LEOPOLD Letter

A NEWSLETTER OF THE LEOPOLD CENTER FOR SUSTAINABLE AGRICULTURE VOL. 10 NO. 2 SUMMER 1998

Leopold Center awards sustainable agriculture grants

Jeri Neal
Research coordinator

The Leopold Center recently awarded $794,062 in its 11th annual round of competitive grants for research, education, and demonstration. Director Dennis Keeney and the Center's Advisory Board funded 22 new projects and renewed 23 existing projects for a second or third year. Grant amounts range from $3,091 to $35,666; grants begin July 1.

In working toward the Center's mission, one goal of the competitive grants program is to build collaboration among diverse organizations. The 1998-99 projects involve 36 principal investigators representing 13 ISU departments, ISU Extension, and nine other educational and nonprofit organizations.

The program also enables Iowa agronomists, environmental engineers, educators, and others to apply technology in ways that promote a sound agricultural system. The 45 projects cover a breadth of topics: foxtail weed control, strawberry fruit rot, food systems, niche markets, and rationales for producers' manure management systems.

In its first ten years, the Leopold Center has awarded almost $ 8.1 million in 174 competitive grants throughout the state.

Farm expertise guides research

This spring, Villisca farmer and Leopold Center Advisory Board Member David Williams testified before a United States Department of Agriculture Advisory Committee on Research, Education, Economics, and Extension in Washington, D.C. Williams was one of several farmers, educators, farm and commodity group representatives, and Extension staff to offer input into the committee's recommendations, which in turn will inform decisions affecting the USDA research agenda.

Williams' perspectives have also shaped the direction of the Center's research in recent years. Excerpts from his testimony are interspersed with project descriptions on pages 4-7.)

New grants

Pest Management

Managing Weeds by Integrating Smother Plants, Cover Crops, and Alternate Soil Management, **$32,090**; Douglas Buhler and Keith Kohler, USDA–ARS National Soil Tilth Laboratory—To expand weed management scope and diversity in corn and soybeans, this work will investigate integrating smother plant systems with methods that reduce weed populations prior to crop planting. (99-03) *3 years* (This work builds on an earlier grant, *Spring Seeded Smother Plants for Weed Control in Corn and Soybeans*.)

INSIDE

Biologically Intensive Manipulation of Foxtail Soil Seed Banks for Enhanced Mortality, **$21,600**; Jack 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. (99-37) *3 years*

Integrating Biologically Rational Strategies for Control of Anthracnose Fruit Rot of Strawberries, **$14,278**; Mark 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. (99-64) *3 years*

COMPETITIVE GRANTS

(continued on page 4)

*The mission of the **Leopold Letter** is to inform diverse audiences, including farmers, educators, researchers, conservationists, and policymakers, about Leopold Center programs and activities; to encourage increased interest in and use of sustainable farming practices; and to stimulate public discussion about sustainable agriculture in Iowa.*

Assessing new technology: farm by farm

Michael Duffy
Extension economist, ISU
Leopold Center associate director

Every day seems to bring a new technology to farmers. Global positioning, infrared analysis, herbicide-resistant crops, new hybrids, and variable rate applications are a few relatively recent innovations in agricultural technologies.

The changes are coming so fast that it is hard to keep pace with them. And these new technologies and changes do not come without a cost. Recently a farmer remarked to me that many of his neighbors were shifting their production to a contract basis simply because the increased complexity made them feel that they could not keep up with the changes; it seemed easier to have someone else do the "keeping up" and evaluating.

Contract production is certainly one approach. However, the contractor reaps the majority of the rewards for adopting technological changes, reducing the role of the farmer to that of a hired employee.

Economic theory holds that the early adopters of a clearly superior technology are the ones who benefit most because by the time late adopters begin to use the new technologies, profits generated through improvements have been factored into the market price.

The challenge is knowing which technologies are superior and which offer only marginal benefits. Some technologies are not the most efficient initially, but as they are refined over time, they become the most effective choices. Knowing which technologies to adopt—and when to adopt them—are critical questions facing farmers. The problem is further complicated when one considers the impact of the new technologies on sustainability.

There are no magic solutions. It is important for farmers to realize that what may be right for one farm may not be right for another. Farmers need to seek the most appropriate technologies for their individual operations—not necessarily the newest technology.

Evaluating a new technology

Evaluating any technology involves two steps. First, farmers must know their goals. This has been said so often that it may seem like a cliché, but it is critical in evaluating the appropriateness of a new technology. Economists often assume profit maximization is the only goal. However, there are additional considerations and goals.

