

Seed Savers Food Forest Training



**Designing, Establishing and Maintaining a
Food Forest**

Introduction

A food forest is at once an ancient and a cutting-edge way to grow your own food – and much more.

Fruit trees, nut trees, berries, vines and vegetables will provide much of the food your family eats. The food forest always has something to eat. In addition, food forests can provide you with timber, firewood, as well as medicine.

The diversity of species in the food forest make it extremely resilient.

The advantages of imitating a forest ecosystem on your farm are many: once established and mature, the food forest generates its own fertility, stores water in the soil throughout the dry season, reduces the number of pests and diseases, and create a beneficial microclimate.

This manual will help you design and maintain your own food forest.

Benefits of a Food Forest



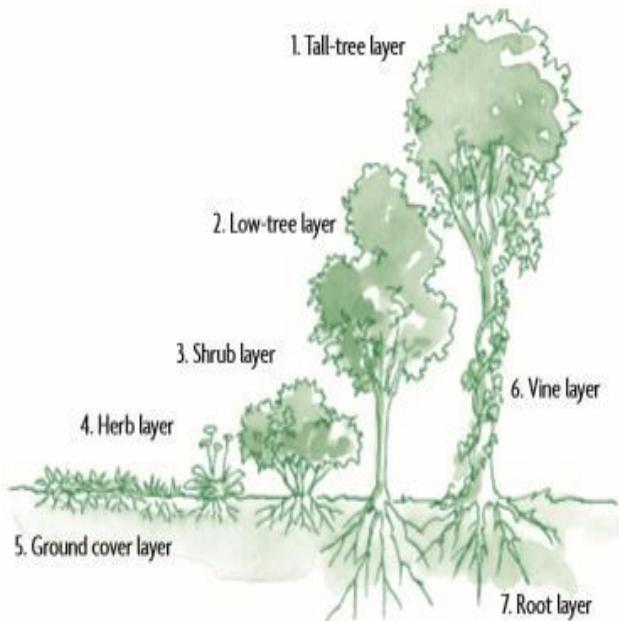
Food forests are nature's way to grow food. By imitating nature, we become ecological gardeners. Over time, our work becomes less. Apart from regular maintenance, we can visit the food forest for pleasure (enjoying the cool shade and breeze), harvest (picking berries and fruits), as well as learning (observing how nature works and teaching visitors).

Some of the key advantages of food forests:

- Grow all the fruits, nuts, food, medicine and timber your family needs
- Share, exchange or sell surplus with others
- Protect and restore the health of the land you are living on
- Be a role model for others so that they can learn how to grow a food forest
- Contribute to the healing of Mother Earth!

Food Forest Key Concepts

The seven layers of food forests



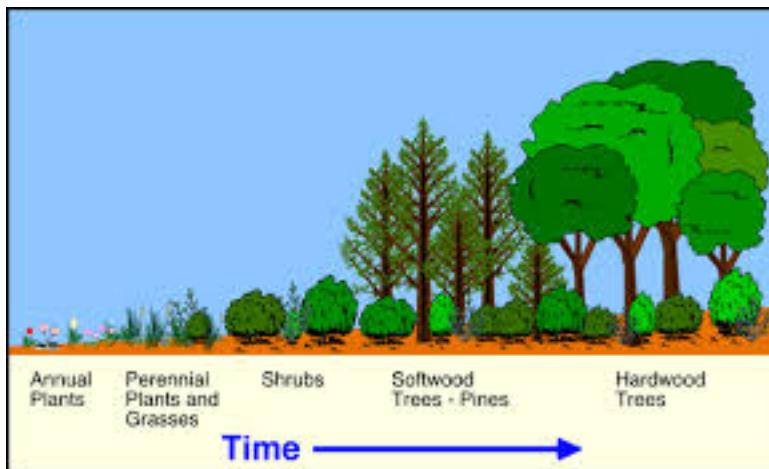
The seven layers of the forest garden.

