perceptions of food, nature, and their territory.

The Backyard Forest Project in Broward County, South Florida, involves property owners who independently manage and work on their projects. Their management plan goals include adding desirable species as they become available; planting trees correctly and providing ongoing care to ensure their survival and growth; studying all species to learn proper training and pruning techniques for maximizing health, growth, and crop production. These property owners also recognize the importance of being aware of government codes related to planting prohibited non-native invasive species and understanding underground infrastructure.

KEY TAKEAWAYS

PHOTO 13. **Fruit tree corridor in Park Beşiktaş, Istanbul, Türkiye. Türkiye**



Credits: Beşiktaş Medya Grup, 2023. Description: Fruit tree corridor in Park Beşiktaş, Istanbul.

Planting urban food trees (Photo 13) represents a significant paradigm shift in urban environments. In a world where urban green spaces are becoming increasingly scarce and access to natural environments often requires travel, these projects challenge the traditional notion that food production is limited to rural areas. While the yield from urban food trees may be smaller, the experience of harvesting fruit directly from the tree not only nourishes the body but also deepens one's connection to nature. Urban food trees also disrupt the conventional image of manicured city gardens, which often feature expansive lawns that consume excessive water and fertilizers while offering limited value to the local community. A biodiverse system of food trees challenges the idea that plants are always in competition, demonstrating instead that they can coexist and thrive together.

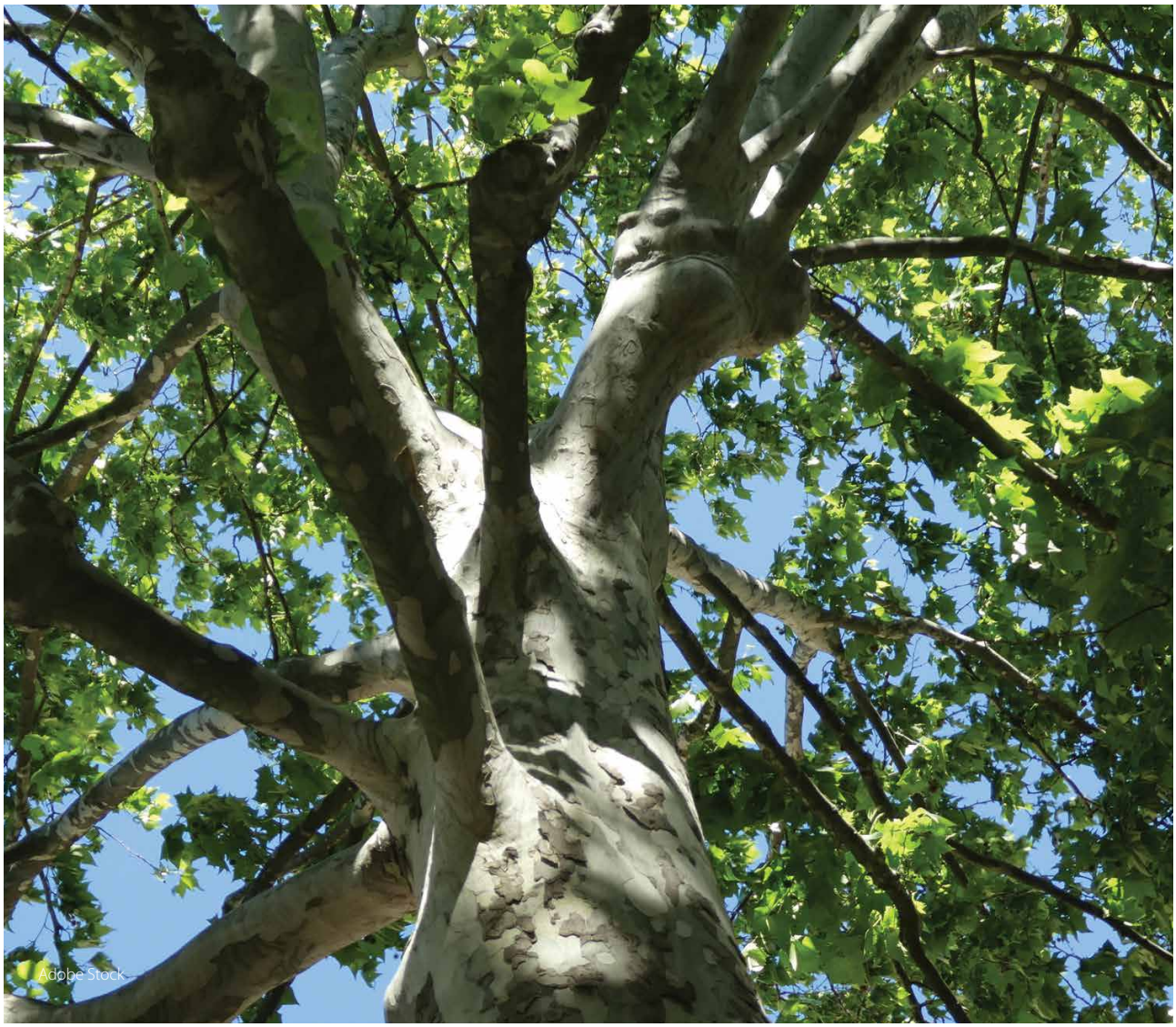
Integrating food trees into urban settings as valuable components of urban forests, parks, and gardens, despite the challenges posed by limited space, offers a **wide range of ecosystem services beyond food provision.** These trees help filter pollution, support local wildlife, and create spaces for social interaction and tourism, enhancing the cultural landscape. Additionally, they can stimulate new economic opportunities that may not have existed previously.

Even if urban food trees contribute to a limited extent to feeding people in cities, they **enhance the experience of reconnecting with nature**, community, experiences, and culinary discoveries of an assortment of fruit and nuts picked from the food tree garden. Schools can bring children closer to nature through urban food tree projects as hands-on learning opportunities for children to understand how food grows and

the importance of caring for trees. This hands-on experience can foster self-sufficiency, sustainability, and resilience of this and future generations. The motivations collected by Backyard Forest Project in South Florida (USA) from homeowners who grow food forests in their yards resonate with many of us: …*"To feed ourselves and share with our neighbors; to control what chemicals we ingest or are exposed to; to allow us to reduce our dependence on food stores and forestall supply chain breakdowns such as occurred during Covid-19; and to sustain a rotating cycle of foods that can produce a steady and reliable source of food year-round."*

Overall urban food trees play a crucial role in improving a city's quality of life and resilience. They **are central elements in achieving local, national and international climate action and biodiversity goals**, arborization, and soil conservation objectives. Urban food trees can play a pivotal role in shaping a greener, more self-sufficient, and resilient future. As Sarah Lovell (2020) from the Centre for Agroforestry at the University of Missouri Columbia (USA) states, "*With a visionary model built on realistic outputs, we might reimagine a 'garden city' for a variable and uncertain future*".