Different technologies use different resource mixes. This mix of resources can determine whether a technology is appropriate. For example, some farmers adopt technologies to save labor. If the labor that is freed up has a higher use, then such technologies will usually be appropriate. The labor that is freed up may be used for more work, more leisure, or family time. The key question is, what value is placed on the labor saved? An appropriate technology for a starting farmer may not be appropriate for one reaching retirement age. Similarly, technologies that involve working with computers and high-technology equipment may not be appropriate for someone who prefers working with animals.

The second step in evaluating alternative technologies is accurate assessment of resources. Economists typically talk about four resource categories: land, labor, capital, and

ASSESSING TECHNOLOGY
(continued on page 8)

LEOPOLD CENTER

The Leopold Letter is also available via World Wide Web:
URL: http://www.leopold.iastate.edu/

Leopold Letter
ISSN 1065-2116

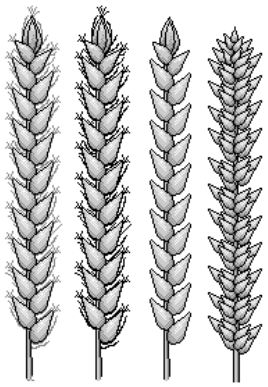
Is agricultural biotechnology sustainable?

Iowa agriculture is undergoing many changes that will profoundly affect its future. One of the most controversial is the adoption of genetically engineered crops. Genetic engineering (biotechnology) is the transfer of genes and other genetic material between organisms that ordinarily do not exchange germplasm. Genes from bacteria, viruses, or completely unrelated plant species can be routinely introduced with the technologies currently available. These very powerful technologies are capable of affecting all of life's processes. For example, we can learn how a disease affects a plant, then build genes into the plant to enhance disease resistance, greatly aiding our ability to manage pests biologically.

Currently, most of the bioengineered crops on the market are the result of simple, single-gene transfers. The traits being added to these crops are known as input traits because they will affect the input of pesticides or other management strategies. In contrast, desirable biological characteristics (output traits) can be added to the harvested portion of crops, enhancing their market value. Examples include corn grain that has more readily digestible energy materials or higher levels of phytase so that its insoluble phosphates can be used more efficiently. Plants might also be developed that can more readily converted to ethanol.

Output traits are harder to engineer because they must be added using multiple genes, and yield characteristics must be maintained. They will be expensive to develop, and it will be more costly to keep their harvest separate from bulk grain that does not have the added-value characteristics. Further, whether the marketplace will offer a sufficient premium to pay for their development costs remains to be seen.

Bioengineered crops will have unpredictable social, economic, and ecological consequences. I see genetically engineered crops as important to the sustainability of agriculture *if* they are developed ethically and for the public good. But I am concerned that the technology is primarily being promoted for short-term economic gain. It seems to me that there are two issues: (1) Who is profiting from the current wave of "biogenic" crops? (2) Are there unintended ecological impacts?



Certainly, these "biogenic" crops must provide a profit to the private developer sufficient to justify their development and marketing. And biotechnology has become too big a business to be conducted entirely by public universities and the Agricultural Research Service, even if government plant breeding programs had not been undergoing budget cuts for many years. I fear, however, that government plant breeding programs have abdicated their leadership to the the chemical-seed industry giants. Clearly, if the environment and the farm community do not benefit, and indeed are harmed, then the ethical derivation of such profits can be legitimately questioned. It is critical that the government research programs step up to the plate quickly to keep new products in the pipeline that enhance sustainability and have the potential to be profitable to the farmer.

When deciding whether genetically altered crops fit a farm operation, farmers must evaluate the costs and benefits of this technology just as they would any other input or management decision. (On page two of this issue, Mike Duffy discusses how adoption of these types of technologies might be considered within the overall farm plan.) Yet tracking profits and sustainability remains a daunting task.

Many scientists fear that the current Bt and herbicide-tolerant crops will give rise to Bt-resistant insects and herbicide-tolerant weeds. If so, the time when these single-trait technologies are effective will be limited, forcing producers to use even more expensive pest control methods. Additional concerns include whether the plant as altered has adverse side effects on other organisms—for example, hidden health effects on animals, humans, or the soil biota. Will plants having the added traits cross with genetically similar wild varieties to create new weed pests? Ideally, such questions should be posed during the development of any technology that could potentially interfere with living systems—but they seldom are, although the Leopold Center sponsors research along these lines (for example, impacts of Bt corn on non-target pests and impacts of transgenic soybeans on soil microorganisms).

