

Heartland Sustainable Agriculture Network

Final Report for LNC98-142

Project Type: Research and Education

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Matching Non-Federal Funds: \$48,950.00

Region: North Central

State: Kansas

Project Coordinator:

[Jerry Jost](#)

Kansas Rural Center

Project Information

Summary:

The Heartland Network stimulates local solutions to problems in agriculture through farmer-to-farmer clusters. These clusters choose to explore innovations such as management intensive grazing, pasture finishing, pasture farrowing, cover crops in crop rotations, organic farming, complementary on-farm and on-station research, relationship marketing, fresh produce subscription services, and cooperative marketing. In order to learn about these changes, clusters used their mini-grant resources for libraries in the local extension offices, field trips, training, on-farm demonstrations, market research, consultation, trade shows and publications. These activities provide opportunities to observe, make comparisons and judge innovative farming practices for themselves.

Introduction:

Freedom to farm requires making choices. As old farm programs fade and new flexibility emerges, farmers and ranchers need to take advantage of innovative management and marketing options. Future opportunities for farmers will come from farming in ways that are fundamentally different from the past and present. To consider change, farmers often need to break from past mental models. Research suggests that any major change in behavior involves new paradigms of thinking. Often, farmers find other farmers as the best reference and support for change. They learn most by watching what new ideas are being tried on their neighbor's land. Formal and informal on-farm research and demonstrations are highly valued as sources of decision-making information.

The Heartland Sustainable Agriculture Network was created based on this rationale. It was initially funded by the W.K. Kellogg Foundation in 1993 to organize producers in local farmer-to-farmer clusters to explore and develop innovative approaches to their problems. The Heartland Network addresses the loss of local ownership of farms in rural communities, loss of farm profitability, and environmental degradation. The need for information sharing among agricultural stakeholders is particularly important because many current agricultural problems are human

management challenges requiring more than technology for their resolution.

The Heartland Network responds to these challenges by providing guidance and resources that allow local leadership to create their own solutions. These clusters in the past have chosen to explore options such as management intensive grazing, beef pasture finishing, pasture farrowing, cover crops in crop rotations, organic farming, complementary on-farm and on-station research, relationship marketing, fresh produce subscription services, and cooperative marketing. In order to explore these options, clusters used their mini-grant resources for libraries in the local extension offices, field trips, training, on-farm demonstrations, market research, consultation, and publications.

The formation of producer clusters within the Heartland Network has created a safe environment that encourages change and experimentation. Farmers in the Heartland Network say that through their participation in a cluster, they feel much more able to try new farming practices than they would on their own. Members report that the most beneficial activities of the Network have been farm tours and field trips. These activities provide farmer interaction and the opportunity for participants to observe, make comparisons and judge innovative farming practices for themselves. Our evaluation has shown that clusters are the keys to lasting impact of training events such as Holistic Management workshops. Farmers who attend training events as a part of a cluster return home with colleagues who have shared their experiences and can continue to reinforce learning and application of information (Peak, 1996).

This proposal will expand the Heartland Network both in size and scope. The purpose of expanding the Heartland Network is to empower farmers and ranchers to develop markets and management strategies that effectively balance profitability, quality of life, neighborliness, and resource conservation. The ultimate goal of this proposal is to build leadership and working partnerships that integrate farms, food systems, and institutions toward a more sustainable future.

Healthy Rural Communities Benefit From Prosperous Family Farms

A wide collection of sociological studies points to a correlation between large-scale, hired-labor farming and deteriorating socioeconomic conditions. These negative conditions include a decline in the rural population, greater income inequality, lower standards of living, fewer community services, less democratic political participation, lower community social participation and integration, decreased retail trade, environmental pollution and energy depletion, and greater unemployment (Lobao, 1990). Because of this relationship between farm structure and rural quality of life, the Heartland Network directs its efforts to strengthen small and moderate-scale, owner-operated farms and ranches.

High Production Costs Threaten Farm Survival

Complex technologies often compromise farmers' understanding of their impact on the environment and society. In addition, these expensive technologies force producers to specialize production systems and borrow more money. In turn, these technologies increase production and depress farm prices. Such trends move decision-making off the farm to technicians, creditors, and market middlemen. As a Heartland farmer concludes, "farmers too often buy solutions to problems rather than managing them."