As integral parts of the greening of cities **urban food trees can reconnect urban and peri-urban regions with their rural counterparts,** valuing their landscapes, habitats, and diverse products. This approach fosters integrated green infrastructure planning, reinforcing green corridors and socio-ecological networks. When carefully planned, maintained, and supported, these projects offer **a model for a new kind of urbanism that prioritizes ecological harmony, community well-being, and a sustainable relationship between humans and the environment**.


Adobe Stock

ANNEX

This part of the study showcases successful examples of urban food tree integration from around the world. These case studies, allow to identify opportunities, challenges, and best practices for implementing similar initiatives.

The listed initiatives and case studies were provided by urban forestry experts. The contributors are solely responsible for the accuracy and veracity of the information presented within each case study. The source of the photos should be attributed to the respective contributors.

Overview of the case studies

1. Community Grove Catherine Strong Splash Park
Delray Beach, Florida, USA

2. Urban Orchard (at Sara Sims Park)
Boynton Beach, Florida, USA

3. Urban Orchard (at St Matthews's)
Boynton Beach, Florida, USA

4. Free Tree Give aways Initiative
Palm Beach & Broward County, Florida, USA

5. Backyard Forest Project
South Florida, USA

6. Julafarr Enterprise Garden,
Kombo East District, West Coast Region, The Gambia

7. Naga City Ecology Park
Naga city, Bicol Region, Philippines

8. Dubai Expo City Farm
Dubai, United Arab Emirates

9. Picasso Food Forest
Parma, Italy

10. Amman Sanctuary
South Amman, Jordan

11. School forest gardens
São Paulo, Brazil

12. Ecoquartier Les Vergers
Meyrin, Geneva, Switzerland

13. Orchard garden concept
Beşiktaş District, İstanbul, Türkiye

Source: Community Greening

1. THE COMMUNITY GROVE

(Catherine Strong Splash Park,
Delray Beach, Florida, USA)

Overview

- **Location:** Catherine Strong Splash Park in Delray Beach, FL (1650 SW 6th St, Delray Beach, FL 33444)
- **Type of climate**: Warm climate, Hardiness Zone – 10b.
- **Species planted**: Asian persimmon, avocado, barbados cherry, black sapote, canistel, guava, jack fruit, lychee, mamey sapote, mango, papaya, sapodilla, soursop, star fruit, sugar apple, tamarind.

Background and context:

- The Community Grove was created in April 2017 as a collaboration with Community Greening, the City of Delray Beach, TD Bank (TD Green Streets), Arbor Day Foundation, the Grass River Garden Club, and community volunteers.
- It turned a vacant lot and dumping ground into a vibrant urban orchard, which is open to the community and free for neighbors to pick from. The property is owned by the City of Delray Beach and maintained by both Community Greening and the City.
- In addition to the numerous fruit trees, Community Greening installed tiki huts and picnic tables, as well as helped to commission a mural featuring two respected elders of the neighborhood.
- The Community Grove, which was once an illegal dumping ground, is now a gorgeous greenspace the entire community is proud of. The Community Greening Youth Tree Team uses The Grove as their pick-up & drop-off location.
- It was also given the Outstanding Urban Forestry Program award by the Florida Urban Forestry Council in 2022.

Challenges and impacts

- It is providing fresh fruit to local residents. The fruit is constantly being picked and not wasted.
- The Community Grove is located in a Justice40 neighborhood, (meaning 40 percent of the overall benefits of certain Federal climate, clean energy, affordable and sustainable housing, and other investments flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution), with low tree canopy.
- Partnering with the City of Delray has also helped with maintenance and upkeep, by allowing the trees to be placed on irrigation.
- Being a public space, there are issues of keeping it clean and people causing damage, but with regular upkeep, it has remained a vibrant space that is cared for by all groups – Community Greening, the City of Delray, and neighborhood residents.

Community Greening

Web: www.communitygreening.org

Social: @communitygreening

Source: Community Greening

2. URBAN ORCHARD

(Sara Sims Park - Boynton Beach, FL)

Overview

- **Location:** Sims Park in Boynton Beach, FL (118 NW 10th Ave, Boynton Beach, FL 33435)
- **Type of climate**: Warm climate, Hardiness Zone – 10b
- **Species planted:** Avocado, barbados cherry, canistel, fig, guava, jaboticaba, jack fruit, june plum, loquat, lychee, mamey sapote, mango, papaya, sapodilla, soursop, star fruit, sugar apple.

Background and context:

- The Urban Orchard at Sara Sims Park was created in March 2020 as a collaboration with Community Greening, the City of Boynton Beach, Community Foundation of PBC & Martin County, Healthier Boynton, and community volunteers.
- It turned a vacant lot into a vibrant urban orchard, which is open to the community and free for neighbors to pick from. The property is owned by the City of Boynton Beach and maintained by both Community Greening and the City.
- In addition to the numerous fruit trees, Community Greening installed a tiki hut and picnic tables.
- The Urban Orchard is located is in a Justice40 neighborhood, with low tree canopy.

Challenges and impacts

- It is providing fresh fruit to local residents. The fruit is constantly being picked and not wasted.
- There have been minor issues with trash, as well as some pest/disease/faulty irrigation that has caused trees to have died and need replacing over the years.

Community Greening

Web: www.communitygreening.org

Social: @communitygreening

Source: Community Greening

3. URBAN ORCHARD

(St. Matthew's Episcopal Church Boynton Beach, Florida, USA)

Overview

- **Location:** St. Matthew's in Boynton Beach, FL (404 SW 3rd St, Delray Beach, FL 33444)
- **Type of climate**: Warm climate, Hardiness Zone 10b
- **Species planted**: Avocado, guava, kumquat, mango, mulberry, sapodilla, soursop, star fruit, sugar apple.

Background and context:

- The Urban Orchard at St. Matthew's was created in February 2022 as a collaboration with Community Greening, Thrive Collective, The Set, St. Matthew's Church, and community volunteers.
- It transformed a dilapidated plot of land behind the church into a vibrant urban orchard featuring fruit trees and vegetables for the congregation members to pick from and use in their community kitchen.
- In addition to the numerous fruit trees, Community Greening installed a tiki hut and picnic tables.
- The Urban Orchard is located is in a Justice40 neighborhood, with low tree canopy.

Challenges and impacts

- It provides fresh fruit for the church and its members.
- The grant money also helped to pay for the church to hire someone to water and maintain the orchard.

Community Greening
Web: www.communitygreening.org
Social: @communitygreening

Source: Community Greening

4. COMMUNITY GREENING

Free tree giveaway initiative

(Palm Beach & Broward County, Florida, USA)

Overview

- Community Greening conducts Free Tree Giveaways throughout Southeastern Florida (Warm climate, Hardiness Zone 10a-11a).
- Participants meet at a pre-advertised location on a specific date/time, and they can take home free trees to plant at their home.
- Giveaways include both native shade trees and fruit trees, with multiple species options so recipients can select the right tree for their particular needs and location.
- Fruit tree species distributed: Avocado, barbados cherry, caimito, canistel, guava, jack fruit, june plum, mango, miracle fruit, mulberry, nance, papaya, soursop, star fruit, sugar apple, tamarind.

