Exploring Sustainability in Agriculture

Ways to Enhance Profits, Protect the Environment and Improve Quality of Life

The Basis of Sustainable Systems

Agriculture is often viewed as consisting of three types of systems: economic, ecological and social. Sustainable improvement in agriculture – usually thought of in terms of farm profitability, environmental stewardship and quality of life for farm families and rural communities – must be based on these interlocking aspects of agriculture.

Cover: Dairy cows at Tom Trantham's South Carolina farm enjoy grazing alfalfa on one of several intensively managed pastures in a SARE-funded project charting profits and forage quality. Photo by Mark Keever.

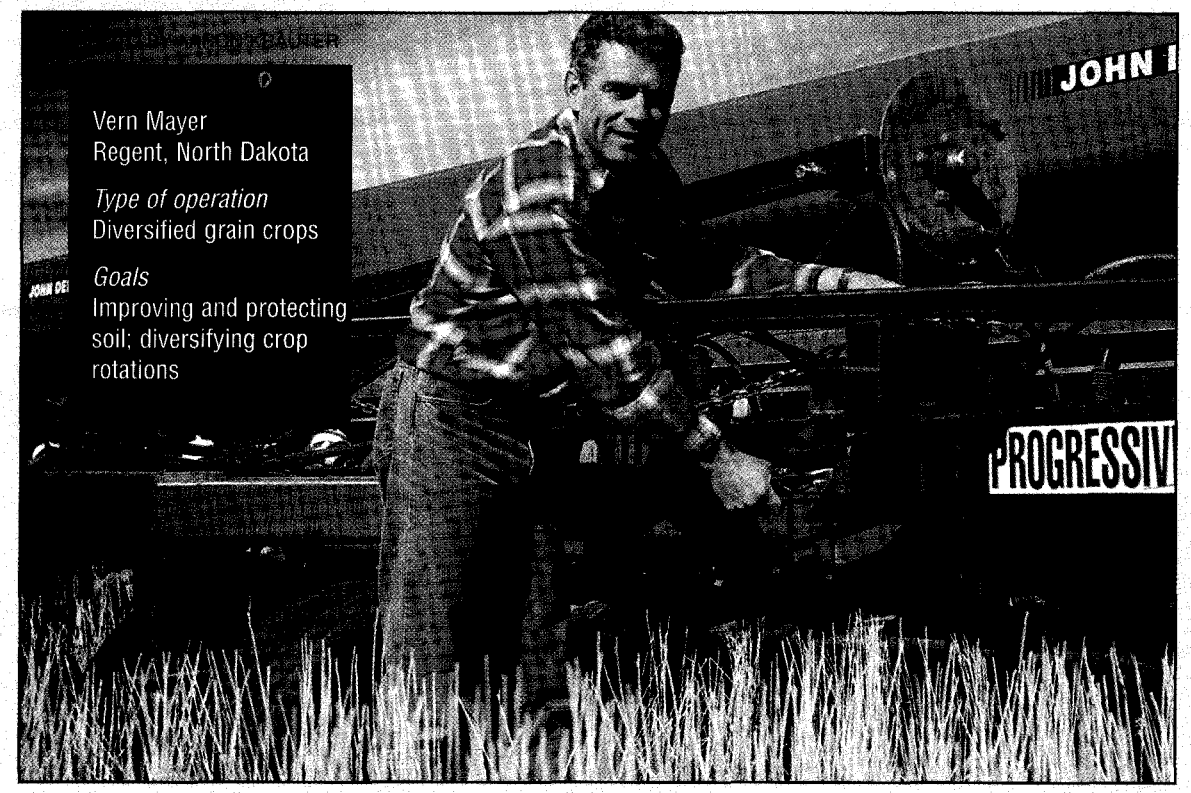
WHAT IS SUSTAINABLE AGRICULTURE?

Perhaps the only constant in our diverse agricultural system is change. Many of today's farmers and ranchers practice a type of agriculture that is far different from how their grandparents, or even their parents, worked the land. Change can be a positive force to improve the world's sources of food and fiber — if those changes are made while balancing profitability, stewardship of natural resources and the health of rural communities.

For generations, American farmers have worked to protect and improve the land and the quality of rural life. Early farmers such as George Washington and Thomas Jefferson, seeing a need to change some standard agricultural practices, became leaders in adopting new farming methods. Washington was among the first of his generation to practice crop rotation, compost livestock waste and help pioneer the use of new planting methods. Jefferson remained a fervent advocate of testing new crops and varieties throughout his life, always seeking plants best suited to the land and people's needs. Washington and Jefferson's search for alternative methods that would improve agriculture, the land and the lives and health of the citizenry is emulated today by producers who farm with an eye toward sustainability. The approaches many of today's farmers and ranchers take as they grapple with these tough issues has come to be known as sustainable agriculture.