The Heartland Network works to promote a shift in agriculture from reliance on highly-technical solutions to problems to knowledge-based solutions. Such a shift parallels similar trends in our society. Drucker (1994) contends we are shifting to a knowledge-based society that creates a knowledge worker. Ikerd (1996) argues the future of agriculture will grow out of "high think" rather than "high tech" approaches

to development.

The Heartland Network Prepares Farmers and Educators for Constructive Change

Future opportunities for farmers will come from farming in ways that are fundamentally different from the past and present (Ikerd, 1996). Often, farmers find other farmers as the best reference and support for change (Freyenberger et al., 1994). They learn most by watching what new ideas are being tried on their neighbor's land. Formal and informal on-farm research and demonstrations are highly valued as sources of decision-making information (Eberle and Shroyer, 1996). The Heartland Network will organize new farmer-to-farmer clusters to change paradigms and transfer management innovations into new rural communities.

Another way the Heartland Network promotes constructive change is to encourage collaboration between producers and university researchers through learning teams. A Kansas State University farmer attitude survey on research and experimentation among Kansas farmers showed that farmers wish to have greater input into the research process and are enthusiastic about on-farm research. The implication from the survey is that on-farm research involving direct participation of farmers can be very important in influencing farmer attitudes about new management choices. KSU research and extension staff were viewed as important sources of information by farmers (Freyenberger et al., 1994).

The Heartland Network Will Use Whole-Farm Planning As a Management Tool

The Heartland Network will use whole-farm planning to manage change within the context of system solutions. It is this experiential knowledge that enables farmers to master the "intricate formal patterns in ordering (their) work within the overlapping cycles -- human and natural, controllable and uncontrollable -- of the life of a farm" (Berry, 1977). Scientific knowledge provides farmers with valuable insights, but to be useful that knowledge must be placed in the unique context of each farm, understood as a complex interface of ecological, production and social systems. To paraphrase Chambers (1989), whole-farm planning puts the "farmer first."

Putting the farmer first does not imply that farmers who practice whole-farm planning must rely solely upon their experiential knowledge. They often incorporate both scientific and other farmers' knowledge into their practices. Farmers in the sustainable agriculture movement, some of whom practice whole-farm planning, share knowledge through networks they have forged with other sustainable agriculture farmers (Hassanein and Kloppenberg, 1995).

Savory's (1988) Holistic Management approach puts primary focus on goal setting as the first step to planning. Holistic management can be a useful planning tool to integrate profitability, environmental protection, and quality of life (Stinner, 1996). Irvine (1994) reports that after a group has gone through this training, they are better able to clarify a shared purpose within an environment of openness and trust. Often, a common goal for Holistic Management clubs is to challenge members with fresh perspectives to maintain a balance between personal relationships and production demands.

The Heartland Network Will Create New Markets to Reward Sustainable Farms

The farming sector between the years of 1910 to 1990 experienced a significant erosion of economic activity to both the input sector and the marketing sector. These two sectors have squeezed both profits and farm families out of agriculture. If farmers take back 20% of that middle -- 10% of both the input and marketing sectors -- net farm income would double (Smith, 1992).

Concentration in agricultural markets reduces sale outlets, depresses farm prices, and separates consumers from farmers. Large-scale vertical integration places

farmers in poor bargaining positions with inadequate price discovery. A Heartland Network rancher describes these forces this way: "We are told to get big or get out. Our response is to get different. We are looking for a way to get closer to the consumer."

Improved profitability helps sustainable farming systems become more attractive and practical for farmers (Schaller, 1988). Hartman's (1997) consumer research revealed a strong consumer interest in buying environmentally-enhanced food products. Diverse products and market strategies must be developed to meet diverse consumer needs. However, traditional marketing firms have been slow to change grades and standards to meet these new consumer demands (Dicks, 1992). This leaves the opportunity for farmers to tailor marketing food products to conform to the values of the today's health-conscious consumer (Ikerd, 1996).

The Heartland Network Will Help Clusters Develop a Menu of Marketing Strategies

One niche marketing strategy is relationship marketing. One example is the farm of Joel and Theresa Salatin in Virginia. They sell everything they raise to about 400 customers -- 75% of whom live within a 50-mile radius. Their customers prefer personal relationships with farmer and high food quality (Salatin, 1995). The Heartland Network will continue to support mentoring opportunities between Kansas farmers and innovative farmers like the Salatin family.

