



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

**Watershed
Science
Institute**



Ecological Sciences Technical Note 2, Agronomy April 2000

Making the Transition to Sustainable Agriculture

The Rodale Institute,
Kutztown, PA,
has been studying
the transition
to sustainable
agriculture
for many years.

*(Photo courtesy
of University
of Nebraska, Lincoln
(UNL) Center
for Sustainable
Agricultural Systems)*



Contents

Purpose	2
Background	2
Why make the transition to sustainable agriculture?	2
Strategies for successful transition	2
A framework for converting to sustainable agriculture	3
Planning the transition to sustainable agriculture ..	4
Plan components	4
Defined goals and objectives	5
Resource inventory	5
Monitoring	7
Yield projections	8

Financial plan	8
Timetable for transition	8
Marketing opportunities	8
Labor and management requirements	9
Processing equipment/machinery	9
Housing and storage requirements	9
Agronomic/ecological considerations for moving to a more sustainable agriculture	9
Soil improvement measures	9
Nutrient management strategies	10
Pest management strategies	12
Case studies summary	13
Information Resources	15
References	17

Contributors:

Stefanie Aschmann, Agroecologist, NRCS Watershed Science Institute, c/o National Agroforestry Center, UNL, East Campus, Lincoln, NE 68583-0822, Tel: (402) 437-5178 ext. 43, Fax: (402) 437-5712, email: saschman@unlserve.unl.edu

Larry Culforth, Department of Environmental Studies, University of Wisconsin, Madison, WI 53706
lbcutforth@students.wisc.edu

Purpose

This technical note provides a conceptual framework for the transition to a more sustainable agriculture. It also includes case studies and information sources on sustainable agriculture.

Background

Technical Note 1 of this series defines a sustainable agriculture that maintains productivity, environmental quality and ecological function, and socioeconomic viability. Characteristics that help identify sustainable farms include use of ecological niches, rotational grazing systems, crop diversity, and conservation of non-renewable energy. Diversity is defined in ecological, economic, and social terms. Concepts are illustrated with four case studies in different parts of the United States. Questions about the definition of sustainable agriculture are clarified in Technical Note 1. Building on the established foundation of sustainable agriculture, Technical Note 2 clarifies issues related to transitioning from conventional to more sustainable farming.

Why make the transition to sustainable agriculture?

People are motivated to move to more sustainable agriculture for a variety of reasons. A 1987 survey by *The New Farm* magazine indicated that the greatest single motivating factor was cutting production costs, since inputs into sustainable agricultural systems are often lower than inputs into conventional systems. The second greatest motivating factor was concern for family health. Other factors included, concern about livestock health, a strong land stewardship ethic, a desire for independence, and quality of life issues (Lockeretz and Madden 1987). Peer pressure may also play a significant role in farmers' decisions to implement certain practices or discontinue others. In a Florida survey this factor outweighed government subsidies and even environmental laws (Lynne 1995).

Sustainable agricultural systems help slow depletion of fossil fuels, reduce erosion losses, improve fish and wildlife habitats, protect water quality, and ensure the productivity of the land for future generations; but there are short-term costs and risks associated with changing systems. Changing from a known "conventional" agricultural system to an unknown "sustainable" agricultural system can be risky if not planned well.

The 1996 Farm Bill makes it easier for farmers to move toward sustainable agriculture, since the bill

allows diversification of crop rotations without losing base acres for temporary crop subsidy potential. Dependency on crop subsidies has been cited as a major hinderance to expansion of sustainable agriculture practices (National Research Council 1989). Some farmers who practice pesticide free or organic farming deliberately stay away from farm programs because government-required plans often restrict creative pest control solutions (Bender 1992; Kirschener 1995). No ready-made recipe is available for making the transition from conventional practices to more sustainable agriculture. Factors affecting the process include farmer goals, commodity prices, natural resource base of the farm, available financial resources, available markets, farmer knowledge and access to information, tolerance for risk, community norms, and consideration of how long the land was conventionally farmed prior to conversion.

Strategies for successful transition

For many farmers, the greatest barrier to sustainable agriculture is a concern that they may encounter

unmanageable problems. Many fear that reducing farm inputs may lead to a dramatic drop in yields, serious weed control difficulties, and a significant increase in labor requirements. There may be financial barriers as well, including costs for modifying equipment, storage, or livestock facilities. Many farmers perceive difficulties in securing operating loans from financial lenders accustomed to conventional crops, practices, and systems. To combat these and other potential problems, successful sustainable farmers recommend a gradual transition. This strategy allows for incremental

adjustments, so that learning can occur with minimal risks to profitability.

The time required to successfully transition into a more sustainable agriculture will depend on the farm size, location, topography, soils, previous cropping history, the farmer's transition goals, market availability for crops and a number of potentially unantici-

Start small

Try setting aside a block of land to experiment with sustainable practices before implementing them on the whole farm.

Talk with others about their experiences, *and plan carefully.*

pated factors. MacRae et al. (1990) suggest that it may take 3 to 6 years to fully implement a sustainable system. It may take time until new markets for alternative crops have been firmly established, and until the necessary new skills and knowledge needed to change the production system have been developed. In some instances, residues associated with certain conventional production methods may prevent some biological processes from reaching new, necessary equilibria that include the right balance of organic matter, decomposers and natural pest controls.

Going slowly will help maintain yields and associated income through the transition period until all changes are made and efficiencies established. Some farmers found it advantageous to change only a tenth to a third of the farm at any one time. Others suggest that converting the whole farm at once is a more efficient method because it is easier to see alternative strategies in the absence of conventional inputs and practices. The total approach is risky, and may in fact lengthen the transition period because of unanticipated effects (Patriquin et al. 1988).



A framework for converting to sustainable agriculture

MacRae et al. (1990) describe a three phase approach to the process of converting from conventional to sustainable agriculture.

Phase 1: Increased efficiency

Conventional systems are altered to reduce consumption of nonrenewable resources.

For example; farmers may:

- alter the method of fertilizer application
- monitor pests and administer inputs only when targeted thresholds are reached
- evaluate crop rotations
- alter timing of management operations to reduce input requirements

Phase 2: Substitution

Materials and management practices that depend heavily on nonrenewable energy resources or have adverse environmental effects are replaced with materials and practices that are more environmentally

Three phases of transition to sustainable agriculture

Figure 1a Phase 1 involves increased efficiency. Crop scouting can improve efficiency of pesticide use. (Photo courtesy of UNL, Department of Entomology)



Figure 1b Phase 2 involves substitution. Substituting a no-till drill for a conventional planter may help provide multiple benefits to the soil resource.



Figure 1c Phase 3 involves a redesign of the entire farming system and may include revamping of the cropping system, tapping new markets, and revising all phases of the farming operation. (Photo courtesy of UNL, Center for Sustainable Agricultural Systems)

friendly. For example, synthetic nitrogen fertilizers may be replaced with organic nitrogen sources, such as manure and legumes; pesticides may be replaced with biological control agents; and conventional tillage may be replaced with conservation tillage.

Phase 3: Redesign

The entire farm operation is redesigned to address problems such as pests with a total system approach. This approach uses naturally occurring interactions and feedback mechanisms to minimize the use of external inputs and optimize sustainable biological and economic productivity. Lewis et al. (1997) provide a detailed discussion of a total system approach to sustainable pest management. In Phase 3 the farm is made more ecologically and economically diverse, and therefore more resource self-reliant. Implementing Phase 3 may involve revamping the cropping system, tapping new markets, adding livestock, changing enterprises, and revisiting all phases of the farming operation.

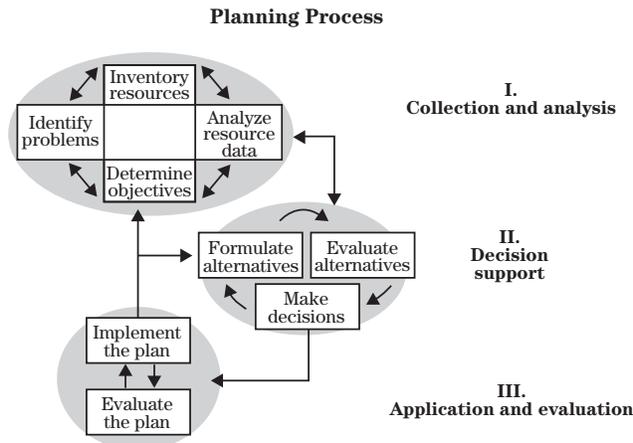
Each of the phases is progressively more complex and involves greater financial risk. Many farmers will choose to move through these phases slowly to become more knowledgeable and gain greater confidence in their abilities to make significant changes without incurring financial hardship.

While some farmers may begin in Phase 1 and work their way through Phase 2 to Phase 3, they may also implement parts of Phases 1 and 2 simultaneously, or they may begin with Phase 3. Others may implement only one phase of the transition. No matter which way one chooses, this framework is a reasonable, comprehensive model to consider.

Planning the transition to sustainable agriculture

The most efficient and smoothest changes are associated with effective planning. NRCS's well-established, 9-step, iterative planning process can be used to develop a comprehensive transition plan for converting to sustainable agriculture. Figure 2 illustrates the dynamic nature of the process that is documented in detail in USDA, NRCS, National Planning Procedures Handbook, Amendment 2 (1998). Terminology presented in this technical note is consistent with the NRCS planning process. The components of a sustainable agriculture transition plan may vary from those of typical conservation plans because sustainable agriculture encompasses added items such as marketing opportunities and labor requirements.

Figure 2 The dynamic NRCS Planning Process involves nine steps and three phases. (Source: *NHCP Amendment 2, Part 600, April 1998*)



Plan components

A transition plan is a modified whole farm plan. Whether a single written document, a series of notes, or a set of ideas in the producer's head, the transition plan should contain some or all of the following components. The first 6 items are essential for all transition plans. The others are essential if applicable to the objectives of the individual producer. Other items may also be appropriate. Every farm is unique, so every plan must be unique.