Further, will agriculture's dependence on these technologies result in even less attention being paid to biologically based pest management strategies? The organic food industry is justified in its position that genetically altered

BIOTECHNOLOGY

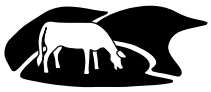
(continued on page 10)

GRANTS

(continued from page 1)

Development of Alternative Carriers for Use of Beauveria bassiana *in* Ostrinia nubilalis *Suppression on Corn*, **$13,889**; Les Lewis, USDA-ARS Corn Insects and Crop Genetics Research Unit, Ames—Investigations will be conducted on seven private farms to evaluate clay, corn cob grits, starch substrate plus corn kernel, and corn kernels as carriers for the fungus *B. bassiana*, which has been proven effective for managing European corn borer activity in corn. (99-75) *2 years*

Livestock Management



Growing Dairy Heifers in Southwest Iowa, **$6,158**; Ron Sanson, Page County Extension, Clarinda—ISU Extension and local producers and lenders will cooperate in collecting and analyzing economic and production data that can be used to refine management practices and assess the growth potential for growing dairy calves in southwest Iowa. (99-11) *3 years*

American Bison as an Alternative Livestock Enterprise in Iowa, **$7,424**; Elton Tophoj, Monona County Extension, Onawa—The project will survey bison production in Iowa, including production costs, handling, market opportunities and market access. (99-14) *2 years*

Chariton Valley Beef Industry Initiative, **$25,800**; Joe Sellers, Lucas County Extension—Beef producers in the Rathbun Lake region will have the opportunity to develop operational plans that assess individual production, management, and marketing needs. (99-71) *3 years*

Nutrient Management

Dairy Manure Quantification and Characterization in Grazing Systems, **$35,666**; Wendy Powers and Marjorie Faust, ISU animal science—Milk production, pasture clippings, and manure are among the measures that will be used to generate manure composition and quantity prediction equations that will help intensive dairy grazers make environmentally sound stocking rate and manure storage management decisions. (99-16) *2 years*

Evaluation of Organic Soil Amendments for Certified Organic Vegetable and Herb Production, **$12,500**; Kathleen Delate, ISU horticulture and agronomy—After analysis for macronutrients, moisture and carbon/nitrogen ratio, several composts will be 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. (99-50) *3 years*

Nitrogen Conservation in Swine Manure Composting: Land Application Systems, **$30,500**; Thomas Richard, ISU agricultural and biosystems engineering; Thomas Loynachan, ISU agronomy; Cynthia Cambardella, USDA-ARS-National Soil Tilth Lab—By quantifying nitrogen transformations as swine manure is composted with corn stalks at varying ratios, and quantifying carbon and nitrogen mineralization when composts of different maturities are applied to soil, the study will provide information to help farmers develop compost products that synchronize nitrogen release and crop uptake and improve overall soil quality. (99-62) *2 years*

Environmental Impacts of the Use of Poultry Manure for Agricultural Production Systems, **$21,300**; Rameshwar 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 NO_3-N (nitrate-nitrogen), PO_4-P (phosphate-phosphorus), and pathogenic bacteria to subsurface drainage water and shallow groundwater. (99-68) *3 years*

Socio-technical and Environmental Dimensions of Swine Manure Management Decisions, **$13,527**; Clare Hinrichs, ISU sociology and Tom Richard, ISU agricultural and biosystems engineering—Qualitative field interviews will be conducted to assess how farm operation characteristics and personal views on environment and technology influence swine producers' manure management decisions on their farms. (99-69) *2 years*

Agriculture and Community

Assessing the Impact of Instructors and Students as "Transfer Agents," **$12,500**; Eldon Weber, ISU agricultural education and studies—Student and instructor surveys will be used to assess the effectiveness of the 1997 FFA On-farm Nitrogen Management Curriculum in promoting changes in nitrogen management practices. (99-07) *1 year*

Examining the Potential for Organic Apple Production—The Homestead Orchard Project, **$8,100**; Steve Muller, The Homestead, Runnells—A model will be established for a commercial organic apple production system for facilities housing people with developmental disabilities and other special needs. (99-22) *3 years*

Alternative and Horticulture Crop Education and Marketing Pilot Project, **$12,000**; Ken Pangburn, Adams Community Economic Development Corporation, Corning—Area farmers will explore development of a cooperative infrastructure to produce, market, and sell specialty and value-added horticultural and agricultural products. (99-56) *3 years*

Environmental stewardship and family farms complement each other as both involve land ownership and a strong concern for the community and the land. Sustainable agriculture is compatible with sustainable communities, and coroporate agriculture is not.

