

Sustainable Agriculture:

Farming for the Future with Ideas from the Past

Sustainable Agriculture's (Re)Emergence

Agricultural practices have changed significantly over the past century. In the late 1940s, the use of mechanized equipment, synthetic fertilizers and chemical pesticides became standard agriculture practices. The changes in farming practices and national agriculture policy have reduced the total labor hours required for farming, encouraged large scale farming operations that increase production and lower costs and reduced farming labor risks. Yet according to the Sustainable Agriculture Research and Education Program at the University of California at Davis (UC SARE), there are also significant costs associated with newer, industrial forms of agriculture, including ground water contamination from concentrated animal feeding operations (CAFOs), topsoil depletion, significant reductions in the number of family farms, substandard living and working conditions for farm laborers, and declining economic and social health of many rural communities. These costs are more difficult to quantify in traditional economic models. To reverse these trends, a set of agricultural methods known as sustainable agriculture have gained significant momentum over the past two decades as a means to restore health to farms, food, and communities. "Definitions may vary, but sustainable agriculture generally refers to practices that are viable over long periods of time, both environmentally and economically. Sustainable agriculture, for example, strives to nurture soil that can produce crops reliably without nutrient depletion and with minimal amendments. In sustainable agriculture, the [farmer] makes a philosophical shift away from control to cooperation and evolves from master to steward."¹ The science of sustainable agriculture is "agroecology" - the joining of modern scientific methods, ecology, culture, and economics with local farming knowledge to create diverse and productive systems.

Sustainable agriculture integrates three main goals: environmental health, economic profitability, and social equity, and addresses the stewardship of both natural and human resources, according to UC SARE. Sustainable agriculture is a method of agriculture that:

- Utilizes biological pest control and natural biological cycles;
- Protects and enhances soil fertility;
- Raises healthy livestock without hormones and antibiotics;
- Produces safe crops without the use of synthetic chemicals;
- Optimizes the management and use of on-farm resources;
- Reduces the use of nonrenewable resources.

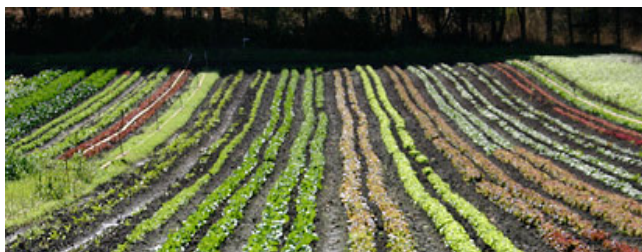


Image taken from http://www.cuesa.org/sustainable_ag/images/lettuce_row.jpg

Sustainable agriculture incorporates many different methods, including organic farming and more specific methodologies such as **biointensive** gardening (double-digging beds and proximity planting); **permaculture** (ecological design that enhances ecosystems, produces energy on site, catches rainwater, and saves seeds); **biodynamic methods** (holistic approaches to farming based on models in nature, with a focus on enhancing soils); and **integrated pest management** (reducing chemical use for pest control by enhancing natural biological systems through timed releases of beneficial insects, timed tillage and pruning). In broader social terms, sustainable agriculture works to provide adequate and dependable farm incomes, to promote opportunity in family farming and farm communities, and to minimize adverse impacts on health, safety,

Tools of the Sustainable Farmer

Farmers and ranchers can choose many ways to increase their sustainability, and their tools vary from place to place. However, a common set of practices has emerged as a means to contribute to long-term farm profitability, environmental stewardship and improved quality of life. These tools include:

- Water conservation and protection techniques such as planting riparian buffers along streams; excluding livestock from streams, stream banks and buffers; and managing irrigation to reduce runoff.
- Using Integrated Pest Management (IPM) systems to control pests.
- Conserving and amending the soil through compost, reduced tillage and not tilling. Compost can be created on a large or small-scale basis, and it involves the decomposition of organic material (largely plant matter) into a rich material that resembles soil and is a beneficial soil amendment.
- Rotational grazing, rotational crop production, companion planting and cover crops such as rye, clover, or vetch after harvest to increase soil health, control erosion, and suppress weeds.
- Agroforestry practices, including planting trees on farms, better management of woodlots and windbreaks, growing specialty trees and growing trees and shrubs along streams as buffer strips.
- Nutrient management planning to reduce runoff of nitrogen and phosphorous into ground and surface water by ensuring that soil amendment quantities and qualities are designed for the intended crops.
- Diversification of crops, landscape, livestock and cultural practices to enhance the biological and economic stability of the farm; avoiding monocrops.
- Promoting livestock and herd health through grass pasture feeding (rather than confined non-grass feeding), thereby using reduced or no hormones or antibiotics.

