

Branching Out

Sustainable Farmers Embrace Alternative Orcharding Methods

by TAMARA SCULLY

The time is ripe to take a new look at orchard design and function. Around the country, from Michigan's cherry trees to New York State's apple and peach crops, orchards have been hit with crop losses after late frosts during the past few seasons. Disease pressures, such as those impacting the Florida citrus industry, are another major concern. In circumstances such as these, growers who aren't diversified may have lost their primary income for the year.

The sustainability of a system dependent upon one cash crop, along with the lack of diversity inherent in such systems, combined with increasing concerns about the amount of chemicals used in conventional fruit and nut production, has led a new wave of orchardists to explore alternative methods of growing fruit.

Forward-thinking growers are utilizing a variety of means to reinvent the way an orchard grows. They are cultivating rare, unusual or native fruits, growing in a scale-appropriate manner and addressing orchard diversity through polyculture and mimicking natural ecosystems.

COMMUNITY FRUIT

There's always the argument that naturally grown crops can't be done on a large enough scale to matter. And there is always the exception. There are indeed large-scale certified organic orchards, but sometimes, scaling down is key to successful, sustainable fruit production.

"What we actually need now are numerous community orchards," said Michael Phillips, well-known orchardist, author and leader of the Holistic



PHOTO COURTESY OF HILLTOP COMMUNITY FARM

Erin Schneider and Rob McClure tend to currants at Hilltop Community Farm in La Valle, Wisconsin.

Orchard Network. "I find the 2- to 5-acre scale to be the sweet spot for making a seasonal living at retail sales of fruit and being happy."

This type of farming scale is, "Hands-on, it's woven into the community, it's what people want more of," said Phillips. "It is the antithesis of large-scale industrial production, where synthetic inputs basically replace labor."

Focusing efforts on this scale allows farmers to target cultivation practices to provide non-synthetic pest and disease controls. One example of a successful community-scale orchard is Hilltop Community Farm in La Valle, Wisconsin. Owners Erin Schneider and Rob McClure are focused on growing "fruits that are high-yielding, grower-friendly and exceptionally nutritious," said Schneider.

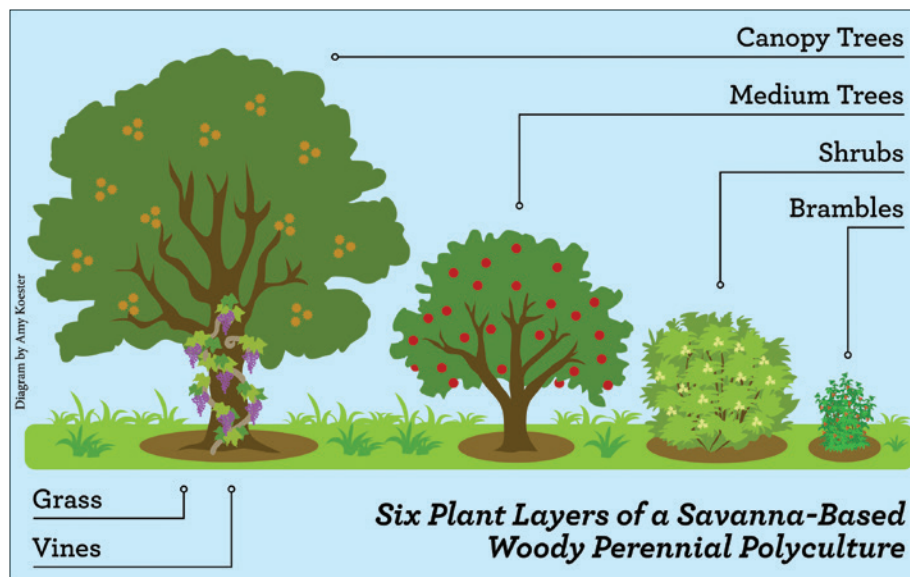
They designed their 1-acre orchard around the concept of a forest garden guild. This concept mimics a natural ecosystem. They've incorporated a selection of rare fruits as well as more traditional offerings into an orchard farming system which not only builds a healthy ecology, but also a healthy community.

"We can consciously apply the principles of forest ecology, structure and function to our farm and garden landscapes," said Schneider. "They also serve as a metaphor in how to live in a community in an autonomous, yet interdependent way. Part of our philosophy is inviting our CSA members and our community into learning and experimenting with us along the way, with a focus on building long-lasting relationships and sustainable food systems one saskatoon at a time."