Essential plan components

1. Defined goals and objectives
2. Resource inventory
3. Monitoring
4. Yield projections
5. Financial plan
6. Timetable for conversion/transition

Plan components often needed

7. Marketing opportunities
8. Labor and management requirements and availability
9. Processing equipment/machinery required
10. Housing and storage requirements
11. Agronomic/ecological considerations for transition
 - a. Soil improvement measures
 - Crop rotation
 - Erosion control
 - Conservation tillage
 - b. Nutrient management strategies
 - c. Pest control strategies

Defined goals and objectives

In developing a sustainable agriculture transition plan, the farmer must first determine the short- and long-term goals and objectives. Writing these down is an essential part of the plan. As Elise Mitchell said, “If you don’t know where you’re going, it doesn’t matter which road you take. You won’t know when you get there anyway”. (Mitchell 1998)

While most people have well defined short- and medium-range goals, long-term goals are often less well defined.

Sustainable agriculture, by definition, is a long-term proposition. Articulating long-term goals can provide insights that might otherwise be overlooked.

For example, a long-term goal might involve reestablishing a particular wildlife species on the farm. A medium-range goal might involve establishing windbreak protection. The tree species selected for planting, the location of the planned windbreak(s), and the continuity of corridors created by them would be significantly influenced by the long-term goal of enhancing wildlife.

Holistic Management (HM) (Savory, et al. 1998) is a process that emphasizes goal setting. HM focuses on defining the *whole* and developing a holistic goal. All decisions can then be tested against this goal and monitored for success or failure in helping meet it.

Resource inventory

An inventory of available resources is also critical to planning a transition. This inventory should be as detailed as possible and should cover not only on-farm physical and biological resources but also human, economic, and information resources both on and off the farm. For example, one may want to know what markets are available, what government programs may assist in the transition, which lending institutions will provide financial resources during the transition, and what information is locally available on alternative crops, integrated pest management, nutrient management, conservation tillage, and conservation buffers. Table 1 provides a sample list of inventory needs for a sustainable agriculture transition plan.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal opportunity employer.

DISCLAIMER: Trade names are used solely to provide specific information. Mention of a trade name does not constitute a guarantee of the products by the U.S. Department of Agriculture nor does it imply endorsement by the Department or the Natural Resources Conservation Service over comparable products that are not named.

NPSS-99-529

Table 1 Sustainable agriculture inventory needs

On the farm	Off the farm
A. Physical resources Soils Physical properties Slope lengths Slope steepness Organic matter Fertility status Toxic residues Water relations Climate Temperature Frost-free period Precipitation Evapotranspiration Solar radiation Microclimate features Purchased/borrowed resources Existing equipment and facilities Processing potential Borrowing and renting potential	A. Physical resources Topography of surrounding watershed(s) Sensitive water bodies B. Biological resources Threatened or endangered species/ Critical habitat Natural buffers and riparian areas Wildlife corridors C. Human resources Community values and attitudes Neighbors Objectives Resources (e.g., unused manure) Potential support (e.g., CSA) ^{1/} Potential urban conflicts and markets Available labor potential Available suppliers D. Economic resources Farm programs (e.g., CRP, CREP, EQIP, WHIP) ^{2/} Lending institutions Markets and market potential E. Information resources Crop advisors/local extension agents NRCS conservationist Libraries Internet Colleges/universities Other growers/grower groups Local and national Sustainable Agriculture Research and Education (SARE) programs
B. Biological resources Livestock inventories Crop histories Weed, insect, and disease histories Beneficial organisms Wildlife resources	
C. Human resources Within-farm labor (farmer and farm family) Current knowledge/experience Current economic resources Computer skills	

1/ CSA: Community Supported Agriculture

2/ CRP: Conservation Reserve Program; CREP: Conservation Reserve Enhancement Program;

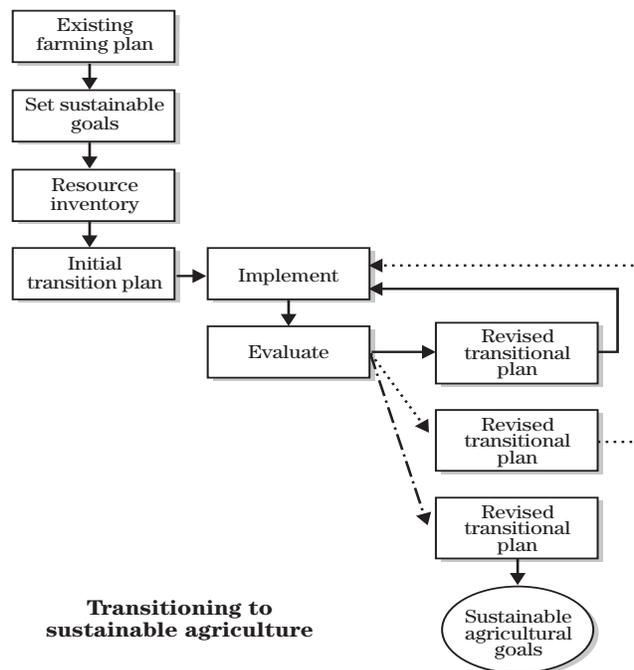
EQIP: Environmental Quality Incentives Program; WHIP: Wildlife Habitat Improvement Program

Monitoring

An important key to successful transition is the ability to assess both progress toward the goal and the overall health of the system (Hall and Kuepper 1998). The transition process is a movement toward the goals established by the producer at the start of the process (fig. 3). The transition plan needs to be continuously adjusted and updated. To make timely adjustments, the producer needs to know if the transition plan is working. Obvious monitoring may include weed and pest inventories, yield measurements, and cash flow records. A number of farm-scale evaluation tools are being developed to assist with monitoring and evaluating agricultural systems for sustainability. The Soil Quality Health Card is one tool available to assess the progress of soil improvement measures. Other tools include the Cropland Health Worksheet, developed by the Watershed Science Institute, and the Pastureland Health Worksheet, developed by the Grazing Lands Technology Institute.

Figure 3 The transition plan is continuously updated and adjusted as the farmer moves toward established goals.

Yield projections



To obtain information on assessment worksheets, contact the following individuals:

Soil Quality Health Card:

Arlene Tugel, NRCS
Soil Quality Institute
Jornada Experimental Range
Box 30003, MSC 3JER, NMSU
Las Cruces, NM 88003-8003
Tel. (505) 646-2660
FAX (505) 646-6041
email atugel@nmsu.edu

Cropland Health Worksheet:

Stefanie Aschmann, NRCS
Watershed Science Institute
National Agroforestry Center
UNL-East Campus
Lincoln, NE 68583-0822
Tel. (402) 437-5178 ext. 43
FAX (402) 437-5712
email saschmann@aol.com

Pastureland Health Worksheet:

Jim Cropper, NRCS
Grazing Lands Technology
Institute
Pennsylvania State University
Pasture Systems and Watershed
Management Research Laboratory
Curtin Rd.
University Park, PA 16802-3702
Tel. (814) 863-0942
FAX (814) 863-0935
email JBC9@psu.edu

Yield projections

Yield projections are needed for financial planning and nutrient management. Accurate yield records can help in developing more accurate yield projections.

When significant changes in management systems occur, the established equilibrium among soil organisms may be temporarily disrupted causing an imbalance in nutrient or pest cycles. This imbalance is temporary, but may initially result in depressed crop yields until a new equilibrium is reached. Being aware of this possibility allows the producer to consider up-front options for addressing changes in yield in the transition plan. Decreased yields may be counterbalanced by lower input costs. Diversifying enterprises, adding value to products, and exploring alternative markets are three options for addressing initially lower yields and increasing long-term profits. It is best to anticipate potential cash flow problems and plan accordingly. Research has shown that yield levels are best maintained by starting with a legume or low N-demanding crop (Andrews et al. 1990).

Accurate yield projections are also important when planning for efficient nutrient management. The quantity of nutrients needed by a crop or animal depends largely on how much the crop or animal is capable of producing. As the transition plan is implemented, records of actual as well as predicted yields will help evaluate the progress of implementation and evaluate the effectiveness of the plan (fig. 4).

Financial plan

Both single- and multiple-year financial plans should be developed as part of a transition plan. Whether a transition plan is affordable must be determined even though all contingencies are impossible to anticipate. It may be necessary to modify the transition plan to account for budget constraints. For example, instead of purchasing a new piece of equipment to accomplish a new task, it may be more appropriate to rent it or hire a neighbor to do the task for the first few years, until its cost effectiveness can be evaluated. It may be necessary to delay implementing portions of the plan until others are completed. Developing a reasonable budget goes a long way toward helping to identify and evaluate transition options. The producer's tolerance for financial risk must also be considered. Other resources on the farm, such as nutrients, breeding stock, irrigation water, labor, and management skills may need to be budgeted. Finally, a detailed financial plan can help educate lending institutions about the transition process should a loan



Figure 4 Records of actual crop yields help the farmer develop yield projections that are needed for financial planning and nutrient management. (Photo courtesy of North Central Region SARE)

be required to implement the plan. Assistance with financial planning and farm budget development may be available through local extension agents.

Timetable for transition

The length of time required to make a transition will vary broadly. It is important to develop a realistic timetable for short-, medium-, and long-term goals to cover all of the anticipated stages. Do not expect instant results, and keep in mind that adjustments to the timetable will likely be necessary as the plan is implemented and improved. Converting to more sustainable agriculture is an evolving process. There is always room for improvement.

Marketing opportunities

Maintaining a secure income during the transition period is critically important. One strategy is to produce crops and commodities that give the producer more control over the price received at the farm gate. Increased control may be achieved by adjusting crop quality and variety to meet local consumer demand. Researching local markets is an important first step.

Another way to secure income is to diversify marketing strategies. Examples of alternative marketing strategies for a variety of vegetable and specialty crops include farmers markets, food cooperatives, pick-your-own, and direct contracts with groups of consumers such as school districts or hospitals (fig. 5). Selling locally can significantly reduce transportation costs and increase net income; however, selling under local contract requires a steady supply

of produce. Cooperative marketing can help alleviate this problem by allowing crop production and distribution to be coordinated to extend the product's period of availability and avoid flooding a particular market at any given time.

Many producers can add value to products before they leave the farm. For example, instead of selling fresh tomatoes, one farmer in California sells sun-dried tomatoes. Some wheat growers in North Dakota have formed a cooperative that makes pasta from their wheat before it is sold. Again, knowing local market needs will help determine what constitutes *value added*.

Since processing of raw products is often governed by different regulations than farming, producers must consult local laws and regulations before initiating a value added enterprise. In some states, formal inspections and special permits may be required.

