



1999-2000 ANNUAL REPORT



LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE

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LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE



seasons of change

1999-2000 ANNUAL REPORT

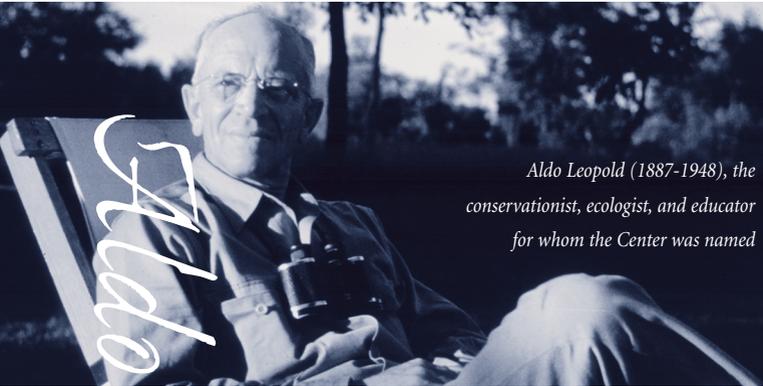




LEOPOLD CENTER FOR SUSTAINABLE AGRICULTURE



LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE



*Aldo Leopold (1887-1948), the
conservationist, ecologist, and educator
for whom the Center was named*

*Information for this report was compiled
by Leopold Center staff with the help of
its researchers and educators, who are
committed to improving Iowa agriculture
and the lives of Iowans.*

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LEOPOLD

The Leopold Center was established by the Iowa Legislature as part of the Iowa Groundwater Protection Act of 1987. Its mandated missions are to identify impacts of agricultural practices, contribute to the development of profitable farming systems that conserve natural resources, and cooperate with Iowa State University Extension to inform the public of new findings.

In those seasons...the powers are gathering their strength for new efforts; as land which lies fallow recovers itself for tillage.
J.W. Alexander

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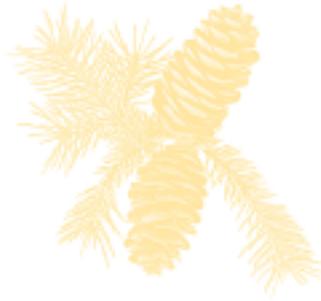
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LETTER FROM THE INTERIM DIRECTOR

winter



Having the opportunity of serving on the Advisory Board for about ten years and now as interim director for the past six months, I would like to share some of my thoughts on sustainable agriculture and the Leopold Center.

Fifteen years ago when more resources began to be directed towards sustainable agriculture on a national and to some extent international basis, expectations were high for improvements in many aspects of the impacts of agriculture on the environment and society. However, there was no universal agreement on the definition of sustainable agriculture and consequently the limited resources were not critically focused on key issues. In many respects this was not bad because various groups have tried many different approaches. As we look to the future there needs to be an in-depth evaluation of what has been done and identification of the important areas for new work.

With a decade of diversified work it should be easier for sustainable agriculture to set priorities for future research. The down side of no widespread improvement on the effects of agriculture on the environment is that it will be difficult to justify continued or increased support for sustainable agriculture in times of limited budgets.

The legislative mandate that established the Leopold Center stated that funds received from the state were to be used to support research and an outreach component to make the research results known. I think there have been successes from the efforts supported by the Center. The competitive research grants, the issue team component of the research and outreach programs, and the publications from the Center have received excellent evaluations from two external review teams. To claim the Center has started change in the dynamics of agriculture to be more in agreement with Leopold's land ethic would be a bolder statement than I want to make. The initial high expectations for sustainable agriculture have been tempered by the reality that many forces influence decisions Iowa farmers

*it takes patience to view the seasons' stately
passage within the great cycle of nature*

patience

and landowners must make with respect to use of the land. As researchers we must develop empathy with people who farm the land to appreciate the factors influencing their decisions.

As the Center reached out to work with more people and to diversify the areas of work, it became necessary to interact one-on-one with individuals and groups of people. This has not been traditional agriculture research. Staff has had to be out in the state and willing to help grant recipients achieve their goals, rather than staying on campus evaluating proposals and reading reports. Many university scientists whose projects are supported by the Center are finding satisfaction from conducting research on

farms and working in partnership with farmers even though the experiments are often not as well controlled as on university farms.

Traditional agriculture research has been adept at providing recipes (i.e., X lbs of fertilizer per acre for Y expected yield) for wide-ranging application. Sustainable agriculture is an evolving process. Dennis Keeney, former director of the Center, likened it to a journey that farmers learn as they understand the land they farm as a living community. Each farm and parcel of land is unique. To be successful, I think some portion of sustainable agriculture research must be shifted to engage the people farming the land with the living community on their farm in order to help them become better stewards of the land.

All of us at the Center look forward to working with Fred Kirschenmann and his perspectives of sustainable agriculture as he assumes leadership as Director of the Center.

Allen Trenkle

Allen Trenkle

WHAT DO YOU SAY about a year whose benchmarks were the gala retirement party for a departing director and a seemingly excruciating wait for the official announcement of the identity of his successor? Geoffrey Chaucer opined that patience is “a heigh virtue” and this sterling quality was much in demand among Leopold Center Advisory Board members and staffers during the past year, as they waited to see when and how the Center’s leadership vacancy would be filled.

This is not to imply that the Center’s operative made this year was one of long-suffering (one definition of patience). Rather, the Center remained steadfast (another form of patience) in its resolve to maintain and improve the research and education programs that have served Iowans so well during the decade just past.

Indeed, patience seems to be a quality that Aldo Leopold would applaud—he certainly needed stores of patience to spend years reclaiming the abused land that housed his famous Wisconsin shack. Rabelais said, “He that has patience may compass anything.”

The true conservationist knows that it takes patience to view the seasons’ stately passage within the great cycle of nature. It takes patience to watch the oak tree grow from a minute seed. It takes patience to wait for the land to heal itself after human mistreatment. And it takes infinite reserves of patience to change the minds and hearts of a society that has lost its elemental respect for the land.

Farmers know the virtue of patience too—they are forever waiting on the vagaries of the weather, the markets, and the government. No matter what else is afoot, the Center will work to reward their patience with well-grounded guidance on how to farm more sustainably, more economically, and more responsibly. It just takes time. And patience on everyone’s part. As the Bible passage (Hebrews 11:1) urges us, “Let us run with patience the race that is set before us.” — M.A.





Frederick L. ("Fred") Kirschenmann, president of Kirschenmann Family Farms, Inc., of Windsor, North Dakota, has been chosen to guide the Leopold Center into its second decade of activities and achievements. Kirschenmann, a longtime leader in national and international sustainable agriculture circles and director of an organic family farming operation, has experience as an academic, an administrator, and a working farmer. He will be the first farmer to head the Leopold Center operations, an important step that will complement the Center's legislative mission of serving Iowa's agricultural community.

He began work at the Center on July 1, 2000. During his first five months of employment, he will be making a gradual transition from management of his 3,500-acre farming operation in central North Dakota to the Leopold Center offices in Ames.

Kirschenmann said of his new position, "It's an opportunity to think about where we want to go with agriculture in the future, and for many farmers, we don't have a lot of time left. Of course, I come into this with some trepidation because I don't have any easy answers either...The Center has a strong background in science and I want to build on that, but also recognize the challenges ahead of us."

On announcing the appointment, outgoing ISU President Martin Jischke remarked, "Dr. Kirschenmann has a talent for looking into the future, bringing people together to agree on goals and keeping them together to get things done. We're delighted that he will provide leadership for the Leopold Center."

Center advisory board members described him as "a true intellectual with an ability to draw upon scientific knowledge, apply it in diverse situations, and link research with agricultural practices." One member felt that Kirschenmann "could take the Center to the next level and add to (not just highlight)

"Dr. Kirschenmann brings new experience, vision and leadership to this position and I expect many people at Iowa State and elsewhere will come to appreciate his noteworthy qualities."

*-Wendy Wintersteen,
Chair, Director Search Committee*

the Center has had many changes—a year of retirements, farewells and new beginnings

Passages

important work done by Aldo Leopold and the University of Wisconsin in conservation.”

Kirschenmann brings a highly diverse set of life experiences to the Center. He has been a department chair, acting dean of students, director of a university consortium for higher education religion studies, and dean of the college at Curry College in Milton, Massachusetts. After his father's illness in 1977, Kirschenmann returned to North Dakota to operate the family farm, which has been certified organic since 1980.



Kirschenmann's educational background includes a B.A. degree from Yankton (South Dakota) College and graduate degrees from the University of Chicago. He received a B.D. degree from Hartford (Connecticut) Seminary Foundation. He also will be a professor of philosophy and religion at ISU.

The announcement by President Jischke on June 7, 2000 was the culmination of a 14-month-long search that involved the Center's Advisory Board, ISU faculty and staff, and numerous other stakeholders from agribusiness and the sustainable agriculture community. Wendy Wintersteen, chair of the director search committee and Leopold Center Advisory Board member commented, "Dr. Kirschenmann brings new experience, vision, and leadership to this position and I expect many people at Iowa State and elsewhere will come to appreciate his noteworthy qualities." Kirschenmann was the first choice of the search committee, the advisory board, and the Center staff from among the 30 applicants for the director's position.

AN ERA OF ADMINISTRATIVE STABILITY CAME TO AN END FOR THE LEOPOLD CENTER THIS YEAR.

- **Dennis Keeney**, the Center's first and only director, retired from Iowa State University on December 31, 1999.
- **Michael Duffy**, the Center's associate director of nine years, resigned from his position with the Center on December 31, 1999.
- **Allen Trenkle**, a longtime Advisory Board member and ISU distinguished professor of animal science, was appointed as interim director for the Center in January 2000.
- **E. Anne Larson**, who came to the Center as its first communications specialist in 1993 and later job-shared the position, resigned in May 2000 to pursue a career in horticulture.
- The **search for Keeney's replacement** as director began in April 1999. Leopold Center Advisory Board member Wendy Wintersteen headed the search committee that recommended three director candidates to ISU President Martin Jischke on March 29, 2000. Dr. Jischke interviewed the three finalists on April 25. Other Center board members on the 11-member committee were Kurt Johnson, Mary Jane Olney, Jim Penney, and Robert Sayre. Jeri Neal, competitive grants coordinator, was the Center staff representative on the search committee.

CENTER OFFERS HELP FOR RURAL IOWA WINTER



Life

AT THE CENTER



The Leopold Center Advisory Board expressed serious concern about the burgeoning farm financial crisis at its September 1999 meeting and directed the staff to consider some ways to alleviate the situation. In response to the board's suggestion, the Center helped cosponsor two ongoing efforts to aid farmers under stress. In both cases, the issue of creating and maintaining sustainable communities was part of the ongoing discussion.

“TOGETHER IN TOUGH TIMES”

The Center provided \$10,000 to extend an earlier farm community support initiative by ISU Extension called “Together in Tough Times.” The funding pays a part-time facilitator from the Ecumenical Ministries of Iowa who has been coordinating “community conversations” in several areas hard hit by the farm economic downturn.

Local cooperatives and school boards also are encouraging participation in these discussions by a wide group of community residents in Alta, Denison, Creston, and West Liberty. Some of the communities are dealing with complex issues of added ethnic diversity in their areas along with economic upheaval.

“BUILDING HOPE IN THE HEARTLAND”

The Center helped fund a training session for parish nurses, clergy, and others interested in assisting rural church congregations and farming communities. “Building Hope in the Heartland” was held in March 2000 under the guidance of the Sharing Help Awareness United Network (SHAUN). The workshop participants learned how the farm crisis affects individuals, families, and communities. They were encouraged to return to their local areas and help individuals and groups come together to support each other. The \$2,500 from the Center was used to provide scholarships for some of the parish nurses, to videotape the sessions for viewing by those unable to attend, and to reimburse speakers at the event.