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Just like a natural forest, food forests have at least seven layers:

- (1) The tall trees (like avocado and mango) form the canopy of the food forest
- (2) The smaller trees (like lemon and tree tomato) form the understory
- (3) Shrubs can be food-producing (like berries) or attracting pollinators with their beautiful flowers
- (4) Especially in the first few years you can grow all the vegetables as the “herb layer”
- (5) Groundcovers are important to shade the soil; cowpeas or sweet potato make excellent groundcovers!
- (6) Climbers allow for making full use of the vertical space (like chayote or passion)
- (7) Tubers allow us to make use of the space beneath the ground (like cassava or arrowroot)

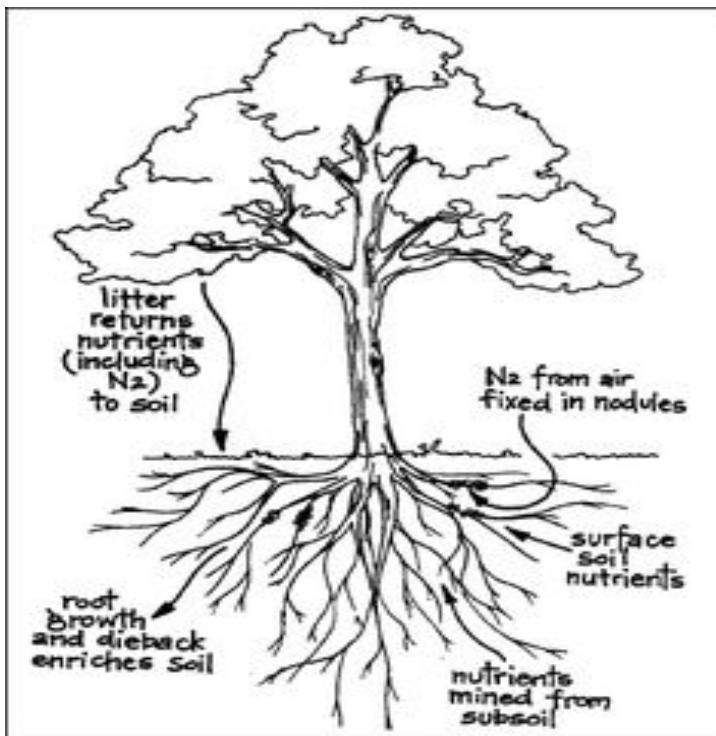
Understanding how nature creates a forest



- Nature is brilliant! With time, it creates a forest from barren land. This process is called “succession”, meaning that plants change over time from pioneering species to tall trees
- As designers, we make use of the principles of succession to speed up the establishment of our food forest

The power of nitrogen-fixers

- We plant many nitrogen-fixers when establishing our food forest
- The nitrogen-fixers shade and cover the ground and create lots of biomass
- When we chop-and-drop, the soil gets covered with organic matter
- The soil quickly improves, improving water retention
- Whenever we prune nitrogen-fixers, roots release nitrogen into the soil that boosts the productive trees



"Overstacking" to speed up the establishment of the food forest



when establishing our food forest ("overstacking") to shade and provide nutrients to our productive trees

- We densely plant nitrogen-fixing support species

Food forest at maturity

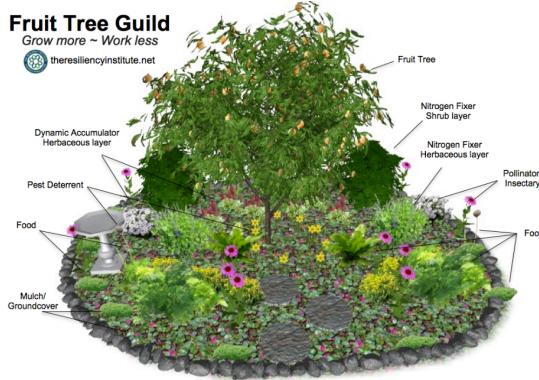


- Support species are sacrificial – pruning them creates healthy

soil that benefits all plants in the system and holds more water

- The number and total mass of the support species decreases over time as the productive trees reach maturity

Guilds



- Guilds are communities of plants that are mutually-beneficial
- A guild

produces food, shades the ground, repels pests, generates mulch, accumulates nutrients, attracts beneficial insects, and shelters wildlife

The importance of diversity

- Food forests are home to a wide range of fruit trees, nut trees, edible shrubs, vegetables, herbs, tubers, flowers and other useful plants. This diversity creates rich soil, attracts beneficial insects, increases productivity, facilitates natural pest control, and reduces herbivores and pathogens
- To support diversity, we can try to create habitats for every kind of good organism we can think of in our food forest.