—David Williams

Youth and Conservation Methods, **$3,091**; Don Groff, Woodbine Community School, Woodbine—Fifth and sixth grade students will learn by doing as they visit local farms to interview farmers and videotape conservation and sustainable agriculture practices. (99-58) *1 year*

Soil Quality/Health

The Effects of Transgenic Soybeans and Associated Herbicide Treatment upon Soil-Surface Mesofaunae, **$35,000**; Larry Pedigo and Royce Bitzer, ISU entomology—By identifying and quantifying springtail species composition in transgenic and other soybeans with their corresponding weed management systems, the study will reveal the effects of these systems on tiny insects that are important to overall soil health. (99-29) *2 years*

Crop and Forage Systems

Organic Farming Demonstration Project, **$13,000**; Warren Johnson, Limestone Bluffs RC&D and Kathleen Delate, ISU horticulture and agronomy—The project will demonstrate organic farming practices for herbs and crops, including corn, oats, and soybeans, at the Andrew Jackson Demonstration Farm and New Melleray Abbey in eastern Iowa. (99-21) *3 years*

Evaluating the Adaptability of Alternative Perennial Legumes, **$5,800**; David Haden, ISU Northwest Research and Demonstration Farm, Sutherland—Stands of Kura clover, cicer milkvetch, and rhizomatous birdsfoot trefoil will be established on ISU research farms across Iowa to evaluate regional adaption, longevity, and forage traits. (99-41) *3 years*

Establishing Production Plots for Local Ecotype Prairie Seed, **$22,348**; Jerry Selby and Keith Fletcher, The Nature Conservancy, Des Moines—The potential for local ecotype prairie seed as an alternative agricultural product for Iowa will be assessed through market analysis and on-farm production demonstration. (99-45) *4 years*

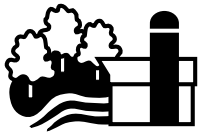
Feasibility of Organic Soybean Production Following Conservation Reserve Program (CRP) Land, **$12,500**; Kathleen Delate, ISU horticulture and agronomy—By evaluating yield, pest status, soil health indicators, and economics of conventional and organic soybeans on CRP ground, the project will document biological and economic outcomes of the two systems and explore implications for management practices. (99-49) *3 years*

Improving Tree Establishment with Forage Crops, **$18,200**; Carl 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. (99-85) *3 years*

Some would say I am emotional about family farm issues. But these are emotional issues. We are at a crossroads. It is time for our farm organizations, our commodity groups, our land grant universities, and our government at state and national levels to draw a line in the sand and decide whether they are going to support family farms or corporate agriculture. These groups cannot continue to straddle the fence if family farms are to remain viable. ***—David Williams***

Renewals

Agroecology



Evaluation of Interactions within a Shelterbelt Agroecosystem, year 3 of 3, **$12,450**; Carl W. Mize, ISU forestry—In continuing work with a computer model based on a shelterbelt near Ogden, this project is expanding its efforts to quantify the economic and environmental impact of shelterbelts on production of corn, soybeans, and oats. (97-53)

Evaluation of Three Cropping Systems Grown Under the Influence of a Shelterbelt, year 2 of 3, **$5,800**; Carl W. Mize, ISU forestry—This project is evaluating economic and biological benefits of applying hog manure to strip intercropping, with hog manure applied to harvested oat strips, continuous corn, and a corn-soybean rotation grown under the shelterbelt's influence south of Ogden. (98-26)

Agriculture and Community

Rural Regeneration Through Direct Marketing Audubon County Meats, year 2 of 2, **$11,746**; Donna Bauer, Audubon County Rural Action Committee, Audubon—The project's goal is to directly market honey, meats and other local products, in part by building relationships with consumers. Project strategies include development of education materials, consumer research data, and cooperative marketing plans. (98-12)

Community and Economic Regeneration through Strengthening the Local Food Economy, year 2 of 3, **$16,900**; Kamyar Enshayan, Center for Energy and Environmental Education, Cedar Falls—This project will identify practical pathways to enable institutional food buyers to invest their food dollars in Iowa and to support Iowa and regional farmers, processors, and distributors. (98-13)

Crop and Forage Systems

Determination of Early Summer Pasture Conditions to Optimize Forage and Calf Productivity and Profitability, year 3 of 3, **$21,240**; Jim Russell, ISU animal science—This project is correlating soil properties, forage growth, and stocking rates at the start of spring grazing with forage yields, cow reproduction, calf weight gain, and profitability

over the summer to help farmers determine the optimal conditions for initiating early spring grazing. (97-20)

Establishment and Persistence of Legumes on Sites Varying in Aspect, Landscape Position, and Soil Type, year 3 of 3, **$18,541**; Kenneth Moore, ISU agronomy—Because of narrow species diversity in Iowa pastures, this work is investigating increasing the diversity of legume species and mixtures in pastures and assessing their impacts on forage quality and quantity. (97-29)

Is it better to have one 1,000-sow corporate farm or five farms with 200 sows each? And it is better to have a 5,000-acre corn-soybean farm or ten 500-acre farms?