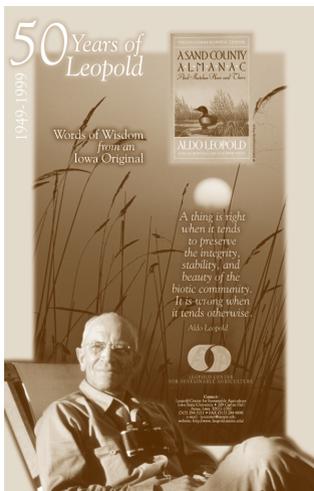
nearly 200 people gathered for a reception just weeks before Keeney's official retirement

retirement

FROM ALDO'S PEN TO YOUR LIBRARY

Early on, the Leopold Center staff learned that the quickest way to gain a convert to Aldo Leopold's unique conservation ethic is to put a copy of his natural history classic, *A Sand County Almanac*, in the person's hands. Aldo's words will do the rest.

So it was an easy call when the Center staff was searching for a fitting way to celebrate the 50th anniversary of the publication of *A Sand County Almanac* on October 27, 1999. The Center provided complimentary copies of Leopold's beautifully written legacy to more than 1,500 Iowa citizens and institutions. Copies of the paperback version of the book and a four-color commemorative poster* were mailed to 573 public libraries, 436 high school libraries, 107 libraries in community colleges, universities, and prisons, as well as offices of 91 conservation boards, 117 soil and water conservation districts, and 100 county extension offices. Judging by the comments received from the recipients, Aldo's message still resonates, even across the span of a half-century.



**The poster shown here received a silver award from the Agricultural Communicators in Education.*



Photo by Rod Swoboda

CENTER STAFF AND BOARD, SUSTAINABLE AG COMMUNITY MEMBERS, AND FRIENDS FETED KEENEY ON HIS RETIREMENT

As Dennis Keeney wrapped up the final chapter in his career as Center director, his professional colleagues, friends, family, and coworkers came together to indulge in a bit of nostalgia and wish him well. Nearly 200 people gathered in the Brunner Gallery of ISU's Scheman Building for a late afternoon reception on December 4, 1999, a few weeks before Keeney's official retirement from the Center.

The event began with a program highlighted by remarks from Paul Johnson, then director of the Iowa Department of Natural Resources, one of the legislative godfathers of the Leopold Center, and a longtime Keeney friend who would follow him into retirement just a few months later. David Williams, a farmer, friend, and member of the Leopold Center Advisory Board, also offered some reminiscences about Keeney's time with the Center. Keeney then took to the podium to make a heartfelt speech of thanks and benediction to his friends and coworkers.

Center staff presented Keeney with a memory book, videotape of the reception with appropriate musical scoring, and an addition to his extensive collection of moose-themed memorabilia.

FY2000
FEDERAL CENTER FOR SUSTAINABLE AGRICULTURE
ADVISORY BOARD



Lyle Asell
interim director
Iowa Department
of Natural Resources

Leon Burmeister
professor of health sciences
University of Iowa
(board chair for 1999-2000)

Thomas Fogarty
professor of geography
University of Northern Iowa

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*Iowa Association of Independent
Colleges and Universities Mingo**

Connie Greig
*farmer, District Soil and
Water Commissioner*
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Mary Jane Olney
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Jim Penney
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Agribusiness Association of Iowa*

Robert Sayre
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University of Iowa

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Marvin Shirley
farmer
Iowa Farmers Union, Minburn

Craig Struve
*Agribusiness Association
of Iowa, Calumet*

Allen Trenkle
professor of animal science
Iowa State University (also
interim Center director)

Paul Whitson
professor of biology
University of Northern Iowa

David Williams
farmer
Villisca

Wendy Wintersteen
senior associate dean
College of Agriculture,
Iowa State University

**Board member serving
for a portion of the year*



Life

AT THE CENTER



budget

STAFF

Allen Trenkle
Interim Director
(through June 2000)

John Lane
*Secretary**
(through August 2000)

Dennis Keeney
Director
(through December 31, 1999)

E. Anne Larson
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**part-time or shared appointments*
***partial Extension appointment*



Advisory Board members: (left to right) (first row) Neil Hamilton, Marvin Shirley, Wendy Wintersteen, (second row) Allen Trenkle, Kurt Johnson, Kathleen Gannon, (third row) David Williams, Lyle Asell, Paul Whitson, (back row) Paul Mugge, Tom Fogarty, Colin Scanes

	Operations	Research	Education & Outreach	Totals
Funding:				
AMA	1,100,000			1,100,000
GPR		390,000	170,000	560,000
Balance	392,320	706,080	401,600	1,500,000
Total Funds	1,492,320	1,096,080	571,600	3,160,000
Expenditures:				
Salaries & Benefits	293,970	64,530	119,500	478,000
Office expenses	51,350	30,550	48,100	130,000
Competitive Grants		536,000	264,000	800,000
Issue Teams			250,000	250,000
Long-term Agroecological Research Initiative		50,000		50,000
Bear Creek & Raccoon River Watersheds		50,000		50,000
Hoop Initiative		75,000		75,000
Practical Farmers of Iowa Partnership			50,000	50,000
Director's Research		20,000		20,000
Associate Director's Research		20,000		20,000
New Publications			15,000	15,000
Conference Grants			35,000	35,000
Education Programs			25,000	25,000
Annual Conference			15,000	15,000
Reserve FY2001	660,000			660,000
Total Expenditures	1,005,320	1,096,080	571,600	2,673,000
Fund Balance	487,000	0	0	487,000



The Agroecology Issue Team continues its long and successful run with a mixture of practical research, student involvement, work with different partners, and eye-opening tours. Led by Richard Schultz and four other ISU scientists, this issue team offers a look at the best of multidisciplinary research.

WATERSHED CELEBRATION HELD

In September, the team hosted a field day and dinner for about 100 watershed residents and other project cooperators. The event celebrated the designation of the Bear Creek Watershed as a National Restoration Demonstration Watershed under the Clean Water Action Plan in June 1999. Experiencing the stream table and going up in the boom truck for a “bird’s-eye” view of the project were popular activities.

NEW BUFFER SITES ADDED

An additional one-half mile of on-farm buffer was established in the lower portion of the Bear Creek Watershed on the Jim Cooper farm. This site is highly visible from the southbound lane of Interstate 35 where Bear Creek flows between the two rest areas north of Ames. The team is also working with two landowners to extend the length of contiguous buffer to five miles in 2001, beginning near the original Ron Risdal farm site.

GRADUATE RESEARCH AND EDUCATION

A primary objective of the issue team has been to provide graduate student training. To date, 15 graduate students have conducted their research on the riparian buffer project. Students have come from the United States, Nepal, India, Liberia, Venezuela, Turkey, South Korea, and China. Students who finished within the last year conducted research on topics such as

- spatial modeling in an agricultural watershed,
- stream bank erosion adjacent to different land-use practices,





Cross-section of a riparian buffer on the Lon Strum farm within Bear Creek National Demonstration Watershed. The seven-year old buffer contains zones of switchgrass (foreground) and mixed trees and shrubs. This section is part of over five miles of buffer established within the watershed.

- effectiveness of buffers for sediment and nutrient removal,
- fate and transport of nitrate in groundwater, and
- microbial biomass and nitrogen immobilization under buffer vegetation.

Five papers have recently been published from these student efforts. Several of these students are now employed in environmental consulting firms, while others are continuing their graduate education.

NEW “BUFFER” TECHNOLOGY DEMONSTRATED

Alteration of watershed hydrology by humans has created many stream channels that have down-cut 10 to 15 feet into the land. This has increased the velocity and energy of floods that can erode stream banks and cause exaggerated stream meandering. In an effort to reduce this problem, team members are in the midst of installing a series of grade-control structures or boulder weirs within an eroding reach of Bear Creek. These structures will reduce the energy of the water and stabilize the channel, thus reducing bank erosion and the sediment production associated with them.

This also will improve water quality and aquatic habitat because of the reduced sediment load and improved aeration. Team members are working with resource professionals from the Illinois Water Survey in this “first-time-in-Iowa” application of the technology.

TEAM RECEIVES GRANTS

The team was awarded a grant from the U.S. Department of Agriculture’s Sustainable Agriculture Research and Education (SARE) program to look at the long-term effects of two contrasting buffer vegetation types—cool-season and warm-season grasses—on soil carbon cycling and storage,

and soil food webs. The work will take advantage of the different aged buffers within the Bear Creek Watershed and with knowledge gained will contribute to the design of improved riparian buffers in the Midwest.

The team also has been awarded a grant from the Iowa Department of Natural Resources to look at the carbon sequestration potential within restored native prairie ecosystems at the Walnut Creek National Wildlife Refuge. Extensive efforts also continue on an EPA-University of Missouri grant in northeastern Missouri where the team is conducting comparison studies in watersheds of similar size to Bear Creek.

At year’s end, the agroecology team was beginning work with the Iowa Cattlemen’s Association and the Center’s Animal Management Issue Team on a study of the impact of grazing management on riparian and stream health, including assessing the contributions of phosphorus inputs to stream waters. Support for the work will come from U.S. Environmental Protection Agency 319 funds.

TOURS, TOURS, TOURS

The Agroecology Issue Team hosted more than 25 tours of the Bear Creek sites for visitors from all over the world and made more than 30 presentations at regional and national meetings. The team has continued to work with Trees Forever on the Iowa Buffer Initiative that is now in its third year. To date, this program has been involved in the establishment of 60 buffer demonstration sites across Iowa. The associated field days at these sites are a prime opportunity to transfer buffer technology to landowners and natural resource professionals.

ANIMAL MANAGEMENT

ISSUE TEAM MANAGES IN THE PASTURE

Spring



Now in its tenth year of operation, the Animal Management Issue Team

continues to investigate many aspects of animal feeding and grazing in Iowa, as well as surveying their impacts on animal production. ISU animal scientist James Russell coordinates the activities of the team. Some recent research highlights for the multidisciplinary group:

ALFALFA AND LEGUMES

Incorporating legume forage species like alfalfa into cool season grass pastures will increase animal production while reducing N-fertilization costs. But the low plant persistence and bloat problems associated with legumes have limited their use in pastures. Animal Management Issue Team studies showed that incorporation of a grazing-tolerant alfalfa hybrid into cool season grass pastures did not improve legume persistence or animal production compared to use of a hay-type alfalfa. Use of alfalfa in a complementary system did improve legume persistence, but this change decreased calf production compared to grazing alfalfa throughout the entire grazing season.

GRAZING BT CORN RESIDUES

Feeding of stored feeds is the largest cost in beef cow-calf production, therefore optimal grazing of corn crop residues is the largest factor separating high- and low-profit beef cow-calf producers in Iowa. In the 1990s, some corn hybrids were genetically modified to contain the Bt insecticide produced by the bacterium *Bacillus thuringiensis* (Bt) to protect corn from the European corn borer. Little research has been done on the nutritional value of the Bt corn crop residues, and producers had questions about digestibility and palatability of Bt corn residues. The team conducted an experiment to investigate the nutritional composition of the crop residues from Bt hybrids and their effects on the performance of pregnant beef cows. Although chemical analysis of corn crop residues sampled during the winter of 1999-2000 continues, no differences in the concentrations of digestible dry matter, crude protein, and fiber constituents of crop residues related to the presence of Bt proteins were observed. Body scores were equivalent and no grazing selection preferences were observed. Results imply that the presence of Bt protein in corn crop residues has little effect on their value for grazing by pregnant beef cows.



Photo courtesy of Jim Russell. Cows that rotationally grazed alfalfa had 17 percent greater calf production per acre than cows grazing smooth bromegrass.

YEAR-ROUND GRAZING

Previous team research has shown that use of rotational grazing and incorporation of legume forage species will increase the profitability of cow-calf production from summer pastures by increasing calf production per acre. Other research has shown that grazing of corn crop residues and/or stockpiled perennial forages will decrease cow-calf production costs by reducing the need for stored feeds during winter. However, because each of these management practices affects forage availability and cow nutrient status in other seasons of the year, it is necessary to evaluate these practices in systems over the entire year. Preliminary results from further team research imply that winter grazing of corn crop residues and stockpiled forages will significantly reduce the amounts of stored feeds required to maintain both spring- and fall-calving cows during winter. Grazing of stockers with spring-calving cows before pregnant fall-calving cows in a lead-grazing, rotational system will maintain pasture quality and total growing animal production in a manner similar to a minimal land system in which a first-cutting hay harvest was used to maintain pasture quality and provide the winter feed supply.