Designing the Food Forest: Step by Step

Step 1: Mapping your site

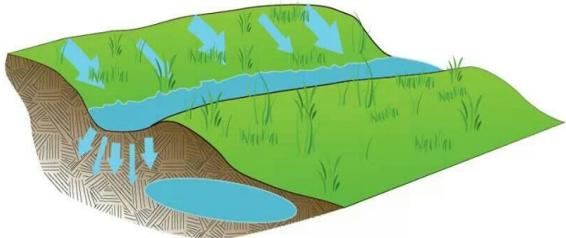


- Decide where you want to plant the food forest – a suitable site will allow you to expand the food forest in

the coming years (for example by adding a second swale below the first)

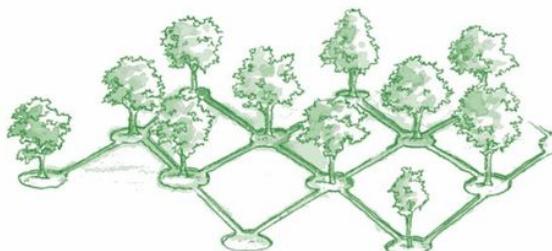
- Draw a map that includes the existing vegetation
- Include permanent structures (like a house, or shed), roads and paths in the map
- Other things to map: available water harvesting structures; slope; rocks; distances; wind and sun direction

Step 2: Water harvesting



- Think about ways to store the rainwater in your soil
- On hilly land, ditches dug on

contour can help catch the water, slow its movement, spread it along the contour, and soak it into the ground



- If your land is flat, you can still improve

Trees in drylands can be planted in small depressions, called net-and-pan. The basins are then connected by a network of shallow trenches. The trench network collects rain and runoff water falling over a large area and delivers it to the base of the trees. Mulch also collects in the basins, building soil.

rainwater harvesting for your food forest!

- Make large circles around each tree you plant, mulch them, and connect them with trenches as shown in the picture on the left

Step 3: Visioning



- Imagine your food forest in 10 years; how do you want it to look like?
- What do you want and need from the food forest

(food; medicine; timber; income; ...)?

- What kind of food, herbs, medicinal plants, firewood, timber, or other product would you like to get from the food forest?

Step 4: Designing



- Draw the large productive trees (like avocado, jackfruit, macadamia, mango, etc.) into your map, making sure to sketch the canopy at maturity
- Draw in the long-term nitrogen-fixing trees (like *tipuana tipu*, *albizia lebbeck*, *feidherbia albida*, etc.) that will also form part of the canopy and ensure long-term fertility of the system
- Draw in the understory (like citrus, tree tomato, papaya, guava, banana, etc.)
- Plan for 100% canopy cover at maturity
- Make sure to place productive trees strategically based on availability of water, shade, microclimate etc. so that each tree is at its optimal position in the system

- Design guilds for each productive tree. Each guild should include nitrogen-fixing support species (like *sesbania sesban*, *leucaena leucocephala*, *calliandra calothrysus*, *senna didymobotrya*, etc.), nutrient-gathering plants ("dynamic accumulators") and insect- and bird-attracting flowering plants and shrubs. If possible, also include scent-masking plants and trap plants
- Don't forget that each guild should also include food. You can grow greens (like sukuma wiki, terere, managu, spinach, etc.); vegetables (pumpkin, cabbage, capsicum, etc.); tubers (cassava, arrowroot, sweet potato, etc.); herbs (dhania, rosemary, etc.); seeds and grains (millet, sorghum, maize, chia, etc.)
- Draw the paths that will allow you to transport materials, carry water, show visitors around, harvest, etc. without having to disturb and compact the soil; in your design of the paths try to imitate natural patterns

Establishing the Food Forest: Step by Step

Step 1: Procurement of materials and tools

Get ready all of the materials and tools needed for establishing your food forest:

Plants	Materials for soil prep	Tools
Seedlings of productive trees	Manure	Wheelbarrow
Seedlings of nitrogen-fixing support species	Compost (if available)	Hoe
Seeds of pigeon pea (or other short-term nitrogen-fixers)	Mulch	Machete
Flowers and shrubs (seeds, seedlings or cuttings)		Buckets
Dynamic accumulators such as comfrey, nasturtium or African nettle (seeds, seedlings or cuttings)		Jelly cans filled with water (if possible)
Groundcover seeds (mixed beans and cowpeas)		Sticks to mark productive trees and support species
Sweet potato cuttings (for establishing groundcover)		
Seeds/seedlings/cuttings of any vegetable, tuber and climber you wish to plant when installing the food forest		

