Harnessing Food Forests for Sustainable Agriculture and Ecosystem Services

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What is a Food Forest?

A food forest is a planting system that mimics the structure and dynamics of a natural forest while focusing on the production of edible or otherwise useful plants. Although there is no universally fixed definition, food forests are typically based on **multilayer polycultures** diverse plant communities designed to function like young woodland ecosystems. They aim to create resilient, self-sustaining systems that combine food production with ecological benefits such as biodiversity enhancement, soil regeneration, and climate adaptation.

FIGURE 1

A key feature of food forests is their vertical structure, usually composed of **seven different layers**, each contributing to the overall productivity and resilience of the system.

The **canopy layer** includes full-sized trees that produce fruit, nuts, or other resources. Examples include walnut (*Juglans regia*), sweet chestnut (*Castanea sativa*), apple (*Malus domestica*), and pear (*Pyrus communis*). These trees provide not only food but also ecological functions like habitat creation, microclimate regulation, and support for beneficial insects and pollinators. Species such as black locust (*Robinia pseudoacacia*) or alder (*Alnus glutinosa*) may be planted for nitrogen fixation or erosion control. Open-crowned trees and adequate spacing are essential to ensure enough light reaches the lower layers.

The **low tree layer** consists of smaller or pruned fruit and nut trees that are easier to manage and harvest. This may include quince (*Cydonia oblonga*), medlar (*Mespilus germanica*), dwarf cultivars of apple (*Malus domestica*), or hazel (*Corylus avellana*). These species are selected and managed to reduce shading and maximize fruit production in smaller spaces.

FIGURE 1. Figure caption

The **shrub layer** sits at around eye level and features fruit-bearing or multifunctional shrubs. Common examples include blackcurrant (*Ribes nigrum*), redcurrant (*Ribes rubrum*), gooseberry (*Ribes uva-crispa*), elderberry (*Sambucus nigra*), and sea buckthorn (*Hippophae rhamnoides*). These shrubs are valuable not only for their edible fruits but also for their role in supporting pollinators and local wildlife.

The **herb layer** includes non-woody perennial and annual plants such as vegetables, herbs, flowers, and dynamic accumulators. Plants in this layer may include wild garlic (*Allium ursinum*), comfrey (*Symphytum officinale*), perennial kale (*Brassica oleracea* var. *ramosa*), chives (*Allium schoenoprasum*), mint (*Mentha* spp.), lemon balm (*Melissa officinalis*), and yarrow (*Achillea millefolium*). These species often support pollinators, improve soil fertility, or provide culinary and medicinal value.

The **ground cover layer** features low-growing plants that spread horizontally, helping to suppress weeds and protect soil from erosion. Edible or multifunctional examples include wild strawberry (*Fragaria vesca*), creeping thyme (*Thymus serpyllum*), and sweet woodruff (*Galium odoratum*). These plants are particularly useful for occupying gaps between larger plants and for reducing maintenance needs.

Below the surface lies the **root layer**, consisting of underground crops and fungi. These include Jerusalem artichoke (*Helianthus tuberosus*), burdock (*Arctium lappa*), chicory (*Cichorium intybus*), horseradish (*Armoracia rusticana*), and fungi such as oyster mushrooms (*Pleurotus ostreatus*) and shiitake (*Lentinula edodes*), often cultivated on logs or shaded beds.

The **vine layer** includes climbing and trailing plants that grow vertically through trees, shrubs, or trellises. This layer maximizes vertical space and may include grapevine (*Vitis vinifera*), hardy kiwi (*Actinidia arguta*), hops (*Humulus lupulus*), and annual vines such as cucumber (*Cucumis sativus*), melon (*Cucumis melo*), and squash (*Cucurbita moschata*).

When these layers are carefully planned and managed, a food forest can provide abundant harvests, ecological services, and habitat for wildlife all while requiring minimal external inputs. The system evolves over time, becoming more productive and resilient as ecological relationships deepen. Food forests provide a regenerative model that reconnects people with nature, an especially vital approach in the face of accelerating climate change and biodiversity loss.

The Importance of Planning, Design, and Management in Food Forests

The planning and design of a food forest are critical to ensuring it functions well as a productive and resilient multilayer agroforestry system. A carefully thought-out layout allows different plant species to complement one another, optimize vertical space, and fulfill ecological roles, all while meeting human needs.

The **goals of the food forest** play a central role in shaping its design. While food production is often the primary objective, the type of products grown and their economic value also influence the system's structure. In addition to edibles, food forests can provide other services and functions such as education, recreation, ecosystem restoration, and biodiversity support that help define design choices. These additional functions often add social and environmental value and can guide species selection, layout, and access design.

Though food forests are typically **low-maintenance systems**, some level of **ongoing management** is still essential to ensure healthy plant growth and sustained productivity. Pruning is a key management activity, particularly in the canopy, low tree, and shrub layers. It helps to maintain airflow and light availability, encourage fruit and nut production, and ensure that each layer performs its intended function. The resulting biomass can be repurposed as mulch, compost material, or firewood.

Weed, pest, and disease management are especially important during the early establishment phase. While weeds are often seen as undesirable, not all non-intended plants are necessarily harmful. Some species may play valuable roles by improving soil structure, breaking up compaction, or enhancing above- and below-ground biodiversity. The goal is not to eliminate all weeds, but rather to manage them within the broader ecological framework of the system.

Other important management aspects include **protection from livestock or wildlife browsing** and fostering conditions that support **natural pest predators**, such as birds of prey, beneficial insects, hedgehogs or amphibians. Encouraging these allies reduces the need for chemical inputs and strengthens the ecosystem services provided by the food forest.

Thoughtful planning, adaptive design, and attentive management are essential for transforming a food forest from concept to thriving reality one that serves both people and the environment.

Opportunities and Challenges

Food forests are increasingly seen as climate-resilient agricultural systems where diverse food production goes hand in hand with ecosystem restoration and biodiversity enhancement. They offer an alternative to conventional agriculture by combining ecological functions with multiple yields ranging from fruit, nuts, herbs, and medicinal plants to honey and mushrooms.

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With the growing demand for **healthy, locally produced food**, food forests are well-positioned to meet consumer interest in sustainable and regional food systems. In addition to providing edible crops, food forests serve as **green oases** that reconnect people with nature and food production. Their layered design and natural aesthetics often invite greater public interest, creating opportunities for **education, recreation, and community engagement**.

However, in Flanders, the **economic model of food forests** often extends beyond food production alone. Given the typically small size of these systems, **commercial yields are usually limited**, and access to agroforestry subsidies is often not possible. As a result, many food forests are structured not as farms but as **non-profit organisations** or community-led initiatives.

Revenue is therefore frequently generated through **diverse income streams**, such as **educational programs, workshops, guided tours, events, volunteer days, and experiential learning opportunities**. These services not only provide income but also strengthen the social and cultural value of the site. In some cases, on-site processing of food products, sales of plant materials, or participation in local food networks can add further income potential.

Despite these opportunities, challenges remain particularly in establishing a **sustainable revenue model** that balances ecological goals with financial viability. Many food forests rely on a mix of **project funding, grants, and volunteer labor**, which can limit long-term financial security. Additionally, the lack of formal recognition or tailored subsidies for small-scale, multifunctional systems presents a structural barrier.

Nevertheless, food forests continue to offer promising potential as **regenerative, multifunctional landscapes**, where income is generated not just from harvests, but also from education, tourism, community involvement, and ecosystem services. Developing more supportive policy frameworks and diversified business models will be key to unlocking their full potential.

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