Additional research funded by the Animal Management Issue Team deals with winter grazing of stockpiled kura clover used as a permanent strip crop for corn production. Evaluation of the effects of corn crop residue grazing on soil properties and subsequent crop production is funded by Leopold Center and USDA-Foreign Agricultural Service Competitive grants.

OUTREACH

The Animal Management Issue Team members gave presentations on their research at the:

- ❖ Annual Management Intensive Grazing symposium,
- ❖ In-service training of ISU Extension and USDA-Natural Resources Conservation Service personnel,
- ❖ Iowa Communications Network class on organic farming, and
- ❖ Pasture walks and field days in Clay and Butler counties as well as in Ohio and Wisconsin.



CENTER & CHEEC SURVEY AIR QUALITY IN SWINE PRODUCTION

How does the air quality differ between large-scale hog confinement units and hooped houses, both inside the structures and outdoors? The Leopold Center has committed \$25,000 to a 15-month project to study this important question for swine production facility planners. The research is being conducted by Iowa State University's agricultural and biosystems engineering department in tandem with the Center for Health Effects of Environmental Contamination (CHEEC), the Leopold Center's counterpart at the University of Iowa. Project coordinators are Dwaine Bundy at ISU, Peter Thorne at the University of Iowa, and Peter Weyer at CHEEC.

RESEARCHERS WILL ATTEMPT TO

- 1) Quantify airborne contaminant concentrations and exposure duration in hooped houses and conventional confinement units, and
- 2) Compare exposure of airborne contaminants around and downwind of hoop structures and conventional confinement operations.

HOOPS GROUP

LABS HOODS HOOPS

Spring



Since 1996, an estimated 1,500 hooped structures have been built in Iowa for raising hogs. These tent-like, low-cost buildings are easy to assemble and quite versatile. But how do they rate when compared to more conventional hog production systems?

That was the main question for the Leopold Center's interdisciplinary group of scientists conducting research on hoop production facilities for swine. Formed in 1997, the hooped house initiative (a.k.a. the "hoop group") is led by Mark Honeyman, coordinator of ISU's research and demonstration farms, and James Kliebenstein, ISU professor of economics. Co-investigators include ISU professors Jay Harmon (agricultural and biosystems engineering), Donald Lay (animal science), Thomas Richard (agricultural and biosystems engineering), and Brad Thacker (veterinary medicine).

Most of the group's work is at ISU's Rhodes Research Farm in central Iowa to compare finishing pigs in hoops and in confinement systems. Pigs of similar genetics were fed identical diets and managed by the same staff at the same location. Four groups of swine have been fed thus far: two in the winter and two summer groups. The results disseminated from the group's investigative efforts have helped Iowa State become a nationally and internationally recognized leader in the hoop swine production area, with other universities looking to the Iowa system as they develop their own hoop research/demonstration projects.

Among the findings the group has generated:

- Health status of hoop-raised pigs was similar to that of confinement-raised pigs;
- Pork production cost was similar (but structured differently) between the hoop and confinement systems;
- Composting of manure in hoop systems can be accomplished effectively and easily with low-tech methods;





ORGANIC INITIATIVE EVOLVES

- ❖ Hoop-raised pigs fought less, showed less stereotypical behavior, and responded to stress with a lower cortisol response that confinement pigs;
- ❖ Hoop pigs grew more slowly and less efficiently during the winter, but faster and more efficiently during the summer; and
- ❖ Nutrient losses from manure are a significant concern for hoop as well as other production systems.
- ❖ No major differences were apparent in feed intake, growth rate, feed efficiency, and pig mortality for pigs in hoop and confinement systems;
- ❖ Ammonia levels were shown to be higher in confinements than in hoops;
- ❖ Lean gain and efficiency of lean gain were similar for the two housing systems;

On June 20, the hoops group met with 15 producers to discuss their ongoing research efforts as well as potential areas of research. The day's meeting allowed the scientists and farmers to engage in a frank exchange of views and set priorities for future studies.



Iowa's acreage for all organic crops increased nearly ten-fold between 1995 and 1998, sparking a \$200 million industry and an urgent need for more information about organic production. With the dismal farm economy, the appeal of raising crops that commanded premiums from 20 to 300 percent above market price was considerable. But what organic crops can be raised in Iowa, and how?

The Leopold Center recognized the need for dedicated lands throughout the state where long-term scientific research on organic crops could be conducted. ISU's organic crops specialist, Kathleen Delate, responded to the challenge with the establishment of 12 research projects at nine ISU and private farms around the state, many under the umbrella of the Center's Long-term Agroecological Research (LTAR) initiative. The Center has provided more than \$100,000 over the past two years for Delate to conduct growing trials for organic and conventional commodities.

At the Neely-Kinyon Farm, a 17-acre block has been assigned for the long-term study of rotated trials of organic corn, soybeans, oats, and rye. Organic clear-hilum soybean production is of particular interest to farmers because of their high market premiums (as much as two to three times more than conventional prices). A very wet spring in 1999 caused some problems with timely cultivation for the organic plots, but soybean yields did not suffer.

Second-year results from the Neely-Kinyon LTAR site were very encouraging for organic soybean production. The plots had an average yield of 47 bushels per acre and a 41 percent protein content, both slightly better than the 1998 totals. Organic corn yields were lower than in 1998, but the \$2 bushel premium for organic corn could offset any decrease in yield. Production costs for 1999 were much similar to those from 1998, and both years remained close to conventional production expenses. Soil quality was enhanced after only one season of organic management, as was anticipated. With longer crop rotations and additions of organic matter from compost and cover crops, yields are expected to continue to improve in the organic systems. As organic systems mature and premiums are likely to stabilize, components such as soil health and cost control will become increasingly important to producers.

In addition to the field trials, Delate spends a great deal of time on public education and outreach. In 1999, she gave 52 presentations on the ISU organic research program, including information on LTAR. Two field days were held at the Neely-Kinyon LTAR site with 250 farmers and media attending.

LEOPOLD CENTER FUNDS

FIELD TRIALS LEVERAGE OTHER PROJECTS

Spring



Practical Farmers of Iowa

(PFI) used their second annual \$50,000 grant from the Leopold Center to support continuing on-farm research and information dissemination, and to help generate new funding from other sources.

Twenty-two farmers conducted more than three dozen research trials, along with several observational studies and numerous demonstrations during the 1999 growing season. Nearly 1,000 people attended the 33 scheduled PFI field days. This was a decrease from 1998 totals, but was consistent with attendance at other farm events around the state in a year when farm income hit record lows. Those who did attend the field days rated the information presented at 3.4 on a scale of 1 (lowest) to 4 (highest).

PFI was able to use Leopold Center funding to leverage other projects including work with the Iowa Farm Bureau Federation, the Sustainable Agriculture Research and Education (SARE) program of the U.S. Department of Agriculture, the Natural Resources Conservation Service, the Organic Farming Research Foundation, and the Wallace Genetic Foundation.

Contact between PFI/ISU Extension staff and the Center was not as extensive as in 1998, possibly due to the impending changes in leadership at the Center. However, Center staff took part in several PFI farm field days. Education coordinator Rich Pirog attended the spring planning meeting for cooperators in February 2000, and Pirog and Jeri Neal attended the PFI summer 1999 board meeting.

In 1999, PFI received financial support from the Iowa Farm Bureau Federation for the first time and nine farmers identified by the Farm Bureau were integrated into the PFI research network. Their field days were well attended by other Iowa Farm Bureau members.

Swine producers using alternative production systems collaborated with ISU Extension economist Michael Duffy and Mark Honeyman, coordinator of ISU's Research and Demonstration Farms, to gather data on labor costs in hooped house finishing systems. At the end of 1999 Duffy announced that, based on PFI data, the average labor time for finishing in hoops appears to be only 0.27 hours per pig as compared to 0.2 hours of labor for confinement systems.



ISSUE
TEAMS & INITIATIVE





The Weed Management Issue Team conducted research to increase understanding of the factors that influence emergence timing of important annual weeds. Emergence timing of weeds affects the performance of all weed control tactics, yet information concerning this basic biological process is rarely considered in the development and implementation of weed management programs.

Field research was continued to expand the database on relative emergence timing of several annual weeds. In 1999 an experiment was completed near Ames in which emergence timing of 24 weeds was determined. This experiment was established both in the fall of 1996 and 1997

Money from the Center helped PFI obtain matching funds for a new study of on-farm and in-vitro evaluation of alternative practices and materials for the control of gastrointestinal parasites in swine. This has been identified as a particular challenge for producers attempting to raise pork in an organic system.

The 1999 growing season was the second in which vegetable producers took part in the PFI on-farm research network. The number of cooperators increased from three to four and their research ranged from planting studies to biological control to enterprise analysis.

PFI took part in a SARE-funded project that evaluates two major and competing philosophies of soil fertility, one espoused by conventional forces and the other advanced by some producers in the organic community. The project aims to initiate a dialog on these soil fertility questions and determine the gross outcomes in crop quality, soil quality, and profitability for producers following each approach. The SARE grant will support the first two years of the effort, which includes six private farms and two ISU outlying research units. Collaborators include Kathleen Delate, who heads the Center's organic initiative.

WEED MANAGEMENT ISSUE TEAM WRAPS UP WORK

and emergence data were collected for the first two growing seasons after burial. A second set of experiments was initiated in the fall of 1998 at three ISU Outlying Research Farms (Crawfordsville, Lewis, and Nashua) and at Dordt College (Sioux Center). These experiments included nine common species and one or two species selected for local importance by the farm manager. These experiments also were initiated twice. Emergence data was collected during 1999 and also will be collected during the 2000 growing season.

The completion of this research will result in the compilation of one of the largest data sets on weed emergence. It will provide information on both timing of emergence and percent emergence of seeds within the seed bank.

The initial goal of the issue team was to develop simple tools based on growing-degree days that farmers, consultants, and others could use to improve the efficiency of weed management systems. Preliminary analysis has shown that simple models based on air temperature and rainfall fail to predict weed emergence with sufficient accuracy to be useful. Possibly the accuracy of emergence models can be improved by including additional environmental parameters

while still maintaining sufficient simplicity for use by people in the field.

Although the issue team has been unsuccessful at developing predictive models to describe weed emergence, several publications have been released that provide useful information on the behavior of the weed seed bank. A regional project initiated by the issue team, involving Iowa, Illinois, Minnesota, and Wisconsin, obtained a grant from the North Central Region Integrated Pest Management program. It funded development of a poster titled *Weed Emergence Sequences: Knowledge to Guide Scouting and Control*. The poster was produced in two sizes and has been well received by farmers and agribusinesses. It was reprinted in the February issue of *Soybean Digest*.

The issue team has demonstrated the usefulness of basic biological information regarding weed behavior for increasing efficiency of weed management systems. Team members have prepared Extension bulletins and articles in refereed journals. While the formal research will conclude following the 2000 growing season, the data generated from the project should help improve understanding of the fate of weed seeds in agricultural fields.

TAKING A WATERSHED-EYE

V E N U E F I E

summer



Partners in Future Success: Working Together to Build Our Future,

a community forum on water management in the Des Moines and Raccoon River watersheds, was held at the Iowa Farm Bureau Federation conference facility in West Des Moines July 28-30, 1999. Dennis Keeney and Rich Pirog represented the Center in the group of 50 participating shareholders.

Other partners in the watershed planning experience were the Des Moines Water Works, Polk County Farm Bureau, Raccoon River Watershed Project, Polk County Soil and Water Conservation District, Iowa State University, and ISU Extension.

In sessions on milestones, trends, and the future, the participants sought to discover common ground amidst their varied collective interests and develop new action plans that could lead to better coordination of water management activities now spread among several agencies.

The forum members agreed to continue their dialogue in the months after the meeting and selected five areas for future action and accomplishment:

- 1) Reducing soil and streambank erosion and nutrient loss,
- 2) Forming an effective watershed council,
- 3) Initiating countywide citizen dialogue projects on planning and zoning issues to result in comprehensive land use plans,
- 4) Facilitating effective stakeholder ownership and community participation, and
- 5) Implementing 10 model farms that use best management practices by 2001.

