Edible Forest Gardening

A sustainable and productive way to grow healthy food

By Dave Sansone

Provided by:

Perennial Harvest

Perennial Harvest is a 501(c)(3) non-profit organization dedicated to researching, developing, and advocating sustainable cultivation systems suited to Western Washington State.

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It's 3:00 pm on December 21st and daylight is waning in this secluded area of Northern Washington State. Today is the winter solstice, the first day of winter. The temperature is mild and surprisingly, it isn't raining. It feels good to be outside in the forest garden to see what fresh food I can russel up for tonight's potluck dinner celebration.

The tail end of autumn covered the ground with snow followed by weeks of freezing fog. Thankfully, the typical mild climate returned in time for me to harvest a feast. I decide to snack on some Chilean Teaberries first. They are chilly and mildly sweet. The attractive evergreen shrubs are loaded with fresh pink berries all winter long--that is, if I can control myself.

Next on the harvest agenda is salad. With a bit of work, I fill a large bowl with over 15 species of salad greens. Each vibrant leaf has its own unique shade of green. I realize on this winter day that my garden offers natural colors that most people won't see until the emergence of spring still months away. Row covers and greenhouses are not required since most of my salad greens are hardy herbaceous perennials including chicory, mallow, red valerian, and earth chestnut. My favorite, corn salad, is a self-seeding annual that migrates around the garden like a weed. Even after the snow, it's still tender like butter lettuce.

Now it's time to get my hands dirty, the roots are calling! I'm going to dig up some roots for baking. Parsnips, Jerusalem artichokes, and skirret (an ancient perennial root crop from China) all get sweeter when baked.

I have the rest of winter to enjoy these and the other 10 species of edible roots in the garden. With such diversity, each meal can be a new creation. Edible forest gardening is opening unlimited choices that add up to many novel and delicious meals with friends and family.

The light continues to fade as I look around the garden. Instead of dreaming about sugarplum fairies tonight, I'll be dreaming of homemade persimmon butter, chestnuts roasting in my woodstove, and hardy citrus marmalade. The forest garden is still young, but today's harvest gives me a glimpse of what the future has to offer.

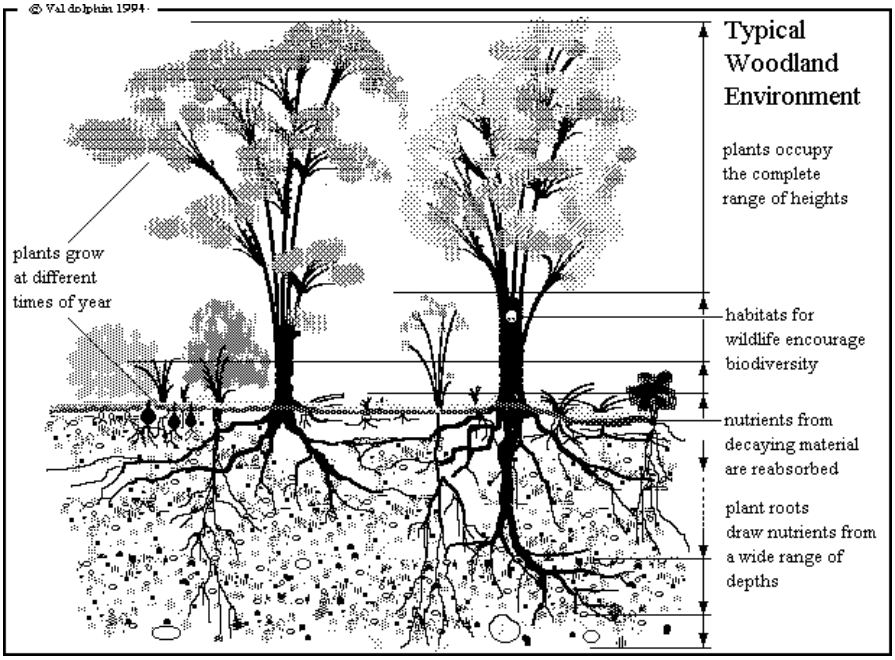
What is a Forest Garden?