Labor and management requirement and availability

Converting to sustainable agriculture may involve an increase in labor requirements, at least in the short-term. Setting up new systems takes increased management. Diversification may require added operations, and some operations in sustainable farming systems are more labor intensive

than in conventional farming systems. In many cases labor requirements gradually decrease over time, as farmers become more efficient with their new systems. Some systems may not require additional labor. For example, farmers converting from animal confinement operations to rotational grazing systems may experience little or no added labor requirements. Some producers don't see added labor associated with transition as work, but as education, training, or simply a means of bringing the family together. The labor needed to effectively make the transition varies farm-by-farm, but should be considered in the plan.

Processing equipment/machinery required

New enterprises or new ways of farming may require new processing equipment or farm machinery. Equipment needs must be considered carefully in developing the transition plan. Options for obtaining equipment or machinery will vary, but could include borrowing, renting, purchasing, sharing or redesigning existing equipment to meet current and future needs. When undergoing a transition, starting with one of the less expensive alternatives is often advisable, this is because equipment and machinery requirements may become more apparent as the process continues.

Housing and storage requirements

Requirements for new housing and storage facilities resulting from new enterprises or new ways of managing old enterprises must be considered in the transition plan. Examples might include on-farm grain or feed storage facilities and cold storage facilities for vegetable crops. The plan should address not only the need for housing and storage facilities, but also how to acquire these facilities through time.

Agronomic/ecological considerations for moving to a more sustainable agriculture

Considerations for changing to a more sustainable agriculture fall generally into one of three categories: agronomic or ecological, economic, and social. The relative importance of each varies from farm to farm, but all three categories are critical to successful sustainable agriculture. This discussion only provides examples of the most common agronomic/ecological considerations. Future technical

notes will detail economical and social considerations.

Soil improvement measures

Ensuring that soils will sustain crop production in the long run is a general goal of sustainable agriculture and farmers. Crop rotations, erosion control measures, reduced tillage, and addition of organic materials, such as animal or green manure are important soil-building activities.



Figure 5 The Farmers Market is one means for some producers to sell their products directly to consumers. (Photo courtesy of UNL Center for Sustainable Agricultural Systems)

Crop rotation

Crop rotation is one of the most powerful tools available for long-term soil improvement. Appropriate Technology Transfer for Rural Areas (ATTRA) groups crops into 3 categories based on their soil-building capabilities: **soil-degrading crops** that include most row crops, **soil-neutral crops** that include most cereal crops and annual green manures, and **soil-building crops** that include perennial sod cover such as grasses, clovers and alfalfa (Hall and Kuepper 1998). Crop rotation alone will not determine the soil quality of a farming system. Crop rotation in combination with management such as tillage systems, pest control, and nutrient management will ultimately have the greatest effect on soil improvement (fig. 6).

Erosion control

Soil erosion is, by nature, a soil-degrading process. Measures that reduce soil erosion will reduce soil degradation and allow the soil to gradually rebuild. Combining erosion control practices with soil-building rotations, reduced tillage and addition of organic materials will help achieve sustainability more quickly than any one procedure alone.

Conservation tillage

Increasingly scientists and producers are becoming aware of the benefits of reduced tillage to soil quality and the benefits of no-till to carbon sequestration. Tillage temporarily aerates the soil, drying it, destroying its structure, exposing it to erosive forces, and causing increased microbial degradation of organic matter. By significantly reducing or eliminating tillage, these negative impacts can be reduced. Conservation tillage provides additional benefits. It protects the soil from both wind and water erosion, enhances infiltration and improves soil/water relations, and often provides food and cover for wildlife.

A good rule to consider is that a healthy crop rotation includes a year of soil-building crops for each year of soil-degrading crops, and as many years of neutral crops as makes sense under individual circumstances. (Hall and Kuepper 1998)



Figure 6 A healthy cropping system will balance soil degrading crops with soil building crops. (Photos courtesy of UNL Center for Sustainable Agricultural Systems)

Nutrient management strategies

Nutrient management strategies involve managing the source, rate, form, timing, and placement of nutrients needed by plants and soils for food, forage, and fiber production. Effective management supplies adequate nutrients for good crop production and minimizes loss of excess nutrients to the environment. If crops do not receive sufficient nutrients, the system will not be sustainable. Conversely, an excess of nutrients may result in inefficient nutrient utilization, a costly waste of nutrient resources, and unacceptable environmental degradation. Nutrient management planning should be an important component of most transition plans.

A goal of sustainable agriculture is to reduce off-farm inputs and increase on-farm nutrient use and reuse. Converting to more sustainable agriculture often involves a transition toward the use of nutrients from sources, such as legumes and animal manure (fig. 7) (Andrews et al., 1990), and reliance on crop rotations and cover crops to retain or add nutrients that might otherwise be lost to the environment. Soil testing is an important component of nutrient management planning and application both during and after the transition process.

Developing viable strategies for managing nutrients on a sustainable farm requires an understanding of how nutrients are cycled in nature.



Figure 7 Transition toward sustainable agriculture often involves use of organic nutrient sources, including manures. (Photo Courtesy of UNL Center for Sustainable Agricultural Systems)

The NRCS National Employee Development Center (NEDC) offers a self-paced training course on “Nutrient and Pest Management Considerations for RMS Planning.” For further information on this course contact

Dave Drennan, NEDC
501 Felix Street
Building 23
P.O. Box 6567
Fort Worth, TX 76115-0567
(817) 509-3246
ddrennan@ftw.nrcs.usda.gov

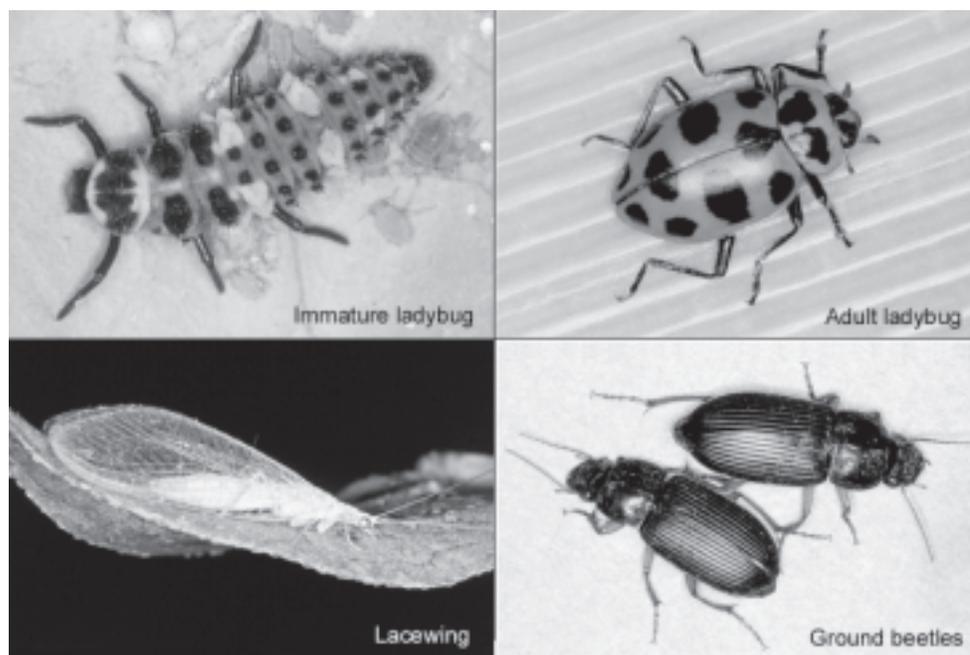
This course provides an excellent background on the underlying ecological principles behind nutrient management.

A recent reference book on the subject is *Soil Fertility Management for Sustainable Agriculture* (Prasad and Power 1997), CRC Press LLC 2000 Corporate Blvd., N.W., Boca Raton, FL 33431.

An excellent reference on cover crops for pest control, soil improvement, nutrient management, and erosion control is *Managing Cover Crops Profitably*, Handbook Series Book 3, published by the Sustainable Agriculture Network. Visit the SAN/SARE web site at <http://www.sare.org> for information about the book.

Figure 8

Ladybugs, lace wings, and ground beetles are natural biological agents that help control crop pests. (Photos courtesy of UNL Department of Entomology)

**Pest management strategies**

Insects, diseases, and weeds can be among the greatest challenges in the early stages of transition to sustainable agriculture, especially when an objective is to reduce or eliminate chemical pesticides. Both chemical pesticides and healthy biological systems can effectively control major pest fluctuations. However, during the period when chemical applications are being reduced, but biological equilibrium has not yet been reestablished, neither of these control measures may be totally effective.

Weed management should be based on an understanding of weed ecology and how it is affected by cropping systems. Strategies for managing weeds may include a combination of crop rotations, cover crops, crop spacing, use of weed-free seeds, and timing of planting and weed control techniques. Timing of planting is often critical to effective weed control, but it may frequently be influenced by weather conditions.

Insects and diseases can often be controlled by natural biological agents, including predatory and parasitic insects, mites, and spiders that keep pest populations below the economic thresholds. The presence of beneficial biological control agents can be enhanced by reducing some practices such as application of broad-spectrum pesticides, and by encouraging the habitat in which beneficials thrive.

As with weeds, insect pests, and disease pests are best managed with a clear understanding of their ecology and life cycles. Knowledge of population levels at any given time is critical in deciding when and how to apply pest control measures. Simple strategies for controlling insect and disease pests include crop rotation, cover crops, resistant cultivars, pest monitoring, and timing of planting. The best approach is usually an integrated one. Many control techniques can be highly pest specific. Future technical notes will discuss some specific strategies for sustainable pest management (fig. 8).

Case studies

Case studies provide practical insights into how making the transition to sustainable agriculture works. Case studies illustrate how new ideas or innovative options have been successful for some individuals. Each situation is unique, so it is important to remember that what has worked for one farm may not be appropriate for another, even in the same region.

The case studies outline the stories of farmers who are making the transition to more sustainable agriculture. These farmers are in different stages of transition, and each has approached the process with a different set of goals, experiences, and resources. Each summary highlights a farmer or farmers who defined and set specific long-term goals, and who are taking different paths to achieve those goals.

Case Study No. 2-1: Bob and Dorothy Ekre

Bob Ekre and his wife Dorothy have been farming in western North Dakota for nearly 50 years and moving toward a more sustainable agriculture for most of that time. Bob began the transition to a diversified no-till system more than 30 years ago by experimenting with not tilling a fallow field. Through time he developed a no-till system that worked for him. He has eliminated fallow and added several new crops to his original wheat-fallow rotation, and the system is still evolving. One of the next steps in Bob's transition may include adding a legume to his rotation.