Two other niche markets that the Heartland Network will expand are community supported agriculture (CSA) farms and farmers' markets. These markets rebuild relationships between people and teach customers about the cycles of the growing season (Guenther, 1992). This interest in such farmer-to-consumer marketing is growing. For example, the number of farmers' markets nationwide has increased by more than 453 percent during the last 20 years. In Kansas, the number of farmers' markets increased from 26 to 55 from 1987 to 1990 (Hughes, 1992).

A fourth marketing strategy is marketing cooperatives. Cooperatives improve farm profitability by getting better prices, strengthening bargaining power, and expanding marketing channels. Normal trading profits of the usual middlemen and processors are diverted to cooperative members. Cooperatives also allow for more direct channels of distribution and improved food quality (Schaars, 1980).

Project Objectives:

1. The Heartland Network will organize six new and support the 10 existing farmer-to-farmer clusters serving more than 200 farm families to help farmers and ranchers work together to learn the skills to plan, develop, and transfer sustainable farming systems into their communities.
2. The Heartland Network will organize three learning teams providing research, extension, and education to farmers and ranchers on sustainable agriculture practices and holistic management. These learning teams will be partnerships of cluster producers, ranchers, researchers, entrepreneurs, and educators. These teams will develop educational workshops, field days, and printed materials to aid project outreach.

Research

Materials and methods:

The Heartland Network effectively promotes sustainable agricultural practices and markets. This project awarded mini-grants to clusters to explore options such as

management intensive grazing, beef pasture finishing, pasture farrowing, cover crops in crop rotations, clean water farming practices, organic farming, and market development. Field trips, farm tours, training, conferences, whole-farm planning, farm trials, mentoring, and networking assist the adoption of sustainable farming practices by clusters. Learning teams assist in the research, documentation and information transfer of successful agricultural innovations into rural communities.

Research results and discussion:

The Heartland Network is currently actively working with 23 clusters. Nine of these clusters focus on grazing management; five on farmers markets; five on cooperative marketing; two on cover crops; and two on education. Twelve new clusters were organized. All together these 23 clusters involved 340 farmers and 232 farms or ranches. Eight learning teams were organized.

Research conclusions:

Marketing Outcomes

Farmers Markets: Heartland clusters have either started or taken the leadership in organizing five new farmers markets.

Rolling Prairie Farmers Alliance: This cooperative of eight growers provides a weekly subscription fresh produce service to customers in Lawrence, Kansas City, and Shawnee Mission. This cluster has mentored three other clusters in developing a cooperative subscription marketing service. Over an eight year period, gross sales increased from \$28,000 to \$80,500 and weekly customers increased from 135 to 285.

Kansas Organic Producers: This marketing cooperative collectively brokers organic grain to both domestic and Japanese buyers. Under a networking project with other organic producers in the Midwest hosted by the KRC, the Kansas Organic Producers took a leadership role in collaborating with other organic producers and the National Farmer Organization to organize a Marketing Agency in Common for organic producers in the region. Over an eight year period, gross sales went from \$20,680 to \$507,150. Certified organic grower members increased from 12 to 64 over this same time period.

Tallgrass Prairie Producers: This grass-fed beef marketing cooperative of 10 ranchers came to the difficult decision to suspend their sales operation. Factors forcing this decision were the lack of expansion capital, high processing costs, insufficient sales volume to maintain financial equity and the lack of paid professional management. This happened even in spite of winning the best Kansas product award. A summary of the lessons learned is included in the appendix.

Educational Clusters Progress

The project provided whole farm training that focused on goal setting, understanding of ecosystem principles, setting testing guidelines, and developing personal whole farm notebooks with two clusters.

Representatives from four Heartland grazing clusters have organized a state grazier affiliation, the Kansas Grazier Association (KGA). This Association seeks to better network Heartland grazing clusters, improve the effectiveness of clusters in serving the needs of farmers, and reach out to new graziers in the state. The KGA has organized two state-wide grazing conferences attracting 95 to 134 people.

Five clusters hosted a regional education event such as a conference, school, or a series of workshops. One cluster hosted two community events featuring local

agricultural-based microenterprises. Over 1,000 people attended. Another cluster has held a community dinner for its 100 patrons of their farmers' market each of the last three years.