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wildlife, water quality and the environment.

Sustainable Agriculture Support

Sustainable agriculture can be supported by all participants in the food system including farmers, laborers, distributors, policymakers, researchers, retailers, and consumers.

Consumers can support sustainable agriculture by shopping at grocery stores that purchase from local farmers and encouraging institutions such as schools, hospitals, and offices to purchase sustainably grown foods. The continued growth of farmers markets across the U.S. suggests more people are interested in purchasing food directly from the farmers who grow it and knowing how and where their food is grown.



Image taken from <http://cuisinecanadascene.com/wp-content/uploads/2009/05/Farmers-Market.jpg>

Community supported agriculture (CSA) programs provide another opportunity for consumers to connect directly with a farm and support sustainable agriculture by purchasing a “share” in a farm. “Shareholders” receive fresh produce weekly throughout the season, including fruits, vegetables, and sometimes cheese, flowers, eggs and meat. CSA members accept part of the financial risks associated with farming and enjoy access to “their” farms for educational events and volunteer opportunities. This also helps ease the financial hurdle most farmers encounter of not receiving any payment until the end of the harvest-- in a CSA there is money exchanged upfront, reducing the chance of farmers going into debt. CSAs also allow members to know where their food comes from, to eat locally and in season, and to get to know the people who grow the food they eat.

To find a CSA farm or Farmers Market in Virginia, see <http://www.vdacs.virginia.gov/vagrown/index.shtml>.

Organics: A Growing Market Sector

Sustainable agriculture has been growing rapidly in popularity for a number of reasons. Many consumers are becoming concerned about the potential risks of pesticides, hormones, and antibiotics in food today. According to the Organic Trade Association’s 2009 Organic Industry Study, organic food sales in the U.S. totaled \$22.9 billion, showing a 15.8% increase from 2007 sales. Organic sales grew faster than conventional food products with a 4.9% increase in total U.S. food sales. Sales may be limited by production, though, as “forty-one percent of producers say that undependable supplies of organic raw materials limit their ability to generate sales.”²

The Organic Food Production Act (OFPA) of 1990 required the US Department of Agriculture to develop organic production and labeling standards. These standards, adopted in 2002 and enforced by the National Organic Program (NOP) include food production regulations such as banning the use of specific pesticides and herbicides, irradiation, biotechnology, and biosolids (sewage sludge) for foods labeled “organic.” Farmers and food processors must be certified to use the term organic on their products. Many small farms employing sustainable agriculture practices elect not to become certified due to the lengthy and costly application process.

Walmart Goes Organic³ and Local⁴

The world’s largest grocery retailer began carrying organic foods in 2006, phasing in organic dairy, dry goods and produce. The company now sells over 200 certified organic products in many of its stores. While some view this as a milestone for social justice and public health, noting that Walmart makes organic food accessible to lower and middle-income families, others believe the mainstream marketing encourages organic farming at an industrial scale with some of the same challenges as conventional agriculture.

In the fall of 2010, Wal-Mart announced that it will put more locally grown food into its stores across the country. This includes training for small and medium-size farms. While there has been much debate about how local the program will be, this is a significant step that could be modeled by other chain stores across the world.

