UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

Sustainable Agriculture

Introduction & Definition

A new term – sustainable agriculture – is being used more and more frequently in conversations about the future of farming. New terms often start out meaning different things to different people, and sustainable agriculture is no exception. The purpose of this profile is to provide a better understanding of this term.

What significance does sustainable agriculture have for Kentucky? By its nature, "sustainable" refers to the practices and values that we wish to preserve. When people mention sustainable agriculture, they are highlighting the positive contributions that farming makes to the entire community. Growing awareness of these contributions can strengthen public interest and investment in a more secure future for agriculture.

The 1990 Farm Bill[1] described sustainable agricultural systems as those that:

- Satisfy human food and fiber needs
- Enhance the environmental quality and natural resource base upon which the agricultural economy depends
- Make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
- Sustain the economic viability of farm operations
- Enhance the quality of life for farmers and society as a whole

Sustainable agriculture should not be an either/or proposition,

such that a farm either is or is not sustainable. Growers with an eye to the future of their farm, their community, and the environment would benefit from incorporating sustainable practices into their own farm business. The economic, environmental, and social goals of sustainable agriculture can serve as a useful yardstick for measuring a farm's performance and progress over time. This approach makes sustainable agriculture relevant to all farmers because it can be applied to farms of every size and type.

Sustainable & Organic Agriculture: How Do They Compare?

While there are important philosophical and practical similarities between sustainable and organic agriculture, there are also fundamental differences. Both organic and sustainable agriculture reflect production systems that rely on biological processes and natural cycles to build diversity and resilience within the farming operation. However, use of the term "organic" is now regulated by the USDA and requires compliance with recognized standards. The term "sustainable" is unregulated and individuals are free to apply it where and when they choose.

NEW CROP OPPORTUNITIES CENTER

An important objective of organic production is a marketable end product that is as free of synthetic compounds as possible. As a result, organic growers may only use natural (non-synthetic) inputs. In addition, steps must be taken to protect crops from, among other things, pesticide drift, chemical run-off, and pollen contamination from Genetically Modified Organisms. Sustainable farmers may use synthetic compounds, although the emphasis is on the minimal use of chemicals that will have the least environmental impact (such as low-toxicity pesticides).

While National Organic Program guidelines are meant to promote sustainability, some approved organic practices are not strictly sustainable. For example, organic growers may use non-biodegradable plastic mulch (polyethylene) in crop production as long as it is removed at the end of the season. However, the plastic is manufactured from a non-renewable petroleum resource, and its disposal after harvest can create environmental problems. Recycling plastic mulch is difficult due to the presence of soil, plant, and pesticide residues that are difficult, if not impossible to remove. As a result, the discarded mulch generally ends up either as "fill" in low areas on the farm or at the local landfill.

With the demand for organic products continuing to increase, organic production has become big business in some parts of the country and around the world. As a result, some large-scale organic farms have come to rely more on machinery (requiring increased fossil fuel use) and purchased off-farm inputs – practices that are contrary to sustainable agriculture.

The Components of Sustainable Agriculture

Sustainable agriculture can be broken into three components: economic, environmental, and social. While discussed separately here, it should be noted that the goals overlap, impacting and influencing each other. For example, economic decisions will also impact the environmental and the social components.

Economic sustainability

To be truly sustainable, a farm must be economically profitable. The environmental and social benefits of sustainable production methods do not always translate into economic gains. Some farms that operate sustainably may be more profitable than their conventional farming counterparts; however, the reverse can also be true. Many factors aside from crop production methods can affect the bottom line. These can include, among other things, the grower's management strengths/weaknesses, decision-making abilities, and marketing skills.

That said, sustainable agriculture practices can have a positive economic impact on a farm. For example, diversifying the farm with several crops and markets helps to reduce financial risk. Over time, improved soil and water quality, as well as other environmental benefits from sustainable practices, may raise the value of the farm. Selling products directly to local markets in the community reduces shipping and fuel costs and can potentially decrease transportation costs. While sustainably grown produce may not bring the full price premiums sometimes paid for certified organic products, growers selling directly to individuals and specialty markets can still capture added value.

Production costs can be variously affected by sustainable methods. Fertilizer and pesticide costs are generally reduced on a sustainably managed farm because, for example, legumes and crop rotations tend to be less expensive than their synthetic alternatives. Labor costs are often higher than conventional systems. The higher labor costs are most often attributed to the increased time required for monitoring and managing pests on sustainable farms. Planting material costs can be lower for growers saving their own seed or producing their own stock. However, those using organic planting material often pay more for seed or other planting material.

Machinery costs (purchase, fuel, and repairs) will vary depending on the specific type of sustainable

production system. Conservation tillage systems and reduced pesticide applications can cut costs related to machinery use and fuel costs. On the other hand, certain systems, such as ridge tillage, can require specialized equipment. Fuel and machinery costs can increase as a result of moving bulky materials, such as organic matter, for soil improvements purposes.