Sustainable agriculture does not refer to a prescribed set of practices. Instead, it challenges producers to think about the long-term implications of practices and the broad interactions and dynamics of agricultural systems. It also invites consumers to get more involved in agriculture by learning more about and becoming active participants in their food systems. A key goal is to understand agriculture from an ecological perspective — in terms of nutrient and energy dynamics, and interactions among plants, animals, insects and other organisms in agroecosystems — then balance it with profit, community and consumer needs.

Farming methods that improve the sustainability of one farm may not be appropriate to a different farm or region. Each practice must be evaluated in a given farming system for its ability to achieve a set of economic, environmental and social goals. However, we can look to changes adopted by farmers across the country, a few of which are described in these pages, to get a sense of how to improve agricultural sustainability. The farmer case studies that follow demonstrate a few of these: increased crop and landscape diversity, better utilization of on-farm resources such as crop residue and manure, and more effective marketing. These changes and many other alternative approaches are contributing to the goals of lasting farm production, stewardship of land, water and wildlife, and improved quality of life for farmers, their families and rural communities.



Season after season on his 4,000-acre North Dakota diversified wheat farm, Vern Mayer focuses on improving what is hands-down his most important natural resource: the soil. In the last few years, Mayer eliminated tillage and traditional fallow periods — when the fields are bare and idle — to keep a vegetative cover on the fields year-round. Maintaining a ground cover reduces erosion and captures some of the moisture that most often graces this dryland area in the form of snow melt.

Mayer's conservation goals meld with his need to make a profit. By planting a good mix of cash crops that also provide nutrients for the soil, he makes money while replenishing key organic matter and increasing his vegetative ground cover.

Conventional Dakota wheat farmers plant half of their acreage and leave the other half fallow. Bare ground, however, accelerates erosion, particularly in areas where much of the soil has lost organic matter and therefore cannot absorb as much water from rain or snow. Conventional tillage can compound the erosion problem by exposing topsoil and its organic nutrients to be carried away by wind and precipitation.

"We've done incredible damage to our soils," says Mayer, who was a mechanical engineer before returning to his father's farm in 1976. "We've greatly reduced the soil's organic matter during the last 75 years by aggressive tillage and fallowing. When we get a downpour, we get tremendous water erosion, and people accept it as a fact of life."

Mayer embarked on his soil rebuilding project after visiting other North Dakota farmers who use no-till successfully. "Totally impressed," Mayer stopped tilling and added new crops to his rotation. Now he grows spring and durum wheat, flax, safflower, buckwheat and canola, as well as peas and mustard, keeping a growing cash crop or crop residue on the soil year-round.

Accomplishing that is no small feat. Mayer plants peas to add nitrogen, break disease cycles that form during unvaried rotations and pull in additional revenue. But harvesting peas using traditional methods leaves stubble too short to trap snow because many pods grow close to the ground.

"We have to have every single droplet of moisture. We can't afford to squander snow," he says.

With a grant from the USDA Sustainable Agriculture Research and Education (SARE) program, Mayer experimented with inter-planting peas with mustard in alternate rows. Not only does mustard provide another cash crop, it offers a living trellis for peas. In fall, Mayer harvests the peas and mustard simultaneously, leaving six to eight inches of stubble to catch snow.

His commitment to conservation takes the long view. Says Mayer, "If either of my two sons or my daughter wants to continue this operation some day, I want the farm they find to be in better shape than when I got it from my dad."

PHOTO BY JEREMY GREEN

David "Mas" Masumoto
Del Rey, California

Type of operation
Grapes, raisins and peaches

Goals
Utilizing cover crops, alternative marketing, quality of life

Fruit farmer David "Mas" Masumoto harbors a healthy respect for both nature and the human intellect. Working with his father on an 80-acre farm near Fresno, Calif., Masumoto follows nature's cycles as well as his own ingenuity. He endlessly looks for fresh ideas to enhance his sustainable methods in a quest to grow great-tasting grapes— most of which are dried into raisins — and peaches.

"To be sustainable, you have to want to work with nature rather than trying to beat nature," he says. "Yet sustainability means you want to farm today, tomorrow and years from now, and obviously, I want to be economically viable."

Masumoto is a vocal advocate of using cover crops and integrated pest management on the farm rather than a prescription of off-farm inputs. He grows vetch, clovers, medics and beneficial weeds between his rows of vines and peach trees, and finds many improvements over keeping the ground bare. He has discovered that cover crops help moderate some of the extreme heat that blows into California's fertile Central Valley and seem to reduce mites. The vetch helps fix nitrogen in the soil. But perhaps most important, cover crops create a habitat for numerous beneficial insects. Masumoto, who considers walking his farm and observing insect interactions a necessary and enjoyable part of his job, sees a marked increase in so-called good bugs that prey on fruit-damaging pests.