Even though the institutional capacity to carry out all of these items is not yet in place for any one entity involved in the project, the general themes of the action plans have helped energize several of the participants. They also have broadened the discussions of water, watershed management, and the roles of stakeholders.

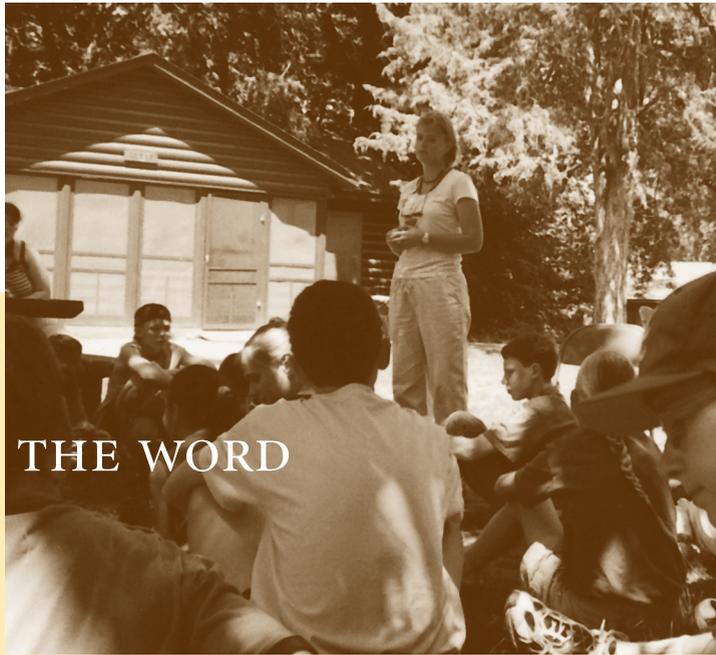


Outreach

& EDUCATION



SPREADING THE WORD (AND WORKS)



*Center Intern Amy Oliver
speaks at PFI Youth Camp.*

*Twenty-five regional
conferences, workshops,
and tours* in 1999-2000

reached more than 2,500 farmers, community leaders, educators, and youth in 18 Iowa communities. Topics addressed included water quality, local food systems, grazing management, organic agriculture, alternative crops, composting, and nutrient management. The Center received a record number of proposals for the conference/workshop and special event support program in 1999, and made minor revisions of the program for 2000 grant applicants. (Numerous educational tours and field days also were held as part of the Center-funded competitive grant projects and initiatives.)

The Center continued support for the Story County Master Conservationist Program in 1999, and expanded the efforts of the Master Conservationist Program to three other counties through a special project.

The Leopold Center sponsored the Johnson County-based Community Guide to Agriculture project for a final year in 1999. The Clear Creek Watershed Enhancement planning efforts continued as part of this project.

The Center continued its summer intern program, providing students with exposure to sustainable agriculture. The 1999 intern, John Tyndall, a graduate student in agricultural economics, assisted with conference evaluations and helped with several local food system efforts, including a paper on apple production in Iowa.

Ellen Cook and Amy Oliver shared the summer 2000 internship, collecting data on past and present Iowa food systems and representing the Center at several field days, tours, and special events. Cook has a degree in biology and environmental studies from Williams College (Massachusetts), and Oliver is an ISU senior in public service and administration in agriculture.

The Center worked with the Iowa Environmental Leadership Institute (IELI), John Deere Corporation, the Iowa Conservation Education Council, and the Iowa Natural Heritage Foundation to sponsor a Web site calendar listing environmental and conservation events. With the help of Center staff, the Iowa ELI received a REAP grant to use professional coaches to build the leadership skills of local environmental and sustainable agriculture leaders.

SUSTAINABLE AG SEMINAR TARGETS MARKETING

The Leopold Center joined five other ISU units in sponsoring the spring 2000 multidisciplinary sustainable agricultural seminar for Animal Science 580. "Using Alternative Marketing Strategies to Sustain Agriculture" presented 10 sessions on various aspects of marketing ranging from basic principles to producer alliances to use of the Internet as a marketing tool. Experts in marketing organic products, branded beef, and specialty milk products made presentations. Other class sessions covered marketing to institutions, European agricultural marketing experiences, and image-making as part of marketing.



IOWA'S LOCAL FOOD TASK FORCE AND FOOD POLICY COUNCIL

Seven people with Leopold Center ties, including staff (Rich Pirog), advisory board members (Neil Hamilton and Mary Jane Olney), and food system competitive grant project investigators and collaborators (Kamyar Enshayan, Carol Hunt, Larry Jacobson, and Gary Huber) served on the local food task force appointed by Iowa Secretary of Agriculture Patty Judge in 1999. The task force released its recommendations in September along with an all-Iowa meal served at Bistro 43 restaurant in Des Moines. They encouraged the creation of an Iowa Food Policy Council, later officially designated by Governor Tom Vilsack, and hiring of a full-time local food systems coordinator.

Members of the local food task force collaborated to write and receive a grant from the USDA's Federal State Marketing Improvement Program (FSMIP). This funding will augment the efforts of the three Center food system projects.

Rich Pirog (and other Center staff) spoke about the potential for local food systems, institutional buying, and food system pathways (for apples and grapes in particular) at:

- ❖ ISU Extension training for food and nutrition specialists and new staff,
- ❖ University of Nebraska-Lincoln meeting to help initiate a local food system effort,
- ❖ ISU Extension Value-Added program training,
- ❖ Annual meeting of Iowa's elementary and secondary school food service staff,
- ❖ ISU sustainable horticulture classes,
- ❖ ISU Agricultural Education and Studies Teachers' Academy, and
- ❖ Midwestern Value-Added Ag Retreat.



Outreach

& EDUCATION



COMMUNICATING ABOUT FOOD SYSTEMS

More than 1,500 copies of an impact sheet on regional and local food systems were distributed at the Farm Progress Show, Iowa State Fair, several annual conferences (sponsored by SARE, NRCS, PFI, and the Iowa Environmental Council), ISU Extension value-added training workshops, field days at project demonstration sites and local community supported agriculture sites, and to Iowa master conservationists.

A paper on the potential for local food systems in Iowa using apples as an example, “Comparing apples to apples: An Iowa perspective on apples and local food systems,” written by Rich Pirog and John Tyndall, was published in October 1999. Positive public



response led to preparation of a similarly themed paper on grape growing and local food systems. “Grape Expectations: A food system perspective on redeveloping the Iowa grape industry” was published in April 2000. This paper also was well received, particularly by the newly created Iowa Wine and Grape Advisory Council and the Iowa Grape Growers Association.

SIoux RIVERS PROJECT CONNECTS FARMERS WITH FOOD BUYERS

Networking of local food systems in northwest Iowa is the goal of a Leopold Center-funded project with Sioux Rivers Resource Conservation and Development (RC&D). Project organizers hope to create a database that will link producers and institutional buyers. Darrell Geib is in charge of the \$7,000 effort to bring together farmer/growers and food service personnel at hospitals, hotels, colleges, and convention centers that want to purchase locally grown foods. Organizers hope that this will be a model for other communities interested in promoting locally grown food products.

The Center published a paper on the local food systems potential for apples in Iowa

Photo courtesy of Mark Winne



Mark Winne shared the success story of the Hartford Food System.

KELLOGG LAUNCHES INITIATIVE ON “FOOD AND SOCIETY”

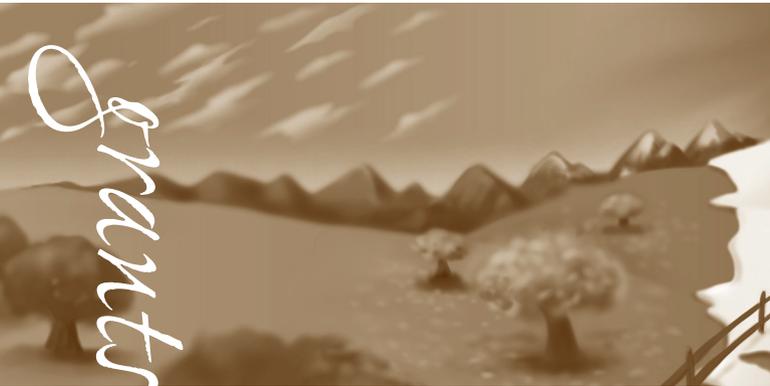
The W.K. Kellogg Foundation in early 2000 inaugurated a new food systems and rural development program initiative called Food and Society (FAS). Center education coordinator Rich Pirog is among the 17 members of the Iowa core group (coordinated by Lorna Michael Butler, the H.A. Wallace Endowed Chair for Sustainable Agriculture, Vision 2020, and ISU College of Agriculture administrators) working on the FAS initiative. FAS will concentrate on four food system elements: food and agricultural sustainability; food and environmental stewardship; food, science/technology and higher education; and food, diet, and health status. FAS will build on the outcomes of earlier Kellogg food system development efforts.

“EAST MEETS MIDWEST: A FORUM ON CREATING A SUSTAINABLE FOOD SYSTEM”

All kinds of food issues—including hunger, exports, production, and farmers selling to local consumers—were on the menu when a Connecticut food expert visited campus May 16. Mark Winne, executive director of the Hartford Food System, a nonprofit agency that works on food and hunger issues in Hartford, Connecticut, led a forum on creating a sustainable food system. Winne’s appearance was sponsored by the Leopold Center, several ISU departments, and agricultural interest groups.



*Grants program coordinator
Jeri Neal spent another busy year
presiding over the dispersal of funds
for sustainable agricultural research,
education, and demonstration
programs of all shapes and sizes.*



Grants

COMPETITIVE

The Center will fund 18 new projects in FY 2001, and funding has been renewed for another 29 projects to finance additional years of work. Eighteen projects are slated to end their investigations by June 30, 2000, and issue final reports on their findings by mid-November.



Alternative and horticultural crop education and marketing pilot project • 3 years

R. Fleharty, Southern Iowa Ag Diversity Corporation, Corning

Area farmers are exploring development of a cooperative infrastructure to produce, market, and sell specialty and value-added horticultural and agricultural products. The project as developed has a wholesale effort and a retail/processing/incubator effort. The retail/processing division has been the most difficult to stabilize. Next year, the investigators will focus on completing a comprehensive business plan, developing additional storage capacity, organizing grower meetings, establishing demonstration plots, and sponsoring cooking classes.

Community and economic regeneration through strengthening the local food economy • 3 years, ending 2000

K. Enshayan, University of Northern Iowa

What practical measures will enable institutional food buyers to invest their food dollars in Iowa-grown products? Investigators worked with many northeast Iowa farmers, three institutional food buyers, food processors, and government officials to identify these practices. Significant changes have been made in local/regional food purchase patterns, and findings were documented and shared with other food buyers.

Establishment of a local food system in eastern Iowa • 3 years

W. Jones, Johnson County Soil and Water Conservation District, Iowa City

By building on an existing Extension 21-funded value-added agriculture project, the Johnson County Soil and Water Conservation District and Johnson County Cooperative Extension will pursue activities to develop a local food system in the region and maintain a local food system directory. Investigators hope to increase commerce between local producers and consumers, strengthen rural-urban ties, and help the public better understand the environmental, economic, and social implications of sustainable local food production. Plans for the upcoming year include increasing the number of producers and institutions participating, the volume of product sold, and the number of all-Iowa meal events.

Examining the potential for organic apple production: the Homestead Orchard project • 3 years

S. Muller, The Homestead, Runnells

A model is being established for a commercial organic apple production system for facilities that house people with developmental disabilities and other special needs. Staff and residents are responsible for the soil sampling, plot and materials planning, orchard planting and maintenance activities for the 360-tree orchard. Residents continue to actively participate in the orchard management. The focus for the upcoming year will be collaboration with an Iowa State University marketing class to design marketing strategies, and continued development of intensive pest monitoring and management activities. The trees are expected to produce a first crop of fruit this year.

NEW Institutional and commercial food service buyers' perceptions of benefits and obstacles to purchase of locally grown and processed foods • 2 years

C. Strohbehn and M. Gregoire, ISU hotel, restaurant and institution management

The goal is to increase awareness about food safety and other procurement issues surrounding purchases from suppliers. The target audience is purchasing managers for institutional food services and independently owned restaurants. The investigators plan to describe current purchasing practices, assess buyers' attitudes about purchasing from local suppliers, and test for pathogen activity in selected products including fresh produce, meat and poultry, eggs and grocery items. They will be looking for similarities and differences between nationally and locally produced foods. Efforts will be focused within a 120-mile radius of Ames.

