

Integrating Permaculture into Farming Systems: Patterning a New Agriculture

A workshop at Washington Tilth's T-40 Conference, November 8, 2014 - Notes for Michael Pilarski's presentation

Bio: Michael Pilarski helped organize the first Tilth conference in 1974 in Ellensburg, Washington. He was the main coordinator for T-10 held near Ellensburg, Washington in 1984 and attended T-20 and T-30. His organic farming career started in 1972 and over the years he has branched out into agroforestry, permaculture, forestry, ethnobotany, wildcrafting, and farming medicinal plants. Michael took his first permaculture design course in 1982 and is one of the leading permaculture networkers and teachers in the Pacific Northwest. He has farmed and gardened in Washington, Oregon, Idaho and Montana. Plants are his passion!

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Also presenting at this workshop were:

Andrew Millison who has studied, designed, built, and taught about Permaculture systems since 1996. He is an instructor in the Department of Horticulture at Oregon State University, teaching the Permaculture Design Certificate Course and the Advanced Permaculture Design Practicum.

Don Tipping has been offering hands on, practical workshops at his Seven Seeds Farm since 1997. Seven Seeds Farm is a small, organic family farm in the Siskiyou Mountains of SW Oregon.

In a way, the fate of the world rests in farmers' hands. Farmers manage a large percentage of the Earth's land surface. Croplands, grazing lands and farm forests cover perhaps 50% of the globe. It is on those lands that the carbon sequestration battle will be won or lost. If we lose the battle, climate change will likely be so severe that the planet's carrying capacity for humans (and most other life forms) will be severely reduced with a consequent die off. If we can fix enough carbon on croplands, pastures, grazing lands and forests we can get the climate back to a nice, equable inter-glacial period.

Permaculture focuses on carbon sequestration, perhaps more so than any other food production system. Permaculture systems have a strong upward curve on carbon sequestration. This occurs in a number of pathways: roots and stems of woody-stemmed plants, leaf and biomass drop, shading of soil from extremes of weather. Soils and ecosystems improve. The result of adding more carbon to soils and ecosystems is that they become more productive; produce more oxygen; reduce soil erosion and flooding; and maintain a much higher degree of biodiversity. It is a win-win situation. Carbon farming is becoming a buzzword and this is having some affect. Organic farming only occupies a few % of US farmland. Carbon farming, Holistic Management, biodynamic farming, and other forms of sustainable agriculture occupy perhaps another couple %. Together, perhaps 5%. Conservation farming on conventional farms takes place on a larger area than this, but we can safely say that a large majority of the US farmland is not increasing in carbon content and much of it is still in decline. The recent wide-scale adoption of no-till (or low-till) farming has sequestered some carbon and reduced erosion, but at the cost of increased herbicide applications which have adverse effects on farm and off-farm ecosystems.

What is permaculture? Permaculture is a whole systems approach to analysis and design of ecological human settlements. Although permaculture has some new ideas most of it is a synthesis of traditional knowledge, ecological science, organic farming, agroforestry, natural building, renewable energy, and humane and ecological ways of relating to the Earth. Permaculture has a set of ethics, a set of principles and a design methodology. Permaculture can be applied to farms, homes, cities, counties, islands and nations. It is applicable at all scales and not just to land use but any enterprise, social system, etc. Organic farming is about agriculture per se whereas almost everything is in permaculture's purview. One of the underpinnings of permaculture is its three ethics; 1) Care of people, 2) Care of Earth and 3) Dispersal of surplus to above ends.

The hallmarks of industrial agriculture is that farms get bigger and bigger and they use more and more machinery. A hallmark of permaculture is that farms get smaller and smaller and use less and less machinery. Permaculture is characterized by using more human labor, more human ingenuity and more reliance on nature to do the work.

Permaculture is the opposite of monoculture. Indeed, it could be called diversiculture. There can be organic wheat farms or organic apple orchards, or organic piggeries but a one-crop permaculture farm, no. Diversity of crops and diversity of income streams characterize a permaculture farm. A diversity of niches and habitats are developed on a permaculture site. The more niches the

more crops, and the better the overall system functions.