Background and context:

- Community Greening distributes thousands of trees each year to residents throughout Southeastern Florida.
- A typical giveaway distributes 150-300 trees in a single morning (giveaways are half native, half fruit species).
- Each tree comes with a tag with details on that specific species, as well as general planting and maintenance guides.
- Allows people to begin their own private food forest at their home.
- Giveaways are typically funded through Municipal Tree Planting Campaigns or by corporate sponsors.

Challenges and impacts

- Giveaways are an ideal way to get large numbers of trees in the ground quickly and utilize private property – as planting on public grounds is limited and comes with more logistical planning and bureaucracies.
- Giveaways are often held in areas with low canopy to help draw residents of these neighborhoods. Targeted marketing is also used to recruit recipients from the most needed locations.
- The downside of giveaways is the lack of control. Despite providing information guides, we can't guarantee trees will be planted and cared for exactly as they should be.

Community Greening

Web: www.communitygreening.org

Social: @communitygreening

5. FOOD FOREST PLANTING FOR URBAN SINGLE-FAMILY HOME PROPERTIES

(South Florida, USA)

Overview

- **Location**: Broward County, Florida, United States of America;
- **Type of climate**: USDA Plant Hardiness Zone 10b Temperature 35-40 degrees Celsius; Humid Subtropical Climate
- **Species planted (Alphabetical by common name)**: Avocado (*Persea Americana*), banana (*Musa spp*), coconut palm (*Cocos nucifera*), cocoplum (*Chrysobalanus icaco*), grapefruit (*Citrus x paradise*), guanabana/ soursop (*Annona muricata*), kumquat (*Kumquat*), loquat (*Eriobotrya japonica*), mulberry (*Morus spp*), peach (*Prunus persica*), ponderosa lemon (*Citrus x pyriformis*), starfruit (Averrhoa carambola), strawberry tree (*Muntingia calabura*). NOTE: While banana plants are not technically a tree but considered an herb or shrub, they are included.

Background and context:

- Private single-family home on more or less 0.3 acres (12000 Sq m.) in size with substantial green spaces in the front of and sides of the lot that have appropriate planting areas, e.g. no overhead power lines, room for canopy spread, and no interference with infrastructure such as sidewalks.
- Purposes: Food for owners and sharing with neighbors; healthy food supply; reduced dependence on food stores and forestall supply chain breakdowns (see Covid-19 disruptions); and sustaining a rotating cycle of foods that can produce a steady and reliable source of food year-round.
- Self-managed plans: (1) To add desirable species as they become available. (2) to plant trees correctly and give them on-going establishment care to ensure they survive and thrive. (3) to study all species to learn proper training and pruning needed for maximizing health, growth, and crop production.
- Private homeowners supply all labor and financial investments, including: (1) purchase of trees. (2) purchase and maintenance of tools. (3) irrigation when needed (hoses and oscillating sprinklers necessary because of frequent periods of drought (4) adding value to the home food forest investment through work such as keeping growing areas weed free and pest free without chemicals, regular pest scouting, training/ pruning the trees to promote heathy growth and produce a maximum harvest, and branch and debris removal. (5) composting fruit and vegetable scraps and apply mature compost to the trees.

- Practical and contextual considerations: Food forest tree crops are not just fruits. Leaves, bark, twigs, sap, and roots are the edible parts of many trees. The guanabana leaves for example are made into a tea that is highly valued for its nutritional and medicinal properties. Knowing if trees produce fruit determinately (D) or indeterminately (ID) is very important. Also, some trees produce fruit more or less all at once over a short period of time; Other trees produce fruits somewhat continuously throughout their growing period. Making the crops a staple part of the diet means that when trees are planted, one needs to learn new skills to safely preserve the harvest, such as canning, dehydrating, freezing, etc., so the crop is not wasted. There can be opportunities to sell or barter crops in case of surplus. Public education programs/ resources that are free and readily available can help in all aspects of food forest tree planting.

Challenges and impacts

- Challenges: It is hard to prevent urban wildlife such as raccoons, lizards, opossums, and rats from damaging and consuming crops. In South Florida, crop theft is very common. Two examples are coconuts and mangoes. It helps to plant trees in the interior of a fenced yard, to plant less well-known trees in open sections of the property and/ or ones bearing crops not sought after commercially. The location is subject to alternating droughts and deluges, so too much or too little water has an impact. Achieving a good crop without the use of chemicals takes skill, experience, and patience for success.
- Social and food resilience impacts were tested during the Covid-19 crisis but brought together neighbors and communities to share shared tree food crops, seeds, and cuttings. The food trees increased bonding over planting and nurturing the trees.
- Currently there are no specific policy incentives for homeowners. Constraints for planting and sustaining similar urban food trees projects would be as follows: (1) Compliance with any applicable government codes where the property is located. (2) Not planting prohibited non-native invasive tree species that cause harm to the environment. (3) Always having an underground locating service come to locate buried utilities before doing any digging. In the US, there is a special service number to get the needed information. Digging can be dangerous.
- In conclusion, private food forest tree plantings can be of great benefit for people, communities and the planet.

Earth Advisors, Inc.
www.earthadvisors.com

Source: Ebrima Jarju

6. JULAFARR ENTERPRISE GARDEN

(Kombo East District, West Coast Region, The Gambia)

Overview

- **Location**: Amdalie Village, West Coast Region of The Gambia.
- **Type of climate**: The climate in the region is typically tropical.
- **Species planted**: The garden features a variety of tree and plants species including oranges, bitter tomatoes, pepper and tomatoes.

Background and context:

- **Owner**: Sambujang Darboe
- **Main purposes**: Creation of self-employment, creation of employment opportunities for youths, contribute to food supply, mitigation of climate change.
- **Management:** the garden is fully managed by Sambujang Darboe himself and two employees.
- **Resources invested:** personal support from GYIN Gambia and Roots Project Gambia.
- Sambujang Darboe's initiative in establishing the garden serves multiple purposes, including addressing unemployment issues, promoting sustainable agriculture, and contributing to climate change mitigation efforts. The support from organizations such as GYIN Gambia and Roots Project Gambia highlights the collaborative nature of the project and its potential impact on the local community and environment. This initiative not only focuses on economic empowerment but also aligns with broader goals of environmental sustainability and social development in the region.

Challenges and impacts

- Limited resources: the limited resources available to Sambujang Darboe and his team may hinder the expansion and sustainability of the project.
- Market Access: Accessing markets for the produce may pose a challenge, affecting the profitability and growth of the initiative.
- Climate change vulnerability: Climate change may pose risks to crop production, highlighting the need for resilience strategies.
- Skill development: ensuring that employees have the necessary skills and training for efficient management of the garden poses a challenge.

