# A Permaculture Approach to Food Production

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April 2, 2010 version
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This article outlines some aspects of what a permaculture approach to food production on a societal scale might look like. The topics here could be better organized and greatly enlarged, but taken all together they paint a picture of an abundant food future.

Most counties in the US only produce a small % of the food consumed there. From as low as 1 or 2% in metropolitan counties to 10% in rural counties. The figure does not get even that much higher for major agricultural counties since most food grown there is exported and most food consumed is imported. About one year ago the US became a net food importing country for the first time ever. The US now imports as much food as it exports. Granting that the exports probably weigh more than the imports, it is obviously not a good idea for the US to be dependent on foreign food.

Low nutrient crops with low mineral and vitamin counts are common and high quality, nutrient-dense foods are rare. A large portion of the food supply is over-processed into forms that are hazardous to human health. Industry bombards the population with advertising for fast food, unhealthy food choices, etc. A lot of food is contaminated with pesticides, fungicides, and biocides. Genetically modified crops, especially corn and soybeans, are becoming a larger part of people's diets.

What if the mechanized agri-business model of production, distribution and retailing breaks down? Every county has an emergency preparedness team. They advise citizens how to prepare for an emergency, how to respond, and how to build neighborhood support networks. Their timeline is generally only days, weeks or at the most months. What about emergency planning that thinks in terms of years? We need emergency planning for a food shortages and/or massive unemployment where people do not have the money to buy enough food. Local citizen groups should prepare such plans. Permaculture has a lot to offer in this regard.

Some components of a permaculture food strategy.

* Increase home food production. Vegetable gardens, perennials, berries, fruits, livestock, as well as processing, canning, and storage areas, etc. Set up community gardens everywhere wherever people want to garden. Convert 50% or more of lawn to food production.
Vegetable gardening and home food production are making a big comeback in the United States. This is partly driven by the economic crisis and partly by lifestyle choices to be more self-reliant

and have a guaranteed source of healthy, fresh food. Every town has its fair share of great gardeners to learn from and more are coming on line every year.

Grow more food in local parks and public spaces. The city of Sandpoint, Idaho has offered Sandpoint Transitions Initiative the space for a demonstration garden in every public park in town.

* Gather wild foods where possible. Do sustainable harvesting. Do restoration and enrichment plantings and land management to increase the amount of wild edibles, medicinals, and useful plants in the landscape.

* Increase the numbers of small, local farms by a large factor. Encouraging young people to start out on a career of farming is one of the most important ways to achieve greater local food production.

* Increase local meat and dairy production with local processing and distribution. More integration of livestock with cropping systems. It is interesting to note that 45% of the milk and meat produced in Russia is produced at the home level as well as 75% of the vegetables and 85% of the fruits and berries. If the US and Russia were in a home food production race, Russia is winning hands down.

* Diversify food production to grow local needs inasmuch as the climate will allow. This can include winter growing of greens.

* Develop infrastructure for scaling up the local food economy. Aid farmer to consumer marketing. Distribution centers for small farmers to pool their products for sale to restaurants and institutions such as schools.

* Develop more local sources of fertilizer and other needed inputs for gardens and farms.

* Build soil fertility and texture on gardens and farms. In a good soil particles clump up because of all the organic glues in the soil created by the soil life. Thus the soil has good granulation. This is also called flocculation. These clumps allow for greater air pore space in the soil, which can hold more air and water, both conducive to good soil life. This kind of soil is said to have good tilth. (This is meaning of the word used by that the various Tilth organizations around the Pacific Northwest.)

The better the soil, the easier it is to achieve high productivity, but even the worst soils can be amended to be productive. The worse the soil, the more inputs are necessary and generally more time as well. Fertility inputs can be costly if you buy all your soil inputs from the store. Another way to go about it is to use free or low-cost local inputs. This includes all organic matter such as spoiled hay, wood chips, hedgerow trimmings, bark, and of course all manures. Chipped power line trimmings are great. There are lots of different techniques and strategies to use the wide range of organic matter/biomass effectively.

* Replace purely ornamental landscaping which has low productivity with landscaping which is highly productive and beautiful at the same time. Edible landscaping is part of this but we can also grow a wide gamut of

other useful products such as herbs, fibers, dyes, wood, crafts, firewood, etc.