Some will say a 500-acre grain farm with a 200-sow farrow-to-finish operation would not return an adequate profit for a family farm, but I say that it can compete as efficiently and as profitably as any farm enterprise.

—David Williams

Eastern Gamagrass Seed Dormancy, year 3 of 3, **$11,600**; Allen Knapp, ISU agronomy—Eastern Gamagrass, a highly productive, warm-season perennial that is palatable to cattle, is a potential forage crop for marginal land. But it is impractical for use because it is very difficult to germinate. This work is trying to unlock this perennial's seed dormancy mechanisms. (97-30)

Economic and Environmental Evaluation of Crop Management Systems for Sustainable Agriculture, year 3 of 3, **$34,920**; William D. Batchelor, ISU agricultural and biosystems engineering—This work is investigating various levels of crop management: traditional practices, grid-based soil sampling and crop scouting, sampling and scouting assisted by global positions systems technology, and full precision crop management that maximizes use of GPS, in an effort to help participating farmers determine the best combination of tools for their operations. (97-48)

Development of Switchgrass as a Viable Agricultural Commodity for Farmers in Southern Iowa, year 2 of 3, **$30,000**; Jim Cooper, Chariton Valley RC & D, Centerville—Funding will aid development and delivery of information and education for the multi-county, multi-agency Chariton Valley Biomass Power Project. (98-14)

Small Grain and Annual Forage Legume Intercrops for Iowa, year 2 of 2, **$7,000**; Jim Holland, ISU agronomy—Five small grain and five annual forage cultivars are being grown alone and in combination to determine the most promising combinations for annual cropping systems, best management practices, and changes in morphological and growth characteristics under different management regimes. (98-68)

Evaluation of Forage Plants Collected from Permanent Pastures Throughout Iowa, year 2 of 2, **$5,000**; E. Charles Brummer, ISU agronomy—To improve producer pasture recommendations, this work will document genetic variation for traits important to persistence and survival in white clover, orchardgrass, and birdsfoot trefoil species that were collected from permanent pastures around Iowa. (98-69)

Livestock Management

Coupling Swine Technologies: Pig Production Systems for Iowa, year 3 of 3, **$40,000**; Mark Honeyman, ISU Outlying Research Center—To demonstrate alternative approaches for raising swine in Iowa, farmer cooperators are coordinating with outlying research farms to study outdoor pig production options, combinations of technologies, and economics of these systems. (97-31)

Nutrient Management

Education-based Incentive Program to Enhance Long-term Adoption of Sustainable Nutrient and Pest Management: A Demonstration with Farmers in Northeast Iowa, year 3 of 3, **$3,900**; Gerald Miller, ISU agronomy—By equipping producers, particularly early career farmers, with skills in soil map reading, soil testing, setting realistic yield goals, and other areas, this project is providing a model for farmers to consistently apply techniques they have learned. (97-21)

Statewide Manure Management Education Initiative, year 2 of 3, **$30,000**; Gerald Miller, ISU agronomy—Under leadership from ISU Extension, the Leopold Center, Iowa Veterinary Medical Association, soil and water conservation districts, and the Iowa Independent Crop Consultants' Association, this project uses intensive workshops with individualized participant plans to encourage appropriate decision making about utilization of manure nutrients. (98-51)

Pest Management

(includes biologicals, disease, and weeds)

Biological Control of Purple Loosestrife by Two Host-Specific European Leaf Feeding Beetles in Iowa Wetlands, year 3 of 3, **$8,000**; John Obrycki, ISU entomology—This project is investigating two beetle species that feed on purple loosestrife leaves and stems, reducing its ability to compete with desirable native plant species. (97-41)

Biological Control and Sustainable Horticulture Principles for Iowa's Vocational Agriculture Curriculum, year 2 of 2, **$14,840**; Gail Nonnecke, ISU horticulture and entomology—A set of instructional materials on biological control and sustainable horticultural principles, the first of its kind in Iowa, is being developed with assistance from Iowa high school teachers and students. The materials, in print and electronic formats, will be provided to Iowa agricultural teachers in the final project year. (98-24)

Use of Intra-field Alfalfa Trap Cropping for Management of the Potato Leafhopper, year 2 of 3, **$19,300**; John Obrycki, ISU entomology—Originating from farmer observations and practices, this project is studying the use of an alfalfa trap crop for potato leaf hopper management. By quantifying interactions among the trap crop, biological cycles of leafhopper populations, and development of the entomopathogen *Zoophtora radicans*, the project is assessing effectiveness of intra-field alfalfa trap crop management at three locations. (98-43)