Permaculture is big in Australia where it had its start but has spread to many parts of the world and is used widely in parts of Africa, Europe and Russia.. Permaculture is being applied to only a small bit of the world's farmland, but it has had more of an impact on home gardening. Permaculture has spread sheet mulching far and wide and hugelkulturs are probably not far behind.

I recommend a new book detailing many permaculture success stories around the world. The title is *Sustainable {R}Evolution: Permaculture in Ecovillages, Urban Farms, and Communities Worldwide*. A 2014 book by Juliana Birnbaum & Louis Fox.

Much of agriculture's history has been based on exploitation. Exploitation of the land/resources and exploitation of the farmer by the political and mercantile castes. It is hard to make farming pay. It is hard to make organic farming pay. Under current circumstances it will be hard to make permaculture farming pay. We are laboring under an unfair, exploitative <http://gaiacodex.com/holiday-offerings-two/> system. We should recognize that farmers are playing against a stacked deck.

Something like only 1% of the US population are farmers and perhaps another 1% are farm laborers (a majority of them speaking Spanish). But if you add up all the people working in factories to make tractors, fertilizers, other farm inputs and you add up all the people who work in food processing plants, trucking companies and supermarkets that actually perhaps fully 18% of the population is still working in the food system. Permaculture would put many of these people back to work on the land at a higher quality of life than provided by the current system.

There are three main yields of ecological and ethical agricultural systems:

One: Products: Food, fiber, meat hides, fruits, grains, etc, etc.

Two: Ecological functions/services. Building soil, sequestering carbon, providing clean water and air.

Three: Social functions, Farms can be a place for people to connect with nature.

Currently farmers are paid for products but generally not for ecological services. Social services is a potential seldom capitalized on. Here are some comments on the potential for ecological and social incomes to help ecological farmers stay in business.

Payment to farmers for ecological services.

On a visit to Australia, I met an Australian who was an ecological economist and he was doing the numbers on the costs of unecological farm management and the benefits of ecological farm management. He said that it is cost effective for people downstream to pay farmers, grazers and forestry concerns upstream to do good management. The losses from the floods, reduced fisheries (in-river and coastal), increased water purification costs, etc was more than the cost of financing watershed restoration.

Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity. Jeffrey A. McNeely and Sara J. Scherr. 2003, Island Press. McNeely and Scherr lay out a strategy of how agriculture can be a major player in preserving the world's biodiversity of species. An ecological sound agriculture that doesn't use much pesticides, herbicides or polluting chemical fertilizers. The emphasis is on long term sustainability. This book is a great addition to the development of an ecological agriculture. It gives thought to how farmers can get paid for ecosystem services.

<http://www.ecoagriculture.org/>

The main thesis of McNeely and Scherr's book is how farmers can help preserve the world's biodiversity. In fact they say that one of the main products of farms should be biodiversity and ecological services. Clean water, clean air, soil erosion control, etc. Ecosystem services payback to farmers includes premium prices for passing eco-certification programs such as Salmon Safe. Government programs such as NRCS (National Resource Conservation Service) and Conservation Districts provide funding. Pacific Forest Trust, Montana Conservation Corps. Land Care is a great example from Australia. While we do see some funding of conservation and paying farmers to do the right thing ecologically, it is still a drop in the bucket of what is really needed. We should increase this type of funding by a factor of ten for a start.

Three: I recently took a course in **"Multifunctional Agriculture"** from a smart fellow from The Netherlands, Maarten Fisher. Maarten spearheaded a movement in The Netherlands which has grown to an \$800 million dollar a year business for Dutch farmers over the last 10 years. 25% of all farmers are involved and 80% of organic farmers. Multifunctional agriculture includes things like cow-cuddling (with dairy cows), pasture golf, farm camping, nursery schools, horticultural therapy, and many other ways for farms to serve the general public or specific parts of it, school-children for instance.