NEW An internship program to help institutional food buyers develop links to local farms in northeast Iowa • 3 years

K. Enshayan, Center for Energy and Environmental Education, UNI

In earlier work to encourage institutional purchases of local farm products, one key element of a successful relationship was having trained interns to provide one-on-one assistance for the food buyer and the farmer. The primary goal of this project will be to facilitate a stable local food-buying process by placing trained interns in several hospitals and nursing homes, and with other large food buyers. Farmer income and satisfaction levels will be monitored as part of the work, and a manual will be prepared to summarize the barriers and opportunities for incorporating local food into institutions.

Iowa Master Conservationist program • 2 years

J.L. Pease, ISU animal ecology

The Master Conservationist program is modeled after the Master Gardener program, Master Woodland Manager program, and a successful Center-sponsored Story County pilot program. It consists of 32 hours of hands-on educational sessions followed by 32 hours of volunteer activity by each course participant. The program meets a need for a community-wide and broadly based natural resource conservation literacy program for adults. Grant funds will be used to expand the program to eight additional counties in the next two years. Counties identified for the first year included Cerro Gordo, Iowa/Poweshiek, and Webster; counties identified for the upcoming year include Buchanan, Jackson, Des Moines, Marshall, Harrison, and Woodbury.

Making the connection: linking farms to hotels, restaurants and institutions (HRIs) • 2 years

G. Huber and R. Karp, Practical Farmers of Iowa

The HRI market in Iowa appears to hold great potential for small- to medium-scale farmers. Investigators estimate that if only 10 percent of the state's annual sales of fruits, vegetables, meat, fish, and poultry are locally grown and raised, the market potential is about \$171 million. They have outlined opportunities and barriers in the market for HRI buyers, staff, and clients, as well as farmer producers. Work will continue in the upcoming year, especially as it relates to developing models for linking Iowa producers and HRIs in these markets.



DNR fisheries biologist Paul Sleeper, Iowa County Conservation Board naturalist Maria Koschmeder, and participants in the Master Conservationist Program in Iowa and Poweshiek counties discuss the catfish rearing project at Lake Iowa park.

Sustainability and community food systems in four Iowa counties • 3 years

C. Hinrichs, ISU sociology

Current popular discussion about globalization in agriculture often refers to global and local food systems without empirical evidence about the nature and dynamics of either. Using case studies in Benton, Audubon, Marshall, and Johnson counties, historical, statistical, and survey data are collected to identify the key food-related issues and ventures and their local and non-local aspects. The first stage of the research has included food system data collection on production, processing, distribution, service, consumption, security, education, and policy. The second stage involves individual field interviews to characterize food system ventures (farmers markets, small-scale processors, community supported agriculture groups, etc) and traditional food system outlets (lockers, independent grocers, congregate meal programs). The aggregate information will be used to help describe the sustainability of the community food system in each county.

NEW Grass-based dairies and dairy networks/ promotions • 2 years

B. Beaman, Ag Connect, Lenox

Ag Connect is leading an initiative to promote, provide information for, and help establish a grass-based dairy network in southern Iowa. This planning grant will include funds for investigators to visit farms and related dairy businesses, to enlist "mentor" operations, and to collect input and expertise from dairy specialists and analysts. It also will include interviews with selected people who attended grass-based dairy meetings last year. The interviews will be used to identify strong candidates for the goal of successfully establishing 12 grass-based dairies in southern Iowa. Collaborators include the Iowa Farm Bureau, Natural Resources and Conservation Service, and ISU Extension.



Grants

COMPETITIVE

“Roses for the 1987 and 1989 Iowa Legislatures, whose leaders made them landmark sessions for environmental protection. They created the Leopold Center for Sustainable Agriculture at Iowa State University and the state’s Resource Enhancement and Protection (REAP) program.”

-Des Moines Register, January 1, 2000, citing things that moved Iowa forward in the past century

Ecology and restoration of farmland woods in central Iowa • 3 years, ending 2000

D. Farrar, ISU botany

What do we know about the ecology of woodland understory plant species in central Iowa and how can they be preserved and increased? An inventory conducted in 1997-98 by graduate student Cathy Mabry provided information and comparisons of grazed and ungrazed woodlands. Her further research considered dispersal, seed germination, and seedling survival for sparse and common understory species. The information will assist landowners in planning successful woodland restoration.

Evaluation of three cropping systems grown under the influence of a shelterbelt • 3 years, ending 2000

C. Mize, ISU forestry

How does a shelterbelt influence growing and yield of various cropping systems in an on-farm environment? Yields were initially analyzed for three combinations (strip intercropping with swine manure applied to the harvested oats strip, continuous corn, and a corn-soybean rotation) Preliminary findings showed little shelterbelt effect on corn characteristics, with soybean response not yet calculated, and oat plots too small for accurate yield monitoring. During the second year, the cooperators decided against strip intercropping. Biomass and some meteorological data also are being collected.

Improving tree establishment with forage crops • 3 years

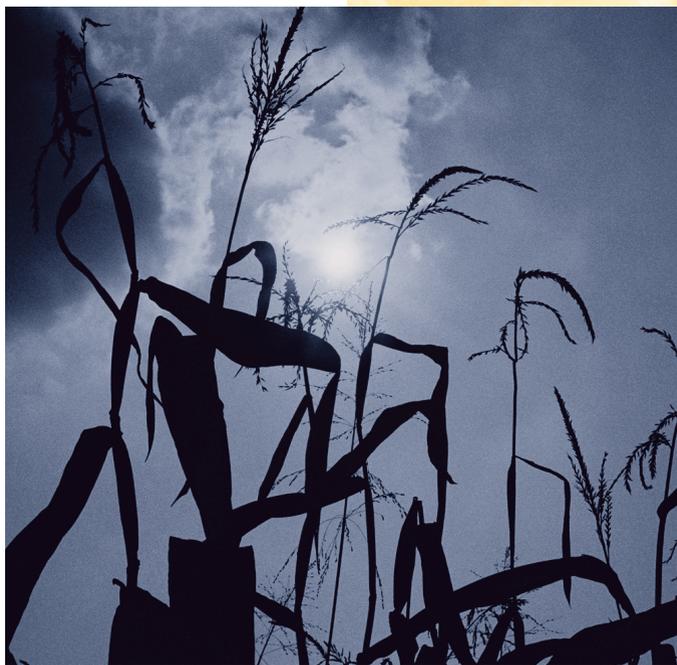
C. Mize, ISU forestry

The project will document tree survival and growth, crop productivity, and system economics for fast growing and high-value hardwood seedlings under weed control treatments that include small grain/forage crop combinations, herbicides, cultivation, and mowing. First- and second-year tree survival was excellent at both bottomland and upland sites, although it has not yet been possible to determine any statistical differences between growth rates under the different treatments.

Iowa location for pawpaw regional trials • 3 years

P. O'Malley, Johnson County Extension, Iowa City

As a first step in evaluating the potential of the indigenous pawpaw fruit as a commercial crop for Iowa, the project established a Louisa County site as part of the Pawpaw Foundation regional trials. Twenty-eight selections will be evaluated for fruit and growth characteristics. Three hundred trees were set out in spring of 1999, and first year survival rates of about 87 percent were as expected. Some replanting occurred in the spring of 2000, and monitoring of survival and growth will continue in the next year.



CROP AND/OR FORAGE SYSTEMS

NEW Development of dormancy breaking mechanisms in eastern gamagrass • 3 years

L.R. Gibson and A.D. Knapp, ISU agronomy

Interest in gamagrass has resurfaced in recent years because of its potential value as a forage that livestock prefer, as a possible silage replacement for corn on marginal land, as grass hedges for control of soil erosion, for wildlife habitat, for biomass production, and for reclamation of certain lowland areas and disturbed sites. Unfortunately, eastern gamagrass also boasts a robust seed dormancy mechanism, making it very difficult to establish. In a continuation of prior work funded by the Center, researchers will search for a way to supply a high-germination dry seed for producers and conservationists. Their objectives will include breaking seed dormancy in a practical manner, increasing germination rate, and speeding seedling development.



Development of switchgrass as a viable agricultural commodity for farmers in southern Iowa • 4 years

J. Cooper, Chariton Valley RC&D, Centerville

Switchgrass has the potential to move from being a conservation/wildlife habitat mainstay to a cash energy crop for southern Iowa farmers. Leopold Center funds are supporting information and education activities of the Chariton Valley Biomass project, which is exploring co-firing, gasification, switchgrass production, management, and environmental assessments. Outreach efforts include fact sheets, brochures, newsletters, publications, displays, slide set, Web site, and public field days and demonstrations.

Evaluating the adaptability of forage species and varieties in northwest and south central Iowa • 3 years

D. Haden, ISU Northwest Research and Demonstration Farm, Sutherland

Stands of legumes and grass species will be evaluated at Doone and McNay research farm sites to determine regional adaptation, longevity, and forage traits. In the legume studies, 'Rhizo' kura clover, 'Windsor' cicer milkvetch, and 'Bigbee' berseem clover will be compared to 'Marathon' red clover, 'Jade II' alfalfa, and 'Norecen' birdsfoot trefoil. The eight grass species and varieties include 'Pete' Eastern gamagrass, 'Barenbrug' perennial ryegrass, 'Sikem' annual ryegrass, and 'Cheyenne' bermudagrass to be evaluated against 'Bounty' smooth bromegrass, 'Duke' orchard grass, 'Climax' timothy, and an endo-free tall fescue. The project was to be established in 1999, but investigators have been unable to acquire the rhizomatous birdsfoot trefoil seed originally proposed to be tested.

Feasibility of organic soybean production following Conservation Reserve Program (CRP) land • 3 years

K. Delate, ISU horticulture and agronomy

By evaluating yield, pest status, soil health indicators, and economics of organic soybeans on CRP ground, this project will document biological and economic outcomes of different treatments within the organic system and explore implications for management practices. Research plot trials were established at the McNay Research and Demonstration Farm near Chariton in the fall of 1998. The 32 plots are being used to evaluate treatments of fall moldboard plow with spring disking and

harrowing; fall plowing with Kverneland plow and spring field cultivating; fall and spring Howard Rotovator treatments; and spring moldboard plow with secondary disking and harrowing. On-farm trials near Clinton and Brooklyn were delayed for the year by producer commitments and lack of NCRS permission.

Genetic diversity and performance of oat variety blends • 18 months, ending 2000

J. Holland, ISU agronomy

While oats would provide added diversity to Iowa's common corn-soybean rotation, farmers are reluctant to plant oats because of their unreliable yields. Current practice is to grow stands of pure-line variety oats. This study looked at oat variety blends, and the level of genetic diversity necessary among the oat blends to achieve more consistent yields.

NEW Improving productivity of warm-season pastures by interseeding legumes • 3 years

K. Moore, ISU agronomy

Growing legumes in mixtures with warm season grasses could improve the quality of forage to grazing animals, and potentially reduce or eliminate nitrogen fertilizer requirements of a pasture. Twelve annual, biennial, and perennial legumes have been interseeded into existing switchgrass and big bluestem pastures at the ISU Western Research Farm near Castana as part of earlier Leopold-funded work. Using strip grazing of beef cattle, and by monitoring cattle weights, forage and soil quality, and legume persistence, the investigator now plans to develop strategies to optimize warm season grass pastures for cattle production.

crop AND/OR FORAGE

SYSTEMS CONTINUED



Local ecotype prairie seed: an alternative agricultural product for increasing the viability of smaller farming operations • 4 years

J. Selby and K. Fletcher, The Nature Conservancy, Des Moines

Investigators plan to assess the potential for local ecotype prairie seed as an alternative agricultural product for Iowa through market analysis and on-farm production demonstration. A diverse mix of seed from 45 species (typical of the Loess Hills tallgrass prairie) was gathered by machine and hand in the fall of 1998 for use in the 1999 plantings, which occur in both the fall and spring. The project has established demonstration sites at the Broken Kettle Grasslands, on a portion of the Briar Cliff College campus that is adjacent to the Sioux City Prairie, and on the private lands of three area cooperators. Other activities have included a prairie management workshop for agency staff, Loess Hills fire management workshops, and development (in cooperation with Carl Kurtz) of a Prairie Production Handbook. Market analysis was delayed and is planned for the next two years.