Biologically Intensive Pest Management: Iowa Apple Growers Take the Next Step Toward Sustainability, year 2 of 3, **$17,300**; Mark Gleason, ISU plant pathology—Apple growers are participating in cooperative trials to identify biologically intensive pest control tactics best suited to Iowa conditions. Research is focusing on apple scab, codling moth, and the sooty-blotch/flyspeck complex. (98-45)

Manipulation of Predatory Insects for Enhanced Biological Control of Insect Pests, year 2 of 2, **$25,067**; John Obrycki, ISU entomology—One impediment to manipulating predators for biological control is that scientists do not understand the chemical cues and behavior used by the predators to locate their prey. This goal of the project is to determine and characterize such behaviors used by predatory lace-wings and adult lady beetles. (98-72)

Soil Quality and Health

Soil Quality, Yield Stability, and Economic Attributes of Alternative Crop Rotations, year 2 of 2, **$20,000**; Doug Karlen, USDA-ARS National Soil Tilth Lab, Ames—Indicators of soil quality, including organic matter, compaction, fertility status, and microbial activity, are being assessed and used with crop rotation data from two 30-year studies, a 17-year study, and a 20-year study to analyze interactions between management practices and soil quality. Diversified crop rotations (involving more than a two-year corn-soybean combination) may create and/or sustain better soil quality or health; if so, this soil condition will result in better economic returns via more stable yields. (98-05)

Development and Implementation of Cost-Effective Fertilization and Tillage Practices for Improving Soil Quality in Corn-Soybean Rotations, year 2 of 3, **$24,450**; Antonio Mallarino, ISU agronomy—Project objectives include development of phosphorus (P), potassium (K), and starter fertilization recommendations for corn and soybean under different tillage systems; evaluation of improved diagnostic tools to assess P and K soil fertility in no-till and ridge till; economic analysis of alternative fertilization and tillage practices; and demonstration of a methodology for on-farm research and demonstrations based on precision agriculture technologies. (98-36)

Reducing soil loss and improving water quality will continue to be one of the biggest challenges to America and to the world. We are going to hear and read a great deal about the pollution of the Gulf of Mexico, referred to as hypoxia or the "dead zone." The Mississippi River Basin, draining to the Gulf, is a watershed that covers 40 percent of the land mass in the United States.

—David Williams

Economic and technological development are out of balance with social development. I want to stress that the emphasis on economic and technological development far outweighs the emphasis on our social development. To encourage larger farms, to move people to larger cities, is a road to disaster.

—David Williams

Water Quality

Toxicity of Pesticides Adsorbed to Suspended Sediment to Larval Fish in the Cedar River, year 2 of 3, **$25,737**; Robert C. Summerfelt, ISU animal ecology—In this National Reasearch Initiative-Leopold Center grant, investigators are describing physical and chemical characteristics, including pesticide residues, of sediment and water samples from the Cedar River; determining the toxicity of river sediments and water to larval walleye; measuring adsorption and desorption on clays; and determining whether toxic pesticides adsorbed to clays are toxic to larval fish. (98-80)

Woodlands

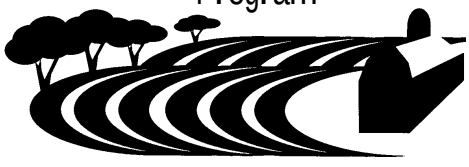
Ecology and Restoration of Farmland Woods in Central Iowa, year 2 of 3, **$12,960**; Donald Farrar, ISU botany—The project will identify the species and the species/site associations that characterize high quality woodlands and provide information that will assist landowner and groups in woodland restoration. (98-21)

Note: When contacting the Center for more information, please cite the four-digit number listed after each summary.

FY2000 Request for Preproposals Coming Soon

The Center's next call for competitive grant preproposals will be issued in late July. For reasons of economy, the Center uses bulk mail for distribution. If you do not receive a copy of the Fiscal Year 2000 RFP by early August, please contact us at (515) 294-3711.

Competitive Grants Program



(continued from page 2)

management. "Land" includes all the plants and animals inhabiting it. "Capital" includes both the liquid assets we typically think of as cash and also the stock assets such as buildings and equipment and the technologies they incorporate. "Labor" denotes the physical activities involved on all farms. "Management" is the combining of these resources. On most family farms, labor and management tasks are performed by the same individuals.