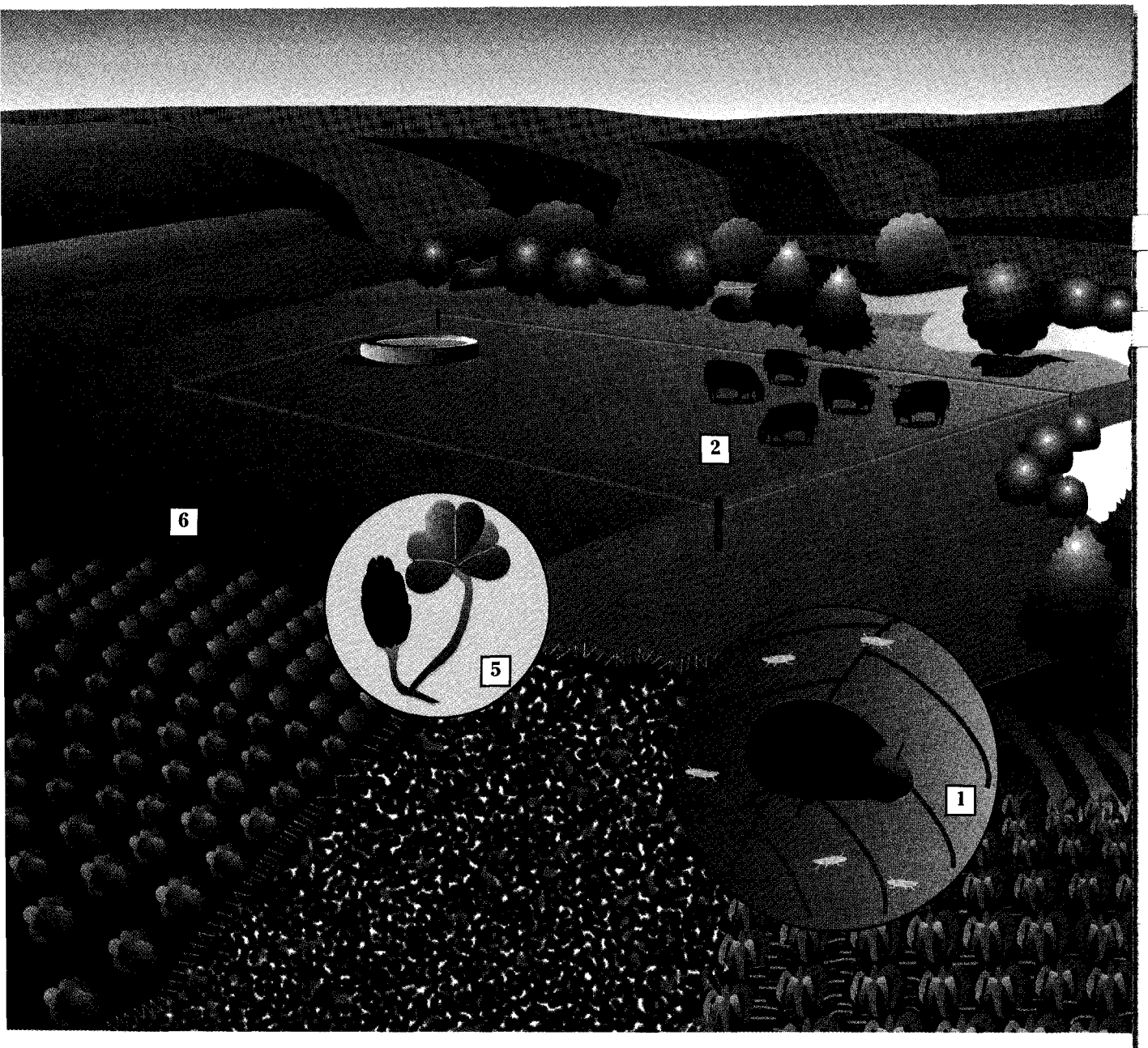
Working with cover crops and observing the presence of insects has helped Masumoto replace much of his commercially purchased fertilizer and pesticides with new, more sustainable ideas.

"I prefer using my own eyes and sense of the land than a technological input," he says. "It's as if I'm paying myself rather than a corporation selling me inputs. When you work with nature, you work with a system that seems very chaotic, but it offers a constant process of discovery, which is exciting."

Masumoto drums up some excitement among central California consumers as well. One of his more successful marketing strategies has been accompanying his peaches to market. Masumoto stands with his fruit in the grocery aisle, offering tastings and information about sustainable growing practices. The public, he says, loves the chance to talk to the man who grows their fruit.

Author of five books, including *Epitaph for a Peach*, Masumoto plumbs his farm experiences to write about the land and how his Japanese-American family has worked in harmony with nature. Thus, Masumoto has expanded the audience of sustainable agriculture from farmers and conservationists to food consumers who, ultimately, could have the most influence on the future of farming.

"People want to know who grows their food and how it is grown," he says. "Part of sustainable farming is your relationship with the community, not just your farmer neighbors but people who buy your fruit."



Elements of Sustainability

There are many ways to improve the sustainability of a given farming system, and these vary from region to region. However, there are some common sets of practices among farmers trying to take a more sustainable approach, in part through greater use of on-farm or local resources. Some of those practices are illustrated here, each contributing in some way to long-term farm profitability, environmental stewardship and rural quality of life.

1. Integrated Pest Management (IPM)

IPM is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks.