A follow-up comment by Maarten: "One extra aspect about Multifunctional Farming is that it reconnects the community with their farms and keeps the dialogue about farming and food production going. As for a website, there are many wonderful ones in Dutch, but the closest thing I know in English is" <http://www.agricultureinurbanizingociety.com/>

<http://landscaperesearch.livingreviews.org/Articles/lrlr-2007-3/>

Permaculture increases the number of symbiotic relationships within ecosystems, whether it is farm, forest or yards. Less well-

known is how permaculture can be applied to increasing symbiotic relationships within social systems. This is one area where permaculture can have a positive impact on farmers' bottom lines. How to get more energy from other people benefiting the farm. Multi-functional agriculture as being developed in the Netherlands and Europe offers us models along these lines. There are plenty of examples of this sort of thing in the US too, but its huge potential is not being looked at much yet. How can farms serve social functions? Farm internships are very well known in the organic farming movement. A lot of people would love to spend some time on a farm. Beds and breakfasts. Farm dinners. Corn mazes, harvest festivals, etc. All these things should leave money in the farmers pocket or contribute positive inputs of labor.

I am sure that we could all brainstorm a lot of examples, A couple of examples I can mention are the farm dinner I attended held at my friend Bruce Bacon's farm outside of Minneapolis, Wisconsin this summer. 135 people paid \$75 each to attend. A gross of \$10,000. Most of the money went to the caterer but some stayed in Bruce's pocket, some went to the local brewery for beers on taps and to the musicians. Most people who attended went on farm tours (three groups) and were favorably impressed and will now be looking for Bruce's farm products to buy in the future. If more food had been raised on the farm and prepared by the farm crew most of that money could have stayed on the farm.

Another example is the Annual Fall Fruit Festival held at Cloud Mountain Farm in Everson, Washington. Hundreds and thousands of visitors show up and spend a lot of money on farm products.

Eco-Agriculture: Food First Farming. Theory and Practice. By Marthe Kiley-Worthington, 1993. Souvenir Press Ltd, London. I just discovered this book at a book stall at the Okanogan Barter Fair this fall. I have read hundreds of books on organic agriculture, but this book still had lots of revelations for me. It was written by an Englishwoman who was raised in Africa. Much of the book details the lessons she learned from three successive farms in the United Kingdom, including a marginal farming situation on Scotland's Hebrides Islands which makes most of the Pacific Northwest Maritime region look like a picnic. Marthe was obviously a scholar and a researcher and she obviously put a lot of creative thinking to come up with a system of agriculture that was above and beyond most of the organic agriculture at the time. Her writings on the ethical treatment of livestock is particularly noteworthy.

I was very impressed by the ecoagriculture farms that Marthe Kiley-Worthington developed in the U.K. Their tact was to be as self-reliant in inputs as possible. The Kiley-Worthingtons produced most of their own food including meat, eggs, dairy, vegetables and fruit. They produced their own livestock feed from grazing, hay and grain. Chickens were free range or fed feed grown on the farm. They used horses for draft power. They refurbished used farm equipment rather than buy new and had a smithy for metal work. They had coppice forest for fuel, fencing and basketry. Hedgerows were established and laid for stock fencing and various products. They used local building materials and traditional building styles. Marthe hated ugly, industrial farm buildings. Their last farm was located in a UK national park so their goals included biodiversity.

Permaculture can be integrated into pretty much all other food production systems. Permaculture is compatible with traditional agriculture, organic agriculture, Biodynamics, LEISA, agroforestry, Grow Bio-intensive, hunter-gathering, etc, etc. Permaculture can be applied to modern, non-organic, industrial farms, but most of them aren't interested yet. Most would go through the organic phase first. There are many different types of organic agriculture. Even though there are now national standards, every organic farm is unique. Permaculture sites are even more diverse since permaculture has no "national standards" so it is even more open to interpretation.

I had the good fortune to be an organic farmer before I learned about permaculture, so my initial experience of permaculture was through the eyes of an organic farmer. The two fit very nicely together. I started organic farming in 1972 and was one of the co-founders of Tilth in 1974. I was a very enthusiastic organic farmer and did a lot of research and reading. Also in the 1970s I was introduced to agroforestry and spent a lot of time researching and integrating that into my outlook. When permaculture came along in 1980 it fit nicely into my worldview. In 1981, Mark Musick and I co-organized a Maritime Northwest Permaculture Conference outside Portland and an Inland Northwest Permaculture Conference near Sandpoint, Idaho.