Case Study No. 2-2: Ken Staten

Ken Staten currently grows greens and peppers on 4 acres in the Florida panhandle. His goal is long-term sustainability, both economic and ecological. He is fairly new to farming, but is eager to learn. He relies heavily on Florida A&M for information on sustainable farming, but he does not limit himself to a few sources. He subscribes to sustainable agriculture newsletters, attends workshops, and searches the World Wide Web for information and markets. Ken has tapped into some reliable local markets for his produce. He is always looking for new markets, but he now grows only what he knows he can sell. Ken is especially interested in building his soil. His ideal is to have a cadillac soil to leave to the next generation.



Case Study No. 2-3: Robert and Terry Weigel

Robert (Bobby) and Terry Weigel run a diversified crop/livestock operation on 2,240 acres in south central North Dakota. They have been moving toward a sustainable agriculture since 1980. Changes they have implemented include developing a rotational grazing system, taking advantage of nutrients in the manure for soil improvement, composting the manure to facilitate transport and more even spreading, soil testing, and developing a nutrient management plan. Their transition has also included strip farming and shelterbelts. Most recently they have begun no-till farming and experimenting with diversified crop rotations. For the Weigels the transition is an ongoing process.



Case Study No. 2-4: Ramon (Dosi) and Norma Alvarez

Dosi and Norma Alvarez grow cotton, alfalfa, herbs, cows, and quarter horses on approximately 850 acres of land in the Mesilla Valley, Dona Ana County, New Mexico. Their farm has been completely organic since 1993. Concerned for the health of their family, Dosi and Norma decided to eliminate chemical use on their farm. They worked through a local cooperative to find a buyer who would work with them through the transition process. They started with 25 acres. Weeds were the biggest concern. Through trial and error, they were able to successfully modify their weed cultivator to control even the most persistent weeds. The boll weevil has recently invaded the Mesilla Valley, and an area wide eradication program has been established. To retain their organic status, Dosi and Norma agreed to avoid growing cotton for 1 year on any fields in which two or more boll weevils have been found rather than participating in the spraying program. Dosi is pleased with his organic operation. It makes him more observant of nature's ways. As he says, "Man tries to dominate his world, and in farming it is through chemical use, but God created nature with a natural balance, and our efforts to control it are often unnecessary."



Case Study No. 2-5: Bob Fogler and John Dorman

Bob Fogler, a dairy farmer, and John Dorman, a potato grower, own and operate separate farms in central Maine, but share resources to form a diversified crop/livestock operation. They began integrating their operations 12 years ago by sharing some land and manure. Gradually they began sharing equipment and labor. By combining and sharing resources they have been able to expand the dairy herd, improve potato yields and quality, and dramatically reduce operating costs. They have gradually become more efficient in their management of nutrients and pests, and their system continues to evolve. Future plans include adding a grass to their rotation and forming similar alliances with other local farmers.



Case Study No. 2-6: Tar Box Hollow Buffalo Ranch

The Masons raise Great Plains bison on a 480-acre farm in northeastern Nebraska called Tar Box Hollow Buffalo Ranch. They began their transition when their traditional corn and soybean land was placed in the Conservation Reserve Program (CRP) for 10 years. When the land was released, the Masons decided to make a major change from traditional row crops to rotational grazing. The transition process was gradual and is still evolving. The bison herd has grown, and the farm enterprises now include a tourist component.



Information resources

Understanding some of the issues involved in transitioning to a more sustainable agriculture is a first step; however, the more information one gathers and uses before making major operational changes, the more likely they are to be successful. Information resources are available from a variety of sources. The following is a list of a few organizations that can provide information on sustainable agriculture and specific techniques that may be helpful in the transition process. Check the Sustainable Agriculture Network directory for additional resources in your State or Region.

1. Appropriate Technology Transfer for Rural Areas (ATTRA)

P.O. Box 3657
Fayetteville, AR 72702
(800) 346-9140
<http://www.attra.org/>

ATTRA is a USDA-funded project providing free sustainable agriculture information. The service is operated by a private, nonprofit organization, the National Center for Appropriate Technology. ATTRA focuses on answering specific questions about sustainable agriculture, but also provides a list of publications on a variety of topics. ATTRA publications may be accessed on the internet.

2. Alternative Energy Resources Organization (AERO)

25 S. Ewing, Suite 214
Helena, MT 59601-5732
(406) 443-7272
aero@desktop.org

AERO is a private, non-profit organization that promotes sustainable dryland agriculture in the semi-arid region through information, networking, education, and on-farm research. AERO produces books, conference proceedings, case studies, two periodicals, and on-farm research results; and organizes field days, networking assistance, and referrals to scientists and farmers and ranchers.

3. Alternative Farming Systems Information Center (AFSIC)

National Agricultural Library
10301 Baltimore Blvd., Rm 304
Beltsville, MD 20705-2351
Phone: (301) 504-6425
FAX: (301) 504-6409
afsic@nal.usda.gov
<http://www.nal.usda.gov/afsic>

The AFSIC at the National Agricultural Library answers questions on all aspects of sustainable agriculture. AFSIC uses the collections of the National Agricultural Library, its AGRICOLA database and the expertise of a network of contact people. Information is also provided in the form of free bibliographies and directories.

4. Community Alliance with Family Farmers (CAFF)

P.O. Box 363
Davis, CA 95617
(530) 756-8518
<http://www.caff.org>

CAFF is a membership organization that promotes family farms as a cornerstone of healthy communities by creating direct links between consumers and farmers, supporting widespread adoption of ecological agriculture, working to preserve California's farmland and water resources, and encouraging public policy that shares this vision of a sustainable future. Through their Biologically Integrated Orchard Systems (BIOS) and Lighthouse Farm Network (LFN), CAFF provides farmers in California with technical support for biologically-based farming methods.

5. Henry Wallace Institute for Alternative Agriculture

9200 Edmonston Road
Suite 117
Greenbelt, MD 20770
<http://www.hawaii.org>

The purpose of the Henry Wallace Institute for Alternative Agriculture is to enhance the scientific credibility of sustainable farming systems and to foster the dissemination of sound information about such systems to increase awareness, understanding, and adoption of sustainable agriculture. They publish the *American Journal of Alternative Agriculture*, *Alternative Agriculture News*, occasional papers, and proceedings of institute-sponsored conferences. They provide referral assistance for sustainable agriculture questions and serve as a voice for sustainable agriculture in the national public policy process.

6. Kerr Center for Sustainable Agriculture

Highway 271 South
P.O. Box 588
Poteau, OK 74953
Phone (918) 647-9123
FAX: (918) 647-8712
mailto:mailbox@kerrcenter.com
<http://www.kerrcenter.com>

The Kerr Center provides grants to Oklahoma producers for research and demonstration projects, and sponsors workshops in sustainable agriculture and rural development. It holds several field days annually to demonstrate an on-site sustainable cow-calf operation, conservation practices and horticulture crops. The Center also supports a subtropical research station for sustainable citrus production in Vero Beach, Florida, (561) 562-3802, and publishes a newsletter, fact sheets, reports on current agricultural issues, and information packets on horticultural/alternative crops.

7. New England Small Farm Institute

Box 937
169 Jackson St.
Belchertown, MA 01007
(413) 323-4531

The New England Small Farm Institute is a non-profit educational organization promoting the sustainable use of the region's agricultural resources through demonstration, education and training, advocacy and policy work. Information is provided on topics specific to the Northeast. Informational documents are available on topics such as composting, soil fertility management, organic certification and farmer training. They also have a non-lending library with more than 3,000 books and journals in print or on microfiche.

8. Practical Farmers of Iowa (PFI)

2104 Agronomy Hall
Iowa State University
Ames, IA 50011
(515) 294-5486
<http://www.agron.iastate.edu/pfi>

PFI is a non-profit membership organization that supports profitable, environmentally sound farming through on-farm research and community networks. Information is provided through publications, by requests to Iowa State University scientists, and by referrals to producers with experience on the topic in question. PFI publishes an annual field day guide and quarterly newsletter containing results of farmer and university research, and the contributions of PFI members.

9. Sustainable Agriculture Network (SAN)

National Agricultural Library
1031 Baltimore Ave., Room 304
Beltsville, MD 20705-2351
Phone: (301) 504-6425
FAX: (301) 504-6409
mailto:San@nal.usda.gov
<http://www.sare.org>

SAN is the communications and outreach arm of the Sustainable Agriculture Research and Education (SARE) program. SARE is a U.S. Department of Agriculture-funded initiative that sponsors competitive grants for sustainable agriculture research and education. SAN is dedicated to the exchange of scientific and practical information on sustainable agriculture systems using a variety of printed and electronic communications tools. See SAN on the World Wide Web or subscribe to the sanet-mg discussion group on sustainable agriculture.

10. University of California Sustainable Agriculture Program (SAREP)

260 Hunt Hall
Davis, CA 95616-8515
(530) 752-8664
<http://www.sarep.ucdavis.edu>

SAREP provides leadership and support for scientific research and education to encourage farmers, farm workers, and consumers in California to produce, distribute, process and consume food and fiber in a manner that is economically viable, sustains natural resources and biodiversity, and enhances the quality of life in the state's diverse communities for present and future generations. SAREP provides funds for applied research projects, economic and public policy projects, seminars and field demonstrations, and graduate student awards. They have a wealth of information on a sustainable agriculture that can be accessed through their web page.

