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Commentary

The Place of Urban Food Forests in Cities of the 21st Century

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Abstract
The history of urban food forests (UFFs) dates back to ancient times, when civilizations incorporated edible species into wild forests to create an ecosystem as natural as and self-sufficient as possible. Since the second half of the 20th century, the practices of integrating edible plants into ornamental landscapes have spread throughout the world. Currently, UFFs must face a number of challenges similar to those encountered by urban forests: land tenure, governance, technical capacities, and pollution and global change issues, and must be addressed in order to identify the most suitable combination of productive, environmental, and socio-economic functions of UFF. The events on a global scale that occurred in the first decades of the 21st century are forcing those who live and work in urban environments to react quickly to address the upcoming challenges.

Keywords
ecosystem services; edible cities; food forests; food security; urban challenges; urban forests

Issue
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1. Introduction

Food production in urban public spaces is not a new concept. In most civilizations, fruit trees in combination with other plants and crops were commonly found in cities. For instance, fig trees, palm trees, jujube, olive, peaches and pomegranates were common in Egyptian gardens, which are considered "pioneers" in the creation of edible landscapes. The desire for natural features aimed at stimulating the senses filled Islamic gardens with cherries, peaches, almonds, as well as exotic plants as status symbols for royals, such as pears, bananas and apples. The discovery of America made it possible to transfer to Europe the American indigenous peoples ecosystemic approach of edible forests, which incorporated a number of edible species in natural forests taking advantage of the natural ecological processes. The concept of edible gardening was already a reality in the Renaissance, where a typical plot could contain figs, pears, and apples, as well as a selection of vegetables and medicinal plants. This was also the time in which the open air orangeries, dedicated to the plantation of citrus fruits, originated in Italy.

In the 20th century, the practices of integrating edible plants into ornamental landscape spread throughout the world under different names: edible landscaping, edible green infrastructure, foodscaping, urban food commons. More recently, Clark and Nicholas (2013, p. 1652) defined urban food forests (UFFs) as "multiple perennial and annual food-producing species in multistoried arrangements, providing canopy cover while at the same time addressing resident needs such as food security and health." In other words, UFFs are high-yield, low-impact, and low-maintenance cultivation practices inspired by natural forest systems which they attempt to mimic.

2. The Benefits of UFFs

UFFs promote the multifunctional use of green public spaces, as they combine food production with biodiversity conservation, maintenance of ecosystem services, and public services provision. If properly designed, an hectare of mature food forest can provide food for 5–6 people, but species whose edible portion is rich in protein, such as *Phaseolus* spp., *Castanea* spp., *Juglans* spp. are needed to make a UFF-based diet balanced (Nytofte & Henriksen, 2019).

In addition to this, UFFs provide a wide range of direct and indirect benefits to human health: They improve eating habits with the introduction of healthier products, increase the availability and accessibility of healthy food in cities, and improve mental health through the provision of spaces where to practice gardening activities to relax and restore.

UFFs may provide important social benefits by promoting citizen engagement and social cohesion (Borelli et al., 2021) as they have proven to be engines of collective action promoting community revitalization and enabling spaces for education, research, and outdoor leisure (Bukowski & Munsell, 2018). The contribution of UFFs to sustainable urban development is also remarkable in aspects such as promoting sustainable farming methods, recovering forgotten fruit and vegetable varieties, giving added value to public spaces, reducing the cost of maintaining green spaces, and providing a habitat for wildlife.

UFFs also provide the ecosystem services associated with urban forests such as prevention of erosion and generation of soil, support and conservation of biodiversity, regulation of the local water regime, mitigation of the urban heat island effect, and provision of quality public spaces.

3. Supporting the Establishment of UFFs

The establishment of UFFs is still not very widespread. To encourage a wider use of this land use system, urban plans should provide frameworks for implementing land-use regulations in an effective and transparent manner. In particular, they should ensure that green spaces, including areas that are designated for urban UFFs, receive equal attention in the urban planning process as the elements of the built environment. Indeed, green space planning should not be seen as a space for conflict between urban forestry, urban agriculture, and urban recreation but rather as an opportunity to create multifunctional spaces maximizing benefits to urban dwellers.

Quality governance of green spaces also requires that the city administration has a solid vision of how natural resources should be managed and that technical municipal services have the necessary skills and knowledge on the establishment and management of UFFs. It is also essential that the community is empowered to actively participate in the governance process. Depending on the local conditions, governance can follow different models ranging from full self-governance of land users to a more comprehensive governmental regulatory framework.

Urban pollution is also a concern. The chronic exposure of UFF to high soil- and air-borne pollution load has raised concerns about the safety of food produced in urban areas (Gori et al., 2019). However, although uptake and translocation of heavy metals from the soil to above-ground organs has been reported for several plant species (Samsøe-Petersen et al., 2002), most heavy metal accumulation by woody plants occurs in other organs than the fruit (Gori et al., 2019), which makes them generally safer for urban consumption than food produced by non-woody crops (von Hoffen & Säumel, 2014). Also, chronic exposure to air-borne particulate matter can lead to fruit contamination because of atmospheric deposition of pollutants. However, as most of available knowledge is based on studies focused on individual species, future research should focus on the understanding of heavy metal uptake by complex, multi-layered systems, such as UFFs.

4. Conclusions

The events on a global scale that occurred in the first decades of the 21st century such as pandemics, wars, and exacerbation of extreme weather events are testing the capacity of cities to respond to both natural and anthropogenic impacts. In addition to these challenges, already complex in themselves, urban environments must address a rapid transformation to accommodate the significant migratory flow of people who move to the city in search of better living conditions. One of the priority actions is to guarantee food security to the entire population, allowing equal access to healthy food and promoting healthy lifestyles (Castro et al., 2018).

In this context, UFF stands out as an effective option to address upcoming challenges. Many cities around the world have begun to redesign their food provision model towards more resilient and equitable ones, which minimize the global trade of food and look inside for solutions (Russo & Cirella, 2019). Several initiatives implemented in the Mediterranean region have highlighted the potential that numerous native species of urban trees could have to be part of UFF (Cariñanos et al., 2019). In addition, the role model that UFF has in reconnecting adults and children to healthy eating habits, food growing, and the special experience of foraging and harvesting food directly from the plant in a nature-like setting has been pointed out (Riolo, 2019). The "incredible-edible-Todmorden" initiative in the UK, or that of the French city of Rennes, which has declared its commitment to become an edible city, are just a few examples of strategies ready to be applied. But it is in the United States that UFFss are capturing the most attention from people and neighborhoods. From the Beacon Hill Food Forest in Seattle, to the Brown Hill in Atlanta,

there are more than 70 UFF across the country, in which the connection of people with a forested space where food grows is reinforcing their social sense of place, values, identity, and community.

These initiatives show that urban food forestry is an increasingly widespread practice. However, more effort is needed in identifying the most suitable combination of productive, environmental, and socio-economic functions and in designing the most effective mosaic of "green" land uses suited to the different conditions of individual cities. It is therefore time to take action and rethink and redesign urban green spaces, using UFFs as a strategy towards a safer, more inclusive, resilient, economically and environmentally sustainable city model.

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Conflict of Interests

The authors declare no conflict of interests.

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