With several Sustainable Agriculture Research and Education grants (SARE) under their belts, Schneider and McClure have been promoting the unusual fruits they grow to chefs and customers, as well as to other growers, hoping that the concept of diversity can be expanded to other farms. They've worked not only to introduce eaters to the more obscure fruits – including elderberry, currant, honeyberry, aronia, quince, hazelnut and hardy kiwi, but to show other farmers how their forest garden guild system works.

The forest garden guilds at Hilltop Community Farm consist of 358 fruit-producing trees and shrubs, planted in four different planting strips. Overall, there are 23 forest garden guilds replicated across the site. An adjacent 3-acre slope is home to the larger nut trees, which they opted not to incorporate directly into their guilds due to space constraints. Instead, fruit trees serve as a canopy layer, with fruiting bushes in the shrub layer. An understory layer is home to a diverse array of plants including mint, dill, phlox, butterfly weed and more. Groundcovers include Dutch clover, a mix of fescue, perennial rye and some daffodils.

This type of orchard design is copied from nature's design, allowing growers to provide, "A lot of food, fiber, fuel and 'farm-a-ceuticals' in a small space, or to replicate the design



COURTESY OF WPP RESEARCH SITE

across a wide acreage," said Schneider.

While they do grow apples, pears, raspberries and other standard fruits, they do so within the forest garden guild system. They have also incorporated pre-existing fruit trees by utilizing them as "hedges and edges" around outbuildings, or interplanted in the CSA vegetable garden area.

PERENNIAL POLYCULTURE

Mimicking the natural ecosystem while producing food crops is also the focus at the Woody Perennial Polyculture (WPP) Research Site at

the University of Illinois at Urbana-Champaign. They are taking the forest garden guild concept and applying it beyond the scope of community-scale fruit production.

The orchard's perennial polyculture is not only meant to mimic the natural Savanna ecosystem, but to demonstrate that replicating it can lead to a vibrant and environmentally friendly agricultural system, one that can replace today's industrialized corn/soybean monoculture.

"How does diversity in an orchard system help the ecology? How can diversity help the economy?" These questions, asked by Kevin Wolz, Ph.D. student in ecology, evolution and conservation biology, and the principle researcher at the WPP Research Site, are the ones the research aims to answer.

Wolz, who spearheaded the project as an undergraduate, believes that the research will demonstrate that a diverse orchard system reduces soil erosion, sequesters atmospheric carbon, conserves water resources, fosters biodiversity and produces an economic profit.

With 5 acres – four 1/2-acre plots planted in canopy, overstory, understory and groundcover layers; four 1/2-acre sites planted in a conventional corn/soy rotation, plus a 1-acre buffer zone – the WPP Research Site focuses on the agronomy, biogeochemistry,



PHOTO COURTESY OF HILLTOP COMMUNITY FARM

Seaberry (sea-buckthorn) is one of many unusual crops grown at Hilltop Community Farm.



PHOTO COURTESY OF WALDEN HEIGHTS NURSERY AND ORCHARD

A swarm of bees converge on an apple tree at Walden Heights Nursery and Orchard in Vermont.

ecology and economics of growing food in a perennial polyculture.

Corn and soy are annuals requiring vast inputs of fertilizer, fuel and chemicals to bring to harvest. The nuts are perennial, utilizing fewer natural resources. In the polyculture system, the canopy layer of chestnuts and hazelnuts will bear fruit in the long-term. These are foundation crops, replacing corn and soybeans in the conventional cropping system. The high-value chestnut crop can be ground up and utilized just like corn, while hazelnuts can fulfill the role of the rotational soybean crop, providing oil and protein.

“A polyculture is ‘multi-functional,’” said Wolz, both in regard to ecosystem functioning and economic vitality.

While pre-emergent herbicides to decrease weed pressures in the orchard row during the first two years of nut tree establishment are being used, Wolz said, cover crop mixes are being studied to determine whether or not they compete with the trees for nutrients. A cover crop will keep the topsoil in place and increase the water-holding capacity of the soil.

In order to mimic the diversity of a natural system and produce a food crop in the short-term, an understory layer of black currants is being planted. Black currants will bear a high-value crop in year two, and will continue to bear well

for several years. They are shade-tolerant, so even though the yield will decrease over time, they will still provide a secondary cash crop as the orchard matures.

“A single species of nuts is inefficient,” he said. “Now you have a high-value crop coming off of that land and not impacting the nuts. We need to look at the full economics.”