A forest garden is a garden modeled after a natural forest that is designed to provide for the needs of people and animals. Just like in a forest, there are many different plants growing with multiple layers of vegetation in one area. This biodiverse planting method is called a polyculture. The polycultural forest garden relies mostly on perennial plants that live and produce for years, such as trees, shrubs, herbs, and vines. They are the foundation of the forest garden.

Self-seeding annuals and common vegetables are grown from seed each year and are utilized more in the early stages of the forest garden when the trees are still young and

cast little shade. It is the reliance on perennial plants in a polycultural system that makes forest gardening a more productive, sustainable, and nutritious way to supply our necessities.

In 1991, the late Robert Hart of England wrote an inspiring book called *Forest Gardening: Cultivating an Edible Landscape*. Hart was enthralled with "home gardening"--a system of multi-story cropping that is widespread throughout the tropics that can have up to 13 layers of vegetation. Home gardening is one of the oldest land use activities dating back to 7,000 BCE (1). Home gardens developed in response to the stresses of an increasing population and a decreasing resource base. Hart was amazed at the productivity and diversity of these small home gardens and decided to and put his lessons to work in the temperate climate of England. Hart coined his style of gardening as "forest gardening" but edible landscaping, permaculture, agroforestry, food forestry all have the similar theme of perennial polycultures, which can be applied in a diversity of climates.



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Hart's book cites the 3.5 million home gardens in Kerala, India that provide the majority of food for the 32 million residents in an area the size of Switzerland. Kerala ranks second in The Physical Quality of Living Index for Asia despite being one of the most populous places on Earth and having an average income of less than $400 per year. Only Japan ranks higher. Life expectancy rivals the US, literacy rates are approaching 100%, free hospitals and Ayurvedic clinics are very common, and ninety percent of the Keralese population owns land where. Their secret is that they don't *need* that much money--practically all of their necessities are growing in the backyard.

Increased productivity and lowered risk

"A recurring observation in the literature is that, quite simply, polycultures yield more total production and do so with greater stability and lower risk than monocultures," according to

Geno and Geno, authors of the report "Polyculture Production". They go on to cite study after study that confirms polycultural systems can outproduce monocultures. Monocultures, also known as monocrops, are plantations of one species such as a field of corn.

One of the cited studies, performed by Stephen Gliessman, reports that the traditional indigenous polyculture of corn, beans, and squash in Mexico surprisingly yields 50% more corn than what a monoculture can yield. The beans and squash yielded less in the polycultural system than when grown in their own monocultures, but considering the increased yield of corn, the beans and squash are a nice addition to a huge harvest. Intriguingly, there were net gains of nitrogen despite crop removal. (2)

Another study cited by Geno and Geno reveals that a polyculture of pears and radishes yielded nearly the same amount as if each were grown in their own monocultures on an equivalent area of land. (3) This means that one acre of polyculture produced the equivalent of nearly two acres of monoculture in one season. This is known as overyielding. Considering increasing hunger and starvation, this more productive model offers hope for a better future.

One reason that polycultures can yield more is because plants are planted in guilds--groups of plants that compliment each other. Think companion plants. Certain plants are generous and "share" extra nutrients with their friends. Some fruit and nut trees' roots go deep into the ground and draw water and nutrients to the surface, of which a portion is "leaked" and utilized by neighbors. There are many plants that benefit from the extra water, nutrients and shade provided by well-spaced, generous trees. Each plant fills its own ecological niche with its unique root depth, periods of dormancy, canopy size, shape and density, along with light, water, and nutritional needs. Plants that fill different niches can thrive in the same area without much competition. This peaceful coexistence allows for the more efficient use of resources.