References

- Andrews, R.W., S.E. Peters, R.R. Janke, and W.W. Sahs. 1990. Converting to sustainable farming systems, pp 281-313. *In* C.A. Francis, C.B. Flora and L.D. King, eds., *Sustainable Agriculture in Temperate Zones*. Wiley, NY.
- Aziz, Frederick. 1989. Soil survey of Golden Valley County, North Dakota. USDA Soil Conservation Service in Cooperation with North Dakota Agricultural Experiment Station, North Dakota Cooperative Extension Service, North Dakota Soil Conservation Committee, USDA Forest Service and USDI Bureau of Land Management.
- Bender, Jim. 1994. *Future harvest, pesticide-free farming*. University of Nebraska Press, Lincoln, NE, 159 pp.
- Blobaum, R. 1983. Barriers to conversion to organic farming practices in the midwestern United States. *In* Lockeritz, ed., *Environmentally Sound Agriculture. Selected Papers from the Fourth International Conference of the International Federation of Organic Movements*, Cambridge, MS. August 18 to 20, 1982. Praeger Scientific.
- Gotlieb, A., and A. Hazelrigg. 1992. Potato scab. Garden disease control leaflet no. 7. University of Vermont Extension.
<http://ctr.uvm.edu/ctr/gd/gd7.htm>
- Hall, B., and G. Kuepper. 1998. Making the transition to sustainable farming. Appropriate technology transfer for rural areas (ATTRA). Fayetteville, AR 72702.
- Kirschenmann, F. 1988. Switching to a sustainable system, Strategies for converting from conventional/chemical to sustainable/organic farming systems. Northern Plains Sustainable Agriculture Society, Windsor, ND, 18 pp.
- Lewis, W.J., J.C. van Lenteren, S.C. Phatak, and J.H. Tumlinson, III. 1997. A total system approach to sustainable pest management. *Proc. Natl. Acad. Sci. USA* 94:12243-12248.
- Lockeretz, W., and P. Madden. 1987. Midwestern organic farming: A ten-year follow-up. *American Journal of Alternative Agriculture* 2:57-63.
- Lynne, G.D. 1995. Modifying the neo-classical approach to technology adoption with behavioral science models. *Journal of Agr. Applied Econ.* 27:67-80.
- MacRae, R.J., S.B. Hill, G.R. Mehuys, and J. Henning. 1990. Farm-scale agronomic and economic conversion from conventional to sustainable agriculture. *Advances in Agronomy* 43: 155-198.
- Matheson, Nancy, Barbara Rushmore, James. R. Sims, Michael Spengler, and E.L. Michalson. 1991. *Cereal-Legume cropping systems: Nine farm case studies in the Dryland Northern Plains, Canadian Prairies, and Intermountain North west*. Alternative Energy Resources Association, Helena, MT, 75 pp.
- Mitchell, E. 1998. Setting goals for the farm, the family, and yourself. *The Kerr Center for Sustainable Agriculture NEWSLETTER*. The Kerr Center for Sustainable Agriculture, Poteau, OK.
<http://www.kerrcenter.com/nwsltr/index.htm>
- National Research Council. 1989. Agriculture and the economy (pp. 25-88). *In* *Alternative Agriculture*. National Academy Press, Washington, DC.
- Patriquin, D.G., N.M. Hill, D. Baines, M. Bishop, and G. Allen. 1986. Observations on a mixed farm during the transition to biological husbandry. *B.A.H.* 4:69-154.
- Prasad, R. and J.F. Power. 1997. *Soil Fertility Management for Sustainable Agriculture*. CRC Press, Boca Raton, FL, 356 pp.
- Savory, A., J. Butterfield and J. Butterfield. 1988. *Holistic Resource Management: A New Framework for Decision Making*. Island Press, Washington, DC, 550 pp.
- Sustainable Agriculture Network. 1998. *Managing Cover Crops Profitably. Handbook Series 3*, 212 pp.
- United States Department of Agriculture Natural Resources Conservation Service. 1998. *National Planning Procedures Handbook, Amendment 2*.
- Wroblewski, D.V. and N.J. Lunde. 1980. *Soil Survey of North Dakota Agricultural Experiment Station*, 185 pp.

Bob Ekre



Bob Ekre stands in front of his harvesting equipment.
(Photo courtesy of NRCS, Golden Valley County Field Office)

Location:

Golden Valley County, ND

NRCS District Conservationist:

Dale Ferebee
USDA, NRCS
Golden Valley County Field Office
P.O. Box 490
Beach, ND 58621
Tel: (701) 872-4551
Fax: (701) 872-4484

Acres farmed:

1,680 (1,280 owned, 400 leased)

Crops:

spring wheat flax
winter wheat barley (occasional)
oats

Making the transition:

Objectives:

Erosion control

Transition sequence:

Ongoing changes

Social issues:

Information sharing

Economic issues:

Risk of family livelihood

Ecological issues:

Moisture

Growing season

Wind and water erosion

Site description

Bob Ekre has been farming in western North Dakota for nearly 50 years. His parents moved to this area in 1910. He and his wife Dorothy began building their own farmstead in 1948. In the late 1960's they began to make changes in their tillage practices to reduce erosion. Their entire farm has been in no-till since 1978.

The climate in this part of North Dakota is continental, with frequent hot summer days and winters marked by alternating mild and frigid periods. Precipitation is heaviest in the late spring and early summer. Winter snowfalls are frequent, but snow cover usually disappears during mild periods. Total annual precipitation averages 15 inches with 80 percent falling from April through September. Average annual snowfall is about 31 inches. Trapping snow on the crop field is an important water conservation measure in this area. The growing season lasts from early May through mid September.

Soils in this area are primarily Chama, Cabba, and Golva silt loams. These are all well drained upland soils formed under prairie in rolling terrain. Tilth is generally good but most of the soils are relatively shallow, with shallow surface horizons. Slopes on the farm range from 0 to 9 percent. Both wind and water erosion can be a problem.

Objectives

In the 1950's and 1960's Bob, like most of his neighbors, was strictly a spring wheat-fallow farmer. He was very concerned about both wind and water erosion but wasn't sure what to do about it. He recognized the soil as one of his most valuable resources. His main objectives in changing his farming practices were, if possible, to stop the erosion on his farm, and reverse the trend of soil degradation.

In the mid-1960's he read an article in the journal, *Crops and Soils*, about a farmer in Kentucky who planted corn without tillage. That article gave him the idea to try no-till.

Bob Ekre grows flax, oats, spring and winter wheat, and sometimes barley. (Photo courtesy of NRCS, Golden Valley County Field Office)

Transition sequence

At first Bob tried applying atrazine for weed control on fallow fields in his wheat-fallow rotation to reduce the soil disturbance. He started with 20 acres and worked his way into changing the tillage on his entire farm to no-till.

In 1978 he bought an air seeder with no-till attachments and used it for 3 years, but was not satisfied with the results. In 1983 he bought a no-till drill. At first it was far more satisfactory, but after several years, the residue became so thick the drill could not adequately cut through it. Eventually he bought the drill that he uses today.

Through time Bob has added other crops to his rotation to improve water management and soil tilth. He no longer uses fallow in his rotation, though it took a number of years to quit the old habit. Besides spring wheat Bob also plants winter wheat, flax, oats, and sometimes barley. He is not fully satisfied with his current rotation, however, and is considering adding a legume crop such as peas.



Social issues

Bob believes that information is the key to a successful transition. He points out that taking risks is only successful if you have the support of your family, as he did. He noted that the entire family's livelihood was at stake as well as his own.

Today, Golden Valley County is almost entirely a no-till area. Some neighbors hired Bob to plant a few acres no-till for them to try it out before they switched, but it was not long before they were buying their own equipment. While information is critical, there is no formal means to share experience among neighbors in Golden Valley County. Some farmer organizations are designed for sharing ideas and practices. In Bob's opinion, one of the best organizations for no-till is the Manitoba-North Dakota No-Till Association.

Run by farmers for farmers, they hold a meeting every year to exchange information on the latest innovations in no-till farming.

Besides getting information from direct observation and farmer organizations, Bob reads everything he can find on the subjects he wants to learn about. He also gets information from Agricultural Experiment Stations, especially nearby locations in Dickinson, North Dakota, and Pierre, South Dakota.

Economic issues

Bob made major economic investments as he changed to no-till. He purchased at least three different pieces of equipment over time. He was fairly confident of their utility before he made those purchases. At first he rented equipment and hired a neighbor to spray weeds. Eventually he decided to do his own spraying, because no-till requires more precise application coverage and timing than his neighbor could reasonably furnish. His credit was so good he was able to make direct payments to the dealer for his equipment. Eventually the equipment paid for itself, through time, fuel savings, and increased yields.

Switching from a spring wheat-fallow rotation to a more diversified rotation also required an examination of local markets. For example, Bob decided to include flax in the rotation because his research showed that there was a constant market for it. Farmers who want to try new crops must find a market before they plant. Other farmers in Golden Valley County have signed contracts with elevators for specialty crops and oil seed crops, making it possible for them to diversify their rotations.

An economic cushion helps when trying new techniques, and it is usually better to try new techniques on small areas the first time. Bob can recall several herbicide failures that were costly, but would have been more costly if he had used them on the entire farm. As more experience is gained with a specific practice or crop, it becomes easier and less risky to change because the market and producers will have adjusted to new knowledge, machinery, and supporting products. The greatest risks are to early adopters. On the other hand, early adopters often capture new market niches that put them in prime competitive positions.

Ecological issues

In this part of North Dakota, moisture availability and a short growing season are major influences on farm management decisions. The cropping system Bob is developing must balance these two factors. No-till improves infiltration, which increases effective precipitation and reduces soil evaporation, resulting in increased moisture retention. On the other hand, soils under no-till warm up slowly in the spring, often delaying planting. Bob's ideal crop rotation will include moisture conserving or drought tolerant crops, those that produce stiff stubble to trap snow in the winter, enhance soil fertility, and have a good market. Bob has found that flax and grain stubble left over winter make excellent snow traps, improving soil moisture for the following crop and reducing the need for fallow in the rotation. His current rotation includes flax followed by winter wheat and spring wheat or oats. He is considering the possibility of planting peas to improve soil fertility. Peas would provide nitrogen for the following wheat crop. Because they produce less residue the soil would warm up more quickly in the spring so the spring crop could be planted earlier. The major drawback to peas is that they do not provide stubble to catch snow.

Bob and Dorothy established a shelterbelt when they built the farmstead. The shelterbelt has required maintenance through the years, but has generally functioned well to moderate the climate around the home. Bob says you can hear the wind, but usually don't feel it inside the shelterbelt.

The Ekres also created a 5-acre wooded wildlife planting about 15 years ago. They selected a site that was close to a water source and difficult to farm. Though he no longer hunts, Bob enjoys observing the wildlife that use the area. Some of the trees in the wildlife planting have been affected by herbicide drift, and will be replaced by more tolerant species.