In my early days of permaculture, some of us used to fault organic farmers for being very similar to conventional farmers. The only difference was that they changed the bags of fertilizers from chemical fertilizers to organic fertilizers imported from around the globe. It was still a high external input system. There is high-external input, organic farming and low-external input organic farming. They are quite different.

When I was a young organic farmer pretty much everyone in the movement was motivated by ethics. As organic became more mainstream some people, farmers/companies came on board that were mainly, or strictly, interested in the profits. This trend has continued. Elliott Coleman distinguishes between "shallow" organic farming and "deep" organic farming.

Just as there is a continuum in organic agriculture between exceptionally good farmers all the way to exceptionally bad farmers, so it is in permaculture. There are some exceptional sites and models to show and there are also lots of mediocre to disastrous experiments. In something so new in permaculture it is not surprising that a lot of lessons are being learned. And, as in any system, we learn from our mistakes and successes.

What can US organic farming and permaculture learn from subsistence farmers in Nepal?

Studies about the sustainability of Nepalese traditional farming found that healthy farms needed 2.5 acres of wild lands to support one acre of cropland. The cropland supplied the bulk of the families food and some cash income. The wild lands supplied: fodder

for livestock from tree lopping and cut and carry collection, fertilizer in the forms of leaves, duff, woody biomass, livestock bedding from bracken ferns and grasses; fuel from firewood and charcoal making; food from wildcrafted berries, fruit, nuts, etc; medicines for man and beast; and supplemental cash income. When population pressure reduced the wild areas available for these purposes compared to the acres of arable land, the farms become unsustainable and the ecosystems increasingly suffer from overuse.

Permaculture aims to design all these products into the farm landscape so that they are produced on site inasmuch as possible. Certainly organic or permaculture farms will be different in the US than Nepal's traditional farming but the principles of having all these resources available should be a matter of design. Nepalese farmers would also benefit from permaculture design to produce more of these things on their farms

Some permaculture strategies and techniques a farmer could use.

Permaculture zone, sector and elevational planning are an integral part of permaculture design. There are hundreds of strategies and thousands of techniques used in permaculture. Many of them are also used in organic farming. Of course no single permaculturist knows all of them.

Permaculture emphasizes increasing the amount of food produced by perennial plants as compared to annual crops, particularly trees and other woody-stemmed crops. Fruits, nuts, medicinals, fiber, resins, etc. Chestnuts for example are starch producing trees. The amount of carbon on an acre of chestnuts is many times the carbon on an acre devoted to wheat or annual grain.

One of the most prescient writers on the topic of tree-based agriculture was J. Russell Smith who wrote his classic book *Tree Crops: A Permanent Agriculture* back in 1929. A contemporary book is Mark Shepard's 2013 book, *Restoration Agriculture: Real World Permaculture for Farmers*. Mark outlines how he is putting J. Russell Smith's idea into practice on a Midwest farm. Another great farm to look at along these lines is Badgersett Farm, where Mark got a lot of his early training.

The yields of permaculture systems involve all parts of the landscape. We should take a close look at the **wild foods situation** in the area and the uses of farm and garden **weeds**. A wild plant species index is compiled and added to over time. Natives and non-natives. What are all their ecological functions, uses? Possible income generation? For instance, some of the weeds I sell into the herbal trade include: burdock root and seed, yellow dock root, sheep sorrel root, dandelion root, leaf and, flowers, St. John's wort, horsetail, catnip, gumweed, wormwood, mullein, teasel, wild lettuce and others.

There are many **native plant crops** which could be developed such as: nettles, Oregon-grape, elderberry, chokecherry, huckleberry, yampah, camas, bitterroot, wapato, salal, various *Lomatium* species, devil's club, and so many more.

Permaculture systems often include bees, mushrooms, seed production and aquaculture. Let nature do the work. For instance, honeybees bring in products from several miles from their hive center.

Hedges, shelterbelts and hedgerows are given careful consideration. Where can they be fit into the landscape? How many useful products can be got off them besides their valuable ecological functions?

Natural Building. Permaculture promotes a greater reliance on local materials are used to a large extent for building. Rock, stone, soil, sand, clay, straw, fibers, roundwood, small-diameter wood, as well as recycled material.

Strive for **energy** self-reliance.