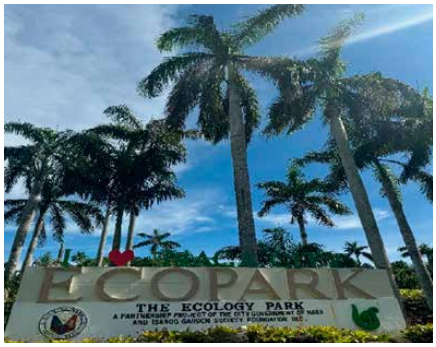
Impacts on Social Resilience

- Employment Opportunities: The project has created employment opportunities for both Sambujang Darboe and local youths, contributing to poverty alleviation and economic empowerment.
- Skill Development: Through managing the garden, individuals are gaining valuable agricultural and entrepreneurial skills, enhancing their long-term employability.
- Community Involvement: The project fosters community involvement and collaboration, strengthening social bonds and promoting a sense of shared purpose.
- Self-Employment: By creating a platform for self-employment, the garden empowers individuals to pursue entrepreneurial endeavors.

Impacts on Food Resilience:

- Local Food Production: The project contributes to local food production, enhancing food security and reducing reliance on external sources.
- Diversification: By growing a variety of crops, the project promotes dietary diversity among community members, improving nutrition and health outcomes.
- Climate Change Mitigation: The focus on sustainable agriculture practices in the garden contributes to climate change mitigation efforts, building resilience in the face of environmental challenges.
- Economic Stability: The project enhances economic stability by increasing food supply within the community, reducing vulnerability to external market fluctuations and food shortages.

Social media : https://www.facebook.com/sambujang.darboe.940?mibextid=ZbWKwl



Source: Maricel C. Macaraig, 2024

7. NAGA CITY ECOLOGY PARK

(Naga city, Bicol Region, Philippines)

Overview

- **Location**: May Palacio Drive, Zone 7, San Felipe, Naga City.
- **Type of climate**: Tropical wet and dry climate (Type II and IV)
- **Species planted:** Fruit bearing trees: Pili, java plum, jackfruit, rambutan, mango, blackberries, breadfruit, soursop, wax apple, cucumber tree, sapota, camachile, neem tree, papaya, coconut. Timber tree: mahogany.

Background and context:

- The Naga City Ecology Park is a partnership project of the City Government of Naga and Isarog Garden Society Foundation, Inc.
- Naga City Ecology Park advocates the importance of planting more trees especially fruit-bearing ones which can provide food for the general public. It also promotes the proper care and upkeep of the general wellbeing of the environment for generations to come. It prides itself on being an urban oasis in Naga City providing an alternative recreation place for Nagueño families and organizations that need a venue for gathering and enjoying nature in an urban setting.
- The park is being managed and maintained by Isarog Garden Society Foundation Inc. with a lot of area of 3.7 hectares that was donated to the Local Government Unit of Naga.
- The park derives its financial capacity from different avenues such as income generated from entrance fees and rentals of venue; donations from other organizations or private individuals; and contributions of members of Isarog Garden Society Foundation, Inc.
- The park has its set of rules and regulations which basically encompasses respect and continuous nurture for the environment. It has also provided restrictions for park visitors and practical considerations are observed in the park such as the habit of clean-as-you- go, throwing garbage in the trash bins provided, and no picking or stepping on the plants. However, visitors can freely avail themselves of fruits borne by trees planted in the park premises.

Challenges and impacts

- The park has become a landmark for Nagueños and also of others residing in and outside Naga City who intend to gather in the park for socialization, at times for educational purpose as well.
- With the availability of fruit-bearing trees in the park, seasonal harvests are possible and visitors get to enjoy these fruits for free while staying at the park. Some of these fruits are not even readily available in the market and with the increasing prices of these commodities, it becomes a pleasure to know that these fruits are a pick away from the trees in the park.
- In sustaining the project for urban food trees, the City Government of Naga through the City Environment and Natural Resources Office (ENRO) has budget allocated to provide for the additional funding for the salaries of workers of the park. This is to ensure the continuous operation and maintenance of the city's only urban park.

Isarog Garden Society Foundation, Inc.
Email: nagacityecologypark78@gmail.com
Facebook Page: Naga City Ecology Park

Source: Odyssey Global Media

8. DUBAI URBAN FOOD GARDEN

(Dubai Expo City Farm, Dubai, UAE)

Overview

- **Location**: Dubai Expo City 2020
- **Type of climate:** Arid desert climate
- **Species planted:** date palm trees, root vegetables, carrots, beetroot, fennel, radish, leeks, lettuce iceberg, romaine, herbs, mint, coriander, parsley, basil, rosemary, pumpkin, tomatoes, eggplant, bell peppers capsicum, fungi mushroom, desert varieties plants such salicornia.

Background and context:

- Expo City Farm features 5 components and 2 technologies delivered in collaboration with local and international partners. Outdoor Organic Farm - Emirates Bio Farm and Emirates Bio Fertiliser
  - Indoor Hydroponics Farm - Alesca Life; Mushroom Farm - Below Farm; Workshops and Talks - Expo City Dubai; Farm Café; Biochar Plot - A Healthier Earth; Air to Water Technology - AirJoule, Montana Technologies.

Main purposes

- Increase access to fresh, nutritious produce in the city; demonstrate sustainable urban farming practices; educate the community about growing food locally.

Resources invested: Funded through a combination of municipal grants, private donations, and community fundraising; Staffed by a mix of paid urban farmers and volunteer community members

- As an extension of Expo City Dubai, the urban food garden prioritizes accessibility with well-maintained ramps, tactile guide paths, induction loops, and adjustable tables for our cooking classes. Commitment to an inclusive experience for all.

Challenges and impacts

Social and food resilience impacts

- Increased food security and access to healthy, affordable produce for local residents
- Greater community engagement and social cohesion through volunteer opportunities
- Educational programming that teaches urban agriculture skills and environmental sustainability
- Potential to inspire similar urban farming initiatives in other neighborhoods

Policy incentives for sustaining the urban food trees project

- Municipal policies that provide funding or other support for urban agriculture
- Zoning regulations that allow and encourage urban farming in designated areas
- Public-private partnerships that leverage resources and expertise

Web: www.odysseyglobalmedia.com
Social: @odysseyglobalmedia

Source: Fruttortiparma

9. PICASSO FOOD FOREST

(Parma, Italy)

Overview

- **Location**: Via Marconi, Parma, Italy
- Public green area of about 0.5 ha
- **Type of climate**: The climate zone corresponds to zone 8 of the USDA classification characterized by hot summers and cold and rainy winters. In recent years, mild winters and extreme rainfall and drought events in unusual periods seem to occur more frequently due to the ongoing climate change
- **Species planted:** Over 200 varieties of edible plants including fruit trees and shrubs, officinal and aromatic plants. Over 30 autochthone aquatic species in the wildlife pond and bog garden, most of which are edible. In addition, there are over 100 different species of volunteering plants, many of which are also edible.