2. Rotational Grazing

New management-intensive grazing systems take animals out of the barn and into the pasture to provide high-quality forage and reduced feed costs while avoiding manure buildup.

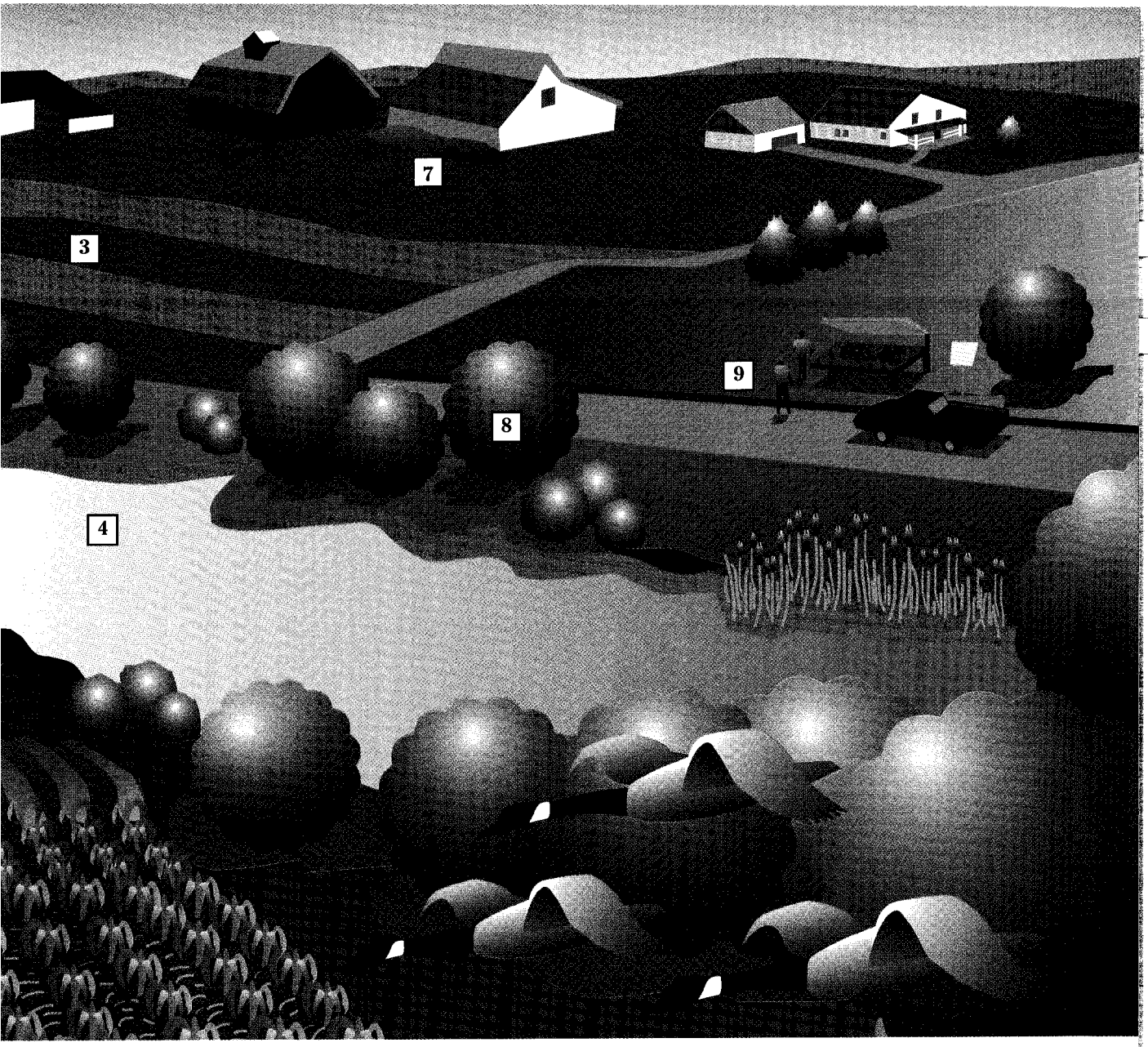
3. Soil Conservation

Many soil conservation methods, including strip cropping, reduced tillage and "no-till," help prevent loss of soil due to wind and water erosion.

4. Water Quality/Wetlands

Water conservation and protection have become important parts of agricultural stewardship. Many practices have developed to improve quality of drinking and surface water, as well as to protect wetlands. Wetlands play a key role in filtering nutrients and pesticides, in addition to providing wildlife habitat.

ILLUSTRATION BY JOANN SCHISSEL



5. Cover Crops

Growing plants such as rye, clover or vetch in the off season after harvesting a grain or vegetable crop can provide several benefits, including weed suppression, erosion control, and improved soil nutrients and soil quality.

6. Crop/Landscape Diversity

Growing a greater variety of crops on a farm can help reduce risks from extremes in weather, market conditions or crop pests. Increased diversity of crops and other plants, such as trees and shrubs, also can contribute to soil conservation, wildlife habitat and increased populations of beneficial insects.