New Clusters Organized During This Project

The Heartland Network organized the following 12 new clusters during this SARE funding period.

The Doyle Valley Farmers Market was started this year in Peabody, Kansas. Sales have increased from \$4,700 to \$5,650 over three years. As many as 17 vendors participated in the market with a range of 3-10 vendors on market day.

The Blue Earth Organic Growers cluster cooperatively sells fresh garden produce at a local farmers market. For many of the growers, this was cluster provided their first experience marketing. During the third year a few members of the cluster started a CSA.

The Land to Hand cluster developed a directory of regional food and farm products listing 16 different farmers. A food fair of these products was organized, some members participated in business planning and a new local farmers' market was organized.

The Matfield Green Microenterprise Project is investigating herbal microenterprises. This cluster is conducting Echinacea trials. It hosted a community day featuring local agricultural-based businesses and artists. It also organized a community garden hiring local youth to work in the garden. Tomatoes were processed into salsa and marketed locally.

The Green Acres Grazers cluster formed to conduct field visits of other rotational grazing farms. This cluster was later terminated due to lack of member participation.

Atchison Farmers' Market used grant support to promote the market. It has a successful relationship with the local chamber of commerce, which has committed public dollars to the market.

Chautauqua Hills is planning a grazing field trip to Oklahoma. This cluster has had weak leadership and little activity.

Food for Thought promoted a local farmers' market and conducted some on-farm trials for alternative insect control. It has since disbanded.

Kansas Grown Petals has conducted flower trials and sponsored a cut flower seminar with the local Extension office attracting over 100 people from several states.

Flint Hills Safaris is investigating controlled leased hunting and other forms of recreation through education events and field trips. It has held public educational events.

Kansas Meat Goat Association promotes meat goats and the development of markets. It has sponsored a series of educational events.

Prairie Petal Pushers is organizing a local cut flower marketing cooperative and a series of business planning workshops.

Learning Teams Supported by This Project

The Heartland Network collaborated with eight learning teams. These teams involved the Kansas Rural Center, Heartland Network farmers, Kansas State University, and the Natural Resources Conservation Service. These teams are listed below.

The Great Plains of Organic Herb Growers Cooperative - a team of producers; researchers from Kansas State University, Kansas University, and the Kansas

Biological Survey; a private business; and the Kansas Department of Commerce and Housing set up a steering committee. They held three years of organizational meetings, developed a 550 member mailing list, and started a newsletter. A grower survey was conducted. Their organizational documents (Articles of Incorporation and Bylaws) were formed. Herb plots were established. A SWOT analysis was made of their co-op and markets. These efforts stimulated the Kansas House of Representatives to pass a resolution supporting a center for scientific study of medicinal plants. This learning team spawned an emerging cluster.

A learning team involving Rainbow Organic Farms, Kansas State University researchers and a Kansas House representative are developing documentation for a quality system certification program (QSCP) based on the internationally-recognized principles of ISO 9000. This "process verified" documentation will allow producers to advertise their beef products with a established standard of quality. This team will present this program to Kansas Producers this winter.

The Noisy Spring learning team consisted of organic producers, Kansas State University researchers and Audubon of Kansas. The purpose was to conduct market analysis of creating a local organic bird seed mix sold to Audubon members in Kansas. A focus group was conducted. A survey of Audubon chapters' purchases was conducted. No market was developed due to the loyalty of present chapters to their existing suppliers and limited producer experience in producing the necessary variety of grains.

A team of organic farmers and Kansas State University (KSU) researchers conducted organic food grade soybean variety trials at two KSU stations and provided individual on-farm agronomic consultations. This learning team received an additional \$15,000 from the Kansas Soybean Commission for trials and on-farm consultations. Another grant of \$12,200 will be used to develop their organic markets.

A team of producers, Kansas State University and USDA Rural Development established a plan for leadership training program for the Kansas Organic Producers. The training workshop will be conducted this winter.

A team of producers and Kansas State University Extension agents organized a two-day grazing school, several field days in south central Kansas and on-farm grazing demonstrations.

A Heartland cluster collaborated with a Kansas State University conducted three years of hairy vetch trials at a local station.

A team of producers, Natural Resources Conservation Service, Kansas State University, and Kansas Rural Center provided oversight of the Heartland Network project.