Background and context:

- The project was initiated in 2012 by an informal group of citizens named Fruttorti di Parma. Since October 2020, Fruttorti di Parma has become one of the projects of the NGO Parma Sostenibile, aimed at promoting better urban green management practices and active citizenship in caring for public spaces. As the Picasso Food Forest is located on a public green area, Parma Sostenibile signed a contract of free use of the area with Parma Municipality and a collaboration pact that defines the objectives of the project and the activities that will take place in the area.
- Experimenting with the food forest model for food production, creating a plant and animal biodiversity hotspot in the urban area as well as a community aggregation site in the neighborhood and an outdoor education facility.
- A small group of volunteers (3-4) with occasional help from larger groups (citizens, employees, students) manages and maintains the food forest
- The Picasso Food Forest is managed and taken care of by volunteers of the NGO Parma Sostenibile. Expenses for materials, tools, plants, water bills etc, require an investment of about 2000 euro per year, initially financed by citizens and since 2021 covered by the municipality. The project won also a participatory budget award in 2017 based on which the municipality financed an irrigation system and a small greenhouse. In 2022 winning a small private tender allowed the creation of a 30 sqm wildlife pond.

Challenges and impacts

- Food production is proportioned to the size of the area and provides free fresh fruits and herbs to visiting citizens but not food resilience at large scale coming out of 0.5 ha of land. Very positive is the impact on plant and animal biodiversity and the one linked to the ecosystem benefits they provide. The social and educational impact is high. The area is visited by thousands of people every year including citizens living nearby or far away, families with kids, and elderly people for their daily walk, visiting schools, students and researchers from different parts of the world, tourists etc.
- The main difficulties encountered by the project are engaging volunteers in long term care of the area on one side and scaling the project practices to a wider context on the other. Policies of Parma Municipality have not yet satisfactorily incorporated the good practices successfully prototyped within the Picasso Food Forest.

Fruttorti Parma
Web: www.fruttortiparma.it/foodforest_en.html
Social: @fruttortiparma

Credits: SUGi Project.

10. AMMAN SANCTUARY

(Amman, Jordan)

Overview

- **Location**: Amman, Jordan
- **Type of climate:** Semi-arid
- **Species planted:** Atlas pistachio (*Pistacia atlantica*), carob (*Ceratonia siliqua*), rockrose (*Cistus creticus*), fennel, peach trees.
- **Number of trees:** 2200
- **Size:** 1,000 Sq m.
  In addition to planting a robust Miyawaki forest, this project involves scalable regenerative solutions, biologically enhanced agriculture techniques, and water-efficient farming practices. The forest is designed as a mosaic of a fruit tree orchard, vegetable garden, alternative crops, and native plant habitat.

Background and context:

The initiative:

- Initiative supported by SUGi an NGO, private project.
- Forest Maker: Team TAYYŪN

Main purposes:

- Inspired by the Japanese Satoyama model, this project integrates native wilderness and productive ecosystems.
- The project aims to inspire urban landscapes to become productive, drought-resilient and ecologically diverse.

Management plan of the forest:

- Community
- Local farmers
- Forest maker: Team TAYYŪN

Type of resources invested: private.

Challenges and impacts

- Education and training for local farmers is the key component of supporting the community and ensuring sustainability.
- This project will welcome urban residents, students, and nature enthusiasts through organized visits and workshops, nurturing a deeper connection between people and the environment.

Web: School Forest Gardens | SUGi (sugiproject.com)
Social: www.instagram.com/sugiproject/https://x.com/sugiproject?mx=2
https://www.facebook.com/sugiproject/

Source: SUGi Project, São Paulo, Brazil

11. SCHOOL FOREST GARDENS

(Unified Educational Center, São Paulo, Brazil)

Overview

- **Location**: São Paulo, Brazil
- **Type of climate:** Humid subtropical climate
- **Species planted:** Papaya (*Carica papaya*), passion fruit (*Passiflora edulis*), cape gooseberry (*Physalis peruviana*), cassava (*Manihot esculenta*).
- **Number of Trees:** 435 trees (+600 shrubs, grasses and vines)
- **Size:** 600 Sq m

Background and context:

- The initiative
  - Initiative supported by SUGi (NGO)
  - Supported by private sector FedEx as well as Arbor Day Foundation
  - Forest Maker: formigas-de-embaúba
- Main purposes:
  - Reforestation, biodiversity conservation, food security, while contributing to the creation of generations who will be able to be part of the regeneration of the planet.
- Forest management team:
  - Forest Maker Team: formigas-de-embaúba
  - 3 School Forest Gardens planted
  - The school community is maintaining the forest
- Type of resources invested: Private.

Challenges and impacts

- Located in highly urbanized and low-income neighborhoods, these are important community spaces, providing free access to educational, cultural and leisure activities for local people.
- Connecting children to nature, support children's wellbeing along with that of the planet.
- The creation of these forests is accompanied by a significant 6-month educational programme, thereby amplifying the project's impact.
- Vital public hubs offering free education, culture and recreation. Making essential services accessible.
- Bring back knowledge about the native Atlantic Forest and other species usually present in Brazilians' diets.

Web: School Forest Gardens | SUGi (sugiproject.com)
Social: www.instagram.com/sugiproject/; https://x.com/sugiproject?mx=2; https://www.facebook.com/sugiproject/

Credits: A. Finger-Stich.

12. ARBRES COMESTIBLES *(Eng. Edible Trees)* ECOQUARTIER LES VERGERS

(Meyrin, Geneva, Switzerland)

Overview

- **Location**: Meyrin, Geneva, Switzerland
- **Type of climate:** Continental temperate (altitude 400m, mean annual precipitation 1468 mm/yr.)
- **Species planted:**
  - High stem fruit trees: 7 varieties of apples, 9 of pears, 4 of cherries, 8 of prunes,
  - Low stem fruit trees: 1 type of medlar (*Mespilus germanica*), 3 of peaches, 2 types of quince (*Cydonia*), 3 of apricots (*Prunus armeniaca*).
  - Fruit bearing bushes with *Hippophae*, *Rhamus*, *Ribes nigrum*, *Rubus*, *Corylus*, *Prunus spinosa*, *Rosa Canina*, *Amelenchiers lamarckii*.

