

Cultivating Sustainability: The Role of Edible Landscapes in Improving Environmental Quality

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Abstract

The rapid expansion of urban environments and the subsequent degradation of ecological health necessitate innovative approaches to landscape management. While traditional urban forestry emphasizes ornamental species, there is a growing body of evidence supporting the integration of fruit-bearing trees into public and private green spaces. This article examines the multifaceted advantages of incorporating fruit trees into environmental design, comparing their ecological and socioeconomic impacts against conventional ornamental vegetation. By analyzing the structural classifications of fruit trees, their physiological benefits, and the integration of water-efficient ground covers—such as the *Talinum triangulare* (waterleaf)—this paper provides a framework for transforming urban landscapes into productive, sustainable ecosystems.

Introduction

Urban vegetation serves as a critical buffer against the adverse effects of industrialization, including the urban heat island (UHI) effect, carbon emissions, and biodiversity loss. Traditionally, urban planning has favored non-fruiting ornamental trees due to concerns regarding maintenance and "litter." However, this approach neglects the potential for urban environments to contribute to food security and ecological resilience. The deliberate selection of fruit trees for reforestation and landscape design offers a dual-purpose solution: improving environmental quality while providing tangible resources for human populations. This paper explores the morphological, physiological, and socioeconomic benefits of fruit trees, advocating for a shift in urban forestry paradigms.

Defining Fruit Trees: Biological and Functional Perspectives

Fruit trees are woody perennial plants characterized by the production of fleshy or dry structures that contain seeds and are derived from the ovary of a flowering plant. From an environmental standpoint, fruit trees are distinct from "normal" (non-fruiting/ornamental) trees primarily in their reproductive investment. While ornamental trees allocate energy toward structural growth and leaf density, fruit trees distribute significant metabolic resources toward the production of nutrient-rich fruits.

These trees are categorized into several size classes, which dictate their suitability for different urban niches:

1. Dwarf Varieties (2–3 meters): Ideal for residential courtyards and container gardening; they provide ground-level cooling and facilitate easier harvest.

2. Semi-Dwarf Varieties (4–6 meters): Suitable for suburban lawns and community school gardens; they offer a balance between shade canopy and human accessibility.

3. Standard/Full-Size Varieties (8+ meters): Best utilized in public parks and peripheral reforestation projects; these provide the most significant carbon sequestration and wildlife habitat potential.

Comparative Analysis: Fruit Trees vs. Ornamental Trees

The discourse on urban greening often pits fruit-bearing species against ornamental ones. To understand why fruit trees should be favored, one must weigh their comparative advantages:

1. Biodiversity and Wildlife Support

Ornamental trees often provide limited ecological value, sometimes functioning as "green deserts." In contrast, fruit trees offer a predictable seasonal food source for pollinators, birds, and small mammals. By fostering a trophic cascade, fruit trees support a broader spectrum of urban wildlife, which in turn aids in pest management and pollination services.

2. Socioeconomic Value and Community Engagement

The "edible landscape" movement posits that when citizens are involved in the cultivation of their environment, they show greater stewardship toward it. Fruit trees turn public spaces into communal assets, combating food insecurity in urban "deserts" and fostering a sense of shared responsibility for plant health.

3. Ecological Resilience

Many fruit tree species are evolutionarily adapted to utilize diverse soil conditions and often possess deeper root systems than smaller ornamental shrubs, promoting better soil aeration and water infiltration.

Integration with Waterleaf (*Talinum triangulare*) Lawns

A critical challenge in urban vegetation management is water conservation. Traditional grass lawns are notorious for high irrigation requirements and lack of ecological functionality. An innovative solution is the replacement of conventional turf with *Talinum triangulare*, commonly known as waterleaf.

Waterleaf is a succulent, fast-growing herbaceous plant that thrives in the understory of fruit trees. Integrating waterleaf as a ground cover offers several environmental benefits:

- **Moisture Retention:** The thick, fleshy leaves of the waterleaf act as a living mulch, reducing soil evaporation and keeping the root zones of fruit trees cool.
- **Nutrient Cycling:** Waterleaf biomass decomposes rapidly, enriching the topsoil with organic matter, which enhances the productivity of the fruit trees.
- **Water Efficiency:** Waterleaf requires significantly less consistent irrigation than standard grasses, aligning with the principles of xeriscaping while maintaining a lush, green aesthetic.