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Organic Farming in Virginia at Polyface Farm



Image taken from <http://www.d.umn.edu/cla/faculty/trouts/anthfood/images/salatin.jpg>

Joel Salatin of Polyface Farm in Swoope, Virginia is a “beyond organic” farmer who has attracted national attention for his books, ideas and advocacy for organic, sustainable family farms. New York Times Bestseller List author, Michael Pollan, writes about Polyface in his book *The Omnivore’s Dilemma*. At Polyface, Salatin and his family raise poultry, cattle, pork, and rabbits using his pastured poultry technique, which is an adaptation of livestock rotation and free-range farming. Polyface’s Mission is to “develop agricultural prototypes that are environmentally, economically and emotionally enhancing and facilitate their duplication throughout the world.” Salatin is also the author of several books including *Holy Cows and Hog Heaven: The Food Buyer’s Guide to Farm-Friendly Food*, and is famous for his exclamation, “Everything I want to do is illegal!” in reference to his desire to sell his poultry to consumers directly from his farm, rather than sending it away to be slaughtered and certified. Critics question whether on-farm butchering and sales adequately safeguards public health, while advocates argue that safety is even higher on small-scale sustainable farms than on large-scale conventional farms. For more information: www.polyfacefarms.com

Can Sustainable Agriculture Feed the World?

Critics and proponents have worried for years that sustainable agriculture may address the environmental concerns of industrial scale agriculture, but cannot produce sufficient food to sustain the large human population.

Genetic modification has been viewed as one potential solution to address global hunger. Genetically modified organisms (GMOs) or genetically engineered (GE) organisms have altered genes or have had the genes of a different organism inserted into the original gene sequence for a desired outcome such as cold tolerance, herbicide resistance or increased yields. Some contend that GMOs may offer promise for reducing hunger and disease in developing nations by creating high yield pest and blight resistant crops, such as a rice variety for Africa with high vitamin content. Others see GM food as a threat to long-term human health (concerns about allergies and transfers

of the genes to human cells and gut flora), human food security through contamination of existing seed stock via cross-pollination with non-GE crops, and environmental damage through unintended impacts on wildlife species. Some genetically engineered crops are designed to be resistant to herbicides, such as Monsanto’s Round-Up Ready soybeans. This technology has led to seed patenting in which companies legally “own” seeds that have been genetically modified. Because a GMO’s genes are patented, corporations such as Monsanto have the ability to sue if anyone uses their seeds without a license. Several farmers have been sued when their fields have been crossed pollinated by genetically modified plants.

Concerns about some of the unknown consequences of genetically modified foods and commercial agriculture have led researchers to look more closely at the capacity of sustainable agriculture. A 2007 study by the University of Michigan analyzed conventional and sustainable agriculture and found that a worldwide switch to organic agriculture could increase global food production by as much as 50 %⁵. Other studies have found even greater increases in food production when farmers use sustainable agriculture methods.

The International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) report titled “Agriculture at a Crossroads,” sponsored by the United Nations, the World Bank and five United Nations agencies was completed in 2008. The report found that agroecology, not GM seeds, shows more immediate promise for ending worldwide hunger. Specifically, the report calls for greater support of small-scale farmers and increased attention to new and existing methods to maintain and restore soil fertility. The report also encourages maintaining sustainable production through low-input resource conserving methods based upon an understanding of agroecology, soil science, agroforestry, conservation agriculture, organic agriculture, and permaculture.⁶

Opportunities for Sustainable Agriculture

Sustainable agriculture requires a commitment to changing public policies, economic institutions, and social values in addition to conserving natural resources and changing agricultural practices. Historically, federal, state and local government policies often impeded the goals and implementation of sustainable agriculture by promoting such programs as crop subsidies for industrial scale farms. New policies would be needed to promote economic profitability for smaller farms focused on sustainable practices. For example, tax and credit policies could encourage a decentralized and diverse system of small family farms rather than corporate concentration.

Research policies for state universities and government agencies could be also be changed to emphasize sustainable practices such as pesticide alternatives, soil building, and biointensive planting. These

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institutions can also help create marketing plans and tools to help connect farmers with local consumers and support the sustainable agriculture market.

Another significant pressure on sustainable agriculture is the loss of agricultural lands, averaging one million acres lost annually to urban growth. Increasing local and state taxes together with rising values for farmland can make it more attractive for the farmer to sell than continue farming. To help preserve farmland, and in recognition that a farm requires far fewer local services than a family, some localities are adopting tax rates that enable farmers to be taxed at lower “use value” rates. Members of all parts of the sustainable agriculture system need to collaborate to address these issues at the national, state, regional, and local level.