Plots are being established to test hazelnuts and chestnut in a monoculture system, nuts interplanted with currants and then with apples added, too. Although other crops might slow down the growth of the nut trees a bit, the complementary root structures occupy different parts of the soil, and are therefore not competing for nutrients.

Gaining the benefits of diversity without impacting the economics of a system producing a large amount of food, through the utilization of a perennial polyculture system, is the aim of the research. A new sustainable cropping system, which requires no change in the existing agricultural infrastructure and no change in the way food is eaten, bought or processed, but produces a high-quality food product, is the goal.

“Having higher diversity brings you better ecological functioning but will require more management and might impact yields,” said Wolz. “There’s definitely a trade-off. There’s some kind of sweet spot.”

For existing orchards wishing to add diversity, adding an understory layer between mature trees won’t work, because the tree roots have already claimed the soil space, Wolz said. Alternating crop species from row to row could be one way to integrate a polyculture system into an existing orchard planting. Adding a pollinator mix in the alleys also adds diversity.

ALLEY CROPPING

“If you have a vegetative alley, the rain that falls in the alley is more likely to be retained in the soil,” said Rex Dufour, western regional office director, NCAT/ATTRA.

Dufour works primarily with walnut and almond growers in California, where alleys have traditionally been kept clean, keeping detritus to a minimum when nuts are mechanically shaken off the tress at harvest. Some growers



PHOTO COURTESY OF HILLTOP COMMUNITY FARM

Harvesting currants at Hilltop Community Farm.



PHOTO COURTESY OF STOUFFER FARMS

Alley cropping — chestnut trees with winter wheat at Stouffer Farms in Missouri.

are using grass alleys, mowing them short and letting the clippings remain, building organic matter, resulting in “a much more effective and efficient way to store soil moisture.”

Moving from grass to a pollinator mix or cover crop grown in orchard alleyways isn’t too far off from the agroforestry principle of alley cropping, where a secondary crop is grown between orchard rows. This allows growers to benefit from those non-bearing establishment years by harvesting a crop, without harming the trees.

During the first few years of orchard establishment, an alley is not shaded. The orchard is not yet producing, so there is no income from the land, Dufour said. Adding a hay crop, or even some small grains, can provide a harvest, and leaving residue will enrich the soil. Alley crops can be selected for a specific market, such as biomass or livestock feed, as well as to provide a specific benefit, such as adding nitrogen to the soil, providing pollinator habitat, or habitat for wildlife and beneficial insects, depending on the specific needs of the grower.

Long-time farmers Bill and Sue Ellen Stouffer established a chestnut orchard in 2009, which has now grown to include more than 600 trees and offers an example of alley cropping. Pumpkins, sweet corn and wheat have been used as alley crops on their farm in Napton, Missouri. These crops provide income during the chestnut es-

tablishment years, without a negative impact on the primary nut crop. Bill recently presented a workshop on growing chestnuts for the 2015 Great Plains Growers Conference, and his slideshow can be downloaded here: www.greatplainsgrowersconference.org/friday-presentations.html.

ADDING RESILIENCE

“Set aside a little bit of land to put in a perennial hedge row,” said Dufour. “It’s habitat for the good guys.”

Dufour advocates for wild refuges, particularly where native bees can shelter, on the edges and borders of orchards. An untilled area, with pollen and nectar, creates the perfect habitat for these very effective pollinators, whose per-bee pollination rates are much higher than those of honeybees. Adding beneficial insects and encouraging “wild diversity” adds another layer of natural resilience to an orchard system.

Phillips, too, considers this natural biological diversity to add vigor to orchard systems. Many orchard sprays, he said, basically function as medicine, making up for existing biological or nutritional deficiencies.

“Growing healthy means putting your efforts into robust plant metabolism by investing in microbe diversity and balanced mineralization,” said Phillips. “The second line of natural defense growers can steward is competitive colonization, by introducing benign organisms that leave little

room at the inn for pathogens. We’ve learned much from IPM about pests, which coupled with holistic understanding for the disease front, leads to methods that can be tweaked to meet the challenges at any given site.”

While dwarfing rootstock, tall spindle apple orchards and trendy varieties are all the rage today, Phillips prefers free-standing trees on more vigorous roots. These, he said, “require less props to produce a viable crop.”

At Walden Heights Nursery and Orchard, in Vermont’s Northeast Kingdom, Todd Parlo and family are growing certified organic fruit with a mission of being “a model of growing fruit and nursery plants in a fully sustainable manner,” he said.

Parlo, too, believes that proper rootstock is one important ingredient for successful natural orchards.