Organic farming demonstration projects (eastern Iowa) • 3 years

W. Johnson, Limestone Bluffs RC&D, Maquoketa; K. Delate, ISU horticulture and agronomy

Three demonstrations were established at New Melleray Abbey, one for weed control methods for organic row-crop production, one for use of compost as

a soil amendment for fertility and to improve soil tilth, and a third for nitrogen-producing cover crops for organic corn production. Organically managed demonstrations were established at the Andrew Jackson Demonstration Farm with three acres of white corn, four acres of clear hilum soybeans, and one-quarter-acre plots of direct-seeded and transplanted echinacea, St. John's Wort, Anaheim peppers and basil. Weed pressure was the biggest issue for the Andrew Jackson farm, especially for direct-seeded crops, and weed management will receive special emphasis in the upcoming year.

A simple method to increase alfalfa yields in the establishment year • 1 year, ending 2000

C. Brummer, ISU agronomy

In its seeding year, alfalfa produces only about 50 percent as much forage as in succeeding years. Researchers tested whether planting a mixture of dormant and non-dormant alfalfa seed would increase yield without compromising long-term stand productivity and forage quality.



Connie Kephart and Linda Swanson plant St. John's Wort.





Chariton Valley Beef helps producers who want to try electronic ID and are willing to have their data added to the database.

LIVESTOCK MANAGEMENT

Botanicals as a part of an integrated value-added pork production system • 2 years, ending 2000

P. Holden, ISU Extension animal science, and J. McKean, ISU Extension veterinary medicine

In the second year, the Leopold grant allowed the continued study of garlic, Echinacea, and peppermint. In addition to the five-week nursery study, pigs were monitored for 12 weeks post-nursery for gain. Goldenseal was omitted because of its high cost, as well as lack of response in the first trial. Garlic was fed at levels up to 0.5 percent and did not produce positive gains over the Mecadox control. At these levels, feed intake was not deterred as in the first year. Similarly, no response was produced by feeding peppermint (1 percent maximum) during the nursery phase although the post-nursery study is still underway. Echinacea was fed in two trials. The first was at low levels (0.5 percent maximum) and pigs did not respond positively. A second Echinacea trial is underway with levels up to 3 percent of the diet. This second trial has not been completed.

Chariton Valley Beef (CVB) Industry Initiative • 3 years

J. Sellers, Lucas County Extension, Chariton

Producers in 20 counties have formed a nonprofit corporation to work on new marketing efforts. They have built a database of 275 producers, 106 veterinarians, 45 vet clinics, 68 feedlots including 38 in Iowa, 15 auction markets, and nine grid marketing systems. The database is used to collect information on the carcass, performance, and health attributes of cattle raised in the region. Data is returned in summary reports to the producer group and in individualized evaluations for the producers. CVB staff is evaluating market effects of source verification, including the role that local auctions should retain in value-added grid marketing efforts. This year over 4,000 source-verified calves were sold in 11 sales at four auction centers. Collaborators include: the Precision Beef Alliance, Iowa Farm Bureau, ISU Extension, Iowa Beef Center, the USDA's Sustainable Agriculture, Research and Education (SARE) program, local economic groups, development groups, auction markets, veterinarians, and other beef industry partners.

Complementary grazing systems for beef cattle production • 3 years

K.J. Moore, ISU agronomy

A grazing study is being conducted at the McNay Research Farm near Chariton to evaluate the impact of legumes and warm season grasses (smooth bromegrass, birdsfoot trefoil, alfalfa, big bluestem, switchgrass, kura clover) on season-long productivity of complementary grazing systems (systems will be stocked with crossbred steers). Eight complementary and four continuous grazing systems are being evaluated. One of the most striking results to date is the impact of yearly weather on system performance, suggesting that a wide diversity of species will be needed to achieve high stability in grazing systems. Primary measures being taken include pound/gain/animal and forage quality analysis.

Demonstration of swine carcass composting as part of an environmentally friendly production system • 2 years

J. Harmon, ISU agricultural and biosystems engineering

Swine carcass composting demonstrations will continue to be conducted at the ISU Bilsland Farm near Madrid and the Lauren Christian Swine Farm near Atlantic (LCSF). The first composter has been constructed at the Bilsland Farm, and is currently being evaluated for design changes that will be used in constructing a second composter at the LCSF. The composters will be used to generate data to examine composting issues that may arise with deep bedding, various co-composting materials (wood chips, straw, and soybean residue), finishing swine mortality (Madrid), and sow farm and nursery pig mortality and afterbirth (Atlantic).

NEW Demonstration and technology transfer to producers implementing sustainable rotational grazing systems • 2 years

M.D. Boswell, Southern Iowa Forage and Livestock Committee, Corning, and B.C. Peterson, Natural Resources Conservation Service, Creston

Using the Adams County CRP farm and producer acres in a multi-county area, investigators plan a series of demonstrations to address issues related to rotational grazing systems. Demonstrations will include stream crossing/water access, use of kura clover, establishment and maintenance of legumes into grass-based forage using a no-till drill, incorporation of warm-season grasses into an existing grazing system, installing water distribution systems, and installing New Zealand-style electric fence. The demonstrations will feature "hands-on" activities for the attendees.

NEW Evaluating pork production systems for niche markets • 3 years

D. Stender, Cherokee County Extension

The investigator will work with 20 area producers to establish on-farm baseline data for side-by-side hoop and confinement operations. Tracking data will include detailed production records including nutrition, labor, bedding, and carcass characteristics. Genetic lines will be identified when possible and data kept by season and type of operation. Antibiotic use will be tracked, and on-farm odor and water quality assessment and a building audit will be available for each participant. It is hoped that the information will help producers assess their suitability for participation in niche markets for different pork production systems.



Growing dairy heifers in southwest Iowa • 3 years

R. Sanson, Clarinda

ISU Extension, local producers and lenders, and the Page County Rural Economic Development Organization are cooperating in collecting and analyzing economic and production data that can be used to refine management practices and assess the growth potential for raising dairy calves in southwest Iowa. A local producer has provided on-farm animal data for the project, and two other producers have provided pasture information. Three informational meetings have been held since the project inception. Current shifts in the dynamics of the dairy market have increased the price of young dairy heifers, which is discouraging local interest in the program.

NEW Investigating sow aggression and piglet crushing mortality in a non-confinement sow production system • 3 years

D. Lay, ISU animal science

The goal of the project is to investigate solutions to the two primary problems—aggression and piglet crushing—associated with sow non-confinement systems. Aggressive behavior will be documented in response to 1) decreasing sow hunger by increasing the bulk in the diet, feeding hay in addition to normal diet, and interval feeding with hay on non-feed days; and 2) maintaining a boar with sows during gestation. Piglet crushing will be evaluated by comparing a standard heat lamp regime with a new device called a “simulated udder.”

Winter grazing of corn residues: effects on soil physical properties and subsequent crop yields from a corn-soybean crop rotation • 3 years

D. Busby, Southwest Area Extension Center, Lewis

This research project will attempt to determine the effects of grazing of corn residues in different winter months on soil physical and chemical properties, and on subsequent crop production (corn-soybean rotation using either conventional or no-tillage methods). Data is also being collected on monthly cow condition scores and amounts of hay fed. Sites were established with cooperators near Atlantic and Chariton and grazing was initiated in October and November of 1999, respectively.



Products

COMPETITIVE



NUTRIENT MANAGEMENT

NEW Agronomic and environmental soil testing for phosphorus and threshold levels in soils • 3 years

A.P. Mallarino, ISU agronomy

The overall goal of the project is to provide practical information that can be used to improve phosphorus (P) management, improve soil test interpretations for manured soils, develop guidelines for environmentally sound land application of P, and contribute to more efficient use of P resources in agronomic settings. The objectives for the work include a performance comparison in both manure and fertilizer environments between standard soil tests for P and newer environmental soil tests for P; establishment of values for both kinds of tests with water runoff and tile flow in selected manure/fertilizer management systems; and conducting of on-farm variable rate technology applications of P fertilizer and liquid swine manure to determine impacts on crop yields, soil P levels, and soil P variation over the field. Project observations should be useful in constructing preliminary environmental P threshold values.



Crop response to zinc as a micronutrient in Iowa • 2 years

R. Killorn, ISU agronomy

The study is looking at responses to zinc (Zn) fertilizers within fields, and defining the soil characteristics in responsive areas. Three sites selected in 1998 in Hancock and Wright counties and five sites selected in 1999 in Pottawattamie, O'Brien, Webster, Hancock counties—each with at least two different soil types—were examined in the past year. Preliminary results showed that if the soil has a pH 7 or higher and the soil Zn concentration is .9ppm or lower, the producer might see a yield increase. Zinc assessments will continue on a number of sites in the state in the upcoming year, and one trial will make a preliminary assessment of crop response to sulfur.

Dairy manure quantification and characterization in grazing systems • 2 years, ending 2000

W. Powers, ISU animal science

Two grazing dairy operations, each with a different breed of cow, were studied. Samples of milk and manure were collected from 10 cows in each herd year-round and tested for various characteristics. Data generated from the surveys is being evaluated for use in predicting environmental impact of management decisions in grazing systems.

Evaluation of organic soil amendments for certified organic vegetable and herb production • 3 years

K. Delate, ISU horticulture and agronomy

After analysis for macronutrients, moisture, and carbon/nitrogen ratio, several composts are being applied to production systems and the composts compared through an evaluation of their impact on product yields, pest status, soil health indicators, product quality, and economics. On-farm sites have been established near Kanawha (Jan Libbey farm, broccoli) and Ames (Heenah Mahyah Student Farm, herbs), and a research farm site has been established in southeast Iowa at the Muscatine Island Research and Demonstration Farm (peppers). Types of amendments being tested include poultry litter, feathermeal, Bio-Cal®, and conventional fertilizer.

Livestock and the environment project in Sioux County • 2 years

K. Kohl and J. DeJong, Buena Vista and Plymouth County Extension, Storm Lake and LeMars

The Northwest Iowa Extension environmental team will investigate the barriers that deter producers from utilizing manure as a crop nutrient, and test a new pit-sampling method for producer acceptance. The goal is to increase manure credits taken by producers in Sioux County. The survey results (1) indicated that the Sioux County livestock producers are likely managing manure as a crop nutrient better than others on a statewide basis, and (2) also provided insight into concerns and practices of area farmers. The pit sampling method will continue to be tested for reliability. The project investigators plan to design a countywide educational effort based on the survey findings, and hope to increase manure credits taken in the county.

Nitrogen conservation in swine manure composting-land application systems • 3 years, ending 2000

T.L. Richard, ISU agricultural and biosystems engineering; C.A. Cambardella, USDA-ARS National Soil Tilth Laboratory; and T. E. Loynachan, ISU agronomy

How are swine manure nitrogen dynamics influenced by the composting process and land application of the compost product? This study measured typical rates of nitrogen loss from hoop house manure (particularly significant in intensively managed compost piles when compared to passively managed compost piles) to determine management strategies for conserving nitrogen while composting and synchronizing nitrogen release with crop demand.



NEW Optimizing solid manure application by improving distribution • 3 years

M. Hanna, ISU agricultural and biosystems engineering

Much of today's manure spreading equipment, designed during decades of cheap fertilizer and minimal environmental regulations, maximizes rapid disposal rather than effective nutrient application. Solid manure application, which has environmental benefits and could substitute for commercial fertilizers, would be more acceptable to farmers if they could rely on uniform application. The project will evaluate the uniformity of existing spreaders, make recommendations for operating strategies that will improve uniformity, and develop a prototype solid manure applicator with improved application performance.