Use of woody biomass

Fodder and forage

Hugelkultur

Ramial chipped wood

Biochar.

Sheet mulching.

Livestock Integration. Neither permaculture or organic farming requires domestic livestock, but overall yields and ecological function are generally better with them. There are many books and writers on this topic. Several to mention in particular in this guise are Joel Salatin of Polyface Farm in Virginia and Mark Shepard who wrote the 2013 book *Restoration Agriculture: Permaculture for Farmers*. Both have a focus on what animal follows another in a livestock rotation across a field. Shepard lays out a case for permaculture and perennial crop systems feeding the world. His livestock integrated with tree crops, grapes, and berries.

Integrated pest management.

Permaculture uses more human labor and less machines, hence is easier on the world environment.

Water catchment and storage are an important part of permaculture design. How can water be held in the system as long as possible and do as many duties/yields as possible before exiting. Swales, contour farming, roof catchment, ponds are used where appropriate. The Keyline System of Soil & Water Management is an integrated systems design method for managing water on farms which was developed by P.A. Yeoman of Australia and has now been taken up by permaculture.

Home gardens are a key strategy. Produce most of your own food. Please read my in-depth article "The Role of Home Gardens in Feeding the World and Sequestering Carbon". <http://inlandnorthwestpermaculture.com/content/role-home-gardens-feeding-world-sequestering-carbon>

Permaculture and agroforestry share a lot in common. Multi-level

stacked systems. More companion planting. Many species in a small area.

Designing guilds, wherein many plants and animals work together.

Sepp Holzer. Sepp Holzer is one of the world's most well known permaculturists. He has to be good farmer with net profits since he is known as the most fined farmer in Europe. He has to be making some good money to pay all the fines. It is obvious from reading Sepp's books that he didn't arrive at permaculture by reading the books, taking pc courses, etc. He basically created his own system and when people pointed out how similar his farming system was to permaculture, he decided to call it permaculture. His farming systems are very permacultural and his books yield many good insights. His pig systems in particular are worth study as are his aquaculture and water systems.

A look at Michael Pilarski's personal farming projects:

I have planted a number of what I call "medicinal food forests" at various locations. In consecutive order starting in 1986: Whispering Pines Farm near Chelan, Washington; Sunny Pine Farm near Twisp, Washington; Riversong Farm near Hood River, Oregon; three locations near Tonasket, Washington and several locations near Hot Springs, Montana. There are youtubes of 5 of the locations.

Here is what I have developed. My goal is to create agricultural systems that are a mixture of annual crops, herbaceous perennials, shrubs, and trees. The goal is high productivity from year one. This is achieved by planting all levels of the succession in year one. Potatoes and all manners of annual vegetable and herb crops bear in year one. Vegetables, biennials crop in year two. Berries are important crops starting in year two and three. Tree fruits follow thereafter, then nut crops, then longer-term tree crops. The understory changes from year to year and decade to decade. The system can be tailored to emphacize food crops, medicinals, honey, fruits, nuts, wood products, etc. I usually plant 50 to 100 species in year one and add additional species each year. The most species I have got to so far is 200 species. I plant shrubs and trees at high densities. Up to 1500 trees/shrubs to the acre.

I hire someone with a tractor and equipment to till the ground in year one. Generally no machinery is used after year one. I don't own a tractor or even a rototiller. They would be handy to own but my way has not required a lot of capitalization. I own and use a wide array of hand tools.

Minerals, manure and organic fertilizers are applied in year one to insure good yields in year one and balance the soil for the long haul. Cardboard for sheet mulching, wood chips and other biomass are brought in over the first couple of years to help kick-start the system. Nutrients are cycled in later years. Woody plants increasingly dominate the system. The ground becomes self mulching. The biodiversity of birds, insects, worms, microorganisms, fungi, etc increase year by year. The system gains taller stature and deeper rooting depths. The one-level farmland becomes a forest. Carbon sequestration levels go up, up, up. Ecosystem function goes up, up, up. Net yields go up over time. The amount of income per acre can lessen over time, but the amount of labor and inputs relative to output goes down. In other words, it takes less hours to manage per acre.