Step 2: Site preparation



- Dig the swale(s) or other water harvesting earthworks (mulch the bottom of the swale)
- Remove unwanted existing vegetation (use as mulch)
- Prepare and dig up soil to remove unwanted grasses and weeds
- Mark out path(s)
- Dig holes for productive trees (both canopy and understory), saving topsoil in a separate pile; ideal hole size: 2ftx2ftx2ft

Step 3: Planting the guilds



- Plant productive tree seedlings, mixing a bucket of manure (and compost if available) with topsoil – use sticks to help you find the productive trees later
- Plant nitrogen-fixing support species (at least 3 for each productive tree) – use sticks to help you find the support species later
- Plant all other guild members (shrubs, dynamic accumulators, herbs, food, etc.) as per your design

Step 4: Planting ground cover & mulching



- Plant beans and cowpeas so that the entire ground can soon be completely covered
- Plant nitrogen-fixing pigeon pea seeds near the productive trees
- Mulch thoroughly and deeply to protect the ground from drying out

Maintaining the Food Forest

Strategic Chop & Drop to Build up Fertility of the Soil



- At the beginning of rain season, we open up the canopy (putting down the pruned material as mulch), giving sunlight and nutrients to the productive trees so that they can grow fast

- Heavily pruning all the nitrogen-fixing support species (including the pigeon peas) gives us mulch material that we can put around the productive trees
- Pruning should be done by “pollarding” the trees (see image); this prevents regrowth to interfere with productive species and facilitates maximum production of biomass (make sure shoots are removed weekly after pollarding, with only a few main branches allowed to develop fully)
- Ideally, separate the leafy material (“nitrogen rich”) from the branches and twigs (“carbon rich”); the leafy material goes down before adding the chopped-up branches and twigs on top
- In dry season, we want the support species to shade the ground and shelter the productive trees

Adjusting to the Dynamic Changes of the Food Forest



- In the early years, when the productive trees are still young, the fertile soil of the food forest allows you to grow many edible berries, foods and herbs in the open spaces
- As time passes, the canopy begins to fill out and get higher yields from the main productive trees; you may wish to plant additional shade-tolerant trees (like papaya, banana and guava) and tubers (like cassava and coco yam)

- Once the support species reach a good height, you can plant climbers (like chayote, passion fruit, nderema, etc.) at their base
- The food forest will change and evolve over the years; space will open up that can be continuously planted with suitable species
- If you can trust nature and increase the number of species you are growing year by year, you will find that the soil becomes healthier over the years and that more and more water is available for the plants even in dry season
- The food forest will become home to many species of insects and animals, helping with natural pest control
- The food forest becomes a dense web of connectedness with every element performing many functions
- A food forest is a diverse system that is resilient to shocks

Appendix: List of Edible Species available in Kenya

Canopy

Macadamia (grafted)

Mulberry (mforsadi/mutare)

Tamarind (mkwaju)

Jackfruit (mfenesi mfuu)

Syzygium guinensee (mzuari)

Cordia africana (makobokobo)

Mango (grafted)

Soursop (*Annona muricata L.*)

Japanese Persimmon (*diospyros kaki*)

Custard Apple (*Annona cherimola*)

White Zapote

Understory

Dwarf Red Strawberry Guava

Guava

Tree Tomato

Pawpaw

Lime (grafted)

Tangerine (grafted)

Pixie Orange (grafted)

Washington Orange (grafted)

Valencia Orange (grafted)

Local Orange

Local Lemon

Pomegranate

Jaboticaba (*plinia cauliflora*)

Fig

Abyssinian gooseberry – *dovyalis abyssinica* (muirungi)

Shrubs

Wineberry

Cape Gooseberry

Raspberry

Capsicum

Hot peppers

Rosemary

Kei apple (kaiyaba)

Dovyalis macrocalyx (munyee)

Grewia tephrodermis (mkone)

Herbaceous

Sukuma Wiki

Spinach

Indigenous Vegetables

Herbs (mint, parsley, coriander, etc.)

Ground Cover

Sweet Potato

Cowpeas

Beans

Climbers

Passionfruit

Chayote

Thorn melon

Malabar spinach (nderema)

Kiwi

Grape

Roots

Arrowroot

Coco yam

Carrots

Cassava