Background and context:

- The project is part pf a recent peri-urban housing development "*Quartier des Vergers*" (The Orchads' neighborhood) located in Meyrin, with a dense population and a third of its surface being agricultural land with some forests.
- The housing development covers 14 hectares with 7 ha of fruit trees, sometimes in combination with pasture for sheep, chicken, donkeys and ponies.
- The cooperative Ferme des Vergers is responsible for the planting and valorization of the products. Vegetables for example are given to school cantines or sold in a participatory local grocery store, *La Fève*, or at a weekly local farmers' market. All products are certified Bio Suisse.
- The about 250 fruit trees planted 3-5 years ago are in very good condition. There is sustained watering during periods of drought and high temperatures. While the young trees have not reached maturity yet, the cooperative has already started organizing produce valorization activities, such as juicing or jam making from some plum trees. The farm is very accessible and well connected with local transportation.

The initiative

- Biodiversity and food trees have been a focus in the *Quartier des Vergers* since the project's beginning (as part of a "sustainable neighborhood" concept). The farm-based vision was included with the aim of preserving the area's agricultural heritage, and residents' interest in the neighborhood's own food production. Therefore, the municipality organized a tender for landscape maintenance combined with food production, won by *La Ferme des Vergers* in 2018.

Impacts of the initiative

- The project had great impact on biodiversity (obtaining the Bio Suisse label) and established very good cooperation with the municipality, recycling and upcycling of waste, efficient watering, pruning of trees and hedges, quality of green spaces, and animal welfare.

Main purposes

- The Cooperative works according to the objectives of the FADAER (French Network for Urban Agriculture) and of the Urban Confederation *Réseau de l'agriculture paysanne* and the *Confédédération paysanne*, www.agriculturepaysanne.org.
- The objectives of the urban farm include also public and school education with regular events showcasing food trees. School classes have already been involved in the cooking and valorization activities.

Who is managing and maintaining the food forest?

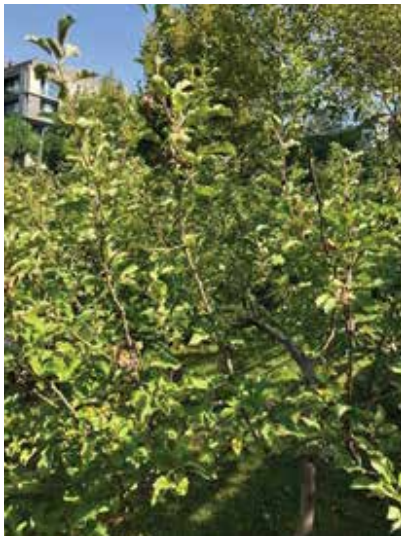
- The Cooperative has a contract with the municipality of Meyrin for managing the entire 14 ha of land, including the built area. The land is partly municipal (47%) and partly private (historically owned by farmers, a Foundation and cooperatives of inhabitants). Currently, the land is managed as one common area, as agreed in a participatory process involving owners, inhabitants and associations.
- The resources invested in planting and in maintenance are from the municipality of Meyrin and the private owners of buildings. The municipality also coordinated the landscaping.
- **Practical and contextual considerations**

  The Municipality of Meyrin applies a differentiated management of its green areas to favor biological diversity and quality landscapes, limit polluting inputs and sustainably manage natural resources (water, wood and organic products and waste). According to the municipality, practical constraints of growing urban food trees include public health risks resulting from possible pollution. Public health concerns also determine the decisions on which trees to plant, where and how to manage access and use of its products.

Challenges and impacts

- The food trees project at *Le quartier des Vergers* is considerably young. Responsibility for the maintenance of the orchard and who gets to harvest for what purpose is still to be decided.
- At the moment, it is planned to educate inhabitants and visitors with labels and QR codes to provide information on the type of tree, fruit, and when and how it can be harvested. Inhabitants should be informed about users' rights and responsibilities, including common and respectful use of the fruit. Rules will also have to address damage as all trees are accessible to the public.
- The impacts on biodiversity still need to be monitored, the regulation of the multiple uses within the open spaces of the settlement need constant adjustments, also with the growing vegetation, and fluctuating needs, as well as increased climate extremes.
- A collateral benefit is that the municipality engages also in the rehabilitation and extension of an urban farm adjacent to the *Ferme des Vergers* with an orchard and public park open to a nearby hospital visitors and Meyrin residents.
- The contract with the municipality provides the resources, including salaries for several professionals working year-round at *Le quartier des Vergers* and its farm. The municipality provides financial support to urban food tree projects through a fund entitled "*Fonds communal pour l'Energie, le Climat et la Biodiversité*" which encourages private, associative and public initiatives in the municipality.

Web: www.fermedesvergers.ch



Source: Diler Çiftçi, 2024

13. AN ORCHARD GARDEN CONCEPT - CASE STUDY OF THE MUNICIPALITY OF BEŞIKTAŞ

(Beşiktaş District, İstanbul, Türkiye)

Overview

- **Location**: İstanbul/Beşiktaş (District), Ulus (Neighbourhood),Ahmet Adnan Saygun Street
- **Type of climate:** Characterized by the Marmara climate type, there are distinct features of a temperate maritime climate. Winters are typically mild and rainy, while summers tend to be hot and relatively dry.
- **Species planted:** 2,060 plants from 54 different species, 1,300 of these are fruit trees.
  Key fruit tree species include: Pear (*Pyrus communis*), quince (*Cydonia oblonga Mill.*), almond (*Prunus dulcis*), white mulberry (*Morus alba*), walnut (*Juglans regia*), laurel (*Laurus nobilis*), green plum (*Prunus domestica subsp. italica*), hazelnut (*Corylus colurna*), jujube (*Ziziphus jujuba Miller*), fig (*Ficus carica*), cherry laurel (*Laurocerasus officinalis L.*), cherry (*Prunus avium*), lemon (*Citrus limon*), mahaleb cherry (*Prunus mahaleb*), maltese plum (*Eriobotrya japonica*), tangerine (*Citrus reticulata*), pomegranate (*Punica granatum*), orange (*Citrus × sinensis*), Japanese crab apple (*Malus floribunda*), cherry plum (*Prunus cerasifera pissardii*), weeping black mulberry (*Morus nigra 'Pendula'*), cherry (*Prunus avium*), grape (*Vitis vinifera*), and olive (*Olea europaea*).
- The park is open 24 hours a day and features promenades, a café, children's playground, and sculptures with no admission fee.

Background and context:

The initiative

- The initiative for the park originated from the Beşiktaş Municipality. The "Orchard Garden Concept" was adopted following a joint decision by the Director of Parks and Gardens (landscape architect), the Deputy Mayor (architect), and the Mayor (architect). The development of the park's café was subcontracted by the Directorate of Public Works, while municipal workers undertook the construction of roads, ramps, and afforestation of green areas. Completed in 2012, the park spans a total of 24,700 m^2.

Main purposes

- The park aims to provide the urban population with a rural experience, allowing them to pick their own fruit.

Who is managing and maintaining the food forest

- The park is maintained and managed by the Parks and Gardens Directorate of Beşiktaş Municipality.