Environmental Impact: Carbon Sequestration and Microclimate Regulation

The primary argument for planting trees remains their ability to mitigate climate change. Fruit trees perform photosynthesis at rates comparable to, and in some cases exceeding, their ornamental counterparts due to the intensive metabolic activity required for fruit production.

Furthermore, the canopy cover provided by fruit trees reduces the UHI effect. By shading pavement and building surfaces, fruit trees reduce the solar heat gain of urban structures. The transpiration process in fruit trees—particularly those with broader leaf surface areas like *Mangifera indica* (Mango) or *Citrus* species—actively cools the surrounding air, creating microclimates that reduce the energy demand for air conditioning in adjacent buildings.

Challenges and Mitigation

Despite the benefits, critics emphasize the "messiness" of fruit trees and potential waste management issues. However, these are largely design challenges that can be addressed through:

- **Site-Specific Selection:** Choosing sterile varieties or fruit trees with smaller, less persistent yields for high-traffic pedestrian areas.
- **Maintenance Programs:** Implementing community-led harvesting programs to ensure that fruit is harvested before it decomposes, thus preventing sanitary issues and pest proliferation.
- **Strategic Placement:** Planting fruit trees away from sidewalks and parking structures to minimize infrastructure damage or staining.

Nigeria hosts a rich variety of fruit trees, including mango, pawpaw, citrus, guava, almond, and plantain, many of which are cultivated for both household consumption and commercial purposes.

Commonly Cultivated Fruit Trees

Mango (*Mangifera indica*): One of the most popular tropical fruits in Nigeria, it thrives in warm climates and is widely grown in backyards and orchards. The fruit is rich in vitamins A and C and is consumed fresh or processed into juices and desserts

Pawpaw (*Carica papaya*): Known for its antioxidant content, pawpaw grows well in southern Nigeria's humid conditions. It is both a food and medicinal fruit, supporting digestion and skin health

Citrus Trees: This includes oranges, lemons, and tangerines, which are distributed widely across Nigeria. Citrus fruits are a major source of vitamin C and are cultivated extensively for juice production and commercial sale

Guava (*Psidium guajava*): An evergreen fruit tree cultivated in many regions, guava offers a sweet, vitamin-rich edible fruit. It is also used in local beverages and has medicinal properties

Almond Tree (*Terminalia catappa*): Known locally for its protein- and fiber-rich fruit, the tropical almond is often planted in school compounds and home gardens. Its edible seeds and nuts have high nutritional value

White Star Apple (*Gambeya albida*): Called Agbalumo in Yoruba and Udala in Igbo, this fruit tree is native to West Africa and is commonly cultivated in home gardens. It bears sweet, forest-fruit-style edible fruits

Red Mombin (*Spondias mombin*): Known regionally as iyeye, the red mombin is oval shaped and rich in vitamins and minerals. It is valued for improving and supporting nutrition

Red Monkey Kola (*Cola acuminata*): Locally called Obi Eḍun, this tree produces reddish seeds used traditionally for medicinal and nutritional purposes. It supports metabolism and bone health

Plantain and Banana: Widely grown in southern Nigeria, these trees provide staple foods rich in carbohydrates. They are propagated vegetatively for uniform yield and play a crucial role in household diets and local markets

Pineapple (*Ananas comosus*): Although technically an herbaceous plant, pineapple "trees" are cultivated in many regions for their sweet, vitamin-rich fruit, contributing to both home consumption and commercial production

Other Notable Fruit Trees

- **Cashew (*Anacardium occidentale*):** Provides both nuts and edible cashew apples
- **African Peach (*Nauclea latifolia*):** Produces edible fruits with local medicinal uses
- **Moringa (*Moringa oleifera*):** Though more famous for its leaves, the fruit is also edible and highly nutritious
- **Kolanut (*Cola nitida*):** Culturally significant as a stimulant and in social ceremonies

Conclusion

The transition toward edible urban landscapes represents a necessary evolution in environmental management. Fruit trees provide a superior return on investment by combining standard ecosystem services—such as carbon sequestration, air filtration, and thermal regulation—with the added benefits of biodiversity support and food self-sufficiency. When paired with sustainable ground covers like *Talinum triangulare*, these trees create self-sustaining, low-maintenance, and highly productive environments. Professional urban planning must move beyond the cosmetic value of trees and embrace the inherent utility of the orchard as the standard for 21st-century environmental design.

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