* Greater reliance on perennial crops as opposed to annual crops. Permaculture puts a lot of emphasis on tree crops, shrub crops, vines and perennial vegetables. These should be planted starting in year one with subsequent plantings yearly until the planting objectives are met. Productivity starts for some species (like raspberries, strawberries, currants) in year two. Other species start in year 3, such as asparagus, rhubarb, grapes, other berries. Many tree fruits don't bear anything much till years 4 to 6. Nut trees can take 10 years or more. For some crops we have to be patient, but they then bear for decades or even centuries.

* Vegetables and annual crops are also important in permaculture food systems. The goal of a good permaculture garden is to get a lot of productivity every year, starting from year 1. This is achieved by growing lots of vegetables in between perennial plants and choosing crops adapted to the particular set of soils, climate, water, etc at each specific site.

* Encourage seed production and plant breeding at the local and regional level, teach classes, and distribute booklets on local seed production.

* Increase the diversity of livestock breeds in each region. Where are the holes in terms of functional, productive diversity? What should be brought in from outside? What are the breeding needs for local production?

* Increased local production of nursery stock: fruits, nuts, berries, ornamentals, medicinals, native plants, native grasses, hedgerow, windbreak trees, etc. This local production creates right livelihoods and products which make their customers better off.

* Plan ahead for increased demand for community garden space. Select the best available sites and prepare them with green manure crops, fertilizers and irrigation. If deer are a problem then put up a deer fence. Install irrigation if an adequate system is not in place.

A sane society would insure that every single person that wanted to grow their own food had a plot of land to garden on. I think our goal should be to have a community garden space available for everyone who wants one within walking distance. This network of community gardens can take many forms. There are lots of examples to study. These gardens need coordinators to assist new gardeners in planning. The gardens should have access to irrigation water. Wood chips, manures and fertilizers can be purchased in bulk to make it easier and cheaper for the gardeners. Public fundraising could help with things like fences and infrastructure. Volunteerism, work parties and making do with local resources will be necessary in many cases. This is a useful investment in local productivity.

* Replace outside inputs with local inputs. The current farming systems require outside inputs to operate including fuel, machinery, parts, fertilizers, pesticides and herbicides (if they use them). What parts of these inputs could be produced locally? Certainly much of the fertilizer, and there are management techniques and organic materials that can replace the use of pesticides and herbicides. Some fuel

can be produced locally. The trend in American agriculture for the past two centuries is replacing labor with machines. We have perhaps reached the pinnacle of that trend. Organic agriculture and small-scale agriculture are growing trends which are more labor-intensive and less machinery intensive. This could be the source of a large number of right livelihoods in the future.

These are some of the major components of a permaculture food strategy. We will explore some of them in more detail in this article along with some practical comments.

Compost piles have multiple-purposes. The long-term goal is that the compost will be incorporated into the soil once completed. Compost piles can be situated where they will prepare the land under them for cultivation. Compost piles condition and fertilize the ground underneath them and usually eliminate all weeds. Cool compost piles made of easily digested material take a year or less before they are ready to spread. Some woodier compost piles may stay in one spot for two years or occasionally longer. Vining crops are grown on the compost piles, usually winter squash. Introduce red wiggler worms to the compost piles. After the compost pile is finished, chickens can obtain lots of worm protein by letting them have access to the pile or dismantling it gradually for them. Hot composts can generate large amounts of heat which can be used in various ways.

Almost all types of organic matter have uses in the garden such as: sheet mulching lawns, mulching annual and perennial crops, for mulching paths, hugelkulturs (biomass raised beds), hot or cool compost piles.

There are many kinds of manures as well as different strategies of using manure. Different livestock give differing qualities of manure. As a general rule of thumb we could say that fertility levels go up as livestock intensity goes up. Because a permaculture goal is to minimize outside inputs, livestock feed should be produced on site as much as possible. This limits the number of animals. The carrying capacity for livestock of any particular site will go up over time as fertility and plant growth increases. A backyard garden will produce more if there is a small flock of chickens on site. The chickens only have access to the garden at the beginning and end of the growing season. Chickens should have a run for exercise and fresh food. The chicken yard can be moved around the garden/landscape and used to prepare and fertilize areas for gardening. Chickens are great bug control, and turn kitchen compost and weeds into protein. They are not for every gardener but we can expect to see a lot more chickens in backyards. Chickens need to be integrated into the overall system and given a good life (and protection) so we can achieve maximum benefit. Permaculture has a lot to say about chickens (chooks as they call them in Australia).