Resources invested

- The construction and maintenance of the park were funded by public funds.

Practical and contextual considerations for the park

- Ulus neighbourhood is located in the Beşiktaş district, on the European Side of Istanbul. Located on the northern shore of the Bosphorus, this region is of historical and cultural importance with various cultural and social events. The urbanization process since the 2000s put significant pressure on its green areas. throughout the entire neighborhood.
- This situation has led to a decrease in biodiversity, natural habitats, and environmental quality. Therefore, recent efforts of environmental protection and sustainable urban planning aim to protect and increase green areas.

Ulus Meyve Bahçesi and its surroundings over the years

- The area is historically renowned for its orchards and agricultural endeavors being once a significant agricultural hub where various farming practices thrived across different neighborhoods. Arnavutköy cultivated strawberries, Etiler and Gayrettepe were known for their mulberry gardens, Karanfilköy boasted flower gardens, Ortaköy and Ulus had orange orchards, and Vişnezade featured cherry gardens. Today, Ulus Meyve Bahçesi preserves echoes of this rich agricultural heritage, offering a space where locals can connect with the past.

Workers collecting fruit from trees in the park

- The park used to be an area where residents could pick fruits from the trees. However, in the last two years, due to an increased social media promotion of "free fruit" the number of picnickers increases during the ripening period of the fruits (June-July). As a result, the park faces problems such as looting of trees, breaking branches and environmental pollution.

Challenges and impacts

Social and food resilience impacts

- The park was established in response to requests from local residents and developed by professionals and municipal experts. A number of fruit trees were already there as part of the green areas. The introduction of the new Orchard Garden Concept led to an increase in the number of trees and a more thoughtful design.
- While urban food forests might improve the sustainability and resilience of urban communities, this park is small in scale, the only one in Beşiktaş and therefore alone cannot significantly affect the food security or resilience in difficult times.
- It serves as an inspiring space for urban fruit growing for visitors who come to enjoy the experience.
- It also serves as a communal space where citizens engage in a variety of activities such as relaxing, dining and socializing and enjoy amenities such as a children's playground, picnic areas and fruit picking opportunities.

Policy incentives and constraints for sustaining the urban food trees project

Beşiktaş Municipality provided that resources for the Ulus Meyve Bahçesi park.

Web: http://en.besiktas.bel.tr

BIBLIOGRAPHY

Agarval A., Ostrom, E., 2001. Collective Action, property rights and decentralization in resource use in India and Nepal, Politics and Society 29 (4).

Albrecht, S., & Wiek, A. (2021). Food forests: Their services and sustainability. Journal of Agriculture, Food Systems, and Community Development, 1, 91-105.

Altieri, M. A. (1995). Agroecology: The science of sustainable agriculture (2nd ed.). Boulder, CO: Westview Press.

Araujo Bernardo: Rio's grassroots agroforestry sustains birds, bees & communities (2024) https://news.mongabay.com/2024/08/rios-grassroots-agroforestry-sustains-birds-bees-communities/?mc_cid=cea81c8b66&mc_eid=b63cb581f3

ATTRA, National Center for Appropriate Technology's. Sustainable Agriculture program. Favor K. (2023). July 2024.

Avampato Christa: Urban ecology that saved Argentina's Rosario held up as a mode for others (2021) https://news.mongabay.com/2021/12/urban-ecology-that-saved-argentinas-rosario-held-up-as-a-model-for-others/.

B+ Dergisi. Kent Kültürü Dergisi. 2021 Yaz. Sayı 33. https://admins.besiktas.bel.tr/storage/images/22NxU6i3uM.pdf.

Bakay, L. (2014). Fruitmap and falling fruit - Tools for mapping urban fruit trees in the city of Nitra. Plants in Urban Areas and Landscape.

Bukowski, C., Munsell, J., & Joy, L. (2018). The Community food forest handbook: How to plan, organize, and nurture edible gathering places. Chelsea Green Publishing. White River Junction, VT.

Borelli, S., Conigliaro, M., Quaglia, S., and Salbitano, F. (2017). Urban and periurban agroforestry as multifunctional land use. Chapter 28 in Dagar J.C., Tewari V.P. (eds). Agroforestry https://doi.org/10.1007/978-981-10-7650-3_28 .

Cardoso, A., S., Domingos, T. (2023). Integrating food provisioning ecosystem services and foodshed relocalisation targets with edible green infrastructure planning. A case study from Lisbon city region. Sustainable Cities and Society, Volume 96, 2023, 104643, ISSN 2210-6707, https://doi.org/10.1016/j.scs.2023.104643.

Castro, J., Ostoić, S. K., Cariñanos, P., Fini, A., & Sitzia, T. (2018). "Edible" urban forests as part of inclusive, sustainable cities. Unasylva, Forests and sustainable cities. Vol. 69 69(250), 59-65. https://www.researchgate.net/publication/324014460_Edible_urban_forests_as_part_of_inclusive_sustainable_cities

Clark, K. H., Nicholas, K. A. (2013). Introducing urban food forestry: A multifunctional approach to increase food security and provide ecosystem services. *Landscape Ecology*, *28*, 1649-1669. DOI 10.1007/s10980-013-9903-z.

Coffey, S.E., Munsell, J. F., Hübner, R., Friedel C.R. (2021). Public food forest opportunities and challenges in small municipalities. Urban agriculture & Regional Food Systems. DOI: 10.1002/uar2.20011.

Crawford, M. (2022). Creating a Forest Garden. Working with nature to grow edible crops. Green Books, Cambridge, England. ISBN: 9781900322621.

Dal Borgo, A.G.; Chiaffarelli, G.; Capocefalo, V.; Schievano, A.; Bocchi, S.; Vagge, I. (2023). Agroforestry as a Driver for the Provisioning of Peri-Urban Socio-Ecological Functions: A Trans-Disciplinary Approach. *Sustainability* 2023, *15*, 11020. https://doi.org/10.3390/su151411020

Dupraz, C. European Agroforestry Federation. INRA Agroforestry Fact Sheet. Based on Dupraz C. and Liagre F. (2008). Agroforesterie, des arbres et des cultures. Editions France- Agricole, Paris, 413 pp.

Evans, D. L., Falagán, N., Hardman, C. A., Kourmpetli, S., Liu, L., Mead, B. R., & Davies, J. A. C. (2022). Ecosystem service delivery by urban agriculture and green infrastructure–a systematic review. Ecosystem Services, 54, 101405, ISSN 2212-0416.

Favor, K., Hemmelgarn, H. and Stubblefield, K. (2023). Urban Agroforestry. ATTRA Sustainable Agriculture program, National Center for Appropriate Technology (NCAT), Missouri.

Finger-Stich A., (2022). Well-Connected Urban Green Infrastructures for More Livable and Resilient Urban Systems. Chapter 14. In Finger M., Yanar N. (edt.), 2022. The Elgar Companion to Urban Infrastructure Governance: Innovations, Concepts and Cases. Cheltenham, Edward Elgar publishing, 238-262. ISBN: 978 1 80037 560 4.