Optimizing swine hoop manure management for soil quality and crop system performance • 3 years

T.L. Richard and M. Liebman, ISU agricultural and biosystems engineering and agronomy; D.N. Exner, Practical Farmers of Iowa and ISU agronomy; C.A. Cambardella, USDA-ARS National Soil Tilth Laboratory

Researchers plan to continue on-farm and research station experiments to evaluate the impacts of alternative hoop manure management strategies (corn/soybean rotation, composted manure, bedded manure, spring and fall applications) on soil quality and cropping system performance. Observations being made include farm management data, compost and bedding composition, soil biochemical properties, soil microbial biomass, crop biomass and macronutrient content, and seed yield data. Two research stations, at Rhodes and at Boone, and six on-farm cooperators are participating in the project.

Reducing anhydrous ammonia application by optimizing distribution • 3 years

M. Hanna, ISU agricultural and biosystems engineering

In ongoing work to minimize inconsistent application by anhydrous ammonia equipment, researchers will compare field distribution by a conventional manifold, a vertical dam manifold, a Cold-flo® device, and newly available manifolds and pump systems; develop and compare an alternative design; and field test the results. During the past year, experiments and approximately 80 application runs have identified a number of concerns that need to be addressed, including controlling the collected ammonia and regulator control for the correct application rate. During the next year, field testing of manifolds will continue, as well as work on design alternatives to improve flow division and outlet variability.

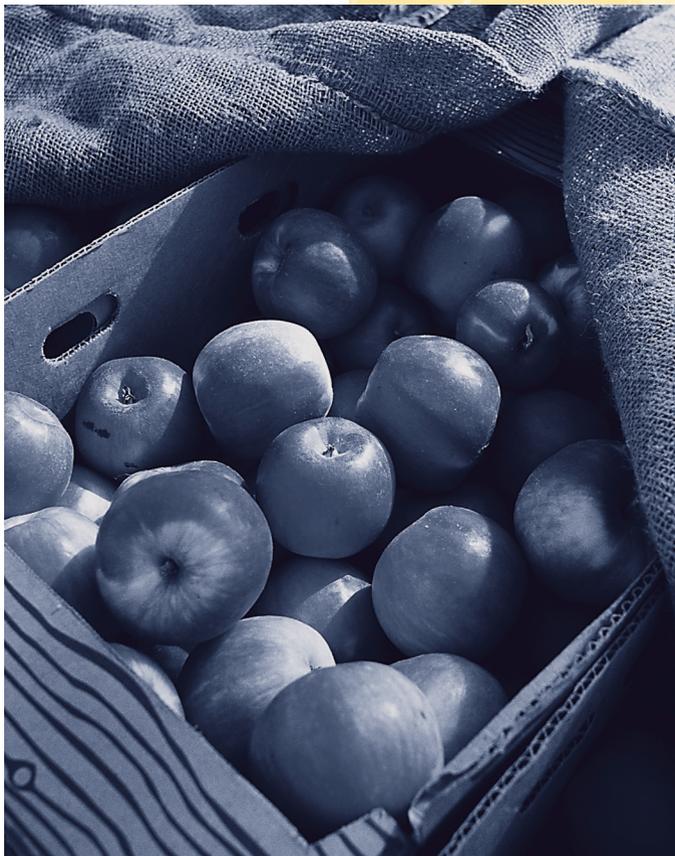
Socio-technical and environmental dimensions of swine manure management decisions • 2 years, ending 2000

C. Hinrichs, ISU sociology

Swine producers in two Iowa watersheds—Raccoon River and Iowa River—have been interviewed about why farmers make the choices they do regarding their manure management systems. Questioning focused on how farmers view manure in their overall farming system, how farmers select a manure handling system for their operation, and whether watershed perceptions influence on-farm manure management decisions.



GRANTS
COMPETITIVE



PEST MANAGEMENT

(includes biological control, diseases, insects, and weeds)

Soil amendment effects on crop-weed interactions • 3 years

M. Liebman, ISU agronomy, and T. Richard, ISU agricultural and biosystems engineering

This project is investigating how amending soil with compost made from hog manure and cornstalks affects the growth and competitive ability of three weed species commonly found in Iowa corn fields (giant foxtail, velvetleaf, and waterhemp). The manure and cornstalks come from swine hoop structures. Investigators are using both field experiments and laboratory analyses for the three primary objectives of the work. Among them: (1) characterization of the manure properties and application rates, (2) evaluating the impacts of the composted manure on corn and weed growth, yield, and competitive interactions, and (3) integration of their information within a broader study of manure, legume residues, and tillage effects of soils, crops, and weeds.

Statewide manure management education workshops • 3 years, ending 2000

G.A. Miller, ISU agronomy

During three years of implementation, 267 manure management education workshops have been conducted across the state, reaching more than 1,900 people, including nearly 1,810 livestock producers representing all sizes and types of livestock and crop operations. Workshops have been integrated with the Pork Producers Environmental Assurance Program and certification training for confinement operators. Program evaluation continues.

Biologically intensive manipulation of foxtail soil seed banks for enhanced mortality • 3 years

J. Dekker, ISU agronomy

By determining the emergence, mortality and long-term carryover of giant foxtail in soil seed banks, and how these fates vary over time by biotype, location, and burial depth, the project seeks to enhance weed seed death and provide practical weed seed bank management tools. A correlation has been found between fall germination rates and subsequent foxtail seedling emergence. To further define this correlation as a management tool, mortality, emergence, and other seed data will continue to be collected from the 30 different populations established at research sites near Ames and Crawfordsville. The data also will be used to continue investigation of another critical element of weed control, understanding seed death and carryover in the soil seed bank. Work in the final year of the project will focus primarily on analysis of the extensive data set that has been established.

Biologically intensive pest management: Iowa apple growers take the next step toward sustainability • 3 years, ending 2000

M. Gleason, ISU plant pathology

Research centers on three apple pests: apple scab, codling moth, and the sooty blotch/flyspeck complex. Apple cultivars genetically immune to scab are being evaluated. Insect growth regulators

are being substituted for conventional insecticides for codling moth control. The first two years of study used a disease warning system and a reduced spraying schedule for sooty blotch and flyspeck, and showed encouraging results. A postharvest chlorine wash seemed to reduce the severity of sooty blotch and flyspeck.

NEW Biotic interference of biological control of purple loosestrife • 3 years

J. Obrycki, ISU entomology

In an earlier grant, the Leopold Center and Iowa Department of Natural Resources funded a biological control program to develop a mass rearing and release program for *Galerucella* beetles, natural enemies of an invasive exotic wetland plant (purple loosestrife) that is threatening water features in the state. However, the expected reduction in plant density has not been recorded. This project will investigate several ecological interactions, such as identifying arthropod predators and quantifying predation at different life stages, to look for strategies that will improve the effectiveness of the beetles as a biocontrol agent.



Development of alternative carriers for use of *Beauveria bassiana* in *Ostrinia nubilalis* suppression of corn • 3 years, ending 2000

L.C. Lewis, ISU USDA-ARS Corn Insects and Crop Genetics Research Unit

Four alternative carriers to apply a fungus that controls European corn borer (ECB) infestations were tested for efficacy and mycotoxin activity. No detectable levels of aflatoxin were present for any of the carriers (corn cobs, clay, and two mesh sizes of starch substrate) and ECB pressure was too light for significant efficacy measurements. In early results, application of the fungus using a corn kernel-based carrier was linked with a decrease in corn borer infestation and an increase in corn yield.

NEW Development of *Sporidesmium sclerotivorum* as a biocontrol agent for *Sclerotinia* stem rot of soybean • 2 years

C.A. Martinson, ISU plant pathology

Current management schemes for white mold in soybeans involve the application of pesticides, use of wide rows, and/or planting lower-yielding tolerant varieties. Prior Leopold Center research has found that *Sporidesmium* spores applied to soybean fields after a white mold epidemic will reduce the amount of disease in a subsequent soybean planting by 50 to 100 percent. For this biocontrol agent to become a practical option for farmers, further management information is needed, as is a better method of mass producing the spore itself. The objectives of the research include development of an inoculum production system adaptable to mass production, and determining the effectiveness of the agent under different production practices such as no tillage, deep tillage, and ridge tillage.

Ecological impact of herbicides associated with transgenic soybeans on spider mites

• 2 years

L. Pedigo, ISU entomology

Fungal diseases of insects are the main forces responsible for keeping many potential pests below economic thresholds in Iowa soybeans. If these fungi are susceptible to glyphosate formulations (Roundup® formulations), soybeans could suffer outbreaks of pests. This research is attempting to determine if outbreaks of spider mite and green cloverworm populations could be expected with the use of transgenic herbicide-resistant soybeans and their corresponding herbicide management packages. The research is using laboratory cultures, greenhouses, and commercial fields. Difficulties thus far have included (1) high spider mite populations in fields, which forced growers to use acaricides and which may have influenced last year's data, and (2) unsuccessful culturing in the lab which led to a change in the media being used for the upcoming year.



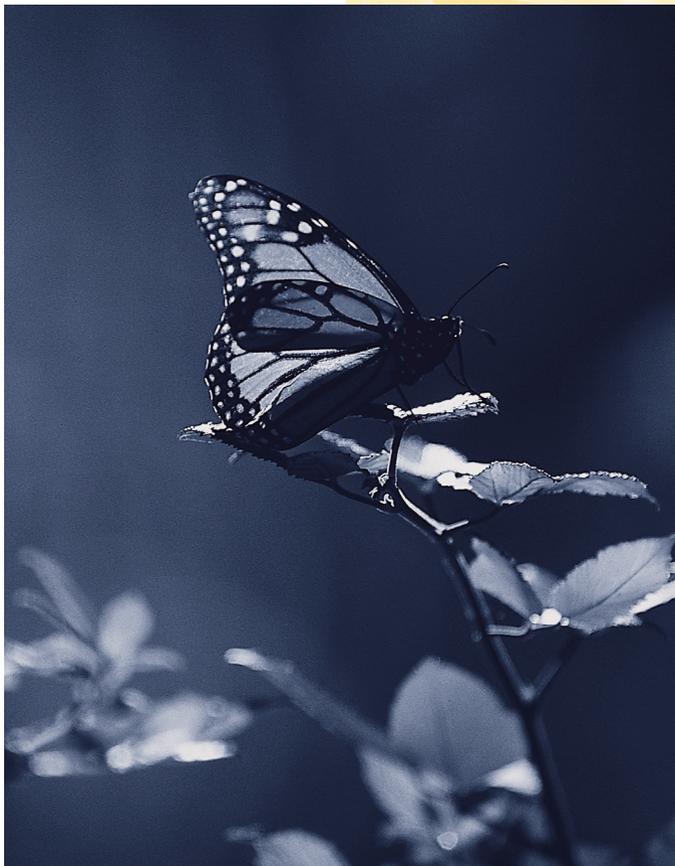
COMPETITIVE



"Sustainable agriculture has come a long way in Iowa over the past 10 years thanks to Leopold Center cooperators like Dick Thompson and Dr. Richard Schultz. Your organization has assisted many individuals in pioneering new ideas to shape the future of land stewardship throughout the state. I know for a fact that Minnesota currently looks to Iowa as a leader in sustainable agriculture."

-Anthony B. Cortilet,
weed biological control scientist,
Minnesota Department of Agriculture





NEW Effects of transgenic *Bacillus Thuringiensis* (Bt) corn pollen on the monarch butterfly • 2 years

J. Obrycki, ISU entomology

The monarch butterfly is a species likely to be effected by the increasingly widespread planting of Bt corn. Previous research has shown that Bt insecticide sprays can have negative effects on non-target moth and butterfly species. The objectives of the research are to 1) determine the sub-lethal effects of Bt corn pollen exposure on monarch larval development and adult characteristics, 2) quantify the use of milkweeds adjacent to Bt and non-Bt corn fields by monarchs, and 3) compare the survival of experimental cohorts and natural populations of monarchs adjacent to Bt and non-Bt corn fields.

The effects of transgenic soybeans and associated herbicide treatment upon soil-surface mesofauna • 2 years, ending 2000

L.P. Pedigo, ISU entomology

How do transgenic (GMO) crop varieties and associated herbicides affect small insects that live on the soil surface and help decompose fresh organic matter to humus? Early results showed consistent positive correlations of the herbicides and their associated weed management systems (as compared to mechanical systems) with the numbers and growth rates of several of the largest and/or most common species of springtails in the research samples.