Bob has another project he is proud of. In this rolling country, he noticed that much of the topsoil had eroded from knolls into depressions on the farm. He felt responsible for the loss and during the course of several years moved the topsoil from the depressions back to the knolls. It was an arduous task, and one he probably won't have to repeat. He knows it is far easier to keep the soil in place than to move it back once it is eroded.

Ken Staten



Ken Staten examines his peppers. (Photo courtesy of the NRCS Leon/Wakulla Office)

Location:

Wakulla County, FL

District Conservationist:

Darrell Johnson
Wakulla and Leon Counties
615 Paul Russell Road
Tallahassee, FL 32301
Tel: (850) 877-3724
FAX: (850) 878-5354

Acres farmed:

4 (20 potential)

Crops:

Habanero peppers
Collard greens
Mustard greens

Transitioning issues:

Objectives:

Long-term sustainability

Transition sequence:

Ongoing

Social issues:

Local markets
Urban encroachment

Economic issues:

Finding markets

Ecological issues:

Soil quality

Site description

Ken Staten has been growing vegetables on 4 acres of family-owned farmland in Wakulla County, Florida, just south of Tallahassee for about 7 years. He has learned a lot in that time and is still learning. Wakulla is an urbanizing county located in the Big Bend area of the Florida Panhandle. The proximity of the farm to Tallahassee creates a ready market as well as potential land use conflicts.

The climate in this area is considered moderate with long, warm, humid summers and mild or cool winters. Average annual rainfall is about 57 inches. About half of this rainfall occurs as intense summer thunderstorms and occasional tropical storms. Winter rainfall tends to be gentler and longer lasting. October and November are the driest months. Frost has been known to occur as early as November 1 and as late as April 15.

The soils on Ken's farm are Otela and Shadeille fine sands. These are nearly level to gently sloping, moderately well drained soils. Their greatest limitations to farming are drought and leaching potential, so they need to be managed carefully to protect the soil and water resources.

Objectives:

Ken grew up with farming, but got away from it for a number of years. Seven years ago he decided to go back to the family farm and make it work. He wanted to develop a long-term, economically viable operation that he could pass on to his children if they were interested, and to make good use of family farmland that had been idle for years. Because this was to be a long-term operation, Ken wanted to make sure he did not degrade the farm resources, but he also wanted to make money.

Transition sequence:

The first two years, Ken planted peas and okra, the crops his grandfather and great-uncles had grown. It was difficult to sell the crops quickly, and he found that some of the crops had to be turned under.

He visited the NRCS field office to see about possible financial help. Darrell Johnson introduced him to the Florida A&M small farmer outreach project and a number of outstanding scientists, who taught him to think outside the familiar and try new crops and new management techniques. The university was promoting several alternative crops, including muscadines (juice grapes) and habanero peppers. They were also actively working to locate viable markets for these products. About this time Ken met Glen Holmes, the local NRCS small farm outreach coordinator. Glen was helping local farmers market produce for a school lunch program. Ken began growing greens to supply this market, and he is currently looking into the possibility of incorporating pastured poultry into his farming operation. He feels the pastured poultry will benefit the soil and be a good complement to his other enterprises. He is also interested in learning more about community supported agriculture (CSA), a fairly recent marketing strategy for farmers near urban centers. The CSA is one way to bridge the gap between farmers and urban dwellers. In a CSA, members buy shares in the farming operation. They reap benefits and share risks, and are often allowed to share labor as well.

Ken has begun the organic certification process. Since the price he can get for organic produce is considerably higher than that for standard produce, his income could increase. He is considering waiting

on certification until he learns more and builds up his soils. Ken is also interested in learning more about biodynamic farming. He feels he is in an excellent strategic position. Opportunities are wide open for expanding and improving his operation. He has a total of 20 acres in which to expand and diversify his operation.

Social issues

When he first started to go back to farming he relied on tradition, but since he has been introduced to Florida A&M, Ken's opportunities to learn and diversify have multiplied. Ken does not rely solely on the university for his information. He subscribes to sustainable agriculture newsletters, attends workshops, and surfs the World Wide Web regularly. According to Ken his wife Gwen is really the brains of the operation. She attends the meetings and workshops with him and keeps records of the progress they are making. His children help when it is really needed, but he is not forcing them into this line of work. They need to find their own way.

Neighbors have been very supportive. Much of the neighborhood belongs to relatives, and they have not yet complained about noise or odors.

Economic issues

Marketing has been a major focus of Ken's operation. His philosophy is not to produce anything to sell that he does not already have a market for. He believes in doing the marketing research before planting. Since he owns many more acres than he's currently farming, he feels poised to tap new markets as they become available, and he is always looking.

Cost is another element of the operation with which Ken is concerned. He tries to stay debt free as much as possible. To date he has been able to supply most of the labor himself, and his equipment has been minimal. He owns an 8-horsepower tiller. When heavier equipment is needed, he rents it. He also economizes on his drip irrigation system, reusing parts whenever possible. As the operation grows he may convert an existing storage building to a "cold" room for storing vegetables and add whatever else is needed to make the operation function smoothly.

Ecological issues

Ken is still fairly new to ecological farming, but he is an avid learner and is willing to try new techniques. For example, in 1998 he tried planting a rye cover crop to help protect and improve the soil under his crop. He had difficulty managing the weeds that year. He has not given up on the cover crop idea, but he thinks he may need to try a different cover crop next time.

Building the soil is one of Ken's highest priorities. One of his neighbors has a "cadillac soil," he notes, and it shows in her crop quality and yield. Ken is working to build soil quality on his farm, too.

Robert & Terry Weigel



Terry and Bobby Weigel farm 2,240 acres of land in North Dakota.
(Photo courtesy of NRCS, Logan County Field Office)

Location:

Logan and Emmons
Counties, ND

NRCS District Conservationist:

Kyle S. Hartel
USDA, NRCS
Logan County Field Office
P.O. Box 240
Napoleon, ND 58561
Tel: (701) 754-2234
FAX: (701) 754-2231

Acres farmed:

2,240 (1,260 cropland,
980 pasture and hayland)

Crops:

sunflowers garbanzo beans
soybeans naked oats
corn hay
peas

Other enterprises:

Beef cattle

Making the transition:

Objectives:

Risk reduction
Effective landuse
Erosion control
Water conservation

Transition sequence:

Ongoing

Social issues:

Breaking tradition

Economic issues:

Equipment needs

Ecological issues:

Disease and weed pressure

Site description

Brothers Terry and Robert (Bobby) Weigel farm 2,240 acres of land along the border of Emmons and Logan Counties, North Dakota. They own much of this land and lease the remainder from their mother. Although their farms are seven miles apart, they share machinery and other resources and often make joint decisions about farming practices. Of the 2,240 acres, 1,260 are in cropland and 980 are in pasture or hay. They have gradually been improving their grazing practices and now have a successful rotational grazing program. In 1997 they decided to try no-till.

The climate in this part of North Dakota is continental, with warm summers and very cold winters. The growing season generally lasts from mid-May through mid-September. Moisture and a short growing season are limiting factors. The average annual precipitation is 17 inches with most falling in the spring and early summer. Average seasonal snowfall is 34 inches.

Soils are mixed. Some soils formed on glacial till, while others formed over residual materials. Most, are moderately deep, well-drained loams or fine sandy loams. Slopes range from 1 to 9 percent (1 to 6 percent on Bobby's property). Most of the soils are suitable for crop production. The soils on Bobby's farm are not considered highly erodible, while those on Terry's land are subject to both wind and water erosion.

Both farms are within priority areas for Environmental Quality Incentives Program (EQIP). Terry's farm lies within the Beaver Creek Watershed. Bobby's farm lies outside this watershed, within the Coteau priority area.

Objectives

Terry and Bobby have a strong conservation ethic as well as a desire to succeed economically. Their decisions are made with both of these goals in mind. Terry and Bobby elected to combine crop with animal production for two reasons:

- They can manage two very different enterprises and therefore reduce their economic risk.
- Grazing animals can use their marginal land more effectively.

The Weigels also decided to try no-till for two reasons. Their main reason was water conservation. They believed that no-till could help conserve moisture in the soil, resulting in better yields and less risk of crop failure due to drought. Secondly, because Terry's land is subject to erosion, they felt that no-till could reduce soil loss.

Transition sequence

Bobby and Terry have completed a number of management changes since they began farming in 1980. Terry had been working on a rotational grazing system for some years, but, as Terry says, "We weren't

doing it quite right." A few years ago he worked with NRCS to develop a pasture management plan that allows the cattle to be rotated through each pasture twice during the growing season. He also received training in pasture management. Since then the stocking rate has increased and the pasture has improved.

The Weigels have applied manure to part of their cropland and hayland. They perform soil tests regularly to ensure that they take advantage of the nutrients supplied by the manure. Three years ago they began composting to make the manure easier to transport. They are in the process of applying for funds from EQIP to develop and implement a formal nutrient management plan.



The Weigels perform soil tests regularly to ensure their hayland and cropland is taking advantage of nutrients supplied by manure. (Photo courtesy of NRCS, Logan County Field Office)

The Weigels have been strip farming for several years to reduce erosion. Kyle Hartel, NRCS district conservationist, had been telling them of the benefits of no-till for some time before they decided to try. They read up on the subject and attended a no-till tour in South Dakota. Then Terry skeptically planted a crop into a field that he had not clean-tilled. That field grew his best crop of the year, so he knew that residue was

not a limiting factor and no-till might work. In 1996, the Weigles rented a no-till planter from the Soil and Water Conservation District and planted 60 acres in no-till. The results were mixed, but were encouraging enough that they decided to continue the experiment, and in 1997 they planted approximately half their cropland using no-till. The next year they rented a 15-foot drill from a dealer and planted their entire cropland with no-till. Their herbicide use has gone up, but they are waiting for the system to stabilize. They can then use fewer, less toxic chemicals. Meanwhile they are looking into diversifying their rotations to improve the soil condition and further distribute their economic risk.



The Weigles have both diversified their crop rotations to reduce danger from disease and weeds, and to improve soil tilth. (Photo courtesy of NRCS, Logan County Field Office)

Social issues

Logan County farmers have successfully used moldboard plows for decades. To some degree these plows have become part of an important tradition. People hesitate to change cultivation methods unless they are sure that new ones will work. The Soil Conservation District purchased a no-till drill to make it available to farmers like Bobby and Terry. The Wiegels borrowed this drill the first year of their experiment. That first year they were alone in their trial. However, the neighbors were watching to see how the experiment turned out. In 1998, 23 nearby producers attended a no-till meeting in Logan County to get more information.