Food and Agriculture Organization of the United Nations, FAO, Agroforestry, https://www.fao.org/agroforestry, August 2024

Gassner, A., Cornelius JP, Dobie P, Mercado A, Mukuralinda A, Okia, C. A., Pinon C., Somarriba E., Thorne P. (2022). Components of agroforestry systems. In Gassner A and Dobie P. eds. Agroforestry: A primer. Design and management principles for people and the environment. Center for International Forestry Research (CIFOR) and Nairobi: World Agroforestry (ICRAF), Bogor, Indonesia. 24–49. https://doi.org/10.5716/cifor-icraf/BK.25114

Jacke, D, Toensmeier, E. (2005). Edible forest gardens: Ecological design and practice for temperate climate permaculture, vol 2. Chelsea Green Publishing Company, Vermont.

Johns Hopkins Center for a Livable Future https://www.baltimorebrew.com/2010/11/05/gingko/. Based on Synk et al. 2017.

Kilchling, P., Hansmann, R., & Seeland, K. (2009). Demand for non-timber forest products: Surveys of urban consumers and sellers in Switzerland. Forest Policy and Economics, 11, 294–300. https://doi.org/10.1016/j.forpol.2009.05.003.

Kusek, W. (2023). Urban Gardens in Poland – How a Polish Tradition Could Inform American City Planning. Rural Insights. 2023. https://ruralinsights.org/content/urban-gardens-in-poland-how-a-polish-tradition-could-inform-american-city-planning/

Lehmann Mølgaard, L., Lysák, M., Schafer, L., Bugge Henriksen, C. (2019). Quantification of the understorey contribution to carbon storage in a peri-urban temperate food forest, Urban Forestry & Urban Greening, Volume 45, 2019, 126359, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2019.06.002.

Lovell, S. (2020). Urban agroforestry and its potential integration into city planning efforts, Urban agriculture & Regional Food Systems DOI: 10.1002/uar2.20000.

Mosquera-Losada, M.R., Santiago-Freijanes, J.J., Rois-Díaz, M., Moreno G., den Herder M., Aldrey, J.A., Ferreiro-Domínguez, N., Pantera A., Pisanelli, A, Rigueiro-Rodríguez, A. (2018). Agroforestry in Europe: a land management policy tool to combat climate change. Land Use Policy 78, 603-613.

Naylor, R. (2009). Managing food production systems for resilience. Principles of Ecosystem Stewardship. Chapin, F.S. (Ed.). Springer, New York, pp. 259-280.

Oberle, B., Bressan, S., McWilliams, J. et al. (2023). Urban food forestry transforms fine-scale soil function for rapid and uniform carbon sequestration. *Urban Ecosyst* 26, 1239–1250 (2023). https://doi.org/10.1007/s11252-023-01384-2

Oncini, F., Hirth S., Mylan, J., Robinson, C. H., Johnson, D. (2024). Where the wild things are: How urban foraging and food forests can contribute to sustainable cities in the Global North. Urban Forestry & Urban Greening, Volume 93, 2024, 128216. ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2024.128216.

Ostrom, E. (2009). A General Framework for Analyzing Sustainability of socio-Ecological Systems. Science 325. 419-422. https://doi.org/10.1126/science.1172133

Park, H., Kramer, M., Rhemtulla, J. M., & Konijnendijk, C. C. (2019). Urban food systems that involve trees in Northern America and Europe: A scoping review. Urban Forestry & Urban Greening, 45, 126360.

Poe, M.R., Mclain, R.J., Emery, M., & Hurley, P.T. (2013). Urban Forest Justice and the Rights to Wild Foods, Medicines, and Materials in the City. *Human Ecology*, *41* :409-422 https://doi.org/10.1007/s10745-013-9572-1

Prosperi, P., Allen, T., Padilla, M., Peri, I. Cogill, B. (2014). Sustainability and food & nutrition security:a vulnerability assessment framework for the Mediterranean region. SAGE Open 4, 1-15.

Roberti, G., von Pfeil, C., Kunzelmann, J., Funke, L., Rutz, T., Kay, S. (2023). Guide de monitoring des systèmes agroforestiers – Méthodes de mesure des effets sur l'environnement. Agroscope. Plateforme Romande d'Agroforesterie et Projet 771 Agroforesterie. ISSN on line : 2296-7230.

Shackleton, C., Hurley, P., Dahlberg, A., Emery, M., Nagendra, H. (2017). Urban foraging: a ubiquitous human practice overlooked by urban planners, policy, and research. Art. 10 Sustainability 9 (10). https://doi.org/10.3390/su9101884.

Synk, C. M., Kim, Brent, F., Davis, C. A., Harding, J., Rogers, V., Hurley, P. T., Emery, M. R., Nachman, K. E. (2017). Gathering Baltimore's bounty: Characterizing behaviors, motivations, and barriers of foragers in an urban ecosystem. Urban Forestry & Urban Greening. 28: 97-102. https://doi.org/10.1016/j.ufug.2017.10.007.

Viljoen A (ed) (2005). Continuous productive urban landscapes: designing urban agriculture for sustainable cities. Architectural Press, Oxford cit in. Clark and Nicholas, 2014.

The Edible City: Why Food Trees Matter

This guide is designed to help local and national officials implement integrated nature-based solutions for enhancing food resilience in urban areas. By strategically integrating fruit-bearing trees, "food trees" into city landscapes, the guide promotes healthier, more sustainable, and shock-resistant urban ecosystems.

While urban forestry and greening initiatives often focus on environmental, social, and economic benefits, the potential of productive trees in urban spaces to strengthen local food systems is frequently overlooked. These trees are often seen as more of a challenge than a solution, and this perception is reflected in urban planning and policies. Despite challenges related to governance, policy, space, and maintenance, these trees offer untapped potential for creating greener, more equitable cities.

The guide's key focus is on developing methodologies to enhance food security through integrated solutions, while also exploring policy frameworks and practical steps for embedding food trees in urban environments. The practical and policy guidance provided in this guide is designed to support collaboration and planning efforts related to the integration of urban food trees. By fostering cross-sectoral collaboration, this resource is intended for policymakers, practitioners, and private sector entities involved in implementing advanced strategies and identifying best practices. The guide aims to facilitate the development of necessary policies and regulatory frameworks to drive progress in this area and establishing sustainable, resilient and food secure cities for all.

Information Service
United Nations Economic Commission for Europe

Palais des Nations
CH - 1211 Geneva 10, Switzerland
Telephone: +41(0)22 917 12 34
E-mail: unece_info@un.org
Website: www.unece.org

Layout and Printing at United Nations, Geneva – 2422244 **(E)** – February 2025 – 76 – **ECE/TIM/DP/99**