7. Nutrient Management

Proper management of nitrogen and other plant nutrients can improve the soil and protect the environment. Increased use of on-farm nutrient sources, such as manure and leguminous cover crops, also reduces purchased fertilizer costs.

8. Agroforestry

Trees and other woody perennials are often underutilized on farms and ranches. Agroforestry covers a range of tree uses on farms, including interplanting trees (such as walnuts) with crops or pasture, better managing woodlots, and using trees and shrubs along streams as riparian buffer strips.

9. Marketing

Farmers and ranchers across the country are finding that improved marketing provides a key way to enhance profitability. Direct marketing of agricultural goods to consumers is becoming much more common, including through farmers' markets, roadside stands and community-supported agriculture.

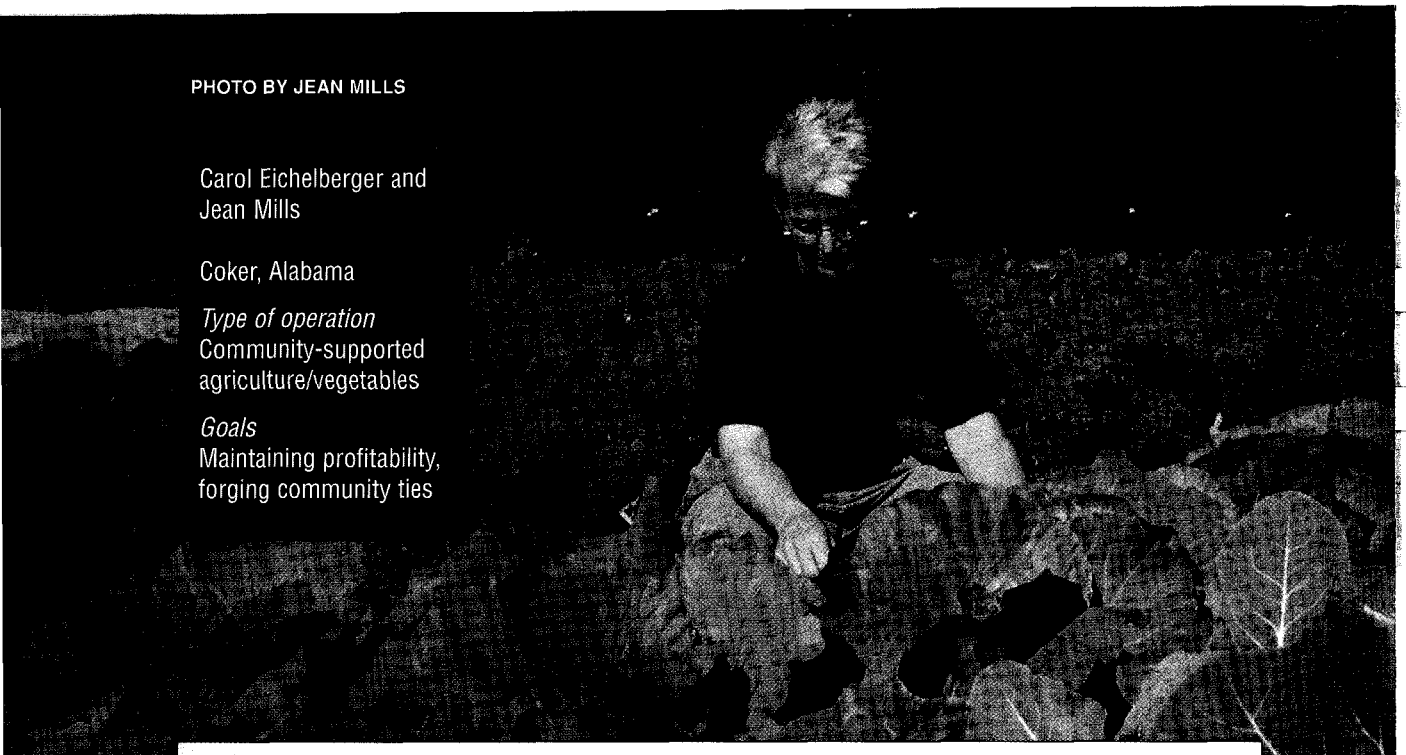


PHOTO BY JEAN MILLS

Carol Eichelberger and Jean Mills

Coker, Alabama

Type of operation
Community-supported agriculture/vegetables

Goals
Maintaining profitability, forging community ties

Each produce pick-up day, as the customers flood Carol Eichelberger and Jean Mills' community-supported agriculture (CSA) farm, the owners renew their commitment to this rapidly expanding form of cooperative farming. The enthusiasm of their customers — partners of a sort who pay in advance for fresh produce harvested from spring through fall — recharge the hard-working CSA partners.

"We love the whole CSA package," says Eichelberger, who opened the four-acre venture with Mills in 1989. While the women grow and harvest the produce, many of their customers volunteer to wash, weigh, bag and distribute, all the while learning more about how their food is produced and how buying locally helps create a sustainable food system in their Alabama community.