“The proper rootstock in our climate is the full-sized seedling. Not only does this afford a degree of insulation of longevity due to germplasm (genotype) diversity, it also requires far less input from humans,” he said. “It also mines nutrients in a very effective way, not only from long distances, but also from great depths.”

The longevity of full-sized trees means that continual replanting can

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be avoided. They also require less in terms of irrigation, staking or increased pest protection.

"Another very important consideration is the ability for the variety to thrive given the environmental conditions of the orchard location," said Parlo. "Here in northern New England, our best success is with zone 3 varieties on zone 2 and 3 rootstocks with good anchorage."

Parlo propagates almost 100 percent of the stock sold at the nursery, growing rootstock from seeds or cuttings, grafting the trees and growing them out. He grafts several thousand trees per year, using scionwood from their 8 acres of diverse orchard. They have the capacity to produce more than 400 varieties of apples.

The correct cultivar selection "is of paramount importance. What is crucial is that the intended fruit, in its natural condition, has merit either financially, or as food value for the producer," Parlo advises. "Even fruit from a disease-susceptible cultivar has merit if it has some outstanding quality. Financially, however, tree fruits intended for dessert sales from a certified organic orchard need to be nearly blemish-free. This really necessitates disease-resistant varieties."

At Walden Heights, tree fruit sold for retail sales is treated with organic-approved sprays. They also trap insects, encourage beneficial insect habitat and pay careful attention to orchard cleanliness, microbial aids and considerations such as air circulation. Outside of the small portion of the orchard dedicated to the sale of certified organic tree fruit, their management and philosophy is based on tolerance.

"More important to our philosophy than organic growing is sustainability. Although we are a certified organic farm, most of what has become associated with organic presently is anything but sustainable," said Parlo. "Fossil fuels, heavy inputs, often with huge carbon footprints and unsustainable raw material collection, and toxic amendments are commonplace."

The orchard at Walden Heights consists of hundreds of species of plants, including tree fruits, bush

RESOURCES

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Michael Phillips, Holistic Orchard Network, 859 Lost Nation Road Groveton, NH 03582, 603-636-2286, www.groworganicapples.com, michael@groworganicapples.com

Hilltop Community Farm, LLC, S850 Heidrich Rd., La Valle, WI; 608-257-6729, www.hilltopcommunityfarm.org

Walden Heights Nursery and Orchard, 120 Vermont Route 215, Walden, VT, 05873; 802-563-3012, www.waldenheightsnursery.com

fruits, vegetables and wild plants. The orchard grows on steep slopes and marginal lands that wouldn't be productive in the modern conventional farming system. There are no rows and alleys; instead, there are winding paths, which exclude tractors. Most work is done by hand. Orchard maintenance requires less than 10 gallons of fuel per year. All systems are designed to reduce environmental impact. Soils high in organic matter and the use of mulches in the orchard, mean that irrigation is not needed. Potted nursery plants are watered by hand with rainwater.

"The orchard was created to mimic a more natural ecosystem than is present in today's modern commercial orchard," said Parlo. "On our farm we are trying to make our system as closed a circle within itself, or with the local community. Our methods have to sustain or improve the ecosystem in which it operates. That means it has to be able to be replicated forever."

Their belief in healthy food, people and planet is the impetus which drives the farm. Sharing that so it can be replicated is a vital part of this farming system. Community outreach, to teach others the methods of a sustainable, resilient orchard growing system, is a large part of the farm's focus.

"We employ classroom settings, hands-on work and field demonstrations," said Parlo. "We have instructed

both amateurs and professionals, ages five to 90."

Parlo, too, has performed research, via a SARE grant, to assist others in cultivar selection of apples and pears for organic production in cold climates. Research, as well as practical outreach to the community, to pass hands-on knowledge and reconnect people to their food, is an integral component of the work being done at Walden Heights, as well as Hilltop Community Farm and the WPP Research Site.

An orchard no longer needs to be equated with one primary fruit crop, grown with herbicide strips beneath the trees and dirt alleyways between the rows. While conventional orchards may lean toward this configuration and utilize herbicides and pesticides to produce magazine-ready fruit for supermarket shoppers, alternatives to this model can be found around the country.

As genetically modified apples make the headlines, non-conventional orchardists are making news of their own. They are promoting new ways of growing fruit, and are doing so in a manner which not only addresses concerns about industrial agriculture's negative impacts, but provides healthy food, feeding communities while enhancing the land on which the fruit is grown.