A further classification of resources proposed by University of Missouri agricultural economist John Ikerd is "internal" versus "external." He uses these terms in discussing agricultural change. We used to rely on the resources that were internal to the farm. But now, we have substituted not only capital for labor but external resources for internal resources. These changes in production agriculture have dramatically increased production levels—but they have also greatly expanded the cost of production. Farms have essentially become a place that money passes through. A professor at Tuskegee University once said, "We have reached the level of sophistication in this country where everybody is making a profit on agricultural commodities except the farmers who produce them."

When evaluating a new technology, it is important to remember that we are seeking the appropriate technology for a given set of goals and resources. The farmer must determine whether adoption of a new technology involves relatively minor (incremental) changes versus significant alterations in the farming operation (embodied technologies).

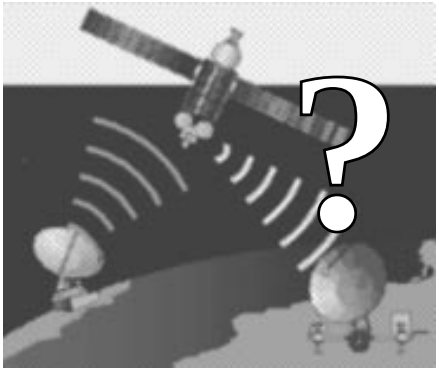
A "partial budget" (see next section) is the best evaluation technique for assessing an incremental technological change. But effectively evaluating changes ("alternative technologies") that will have a significant impact requires whole-farm analysis.

Not all technologies fall clearly into one category or another. But classifying the technology change is not as important as using the right tool to evaluate it. The partial budget approach is easiest, but in many instances the change requires a more substantial analysis.

Partial budgeting

While the partial budget concept is relatively simple, its implementation can be complex. A partial budget examines how adopting a new technology or way of operating the farm affects profitability. It compares the existing situation with the new or alternative method.

There are four categories of changes to estimate in a partial budget procedure. First, one must estimate the added or new cost of adopting the technology. Next, one must estimate the additional revenue generated by using the new technology. The third parameter to estimate is the decreased cost of *not* using the technology that is being replaced. Finally, the lost revenue must be estimated.



Even if a new technology is profitable, it may not necessarily be appropriate for a particular farm. Other factors need to be considered when determining whether to adopt a new technology. Resource use and mix, impact on sustainability, and changes in the nature of the tasks all could have an impact on the desirability of the change.

Whole-farm analysis

If a new technology requires major changes in the farming operation, it will be necessary to evaluate the new technology using whole-farm analysis. Under whole-farm analysis, all of the enterprises on the farm are evaluated. The first step is to determine profitability and resource use under the current system. The second step is to estimate the changes under the new system.

Whole-farm analysis is necessary when certain production factors may limit full implementation of the new technology. A partial budget will not identify these weak areas. For example, if a new technology requires more labor at peak labor demand periods, then labor availability becomes a constraint that must be addressed if the new technology is to succeed. Similarly, the new technology could require a large capital investment. If the capital is not available, either internally or through borrowing, then the new technology cannot be implemented.

In preparing the whole-farm analysis, all enterprises must be identified and considered. Input requirements and outputs must also be estimated, and financial characteristics must be identified. Conducting a whole-farm analysis is time-consuming, but computer programs and spreadsheets can help. In addition, private companies provide such analysis for a fee. ISU Extension also offers a Farm Financial Planning Service.

Example

A new technology being considered by some swine producers is hoop houses. The hoop house is a relatively simple structure consisting of a tarp stretched over a tubular frame. The hoop houses are used primarily as a facility for finishing pigs.

When comparing hoop houses to confinement feeding, either the partial budget or the whole-farm analysis can be used. The most appropriate technique depends on the purpose of the comparison. Comparing the hoop structures does illustrate some important points to remember when evaluating a new technology.

The Iowa State University Midwest Plan Service publication (MWPS AED-41, February 1997) compares the costs and expected returns of using a hoop-house facility versus a confinement building (see table next page).

The comparison shows that the confinement system would have a $.38 per CWT (100 pounds live weight) advantage over the hoop finishing system. Yet it also illustrates the importance of

Selected Costs Comparisons for Hoops and Confinement Swine Production*

Item	Confinement	Hoop
Facility		
Building	$64.29	$19.64
Feed & manure handling equipment	12.86	12.86
Total Investment (per pig sold)	77.14	32.50
Fixed Costs (per pig sold)	10.18	5.36
Operating Costs (per pig sold)	94.70	98.96
Total Cost (per pig sold)	104.88	104.32
Total Cost (per CWT live)	41.95	41.73
Net Cost (per CWT)	41.35	41.73

*Source: Hoop Structures for Grow-Finish Swine, MWPS, AED 41, Feb. 1997. Note that the operating cost estimate assumes 0.21 hours of labor for confinement and 0.4 hours of labor for hoops. The net cost assumes a $.60 per hundredweight premium for confinements.

considering different resource constraints when evaluating technologies.