NEW Evaluating sustainable, integrated management of muskmelon diseases, weeds and insect pests in partnership with Iowa growers • 3 years

M. Gleason, ISU plant pathology

Muskmelons are one of the most widely grown and highest-value crops in Iowa, offering producers the opportunity to rapidly diversify and enhance cash flow. However, current production methods rely heavily on synthetic pesticides and fertilizers, up to 15 applications per season. Using research plots and commercial grower farms, investigators will test management techniques to reduce synthetic chemical use without sacrificing crop quality and yield. Among the techniques to be tested include Melcast, a weather-based disease warning system; soil dwelling bacterium that combat anthracnose and gummy stem and *Alternaria* leaf blights; compounds that lure and trap cucumber beetles; and hairy vetch and winter rye as no-till cover crop.

Integrating biologically rational strategies for control of anthracnose fruit rot of strawberries • 3 years

M. Gleason, ISU plant pathology

Analysis of performance and economics of a number of biological and cultural tactics will lead to recommendations for biological strategies to control this emerging disease of June-bearing and day-neutral strawberries. Seven genera of fungi have been isolated from strawberry foliage and fruit for screening for their antagonism to the anthracnose pathogen, and from that a dozen fungi and bacteria have been identified which can inhibit growth of *c. acutatum* on laboratory agar plates. Field tests are underway for

several biological products nearing EPA registration and a straw mulch trial also is underway. To date, straw mulch has significantly slowed the spread of anthracnose from row to row. The only significantly higher yields and reduced anthracnose were observed in conventional-fungicide treatment and conventional/alternative combinations. In the next year, laboratory biocontrol screenings will continue and modified field trials will continue. Late in 2000 an economic analysis and an educational bulletin will be developed.

NEW Investigation of the influence of tillage for management of woolly cupgrass • 4 years

M. Owen, ISU agronomy

Woolly cupgrass continues to be a problem weed in corn and soybeans. This research looks at woolly cupgrass response to various management practices such as tillage methods, tillage timing, and chemical control, and makes recommendations for effective management systems. Experiments include a tillage/herbicide field experiment to determine woolly cupgrass seed production, soil profile placement and seedbank number; and a tillage timing experiment to look at cupgrass mortality, germination, and emergence.



Managing weeds by integrating smother plants, cover crops and alternate soil management • 4 years

D. Buhler and K. Kohler, USDA-ARS National Soil Tillage Laboratory

This research is focused on encouraging “untimely” weed emergence through tillage soil disturbance, management of the light environment, and management of cover crop and surface residue; and on developing spring-seeded smother plant systems that can provide consistent weed control without sacrificing crop yield. Despite somewhat erratic weather conditions in 1999, the first cropping season for full multi-tactic management approaches, the results of using smother/cover plants for weed management were encouraging. Farmer cooperators near Grinnell and Treynor are providing on-farm sites for the systems research efforts.

Manipulation of predatory insects for enhanced biological control of insect pests • 3 years, ending 2000

J. Obrycki, ISU entomology

What chemical cues can be used by beneficial species to locate their prey? Five predatory species were examined to see how they responded to blends of aphid- and plant-emitted volatiles. Detailed field studies were conducted to optimize distribution systems as well as levels of attraction and arrestment for biologically intensive pest suppression.

Nontarget effects of Bt corn on pathogenic and toxigenic fungi • 2 years

G. Munkvold, ISU plant pathology

The transgenic corn hybrids (Bt hybrids) being integrated into farming systems may have unforeseen effects, either positive or negative, on fungi that interact with pests. The research proposes to determine the effects of different Bt genes on corn stalk infection and stalk rot symptoms; corn kernel infection and ear rot symptoms; aflatoxins, fumonisins, and other mycotoxins; and the occurrence of the beneficial fungi, *Beauveria bassiana*. Some preliminary results indicate no advantages for Bt hybrids over non-Bt hybrids in terms of stalk rot; mixed results with borer, earworm, ear rot on Bt hybrids; and no significant differences in aflatoxin concentrations between Bt and non-Bt hybrids.

Use of intra-field alfalfa trap cropping for management of the potato leafhopper • 3 years, ending 2000

J. Obrycki, ISU entomology

Integrated pest management plans for the potato leafhopper recommend harvesting and/or insecticides to control outbreaks. However, these tactics may kill beneficial arthropods species and disrupt other alfalfa systems. Alfalfa strip-cutting has been monitored at several Iowa locations for three years. This work has determined that alfalfa strips can serve as an effective trap for leafhoppers in uncut areas.



Grants

COMPETITIVE

SOIL AND WATER QUALITY

Development and implementation of cost-effective fertilization and tillage management alternatives for improving soil quality in corn-soybean rotations • 3 years, ending 2000

A. Mallarino, ISU agronomy

Even minor improvements in the corn-soybean rotation will have major impacts on soil and water quality. This work is focused primarily on phosphorus, potassium, and starter fertilizer recommendations and diagnostic tools for reduced, no-till, and ridge till systems. Field trials and demonstrations have been completed. Investigators have begun evaluating the economics of the proposed alternative fertilization and tillage strategies and associated practices, developing ways of incorporating changes into current recommendations, and informing producers about the changes.

Environmental Impacts of the Use of Poultry Manure for Agricultural Production Systems • 3 years

R. Kanwar, ISU agricultural and biosystems engineering

The project will monitor two application rates of poultry manure and commercial fertilizer nitrogen on corn and soybeans for leaching of $\text{NO}_3\text{-N}$ (nitrate-nitrogen), $\text{PO}_4\text{-P}$ (phosphate-phosphorus), and pathogenic bacteria to subsurface drainage water and shallow groundwater. Second-year results of this study indicate that plots and lysimeters treated with 168 kg-N/ha from poultry manure resulted in the lowest $\text{NO}_3\text{-N}$ concentrations and losses within tile water in comparison with plots and lysimeters treated with 168 kg-N/ha



from UAN or 336 kg-N/ha from poultry manure. Plots treated with 336 kg-N/ha from poultry manure resulted in high fecal coliform concentrations in tile water when compared to other treatments.

NEW Evaluating the effectiveness of restored wetlands for reducing nutrient losses from agricultural watersheds • 3 years

A. Van der Valk, ISU botany

Wetlands restoration projects in the Iowa Great Lakes Watershed (IGLW) should have been sufficient to reduce nutrient loading into West Lake Okoboji, as well as other sites, by 50 percent or more. Yet preliminary results from ongoing water-quality monitoring studies are showing little if any reduction. The goals of this project are to examine the effectiveness of restored wetlands within an agricultural watershed to reduce nutrient losses; to determine if nutrient exports from particular watersheds could be reduced further by altering the location, size, design, and/or management of restored wetlands; and to recommend workable guidelines for using wetlands as effective nutrient sinks. The work is quantitatively based and will rely on siting and water flow history as well as monitoring data to construct nutrient budgets and models.

NEW Impact of swine manure applications on phosphorus, $\text{NO}_3\text{-N}$, and bacterial concentrations in surface runoff and subsurface drainage water • 3 years

R. Kanwar, ISU agricultural and biosystems engineering

The goal of this research is to demonstrate the impact on surface and groundwater quality from liquid swine manure application when application is based on nitrogen and phosphorus needs of crops. Comparisons will be made between sources of nitrogen (liquid swine manure and liquid urea-ammonium nitrate, UAN, fertilizer), N-application timings, and improved methods of application on six N experimental treatments. The study will track transport of $\text{NO}_3\text{-N}$, $\text{PO}_4\text{-P}$, and bacteria to surface runoff and subsurface drainage water. The work is being conducted at ISU's Northeast Research Farm near Nashua.

NEW Soil carbon quality and interactions in Iowa wetlands • 2 years

T. Fenton, ISU agronomy

Wetlands are ecosystems that provide many useful economical and environmental traits, from fishing to wildlife to water quality improvement. But significant changes in land use may have altered the natural potential of wetlands to participate in nutrient cycling and water quality maintenance. Researchers will examine soil chemical and physical variability, carbon sequestration, water movement, microbial processes, and denitrification in selected north central Iowa wetlands in the Des Moines Lobe to assess the ecology of similar Iowa wetlands.

Toxicity of pesticides adsorbed to suspended sediment to larval fish in the Cedar River • 3 years, ending 2000

R.C. Summerfelt, ISU, animal ecology, and Dr. David Laird, USDA-ARS National Soil Tilth Laboratory

The objective was to determine whether suspended solids, sediment, and pesticides in the Cedar River affect survival of young (larval) walleye. In the spring of 1998 and 1999, tests were conducted to determine the toxicity of water and sediment collected from the Cedar River to three life stages of walleye. The tests indicated that river water and sediment were not more toxic to any larval stage than reference water and sediment. River sediments, suspended solids, and river water were analyzed for the four most common insecticides and the four most common herbicides. No pesticides were found in sediments or suspended solids. Although very low concentrations of a few herbicides and insecticides were found in the water, the observed concentrations were not toxic to larval walleye in short-term (48-hour) exposure. Although much higher concentrations or chronic exposure to suspended solids and pesticides may be harmful to young fish, during the present study, neither pesticides nor suspended solids were toxic to young walleye. Laboratory investigations, however, demonstrated that chlorpyrifos (a widely used insecticide) bound to humic colloids in suspended sediment is toxic to young walleye. The results suggest that insecticides transported to streams and rivers with sediment during major erosion events could pose a threat to young fish.



FINAL REPORT PENDING

Stability and activity of antibiotics in animal manures • 3 years, ended June 1999

*W. Hyde and P. Imerman, ISU Veterinary
Diagnostic Laboratory*

FINAL REPORTS FILED FOR 13 PROJECTS

Thirteen projects funded by the Leopold Center's competitive grant program completed their work and provided final reports to the Center in 1999. For summaries of their efforts, consult the 2000 Center Progress Report (CPR) or request a copy of the final report for the project from the Center office. (Six other grants came to the end of their funding in 1999, but did not provide final reports to the Center in time for inclusion in the CPR.)

Agriculture and communities

- *Assessing the impact of instructors and students as transfer agents*
- *Community Guide to Agriculture (Johnson County)*
- *Rural regeneration through direct marketing of Audubon County meats*
- *Youth and conservation methods*

Crop management

- *Eastern gamagrass dormancy*
- *Economic analysis of variable rate management for corn and soybean systems*
- *Establishment and persistence of legumes on sites varying in aspect, landscape position, and soil type*
- *Evaluation of interactions within a shelterbelt ecosystem*

Livestock and pest management

- *Biocontrol of purple loosestrife by two host-specific European leaf-feeding beetles in Iowa wetlands*
- *Coupling swine technologies: swine system options*
- *Determination of early summer pasture conditions to optimize forage and calf productivity and profitability*
- *Education-based incentive program to enhance long-term adoption of sustainable nutrient/pest management—a demonstration with farmers in northeast Iowa*
- *Iowa Lakes Controlled Grazing, Inc. (ILCG) project*



*providing funds for programs
dealing with sustainable agriculture*

support

HOW THE LEOPOLD CENTER SERVES IOWA AND IOWA STATE UNIVERSITY

- Through the Leopold Center's competitive grants program, approximately \$722,000 (or 79.5 percent of the year's total funding) was awarded to Iowa State University **faculty members** for sustainable agriculture research.
- Through the Leopold Center's competitive grants program, approximately \$212,000 was dedicated to the support of 16 Iowa State University **graduates** in their **research and study** activities.
- The Leopold Center provided \$74,000 to the **Hooped House Initiative** group, which looks at the longer term management issues for Iowa swine producers. This effort has positioned ISU as both a nationally and internationally recognized leader in hoop swine production research.
- The Leopold Center is providing \$50,000 each year to **Practical Farmers of Iowa** (PFI) in support of on-farm educational and demonstration activities. Many of these research trials and field days were conducted in collaboration with ISU faculty members.
- Financial support from the Leopold Center (minimum of \$50,000 annually) made it possible for the university's only **organic specialist** to conduct 12 research projects at nine ISU research farm sites around the state.
- The Leopold Center is providing \$20,000 in support for ISU's new **Henry A. Wallace Endowed Chair** for Sustainable Agriculture.
- A **survey** conducted in August 1999 found that nearly half of those responding producers who attended the **Center's Swine System Options** conference earlier in the year had changed the management, production, or marketing practices for their operations.