Resources:

Appalachian Sustainable Development
Email: asd@eva.org
<http://www.appsusdev.org/susag.html>

Appalachian Sustainable Agriculture Project
<http://www.asapconnections.org/>

The Compost Resource Page
<http://www.howtocompost.org/>

Center for Sustainable Agriculture
email: sustainable.agriculture@uvm.edu
<http://www.uvm.edu/~susagctr/>

The Cornucopia Institute
<http://cornucopia.org>

“Exploring Sustainability in Agriculture” from the Sustainable Agriculture Research and Education program, part of the USDA’s Cooperative State Research, Education, and Extension Service.
<http://www.sare.org/bulletin/explore/index.htm>

Denckla, Tanya. *The Gardener’s A-Z Guide to Growing Organic Food*. North Adams, MA: Storey Communications, February 2004.

Faeth, Paul, Robert Repetto, Kim Kroll, Qi Dai, and Glenn Helmers. *Paying the Farm Bill: U.S. Agricultural Policy and the Transition to Sustainable Agriculture*. Washington D.C.: World Resources Institute, March 1991.

Aquaponics: The Future of Sustainable Agriculture?

Aquaponics is the method of growing crops and fish together in a re-circulating water system. Advances over the past few years in research, management, and technology have turned aquaponics into a working model for sustainable food production.

In aquaponics, nutrient-rich fish tank effluent flows into hydroponic beds with gravel, coarse sand, or a similar soilless medium. Bacteria in the hydroponic bed act as a biofilter to break down the ammonia in the fish waste water to nitrogen. The fish water provides an organic fertilizer and irrigation for vegetables growing in the hydroponic beds that take up the nitrogen and other nutrients. Water is then recirculated into the fish tank to begin the process again. This system effectively integrates plant and animal agriculture while linking nutrient recycling and water filtration.

Successful aquaponics systems require infrastructure, training, and management, but systems are flexible based upon available resources, space, and desired production levels. Aquaponics have become a popular model of integrated bio-systems for vocational agriculture programs and high school classes. Growing Power, a non-profit community organization leading the urban agriculture movement, uses aquaponics at its two acre urban farm in Milwaukee. The Growing Power aquaponics models grow Tilapia and Yellow Perch fish and a variety of crops including specialty salad greens and tomatoes. Visit www.growingpower.org to learn more.



Image taken from http://commons.wikimedia.org/wiki/File:Aquaponics_at_Growing_Power,_Milwaukee.jpg

For more information about aquaponics, please visit the National Sustainable Agriculture Information Service (<http://attra.ncat.org/attra-pub/aquaponic.html>).

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International Assessment of Agriculture Knowledge, Science and Technology for Development - www.agassessment.org. Jeavons, John and Carol Cox. *The Sustainable Vegetable Garden*. Berkeley, CA: Ten Speed Press 1999.

National Sustainable Agriculture Information Service (ATTRA)
<http://attra.ncat.org/>

Organic Consumers' Association
<http://www.organicconsumers.org/>

SARE National Office
<http://www.sare.org/>

Sustainable Agriculture Research and Education Program
University of California at Davis
<http://www.sarep.ucdavis.edu/concept.htm>

U.S. Department of Agriculture
Sustainable Agriculture Research and Education
<http://www.sare.org/htdocs/sare/>
(provides research and education grants for farmers and provides education and outreach strategies for Extension educators).

Virginia Association for Biological Farming
<http://www.vabf.org/>

Virginia Department of Agricultural and Consumer Services
<http://www.vdacs.virginia.gov/>

Endnotes:

¹*The Gardener's A-Z Guide to Growing Organic Food*, see above.

²Organic Trade Association, *2009 Organic Industry Survey*
http://www.ota.com/pics/documents/01a_OTAExecutiveSummary.pdf

³ *The New York Times* "Walmart Eyes Organic Foods" May 12, 2006.

⁴*The New York Times* "Wal-Mart to Buy More Local Produce."
October 14, 2010

⁵Chappell, M. Jahi. "Shattering Myths: Can Sustainable Agriculture Feed the World?" *Institute for Food and Development Policy*, vol. 13, no. 3, Fall 2007.

"Towards Multifunctional Agriculture for Social, Environmental, and Economic Sustainability." International Assessment of Agricultural Knowledge, Science and Technology for Development - *Issues in Brief*, 2008.