"The involvement of the community in the farm gives them something more than vegetables and gives us energy we don't get just from growing," Eichelberger says.

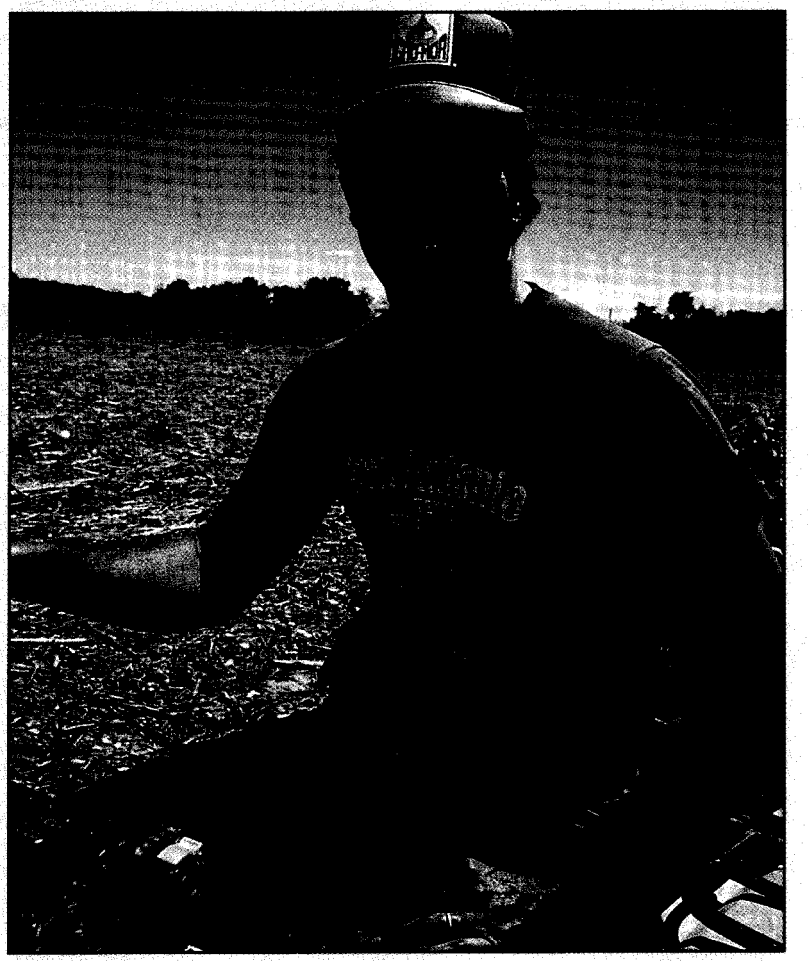
The CSA concept premiered in the United States in the mid-1980s, uniting a non-farm public that craved great-tasting, locally grown fruit and vegetables with farmers who want a secure customer base. This new trend among small vegetable farms helps maintain profitability for growers, who sell fresh food — often to specification — directly to their neighbors in exchange for money up front and a local buyer's empathy for drought, floods or pest outbreaks. CSA's, most of which are organic, also are considered sustainable because they rejuvenate rural communities and can help bridge the widening gap between rural and urban America.

Located outside Tuscaloosa, Ala., Eichelberger and Mills' CSA draws a steady crowd of customers from the University of Alabama and the surrounding community. Eichelberger and Mills, who grow organically, provide a specialized market for customers who want organic produce as well as a greater variety than can be found in the average supermarket.

Eichelberger and Mills work hard to improve a soil that receives 57 inches of rain a year and bakes under the Alabama sun. "We tend to think locally when it comes to sustainability," Eichelberger says. "We have relatively poor soil, and we're trying to do what we can to build it up and preserve what we've got."

The first year, they left some walkways between the rows unplanted and bare. To avoid exposing the soil to the harsh southern conditions, the following year they planted white dutch clover as a living mulch between vegetable beds. The clover cover keeps the soil from compacting and washing away while providing habitat for beneficial insects. As part of a SARE producer grant, Eichelberger and Mills mow the clover and compost it with sawdust, straw, grass clippings and vegetable waste. They apply the compost, rich in nitrogen and organic matter, and hope to eliminate the need to buy fertilizer.

"People around here refer to the fact that they've 'used up' their soil," Eichelberger says. "We wouldn't grow food here if we thought we would make things worse. If we continue to improve the soil, we will continue to farm it."



Steve Groff

Lancaster County, Pennsylvania

Type of operation
Diversified vegetables and livestock

Goals
Stemming erosion, increasing profits

When Steve Groff started farming with his father after graduating from high school, they ran a conventional operation. They grew grains and some vegetables, primarily tomatoes, using typical amounts of herbicides and insecticides. They fattened steers. And every year they filled in two-feet-deep erosion gullies that formed on hillsides throughout the 175-acre Lancaster County, Pennsylvania, farm after heavy rains.

The annual erosion began to bother Groff. He started no-tilling corn to see if he could reverse the trend. Within a few years, he noticed improvements in the soil. He did a little more research, then added cover crops to his rotation. Now Groff refers to fields untouched by a plow for 15 years.