ATTRA[2] lists the following indicators that a farm is achieving economic sustainability:

- The family savings or net worth is consistently going up
- The family debt is consistently going down
- The farm enterprise is consistently profitable from year to year
- Purchase of off-farm feed and fertilizer is decreasing
- Reliance on government payments is decreasing

Environmental sustainability

Environmental concerns are central to sustainable agriculture. Sustainable agriculture is frequently described as: ecologically sound practices that have little to no adverse effect on natural ecosystems. However, more than that, sustainable agriculture also seeks to have a positive impact on natural resources and wildlife. This can often mean taking measures to reverse the damage (e.g. soil erosion or draining of wetlands) that have already occurred through harmful agricultural practices. Renewable natural resources are protected, recycled, and even replaced in sustainable systems. Also inherent to sustainable agriculture environmental concerns is the stewardship of non-renewable resources, such as fossil fuels.

Achieving a healthy, balanced ecosystem takes time. Making the transition to sustainable farming is a process that generally requires moving forward step-by-step. While there are common goals that are critical to sustainable agriculture, there is no single approach that will guarantee sustainable success on every farm. The methods for accomplishing those goals must be tailored to the individual farm.

A key to successful sustainable production is healthy soil. Depending on the condition of the soil, it can take several years to build up organic matter and improve soil quality. Sustainable methods of enhancing soil fertility and improving soil structure can include: using nitrogen-fixing legumes, green manure, and animal manure; minimizing or eliminating tillage; and maintaining year round soil cover. Fertilizer decisions are based upon soil test results. While synthetic fertilizers can be used to supplement natural inputs, they are applied on an as-needed basis. Synthetic chemicals known to harm soil organisms and soil structure must be avoided in sustainable agriculture.

Other sustainable concepts include: maximizing diversity through planned crop rotations, intercropping, and companion planting; protecting water quality; composting; year round soil cover; integrating crop and animal production; soil conservation practices; and attracting beneficial wildlife. Some traditional agricultural practices, such as moldboard plowing, are in conflict with sustainability since they can result in damage to soil structure.

Insects, diseases, and weeds are managed, rather than controlled, in sustainable systems. The goal is not necessarily the complete elimination of a pest, but rather to manage pests and diseases to keep crop damage within acceptable economic levels. Sustainable pest management practices emphasize prevention through good production and cultural methods. Some strategies include: using crop rotations that will disrupt the pest life cycle; improving soil quality; practicing good sanitation; using optimum planting densities; timing planting and transplanting operations to avoid high pest populations; employing biological control; and growing resistant varieties. Monitoring pests through frequent crop inspections and accurate identification are essential to keeping ahead of potential problems. Many Integrated Pest Management techniques can be incorporated into a sustainable program. These may include scouting, targeting pesticide

applications, and the use of biological pest controls. Pesticides are seen as a last resort and are chosen for their low toxicity, specificity to the pest, and lack of persistence in the soil.

ATTRA[2] lists the following indicators that a farm is achieving environmental sustainability:

- There is no bare ground
- Clean water flows in the farm's ditches and streams
- Wildlife is abundant
- Fish are prolific in streams that flow through the farm
- The farm landscape is diverse in vegetation

Social sustainability

Social sustainability relates to the quality of life for those who work and live on the farm, as well as those in the local community. Fair treatment of workers, positive farm family relationships, personal interactions with consumers, and choosing to purchase supplies locally (rather than from a more distant market) are just some of the aspects considered in social sustainability. Community supported agriculture (CSA), farmers markets, U-pick, cooperatives, and on-farm events are just some of the ways a sustainable farm can have a positive impact on the local community. In essence, the farm supports the community and the community supports the farm.

ATTRA[2] lists the following indicators that a farm is achieving social sustainability:

- The farm supports other businesses and families in the community
- Dollars circulate within the local economy
- The number of rural families is going up or holding steady
- Young people take over their parents' farms and continue farming
- College graduates return to the community after graduation

More Information

- Applying the Principles of Sustainable Farming (ATTRA, 2003)
http://www.attra.org/attra-pub/trans.html
- Biointensive Integrated Pest Management (IPM) (ATTRA, 2001)
http://attra.org/attra-pub/ipm.html
- Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Businesses (Sustainable Agriculture Research and Education, 2003)
http://www.sare.org/publications/business.htm
- Defining and Implementing Sustainable Agriculture (Kansas State University)
http://www.kansassustainableag.org/Library/ksas1.htm
- Exploring Sustainability in Agriculture (Sustainable Agriculture Research and Education, 2003)
http://www.sare.org/publications/exploring.htm
- Southern Sustainable Agriculture Working Group (SSAWG)
http://www.ssawg.org
- Sustainable Agriculture: An Introduction (ATTRA, 2005)
http://www.attra.org/attra-pub/sustagintro.html
- Sustainable Agriculture: Definitions and Terms (USDA Alternative Farming System Information Center, 2007)
http://www.nal.usda.gov/afsic/AFSIC_pubs/srb9902.htm
- Sustainable Mountain Agriculture Center
http://www.heirlooms.org

[1] Food, Agriculture, Conservation and Trade Act of 1990, Public Law 101-624, Title XVI, Subtitle A, Section 1603. Government Printing Office, Washington, DC, 1990.

[2] Sullivan, Preston. *Applying the Principles of Sustainable Farming*. ATTRA, 2003.