My focus has been on medicinal crops. I call my systems "medicinal food forests". I have gotten up to two acres under management twice so far. These complex systems take time to establish, maintain, and harvest.

Permaculture is not an end. It is a tool to move our personal lives, and society, towards an ecological lifestyle. Above all it is about design. One of Bill Mollison's most quoted remarks is that "Protracted and thoughtful observation is preferable to protracted and thoughtless labor". Taking the time to design can save lots of effort and money in the long run.

What does the future hold for organic farming? For farming in general? For climate change? Permaculture design can be useful for home gardeners and farmers. There are many websites, internet resources and books. We estimate that there are more than 50,000 permaculture design course graduates in the United States. Several thousand offer design and teaching services. There is a need for many more permaculture designers. As in any line of business the individuals have differing amounts of experience, expertise, ability and business standards. Do due diligence when hiring consultants/designers.

I think one of the best investments a farmer could make is taking a good-quality permaculture design course. Most permaculture design courses (pdc) are costly in terms of time and money. There are many benefits to in-person pdc's. On-line courses are convenient, but won't get you to the same place as an in-person pdc with the same instructors. If you are interested in an on-line pdc, Andrew Millison and Marisha Auerbach's on-line course through Oregon State University is one of the best quality on-line pdc's

available. Pdc's vary in quality so do your research.

If permaculture were applied around the world there would be much less need for farmers. Food would be largely produced in people's yards, home gardens, public food forests, edible landscaping, and large amounts of wildcrafting would be available in the bountiful wild ecosystems. I firmly believe that we can take half of the world's cropland out of agriculture and still feed the world. We can have a bio-diverse world full of wild areas and wildlife and eat very well at the same time. The future is abundant if we apply permaculture, organic farming and ecological ways of living.

A quote from Forum for the Future's website which helps out round out the concerns mentioned above:

<http://www.forumforthefuture.org/our-work/what-we-work/food/more-about-our-work-food-system>

"We want to create a sustainable global food system. We want to transform it so it feeds the world's population without exhausting our ecosystem, so the price of food reflects the true cost of producing it, and so all players in the system, in the developed and developing world, are rewarded fairly.

Our current system is unsustainable. It suffers from a range of factors including: unsustainable patterns of consumption in the west; prices that fail to reflect the true environmental and social cost of production; significant waste at all stages between the farm and the table; unfair relationships between retailers, manufacturers and farmers; and consumers who are disconnected from the food they eat."

Read Michael Pilarski's 2010 article

A CARBON SEQUESTRATION PROPOSAL FOR THE WORLD: Based on Reforestation, Improved Ecosystem Management & Increasing Soil Carbon Levels in Farm Soils.

<http://www.friendsofthetrees.net/articles.shtml>

Here is a brief excerpt:

Here are some methods to increase soil organic matter in farm soils. There are many books written on each of these topics.

- * Reduce or halt water and wind erosion.
- * Integrate multi-year, sod crops of grasses/legumes/forbs into rotations on arable cropland to build organic matter. This builds soil while feeding livestock.
- * Growing green manure crops for incorporation into the soil. One, two or even more crops a year depending on length of growing season and its place in the crop rotation.
- * Careful recycling of farm manures and crop wastes back to the fields.
- * Judicious use of natural fertilizers to get good crop growth. These can be added when making composts to good effect.
- * The judicious use of the Keyline system of soil and water management developed by PA Yeoman in Australia. (12)
- * Addition of tree biomass to the soil. Sawdust, chips, bark, ramial chipped wood (chipped green branches) (13), leaves, leaf litter.
- * Conversion of some cropland from annual to perennial crops, particularly tree crops. Soils devoted to annual cropping have little organic matter in the 2nd or 3rd foot. Tree crops will obviously increase organic matter in all levels of the soil that the tree's roots reach.
- * Long term fallowing of degraded farmland. Take land out of cultivation for a decade or more. Manage for tough pioneers that can stop erosion, build soil and provide wildcrafting income. A prime area for planting some of the needed 5 billion acres of new forest.
- * Terra Preta and Biochar. (14)
- * Soil inoculation with mycorrhizal fungi, blue green algae, EM effective microorganisms, Biodynamic preparations, earthworms, etc.
- * There are many other soil building methods.