"The crop rotation has intensified — it's like a work of art," says Groff, who has changed his sequence of crops in the field and added other sustainable practices. "I really plan what cover crop I want to raise based on what I want to plant the following year."

While conquering erosion was his first goal, Groff began concentrating on how to make more profit per acre. The cover crops are largely responsible for Groff cutting his use of insecticides and herbicides. Under the new system, he spent $10 less per acre last year on agrichemicals. His current average of $14 per acre in chemical costs is far below his neighbor's average per-acre expense of $20 to $30.

To reduce commercial fertilizer use, he augments the manure from his 50 steers with manure hauled in from nearby chicken and hog operations.

"In the last two years, I've been working on soil quality," he says. "I'm able to grow plants that are healthy and can naturally resist drought, disease and insects."

Groff enjoys acting as a sustainable agriculture emissary, speaking to farmers and non-farm groups about agricultural methods that enhance natural resources like the soil. He tells them about no-till and shows them cover crop mixtures of hairy vetch and rye, which reduce groundwater leaching and produce nitrogen for spring planting.

Groff is hoping to improve his integrated pest management program in the coming seasons to further reduce his pesticide use. "I want to farm in such a way that produces a healthy food product that I can earn a living from," he says. "I want to leave the farm in a better condition than when I found it. I'm constantly working toward that, because improving the soil and improving my profits is a continuous process."

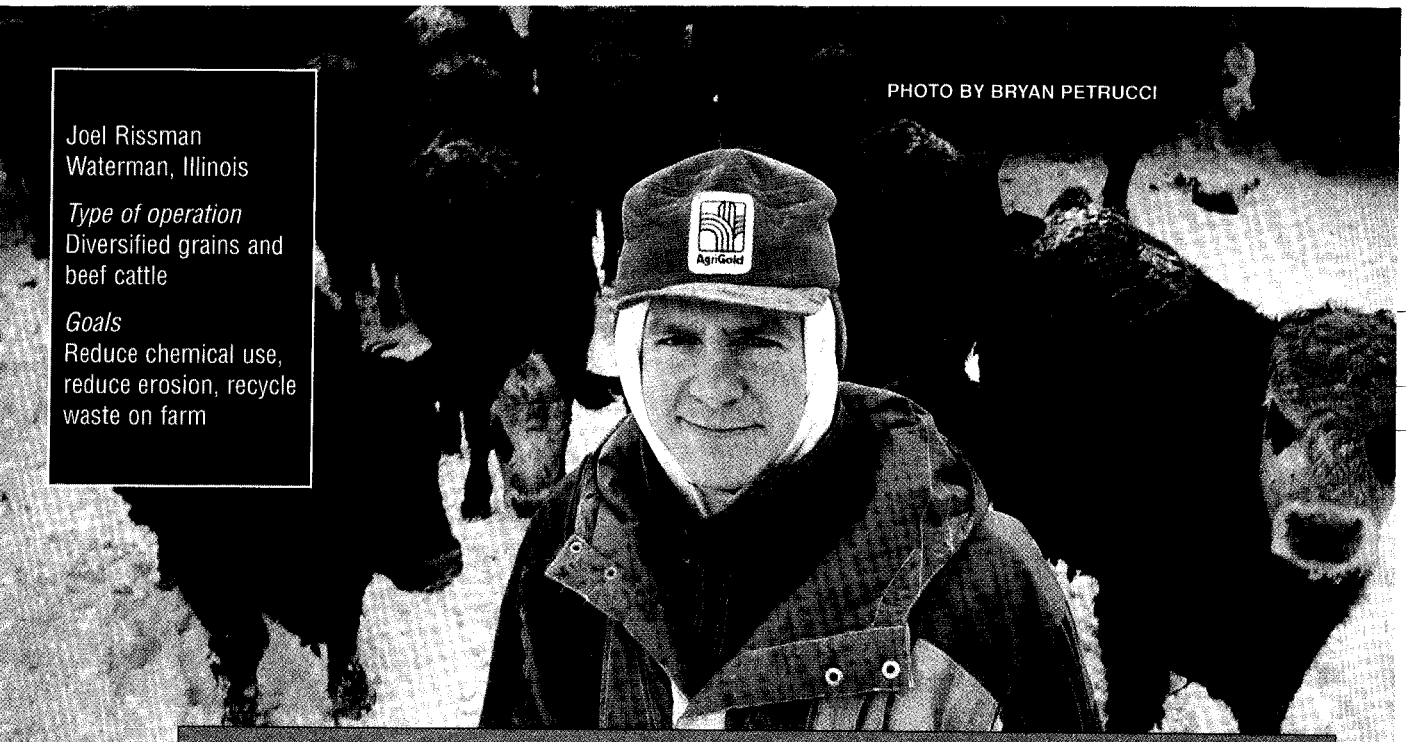


PHOTO BY BRYAN PETRUCCI

Joel Rissman
Waterman, Illinois

Type of operation
Diversified grains and beef cattle

Goals
Reduce chemical use, reduce erosion, recycle waste on farm

It took just two years of managing the family farm for Joel Rissman to figure out he needed to reduce his production costs on the 370-acre Illinois spread to make a profit. He overhauled his farming practices, integrating his crop and livestock enterprises into one system to better utilize on-farm resources. The new system, he found, made good use of his livestock waste, protected the soil and better safeguarded the health of his family.