Some plant members in guilds act as fertilizers. The beans in the corn, beans, and squash polyculture are an example of nitrogen fixing plants that can increase soil fertility. Nitrogen fixers utilize a mutually beneficial relationship with bacteria that gather nitrogen from the air. The bacteria invade the plant's root hairs and create nodules where the gathered nitrogen is stored. The beans use much of this nitrogen, but some can be channeled to the root systems of other plants in the surrounding area through mycorrhizal fungi that act like a web in the soil that can transport nutrients. Also, nitrogen becomes available by harvesting and composting foliage. According to the Agroforestry Research Trust, "Estimates are that on a global scale, these plants (nitrogen fixers) fix 140 million tons of nitrogen per year."(3) I find these plants quite inspiring since they help their neighbors and they leave a place better than when they found it. If only more people would take after these humble plants!

Another reason that polycultures can yield more than monocultures is because they are more resistant to pests. Monocultures are unnaturally large plantings of only one species--this provides an unlimited food source that encourages a population explosion of pests. Since polycultural plantings are not dedicated to just one plant species, pest populations can't get too out of hand. Also, beneficial and predatory insects are encouraged in polycultures since

there are a variety of foods and habitats available. This can lead to better pollination and a further decrease in pests through predation.

Polycultures don't put all their eggs in one basket. A diversity of crops lowers the risk of complete crop failure. This needs to be considered when thinking about production levels. What good is a huge crop if the next year's cannot be relied upon? Humans in agricultural societies have long been the victims of famines caused by blights, plagues of insects, droughts, and erratic weather. Global warming, pesticide resistance, and peak oil are likely to accelerate this trend. It seems apparent that continued reliance on monocultures is more of a liability than an asset.

To quote soil scientist Daniel J. Hillel, author of *Out of the Earth: Civilization and the Life of the Soil*, "In the history of civilization, contrary to the idealistic vision of the prophet Isaiah, the plowshare has been far more destructive than the sword. (4)

The factors that make forest gardening more productive than monocultures also make it more sustainable. Most plants in forest gardens are perennial and provide for years without the yearly cultivation routine associated with the production of annuals. This saves much work and energy; while limiting soil erosion, compaction, and aquifer depletion. Over time, guilds become self-maintaining like a natural forest. All the niches are filled, which makes it tough for weeds to move in. This means that after initial establishment, little maintenance is required besides harvesting.

The members of guilds act to increase the availability of nutrients, thus imported fertilizers are not needed. Since most of the plants in forest gardens are deep-rooted perennials, they do not need irrigation after their first year or two. The deep roots draw water upward and multiple layers of vegetation slow down the evaporation of water from the soil. Forest gardens are self-fertilizing, self-irrigating, and self-maintaining. That sounds sustainable to me!

Nutritional Powerhouse

Hippocrates' famous advice has been touted many times, "Let your food be your medicine." Many of the plants grown in forest gardens are "superfoods" gracing the covers of health and nutrition magazines. These superfoods offer high potency doses of vitamins, minerals, enzymes, amino acids, and anti-oxidants. Some of the better-known superfoods are blueberries, hazelnuts, walnuts, flax, and Jerusalem artichokes.

Since many of the plants in forest gardens are perennial, they are more nutritious. On average, perennial vegetables have 2-3 times more vitamin C, magnesium, calcium, iron, and protein than annual vegetables. Spinach and good King Henry offer a useful example. They are both in the Chenopodium family and are used similarly. Spinach is an annual and is known for being high in vitamins and minerals. Good King Henry is perennial and is virtually unheard of, yet has more than 3 times the vitamin C of spinach and is higher in

nearly every vitamin and mineral. (5) My favorite part is that good King Henry is planted once and produces a surprisingly large amount of food for years with little work.

Rather than abandon spinach for a more nutritious green, it is best to continue to use spinach and add good King Henry to one's diet. A greater diversity in one's diet leads to better nutrition and health. In the agricultural regions of India, malnutrition and early death are more common than in the forest gardening regions. The malnutrition results from a combination of a reliance on a limited number of foods, which generally have lower nutritional value, and oppressive social conditions. Programs encouraging the reliance on a larger diversity of foods from the home garden are alleviating malnutrition in agricultural regions. Malnutrition makes itself at home here in the US and perhaps we Americans should follow the Surgeon General's advice to eat a varied diet. There are literally thousands of useful plants that offer higher nutrition that can thrive in forest gardens.