Rabbits are one of the easiest animals to keep on a small place. During the growing season there is almost always somewhere to collect greens for them on a daily basis. Rabbits love cottonwood leaves. Their manure is one of the best and easiest to use of all manures. Red wiggler worms introduced into the beds below the cages speed the

decomposition and reduce odors. Small rabbit tractors can be used to mow lawns or clean up garden beds.

Goats are the next level up. They are as intelligent as dogs, make great pets, are good for brush and weed control, eat almost anything and produce milk, meat and hides. Their manure does not carry cross-over pathogens for humans such as dog and cat manures do. You need a large yard to fit a goat into the system, but there are still lots of unused corners, lots and brushfields in town which produce goat fodder which can be harvested and brought to the goats. This is called "cut and carry".

Over time and as people desire it, more and more home-owners and land-owners could have a permaculture design team come in and give advice on how to improve productivity, reduce expenses, build soil, improve habitat and have good aesthetics at the same time. Permaculture design teams could include people skilled in home energy audits, retrofits, passive solar, hot water panels, grey water, home power, food production, medicinal herbs, etc.

Forest gardens (sometimes referred to as food forests) grow a wide diversity of food in a system which includes trees, shrubs, vines perennials and some annuals (and sometimes livestock). A permaculture design might include a food forest as well as a sunny vegetable garden and other types of habitats. Terra Commons in Olympia, Washington, has set a goal of planting a demonstration forest garden in every one of Olympia's 30 neighborhoods. Homeowners volunteer their land and volunteers come and plant the forest garden which often involves large-scale, sheet-mulching of lawns. Terra Commons has had a great response from Olympia's neighborhood associations and can barely keep up with the demand. They are now promoting a forest garden in every urban neighborhood in the Puget Sound region.

Erik Ohlsen has started an initiative called Food Forests Across America. Here is Erik's description of a food forest. "First let me share what I think the full expression of a food forest can be. Beyond the staple ingredients of a food forest; water harvest, tons of leguminous trees and plants, fruit and nut trees, wildlife habitat, growing mulch and building soil, I also see some additional elements we can message as part of a food forest. Chickens, outdoor kitchens, greywater, gathering and celebration spaces are all elements that I think can be part of a full expression of a food forest. Combining the kitchen garden with the food forest with the social needs of humans seems like a great way to message a new aesthetic for landscapes."

Here are the emphases from the brochure for a 2010 Illinois permaculture design course:

1. Using Permaculture design to enhance small scale farming and suburban/urban food production

2. Transforming back yards, city lots, roof tops and community commons areas into bountiful (& beautiful) gardens

3. Making a farming business economically profitable, socially responsible and environmentally sound

4. Minimizing work and reducing fossil fuel requirements for an energy lean future

5. Fostering long term financial and food security for ourselves and surrounding communities.

Course topics include: getting the most production from a small space, low external inputs, building soil, water harvesting, irrigation, vertical gardening, stacking, forest gardens, using biomass/organic matter, sun traps, perennial crops, native plants, integrating livestock, hedgerows, permaculture design, zonation, rolling permaculture, where to start, and stepwise evolution.

Peter Bane has written a great article "*Expanding the Niche of Local Food: A City and Regional Plan*" in the Spring 2010 issue of "The Permaculture Activist". This is a well-articulated look at local food production from the perspective of Bloomington, Indiana, the county it is in and the 7-county region. Peter is able to draw on his experience of being part of a year and half study by the Bloomington Peak Oil Task Force. Worthy of study is their list of 21 short term strategies (1 to 5 years), 13 mid-term strategies (6-15 years) and 5 long-term strategies (15-30 years).

"What would it look like for this city (Bloomington) of 70,000, in a county of 110,000 in a seven-county region of 400,000 in south-central Illinois, to grow its own food?"
- Peter Bane.