Moreover, he began saving money, mostly by reducing off-farm chemical inputs — herbicides, fertilizers and insecticides — until today he has eliminated them in an effort to become certified organic.

"I'm thinking of things differently," says Rissman, a young farmer who began working on his uncle's farm after his father retired. "I spent my first two years trying to earn a good living here, but once you pay the chemical bill, you can't pay the other bills."

Rissman, who finishes 200 head of feeder cattle and grows corn, soybeans, wheat, barley, oats and alfalfa as feed crops and hairy vetch for seed, started interseeding cover crops in corn and contour planting on his hillsides. His most dramatic change, however, came from composting instead of hauling out raw manure, a way to both save money and improve the soil.

Rissman began composting after a SARE grant helped him construct a manure pad and retention pond. Using an aerobic process, which requires monitoring carbon dioxide and temperature daily and turning the pile every few days, Rissman creates good compost in six to eight weeks. The pond serves to both moisten the manure pile when necessary and catch feedlot runoff before it can flow into two streams that run across the property.

The economic benefits of using cover crops and manure compost became apparent immediately. Rissman spends about $20 an acre to produce the compost — mostly in lime, straw and compost innoculant — compared to about $50 per acre using purchased fertilizer.

To replace herbicides and commercial fertilizer, he interseeds cover crops — rye, vetch and red clover — with corn to improve the soil. He plants the cover crop and corn mix in early summer. While the corn grows, the cover crops deter weeds. In the fall, he harvests the corn, leaving corn stalks and the cover crops to catch snow and prevent erosion. In the spring, he plows or chisels the cover crops into the ground to provide organic matter and nutrients to the soil and the next cycle of crops.

Eliminating herbicides in favor of cover crops saves Rissman an extra $30 an acre. Such changes require more management, but he appreciates the challenge.

"You get in better touch with your soil," he says. "I now have time to pick up the soil and check its structure. When I farmed conventionally, I was always running around trying to get stuff done."

Rissman's latest projects involve strip cropping corn and grains and planting Christmas trees to halt erosion along the stream banks.

"I'm enhancing what's on the farm," he says. "I want to take what's good and make it even better."

Sustainable Agriculture Information Sources

The Sustainable Agriculture Research and Education (SARE) Program

Since 1988, the Sustainable Agriculture Research and Education (SARE) program has been the U.S. Department of Agriculture's primary means of studying and spreading information about sustainable agriculture. The program has funded hundreds of projects that help advance knowledge about sustainable practices and systems nationwide. Funded by the USDA's Cooperative State Research, Education and Extension Service, SARE administers a wide variety of grants that cover the breadth of sustainable agriculture.

The Sustainable Agriculture Network (SAN) serves as SARE's outreach arm, disseminating information through electronic and print publications.

For more information about SARE, regional grants or publications, contact:

Office of Sustainable Agriculture Programs
U.S. Department of Agriculture
1400 Independence Ave., SW,
Mail Stop 2223
Washington, D.C. 20250-2223
(202) 720-5203
Contact SAN at san@nal.usda.gov/ or visit the Sustainable Agriculture Network web site at http://www.ces.ncsu.edu/san/

Alternative Farming Systems Information Center (AFSIC)

The Alternative Farming Systems Information Center (AFSIC) is one of 10 information centers at the National Agricultural Library. Partially funded by SARE, AFSIC specializes in locating, collecting and providing information about sustainable and alternative agricultural systems, new and industrial crops, and alternative crops.

AFSIC information specialists will answer questions; provide access to books, reports, journal articles, newsletters, etc.; provide references to experts or organizations in a given region; identify researchers and research projects within USDA; and furnish free bibliographies and reference briefs.

For more information, contact:

National Agricultural Library
Agricultural Research Service
U.S. Department of Agriculture
10301 Baltimore Ave., Room 304
Beltsville, MD 20705-2351
(301) 504-6559
Or visit the AFSIC web site at http://www.nal.usda.gov/afsic

Appropriate Technology Transfer for Rural Areas (ATTRA)

Funded by USDA's Rural Business Cooperative Service, ATTRA is the national sustainable agriculture information center. It is operated by the nonprofit National Center for Appropriate Technology, which manages a host of public programs dealing with sustainable agriculture and rural community development. Farmers and others dialing ATTRA's toll-free number can obtain free packets and tailored research reports on a wide variety of sustainable agriculture topics.

For more information contact:

ATTRA
P.O. Box 3657
Fayetteville, AR 72702
(501) 442-9824 or (800) 346-9140
askattra@ncatfyv.uark.edu

Sustainable Agriculture
Research and Education

Spring 1997

Printed on recycled
paper with soy ink