Economic issues

Terry has been able to take advantage of cost share projects under EQIP and other government programs, making it less risky for him to try new conservation measures. Risk is always an issue when making “untested” changes, but knowing and anticipating the risks can help farmers make informed decisions.

Both Terry and Bobby are hoping that their no-till experiment will eventually pay for itself by improving yields. Even if yields do not increase dramatically, the Weigles will be pleased because they have a good erosion control system in place. They will also be saving time and fuel by not tilling their land.

Ecological issues

Terry and Bobby each have diversified their crop rotations to help reduce disease potential and weed pressures, and to improve soil tilth. In 1997, Terry added naked oats and Bobby added garbanzo beans to their rotations.

Both brothers planted shelterbelts on their farms in 1997 using locally adapted tree species recommended by NRCS. When they reach their effective density, the shelterbelts will help reduce heat and cold stress on the animals and crops and provide diversified habitat for wildlife, beneficial insects, and soil organisms.

The Weigles expect their no-till system to reduce soil erosion, increase soil organic matter content, and improve soil structure, water holding capacity, infiltration, and drainage.

Terry and Bobby have just begun phases 2 and 3 of their transition by substituting no-till for conventional tillage and redesigning their cropping systems to accommodate the new tillage system. They know that it will take years for the benefits of their changes to be realized, and they know they will have to make more changes as time goes on. Asked what he would have done differently, Terry replied, “I wish I would have started sooner.”

Ramon (Dosi) & Norma Alvarez



Dosi and Norma Alvarez (shown with their sons) grow organic cotton in New Mexico. (Photo courtesy of the NRCS Las Cruces, NM, Field Office)

Location:

Dona Ana County, NM

District Conservationist:

John Allen
2507 N. Telshor
Las Cruces, NM 88001
(505) 522-8775

Acres farmed:

850

Enterprises:

Cotton
Cow/calf production
Alfalfa
Quarter horses
Herbs

Transitioning issues:

Objectives:

Eliminate pesticide use
Economic stability

Transition sequence:

Gradual

Social issues:

Neighbor support
Legal mandates

Economic issues:

Price differential
Developing budget

Ecological issues:

Weeds, insects,
soil quality

Site description

Dosi Alvarez is a third generation farmer. He and his wife Norma manage an 850-acre organic farm in the Mesilla Valley, New Mexico, on land his grandfather cleared. He has been growing cotton since 1975. The farm has been completely organic since 1993.

The climate in this area is arid. The average annual precipitation ranges from 7 to 9 inches. The average annual temperature is 60 °F, but summer highs often exceed 100 °F while winter lows may be below freezing. Strong summer thunderstorms are common. Winter precipitation may fall as rain or light snow and is generally less intense and less frequent than summer precipitation. Crops are irrigated.

The soils in the valley are generally deep, well drained, and nearly level. They formed in alluvium on flood plains and stream terraces of the Rio Grande. They range in texture from loams to clays. Organic matter is generally low, runoff is slow, water erosion hazard is slight, and wind erosion hazard is moderate.

Objectives:

Dosi and Norma decided to farm organically when their son was born. Before that time they had farmed conventionally, using pesticides and other chemicals regularly. Their concern for their family's health convinced them they needed to stop using chemicals.

Transition sequence:

About 1993, a marketing cooperative in El Paso located a buyer interested in purchasing organic Pima cotton. The Alvarez' were interested. The buyer agreed to pay a premium price for the cotton during the 3-year transition to certified organic cotton, so they decided to give it a try. They questioned their older employees who had farmed before herbicides were common, and Dosi got a lot of good advice from his father, who also had experience in the pre-herbicide era. He knew that weeds would be his greatest challenge. With help from others he began experimenting with weed cultivation. They added wire attachments to an existing weed cultivator to make it more aggressive. Through trial and error they learned to control the weeds.

They started with 25 acres. The first year was so successful they added more acreage the second year. Within 3 years the entire farm was organic. Dosi found that it was too much trouble to farm both conventionally and organically because equipment had to be cleaned every time he changed fields. It was just easier to be completely organic.

In 1998, the Alvarez family was approached by Desert Herb, a local company that sells herbs as far away as Oregon. This company needed land for organic herb production, and the Alvarez' were the only farmers in the valley with the qualifications they required. They formed a partnership and in 1999 grew 10 different herbs on 90 organic acres. Three to 20 acres are devoted to each herb. The process is labor intensive, but seems to be paying off.

Social issues

The Alvarez' are the only Certified Organic cotton growers in the Mesilla Valley. Their neighbors are considerate of their efforts to retain organic status. They respect the 25-foot buffer he maintains around his fields, and they keep him apprised of their chemical applications. At one time several neighbors

considered growing organic cotton themselves, but a boll weevil infestation in the valley scared the buyer into looking for an alternate source of organic cotton.

That crisis occurred in 1998 when the farm board voted to implement a boll weevil eradication program that required spraying of all cotton fields in the valley with insecticides. Spraying would have caused the Alvarez' to lose their organic status. They were able to convince the State legislature to amend the mandate to exempt organic farmers from the spraying. Instead, if two boll weevils are found in any field, cotton will not be grown on that field for a period of 1 year. In 1999, they had 100 acres that triggered this requirement.

Economic issues

Organic cotton has proved to be an economic boon for Dosi and Norma. They receive a premium price for organic cotton. At the same time the yields have increased over time, and consequently their net income has increased.

Ecological issues

The major emphasis of the organic program involves weed control, soil and nutrient management, and insect management. Irrigation water management is also important, but this aspect of the operation has changed little since the organic conversion.

The cultivation system developed for weed management has been quite successful. Unlike their neighbors who cultivate weeds until July and then lay by with an herbicide, Dosi and Norma cultivate weeds as needed through August. This allows them to control nutgrass more successfully than their conventional neighbors by disrupting nut development late in the season. They have been less successful controlling bind weed, but are not discouraged.

In addition to cotton, alfalfa, and herbs, Dosi and Norma have 25 cows and 40 quarter horses. Manure from these animals is insufficient to meet the crop nutrient needs. They purchase additional manure from local dairies and apply both compost and aged manure in accordance with the organic guidelines. The organic matter content of their soils has doubled since 1993 from about 1 percent to 2 percent. They attribute this increase to the organic amendments and

*“Man is arrogant,”
he says. “He thinks
he can do whatever
he wants to, but
Mother Nature plays
a big role in what
we produce.”*

more careful management of the organic system, and they attribute the yield increases to the increased soil organic matter.

Insects, particularly the boll weevil, have recently become a concern. The appearance of the boll weevil makes organic cotton growing somewhat more risky, but it is not an insurmountable problem. Garlic oil applied to the cotton plant is somewhat effective in discouraging this pest. Healthy soil and crop rotations also help.

Dosi and Norma believe they have been lucky with their transition to organic agriculture, but they also started slowly and did not expose the farm to too much risk initially. Dosi would recommend the same procedure for others contemplating a change. He also recommends observing nature when making such a transition. “Man is arrogant,” he says. “He thinks he can do whatever he wants to, but Mother Nature plays a big role in what we produce.”

Bob Fogler & John Dorman



Bob Fogler (left) and John Dorman have shared neighboring farms for 12 years.
(Photo courtesy of NRCS, Bangor Field Office)

Location:

Penobscot County, ME

NRCS District

Conservationist:

Daniel G. Schmidt
USDA, NRCS
Bangor Field Office
28 Gilman Plaza, Suite #2
Bangor, ME 04401-3516
Tel: (207) 947-6622
FAX: (207) 990-1957

Acres farmed:

1,450 (1,200 tillable)

Crops:

corn
barley
potatoes
pasture/hay

Other enterprises:

Dairy

Making the transition:

Objectives:

Soil quality, improvement
Nutrient conservation

Transition sequence:

Gradual sharing
of resources

Social issues:

Need for common
Long-term goals

Economic issues:

Shared labor, land, and
equipment
Nutrient resources

Ecological issues:

Pathogens and pests
Nutrient cycling
Soil quality

Site description

For the past 12 years, Bob Fogler and John Dorman have shared activities on their neighboring farms in Central Maine. Bob is a dairy farmer, while John grows potatoes in rotation with corn and barley. They share land, equipment, labor, and manure.

The climate in this part of Maine is cold, humid continental. Winter temperatures below 0 °F are frequently recorded. Average annual snowfall is more than 80 inches. Average annual precipitation is 35 to 40 inches. Summers are mild and pleasant with temperatures rarely reaching 90 °F. The growing season in the area is about 110 days, making timing a critical factor for producing crops.

Soils in the area are primarily derived from glacial till that includes slate, shale, or calcareous materials. They have a broad range of depth, drainage, surface stoniness, and gravel throughout the profile.

The three predominant soil series in the area are Dixmont, Bangor, and Thorndike. The Dixmont soil is somewhat poorly drained to moderately well drained. Bangor is well drained. Thorndike is somewhat excessively drained. Dixmont and Bangor are more than 60 inches to bedrock. Thorndike is generally 10 to 28 inches to bedrock, although there may be areas ranging from surface outcrops to 4- or 5-foot-deep pockets. All three soils have surface stone cover of 0 to 10 percent and a significant gravel content throughout the profile. Thorndike tends to be much more droughty than Dixmont or Bangor. For the best crop growth, all three soils require added nutrients, especially nitrogen and in most cases lime.

Objectives

Bob and John originally decided to farm together because both needed more land on which to expand their operations, Bob for forage production, and John for potatoes. They both wanted to reduce their costs, and John was hoping to improve the soil quality of his potato ground by applying animal manure and lengthening his potato rotation. During the past 12 years both have exceeded their expectations.



John Dorman hoped to improve the soil quality of his potato ground by applying manure and lengthening his potato rotation. (Photo courtesy of NRCS, Bangor Field Office)

Transition sequence

Bob and John started slowly. The first year of their experiment, they spread manure from Bob's farm on 30 to 40 acres of John's land. Gradually they expanded. They now share all the land on both farms, but they had to learn some things about manure and crop fertility. Together they worked with the local extension agent, setting up 4 or 5 separate on-farm fertility trials to determine the most appropriate amount and timing of manure application for the different crops.