Economic Analysis

Economic analysis has been conducted on several crop rotations used by Heartland Network farmers. Spreadsheets with this data are included in the appendix.

Farmer Adoption

The Heartland Network works with 340 farmers and 232 farms or ranches. Extended season and time-controlled grazing practices have been the most adopted sustainable agricultural practice. Nine of clusters focus on grazing management.

The second most attractive change has been alternative markets. Five clusters work with farmers markets and five clusters work with some form of cooperative marketing. Marketing allows farmers to capture more profit, however marketing has

significant challenges (especially in larger retail volumes) . The attached article on the Tallgrass Prairie Producers cooperative identifies these barriers. There is a growing interest in farmers' markets. This is a low, entry-level approach for farmers exploring direct marketing.

Two clusters focused on cover crops and trials. There has been very limited adoption of cover crops within crop rotations. Barriers have been establishment, inconsistent level of nitrogen fixation and the financial and moisture risk associated with cover crops in areas with undependable rainfall.

Specific Recommendations

- Start slow with cover crops. Learn from other farmers. Read about your options before you try a particular cover crop. Focus management on good establishment, weed control and moisture conservation. Plan cover crops within a larger crop rotation. Explore how cover crops can provide extended season grazing.
- Develop a business plan before marketing. Organize a management team for your business that covers production, marketing and financial management. Know your break even price. Test your marketing skills at a farmers' market.
- Think first about how you can extend your grazing season to fill in the gaps in the grazing season before moving to a rotational grazing cell. Sketch out a grazing calendar matching nutrition requirements with available forages. Search out other graziers and learn from them. Read available literature. Start slow and evolve your management skills.

Testimonials

"At first I was teaching dance lessons and Dan went to the (cluster) meetings. Now I wouldn't miss them for anything And also the Roundup. It would take some thing major to miss that. It gives me a new and different way of thinking with the hope that something that we discover will work ... Everybody has something that you can draw from. And the people (at these events) don't mind sharing something with you. It seems like the people we get to these things don't mind telling you what they know." - Farmer.

"I for one am appreciative of the seed money to get our cluster started. You never get too old to learn. I wish I would have started down this road many years ago. We can see a big improvement in our grass." - Farmer.

"We're finally seeing producers share with each other. They get together to bounce ideas off each other as they learn." - Farmer.

"I just enjoy getting together with like-minded people. We're really bonded together on this cover crop issue." - Farmer.

"The clusters are where we have gained the greatest extension agent participation in sustainable agriculture. Working with clusters has given them a better level of comfort with sustainable agriculture." - Extension Administrator.

"The Heartland Network has opened doors. The Heartland clusters have been so important for farmers sharing with each other. This has done more good than what we were getting handed down to us." - Farmer.

"Do I put my own interests first or do I sacrifice my own personal interest for the group? We have to put our interest on the same par as that of the group. We also need to put the survival of our neighbors on par with our own survival. In fact that helps ensure our own survival." - Farmer.

"My world has widened with new challenges and opportunities since I got involved with the Kansas Rural Center. My future has changed. (My daughter) now thinks about how she can make money off the farm. I value farm life. The Kansas Rural Center has helped me place a value on it." - Farmer.

“The Kansas Rural Center is a premiere organization in Kansas working with farmers on organic and sustainable farming practices.” - an agricultural reporter.

Participation Summary

Educational & Outreach Activities

PARTICIPATION SUMMARY:

Education/outreach description:

The following dissemination strategies were implemented during this project. Much of the support for this outreach came from supplemental funding from the W.K. Kellogg Foundation.

Farmer Profiles: Profiling Heartland Network farmers has been a central part of this project. Twenty-one farmer profiles were developed and featured in both print media and radio interviews. One of the Heartland Network families, the Wilsons, was featured in an exhibit “Listening to the Prairie: Farming in Nature’s Image” at the Smithsonian National Museum of Natural History in Washington, D.C. The Wilsons joined the then Secretary of Agriculture, Dan Glickman, to open the exhibit.

News Articles: At least fifty-three news articles appeared in local and regional papers and magazines. These appeared in Wichita Eagle, Topeka Capitol Journal, Kansas City’s Pitch Weekly, Kansas City Star, National Farmers Union News, Grass and Grain, High Plains Journal, Kansas Farmer, The Gelbvieh World, Ninnescah Valley News, Mount Hope Clarion, Junction City Daily Union, Osage County Chronicle, and the Gazette Bulletin.