Peter Bane gives us some useful figures to work with. The 2007 national average of food consumption was 2053 pounds of food. The standard American diet requires 2.74 acres of land per person to produce under current production practices. Using permaculture best practices and with some modest changes in diet this acreage per person could be much reduced. "John Jeavons has demonstrated and documented that a vegetarian diet for one person, including the fertility crops that would be needed to sustain soil health indefinitely, may be grown on about 4,000 square feet".

This particular article is not up on their website, but there are a large number of articles posted at www.permaculturereactivist.net/articles/articles.htm"

An acre has 43,000 square feet, so theoretically 11 people could be fed from one acre under John Jeavon's (Grow Biointensive) best practices. An average city density is about 8 lots per acre. Of course the yields possible on one acre have different limitations depending on the climate, water available, soils, etc. John Jeavons did most of his testing at his farm in

northern California. Yields go up over time on most parcels of land as soil fertility builds up. The more meat and dairy products in a diet the larger footprint of land that is needed to supply it.

For most habitable parts of the US, it would take between one-tenth and two acres to feed people. This is a big spread, and is probably justified. Where I live in north-central Washington State, I would estimate that with irrigation that a well-managed half-acre of food production could support a family of four with a diet that included a modest amount of eggs, meat and dairy produced on the half-acre. Few people want to eat only what they grow, but surpluses can be traded among local producers to diversify the diet.

How many people could be fed on an acre of potatoes? Potatoes as a main diet is not recommended, but it has kept lots of people alive around the world for many centuries. The US potato harvest average in 1999 set a new record for 35,000 pounds per acre. That would supply 350 people with 100 pounds each. The world record potato yield (as of the mid-1900s) was R. C. Zuckerman of Stockton, California, who produced 71,900 pounds per acre. His record may have been beat by now. www.springerlink.com/content/5484w7345l5l276k"

Diversity is the name of the game in permaculture food production. The potato blight is still with us and so undue reliance should not be placed on potatoes. Still, in the temperate zone it is one of the highest yielding foods that can be grown in a small space, and it can also be grown successfully on “rough” ground. I like to grow it in the early part of a rotation when starting on new ground. It is relatively easy to weed compared to many crops and is competitive with weeds once established. It needs good nutrition to give high yields.

For storage carbohydrate crops I mainly grow potatoes, winter squash and root crops such as beets, carrots, parsnips, rutabagas, and sunchokes, as well as corn. Over the long term it would be wise to plant enough selected chestnut trees (where climate and soils allow) to supply a part of our starch food requirements. It takes about 10 years to start getting significant production with increasing yields for a long time.

Here is just one example. Digging biomass pits in the city. I recently talked to a young couple who live in south Seattle who are converting his parents’ one-fifth acre lot to food production. One of their techniques is to dig big holes in the yard and fill them with hunks of wood, wood chips, lawn clippings, lots of produce waste from a nearby grocery store and other available organic matter. Their soil is heavy clay with a clay pan one foot down. The excavated soil from the big holes provides raised mound areas with a greater depth of aeration and better drainage overall on the site. This aeration increases fertility. They plant fruit trees, berry bushes and useful plants around the edges of the holes. The crop roots have access to the decomposing nutrients. It is taking them a few years in their spare time to gradually fill the yard with pits, fill them with biomass and plant around them. A side benefit of this strategy is that there is more water storage in the soil and there will likely

also be increased infiltration into ground water. This is another good strategy for a specific soil type. They have also bought two 1500-gallon tanks for roof water storage, and are conducting many mushroom projects.

How many people would take to carry out a permaculture food strategy on a societal wide basis? I haven't yet made an attempt to do this in detail, but perhaps 10% of our labor force. Since a permaculture food strategy includes home gardens in most yards, this means that a large percentage of the population would be gardening. This means much more than just the able-bodied workers actively seeking employment. Around the world, gardening is a family activity which includes children, grandparents, retired, and disabled. Everyone who wants to garden should be enabled to do so. This enablement is where a lot of employment can be created. People to help plan and install private gardens, school gardens, senior gardens, community gardens, and so forth. Garden designers of all types are needed including permaculture designers.

A permaculture design course is the fastest way to gain a deeper understanding of permaculture. The permaculture approach to food production has a lot to offer to the world.

This article is only a small sampling.