Gradually, as they became proficient in fertility management, other aspects of their operations began to improve. Pest problems have been reduced, soil quality has improved, milk quality on Bob's farm has improved, and potato yields on John's farm have increased.

The second year after they began sharing land, Bob and John decided to lease a tractor together. This decision proved to be extremely cost effective and efficient. When it is practical, these neighbors now share most equipment and hired help.

Social issues

While the experiment of sharing land has been successful for both John and Bob, they point out that it would not have worked if they did not share

common long-term visions and goals, or if either of them had been overly concerned with the short-term benefits. One week one of them might appear to be getting a better deal, while the next week it might be the other way around. "If you look at the management from a day-to-day perspective it can drive you crazy," says Bob. "You have to manage

with long-term goals in mind. Look 10 to 15 years down the road, not from week to week or even year to year.”

Economic issues

The system of sharing land, labor, equipment, and manure has been an economic windfall for both Bob and John. Bob’s dairy herd has grown from 150 to 450 cows over the past 12 years. John’s potato production has also increased. Since they began sharing, Bob estimates he and John have saved \$100,000 in equipment investment by not having to duplicate equipment and by sharing the rental of the tractor. Because they now have a greater land area to work, they can more efficiently use the manure produced on Bob’s farm.

Bob estimates the annual value of the manure is about \$140,000. Of that, he and John are capturing nearly \$120,000. Before they began working together, he estimates he was using less than 30 percent of the manure’s value.

Last year John experimented with using spring-applied manure as the sole source of nutrients on the potatoes. With the help of the University of Maine he established a field trial on 24 acres, consisting of three treatments and three replications. This year, based on the trial results, he has planted 250 acres of potatoes using manure as the sole nutrient source except 50 pounds of liquid N applied at planting. The fertilizer applied this year cost \$14 per acre as compared with the usual cost of \$110 per acre.

The partnership with John has been so successful that Bob is currently negotiating with another potato farmer in the area to form a similar partnership, so the dairy herd can be further expanded.

Ecological issues

The ecological benefits of farming together have been greater than either Bob or John had imagined. Sharing their acreage has allowed these farmers to develop a more suitable rotation. Potatoes can be grown on a 3-year rather than a 2-year rotation, reducing potential pathogen and pest problems on all crops, improving forage quality, and enhancing yields. In this case, a 3-year rotation consists of barley, corn, and potatoes. Since they began rotating Bob’s forage



Bob Fogler interseeds harvested silage corn with ryegrass for erosion control. (Photo courtesy of NRCS Bangor Field Office)

crops with John’s potatoes and applying manure to the land, Bob and John have observed a dramatic improvement in soil tilth. Soil organic matter has increased, earthworms are now common, and crusting has been all but eliminated.

Both Bob and John benefit from the longer rotation. Corn and potatoes, especially, are less susceptible to insects and diseases in the 3-year rotation than in the traditional 2-year rotation. Insecticide, fungicide, and herbicide-use are generally reduced also. If the land base were available, John would like to add a grass crop to the rotation, lengthening it further.

Potato farmers have generally been hesitant to use manure on their crop because of a perception that it would promote scab infestations (e.g., Gotlieb and Hazelrigg 1992). John has not had scab problems. He thinks this may be because the bedding Bob uses with his manure is made with sand rather than the traditional sawdust, or because newer potato varieties are more resistant to scab, or perhaps both.

Efficient nutrient cycling is probably the greatest ecological benefit of this partnership. Over time, Bob and John have learned to cycle nutrients in the manure efficiently and effectively, dramatically reducing added fertilizer requirements. It took time and some trial and error to work out minor problems in their fertility program, and they are still learning. They test both soil and manure regularly. John also

performs petiole tests on the potatoes to monitor nutrient status in the plants. Manure is applied both in the fall and the spring. However, it is easier to calculate the amount of manure needed for spring application than for fall, since unpredictable nitrogen losses can occur during the winter. They now apply manure in the spring to corn and potatoes, both nitrogen-demanding crops, and in the fall to barley, which has a lower nitrogen requirement. On pastureland, manure is applied once every 4 years to maintain the phosphorus and potassium balance. In other years only nitrogen is applied.

With their nutrient management program already in place, Bob and John are ahead of the curve. If future regulation should require nutrient management plans or restrict applications on agricultural lands, they should have no problems.

Tar Box Hollow Buffalo Ranch



Rosa, Larry, and Monty Mason raise buffalo on Tar Box Hollow Ranch in north-eastern Nebraska. (Photo courtesy of North Central Region SARE)

Location:

Dixon County, NE

NRCS District Conservationist:

Steven Grube
USDA, NRCS
Hartington Field Office
102 East Elm
P.O. Box 46
Hartington, NE 68739-0046
Tel: (402) 254-6858

Acres farmed:

480

Enterprises:

Buffalo rotational grazing
Tourism

Making the transition:

Objectives:

Economic survival
Soil conservation

Transition sequence:

Preliminary planning
Gradual implementation

Social issues:

Community support

Economic issues:

Educating lending
institutions

Ecological issues:

Mimicking the
prairie ecosystem

Site description

Rose, Larry, and Monty Mason's 480-acre family farm is located in the northeast corner of Nebraska in Dixon County. The farm has been in the family since 1948. Today the Masons rotationally graze 190 head of bison (commonly referred to as buffalo) and host tourists during the summer months.

The climate has wide seasonal and annual variations. The average annual precipitation is 26 inches, but recorded annual measures have ranged from a 13 inches to 43 inches. Three-fourths of the average annual precipitation normally falls from April to September during the growing season. The average annual snowfall is about 32 inches with snow coverage for 59 days. The mean high temperature for July is 87 °F.

Predominant soils in Dixon County include Moody silty clay loam, Crofton silt loam, and Alcester silt loam. These are all deep, well-drained upland soils formed on wind-blown deposits. The terrain is characterized by rolling hills in most of the county. Soil erosion is a primary concern.

Objectives

When their land came out of the Conservation Reserve Program (CRP) a few years ago, Larry, Rose, and Monty Mason decided to try something different. Conventional corn and soybeans would not generate enough income to support the family. As an initial objective, they set out to find ways to make more money without expanding their land base. After considering alternatives such as emus and potbelly pigs, the Masons decided that raising buffalo fit their interests and economic needs the best.

Transition sequence

Buffalo management is a relatively new enterprise for farmers and ranchers in the Great Plains. The Masons learned about buffalo management by visiting with a few established buffalo ranchers in Nebraska. Traditional sources did not have information about buffalo management at the time. They chose to use a rotational grazing system to increase the number of animals that they could graze on their limited amount of land. The transition did not require a large capital investment. The system only required an initial investment in fencing. The Masons received enough cost share funds from the Farm Services Agency and the local Natural Resources District

to cover 65 percent of the cost of installing water pipelines and high tensile electric fencing and overseeding bare areas with native grass seed. They had to educate the local banker about the economics of raising buffalo to receive a loan for the remaining funds. However, market information on buffalo sales is not readily available. The Masons tracked down information from buffalo auction barns to secure the loan.

The highly erodible, unproductive soils on their ranch provided another reason not to go back to traditional farming. Even after 10 years in CRP, the land had not regained much fertility. The rotational grazing system helps “fool” the grass into believing it is being treated the way it is supposed to be, according to Monty Mason. The rotational grazing system in which pasture is heavily grazed followed by a resting period mimics the native prairie system where bison would heavily graze an area, then move on for several months or years before returning to graze again. Buffalo pose many management challenges. A 1,600-pound buffalo capable of running faster than a horse is not easy to corral into the next pasture, so they lead the animals with pellets. The buffalo graze the pasture year round and respect the fences as long as they have enough to eat and some room to roam. Supplemental feeding has not been required.



Covered wagon tours are provided during summer months. *(Photo courtesy of North Central Region SARE)*

Word of mouth created much local interest in the buffalo operation. To capitalize on this interest, the Masons took up their neighbors' suggestion to start giving tours for a small fee. This idea blossomed into a profitable on-farm tourism business. In 1997, more than 4,000 people visited the Masons' ranch to learn more about prairie heritage. Visitors are taken in a converted covered wagon to get a close look at the buffalo. Back at the ranch, Rose demonstrates pioneer crafts, such as spinning. Buffalo meat is also available for purchase and taste testing.

Today the Masons rotationally graze 190 head of buffalo on 9 pastures. In the future, they hope to graze the buffalo more intensively to use the pasture more efficiently. They also want to buy more land to expand the number of pastures to 16. Monty Mason believes they won't be as dependent on the weather with more pastures.

Social issues

The Masons have received support from a close-knit community of farmers in the area. They also joined a group of organic farmers in the region to network with others on marketing strategies. University of Nebraska Extension offered a buffalo management course for the first time in 1997 in response to growing demands for information.

Economic issues

Marketing of buffalo meat has not yet become an issue. Meat purchased from other sources is sold on-site as part of the tourism enterprise. The buffalo operation has to date focused on producing breeding stock and increasing the herd size. The herd size is growing rapidly, however. At some point the Masons plan to slaughter some of their own animals for sale. They are currently exploring slaughter and marketing options. The current plan is to form a butchering cooperative with other bison producers in Nebraska.

The combination of buffalo grazing and seasonal tourism has met the economic needs of the Masons. They have found a way to make a living and gain more satisfaction from farm management than with a conventional corn and soybean system.

Ecological issues

The intensive grazing system is working in some ways like a natural ecosystem. The buffalo move from paddock to paddock, never returning to graze until the pasture has recovered. The system is slowly bringing back the natural grasses buffalo love to eat. The Masons also rely on this system to fertilize the grass and to control weeds without chemical inputs. The natural relationship between the buffalo and the tall grass prairie is doing most of the work for them.

Buffalo take care of themselves more than cattle do, according to Larry. As herding animals, buffalo need a critical mass to thrive, but they do not need shelter in the winter. Since they have evolved in the Plains they can eat legumes without bloating, and they are less prone to disease.

Soil quality is steadily improving from careful pasture management in the Masons rotational grazing system. When the operation began, the soil organic matter level was less than 1 percent. A soil test in 1998 indicated the organic matter had increased to over 2.5 percent throughout the entire acreage. Rotational grazing follows ecological patterns of the natural prairie environment more effectively than any other farming system on the Great Plains. The Masons have succeeded in making nature work for them instead of attempting to dominate the landscape.