Radio Interviews: At least 43 radio interviews with three principal radio stations (KKSU, Manhattan; WIBW, Topeka; KFRM, Clay Center) interviews were conducted. These interviews focused on 21 farmers and how they were implementing sustainable farming practices and marketing their products to consumers.

Rural Papers: The Kansas Rural Center (KRC) newsletter, The Rural Papers, is published 10 times a year. Twenty-three feature articles were generated for the newsletter from the farmer profiles and educational events within the Heartland Network. Numerous other announcements and short stories about activities within the Heartland Network were included in the Rural Papers newsletter.

Television: Two interviews were conducted with WIBW- TV in Topeka and Channel 27. One Heartland cluster was featured in a broadcasted state public television documentary.

Personal Presentations: Presentations about sustainable agricultural work at the Kansas Rural Center were given to North Central Region’s SARE Alternative Marketing Conference in Lincoln which drew 350 people from the Midwest. At this conference one Kansas farmer gave a keynote address and another participated in a plenary panel discussion. Two Heartland clusters were featured in workshops. A manual describing how the Rolling Prairie Farmers Alliance organized a cooperative subscription service was published and distributed at this conference.

In addition, KRC staff and Heartland farmers gave personal presentations with Bethel College; the Peabody annual community dinner; Land Institute; a conference sponsored by the Kansas/Oklahoma United Church of Christ and

Methodist churches; Small Farm Conference in Columbia, Missouri; Yale University; Kansas State University Agronomy Field Day; two regional Resource Conservation and Development workshops; Kansas Department of Commerce and Housing's "Value-Added Conference; Kansas Young Farmers Association; a group of Flint Hills teachers; Kansas Farmers Union "Rural Unity Day"; Zenda/Nashville Lions Club; seminary students attending Rural Pastors Training event at Partridge Community Church; Rural Life Conference sponsored by United Church of Christ, United Methodist Church, and Kansas Ecumenical Ministries; seven farm meetings organized by the Citizens Management Committee, a farmer organization in south central Kansas promoting clean water farming practices; Reno County Education Cooperative for gifted students; Wichita's farmers market annual meeting; Kansas Agriculture Vision 2000 Conference; Nebraska OCIA Chapter; Kerr Center's "New Ideas" conference in Oklahoma; Agri Expo 2000 in Jefferson, MO; the Mid-America American Studies Association conference; a church-sponsored forum with KSU administrative leaders; a state women in agriculture network meeting; a Kansas Nongame Advisory Council; a Four-State Vegetable Growers Conference; Lawrence High School; Partridge Public School; MidAmerica Nazarene University; a Public Broadcasting System special program following "The Farmer's Wife" documentary; University of Nebraska; a church youth group; Audubon Society; the Midwest Sustainable Agriculture Working Group; and the International Conference on Women in Agriculture in Washington, D.C.

Workshops, Conferences and Tours: Twenty-seven farm tours were organized. Three rotational grazing workshops and schools were coordinated. An annual sustainable agriculture conference jointly sponsored with Kansas State University has been held. An average of 140 people attended, with the majority being farmers.

Three workshops on whole farm planning have been held in Osage City, Kansas with five farm families. Four workshops on whole farm planning were held in Whitewater, Kansas with four farm families. The workshops used exercises and planning tools in quality of life assessment, goal setting, development of testing guidelines to direct decision making, understanding of ecosystem principles to guide wise natural resource conservation, and meeting on a farm to use this whole farm decision making process in resolving a real management dilemma.

Publications: A case study on the Rolling Prairie farmer's cooperative subscription service entitled "Subscribe to Change" was developed. These guides were promoted in the Kansas agricultural press. A Heartland Network directory is in progress and will be published in December.

Project Outcomes

Recommendations:

Areas needing additional study

These are ways the Heartland Network could be expanded or taken in a slightly different direction:

Match beginning and experienced farmers in a mentoring or coaching relationship.

Provide business planning training and networking farm entrepreneurs to provide management and marketing coaching.

Provide training and dispute resolution services for farmers' markets.

Create links between multifunctional agriculture and rural economic development.

Create a web-based sustainable farm product directory.

Emphasize how sustainable agricultural practices can protect water quality.

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