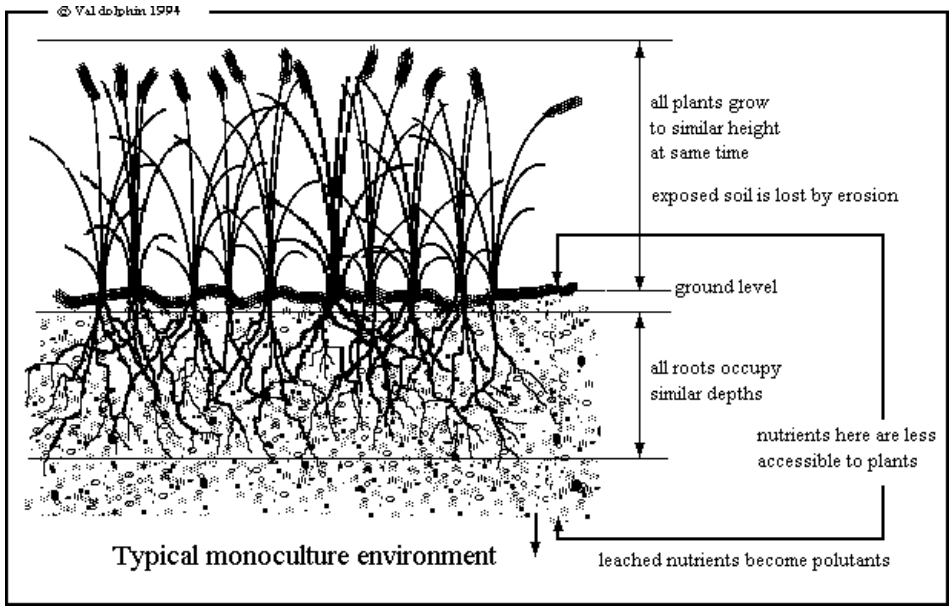
Sustainable cultivation

We can get a report card on sustainability by comparing forest gardening with organic agriculture. Organic agriculture has been successful in promoting the use of natural fertilizers and natural pest controls such as crop rotation and cover cropping. It should be obvious that the quality of organic food is much higher than that produced through chemically induced agriculture. While organic agriculture produces quality food, it is rarely sustainable.

Most organic farms rely on tractors to prepare the ground for planting annual crops in monocultures. This means that the soil must be put through an array of mechanical cultivation to kill off all living plants and form a nice neat fluffy seedbed. One of the problems is that all of this fluffing up of the soil causes the fine soil particles to migrate downward, which leads to soil compaction. It's like all the food scraps that slip through the strainer in your sink; eventually they build up and clog the drain. In the farm scenario, it's the plants' roots that can't get past the build up. When heavy tractors are added to the mix, the soil is further compressed below where the tiller can reach, while the upper level is completely pulverized. Erosion and nutrient leaching are other common results of this frequent-disturbance regime.

While tilling's effects are easy to see, the impacts of organic fertilizers are out of sight. Organic fertilizers are derived from natural sources and there should be no doubt that they are better than chemical fertilizers for the soil and our families.

Unfortunately, these fertilizers are often by-products from destructive and polluting factory farms dependent on chemically grown feed, fish trawlers, clearcut logging, and mining operations. While natural, these fertilizers have an ecological footprint that often spans the world.



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One of the most critical aspects of agriculture is the use of irrigation. Ancient cultures found that semi-wild plants produced more when they were watered; the increase in food allowed human populations to grow. The increased production and resulting population growth are short lived because irrigation nearly always leads to the accumulation of salts in the soil, which progressively render land useless for agriculture. According to a satellite-mapping project by the World Resources Institute, roughly 4 million acres of irrigated land are lost each year to salinization.
Consistently throughout history, cultures have risen and fallen due to the reliance on a pillar of our civilization—irrigation.

If forest gardening is so great, why isn't all our food produced that way?

There are limitations that are inherent to forest gardening that make it nearly impossible to economically compete with industrial agriculture. While modern agriculture makes lots of food for sale, forest gardens make even more food; but forest gardens are simply too complex for machines to do the work. Forest gardens need people. Since farmers are faced with the bottom line of global economics and labor is the most expensive part of agriculture, it is unlikely that forest gardens could produce more profit than mechanized cultivation.

Agroforestry is a hybrid model that relies on very simple polycultures to increase the speed and ease of harvest that has the potential to increase the production and quality of food for sale. Agroforestry is a step in the right direction, but if reliance on fossil fuels and tractors is continued, positive gains will be limited.

It's up to you

As it has been said many times, "It's up to each of us to make a difference". Buying our way to sustainability is not really an option since very few items for sale are actually produced in an ecologically sound manner. Forest gardening offers a way for us to provide

for ourselves sustainably with greater productivity and nutrition. People like you can plant forest gardens and watch your yard turn into a food forest. There are many community gardens for those that do not have access to their own place to grow some roots.

Some of the many benefits of forest gardening include fresh nutritious food year-round, time to relax under trees while the neighbor fusses with weeding, watering, and mowing; and best of all the enjoyment of a whole new range of foods that you and your family can grow such as chocolate berries, hardy citrus, and green tea. There are some great books and websites that can walk you through the creation of your own forest garden. Remember, as with all projects, start small, do your homework, and enjoy the process.

Further reading

Forest Gardening—Cultivating an Edible Landscape by Robert Hart
For inspiration
How to Make a Forest Garden by Robert Whitefield
Great for the beginner
Plants for a Future, by Ken Fern—Reference book of alternative foods for temperate climates
Edible Forest Gardens by Dave Jacke and Eric Toensmeier
Advanced guide, pricey
The Maritime Northwest Garden Guide produced by Seattle Tilth
Good general guide

Informational Websites

Terra Commons—www.terracommons.us
The Bangor Forest Garden—www.thebfg.org.uk
The Agroforestry Research Trust—www.agroforestry.co.uk
Plants for a Future—www.pfaf.org

Where to get plants

Forest Farm—www.forestfarm.com
Burnt Ridge Nursery—www.burntridgenursery.com
Oikos Tree Crops—www.oikostreecrops.com
One Green World—www.onegreenworld.com
Raintree Nursery—www.raintreenursery.com
J.L. Hudson Seeds—www.jlhudsonseeds.com
Wild Garden Seeds---www.wildgardenseeds.com

Some Plants that can be grown in forest gardens

Common Name	*Botanical Name*
Corn Salad	*Valerianella locusta*
Chilean Tea Berries	*Gaultheria pumila leucocarpa*
Chicory	*Cichorium intybus*
Mallow	*Malva moschata*
Red Valerian	*Centranthus ruber*
Earth Chestnut	*Bunium bulbocastanum*
Parsnip	*Pastinaca sativa*

Jerusalem Artichoke	*Helianthus tuberosus*
Skirret	*Sium sisarum*
Persimmon	*Diospyros kaki*
Hardy Citrus	*Poncirus trifoliata*
Spinach	*Spinacia oleracea*
Good King Henry	*Chenopodium bonus-henricus*
Chocolate Berries	*Leycesteria formosa*
Green Tea	*Camellia sinensis*

Sources:

1.) Major Themes in Tropical Home Gardens, The Overstory #147

2.) Gliessman, Stephen R., Agroecology—Ecological Processes in Sustainable Agriculture, Lewis Publishers, Boca Raton, 2000.

3.) Geno, Larry; Geno, Barbara Dr., Polyculture Production--Principles, Benefits and Risks of Multiple Cropping Land Management Systems for Australia, Rural Industries Research and Development Corporation, Barton, 2001, p. 24.

3.) Fertility in agroforestry & forest gardens: Nitrogen, Agroforestry News, Agroforestry Research Trust, Devon, Vol. 3, No. 3, April 1995.

4.) Hillel, Daniel J., Out of the Earth: Civilization and the Life of the Soil, The Free Press, New York, 1991, p. 75.

5.) Food value of annual and perennial vegetables, Agroforestry News, Agroforestry Research Trust, Devon, Vol. 13, No 4, August 2005, p. 3.