If capital is the limiting factor, the most profitable strategy might be the hoops. For example, if a farmer had $200,000 to invest in swine facilities, it would be enough to build a confinement facility holding 1,111 pigs or a hoop facility for 3,636 pigs. For hog prices over $41.73, the added volume would suffice to offset the $.38 per CWT difference in expected returns. But if labor were the limiting factor, the advantage would shift to confinement because of its different labor requirements.

A full comparison of hoops and confinements should address odor, air quality, pork quality, disease problems, manure handling, bedding straw (for the hoops), and other factors. While it is possible to estimate and quantify many of these factors, in the end the decision about which is the most appropriate technology must be made at the individual farm level.

Discussion

Whether a partial budget or whole-farm analysis is used, successfully evaluating new technologies involves several key factors. First, it is critical to identify all of the areas that will be impacted by a new technology. Decisions are often made by focusing on a single aspect of a technology when in reality the level of the change and its impact are much broader.

With new technologies, it is often hard to get good estimates of how the technology will perform under individual circumstances. The cost and benefit estimates are not readily available. In these cases, it is important to gather as much information as possible to help form the best estimate and to analyze the change with several different assumptions regarding the performance of the technology. When possible, test the new technology on a small scale first.

Placing value on costs and revenues also differs in some circumstances. Labor savings may be the best example. As noted, the labor change should be entered at its value. In some cases extra time is quite valuable and in other cases not as valuable. Similarly, labor savings at different times of the year will have different values depending on individual circumstances. Assessing the relative value of machinery changes can also be difficult.

Remember to distinguish between per unit and whole-farm analysis. The per unit profit may be lower, but because of scale changes, the profitability of the whole farm may actually increase.

Another major difficulty is estimating and valuing changes in risk. Some new technologies may have higher expected returns, but the variance of the returns has also increased. What happens to risk is extremely important in determining the appropriateness of alternative technologies for different farms. There is a distinction between risk and uncertainty. Because risk has a known variability, the expected variation in returns can be calculated. Uncertainty occurs when a technology is not well proven and the variability is unknown. Both risk and uncertainty can affect the choice of appropriate technology. Yet risk and uncertainty are extremely difficult to quantify. Many new and alternative technologies will have different impacts on worker health, food safety, and environmental impacts.

Finally, the effects of technologies on the mix of the resources used can have a major impact on the technology's desirability. With some technologies, farmers may rely almost entirely on hired labor and contribute their own labor as management. That's why it is important to know your goals when assessing new technologies.

Conclusion

When evaluating a new technology, collect as much background information as possible. Trade publications, company literature, university research, Extension, and other farmers are all potential information sources. It is important to factor in all the information, consider the source, and adjust it for individual circumstances.

New technologies can represent a totally new way of doing things, a modification in current practices, or simply a refinement of current technology. Some can be implemented relatively easily, while others will involve considerable changes and risk. These factors must all be considered.

A new or different technology is not necessarily better. In some circumstances, the old way remains the most efficient choice for the resources. Willard Cochrane, University of Minnesota Professor Emeritus, coined the term "technology treadmill" several years ago. We must diligently evaluate and assess new technologies to avoid being trapped on the treadmill. Using technology appropriately is key to a successful farming operation.

Food for thought . . .

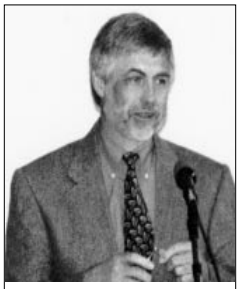
Institutional buying of locally grown food in Iowa

by Rich Pirog
Education coordinator

Does it make economic, environmental, and social sense for Iowa's universities, colleges, hospitals, hotels, and restaurants to purchase, prepare, and serve locally grown foods? How do they go about starting a local food project, and what are the obstacles?

Fifty Iowa farmers, university and hospital food service directors and chefs, educators, and agency personnel gathered to hear Gary Valen and Kamyar Enshayan discuss institutional buying of locally produced foods on April 8 at the Scheman Building (at the Iowa State Center) in Ames.

Valen, currently with the Humane Society of the United States, was formerly the Dean of Students at Hendrix College in Conway, Arkansas, where, beginning in 1987, he helped implement a local food project. Three years later, Hendrix had increased its local food purchases from seven to 30 percent, several new farms had been started, and several others expanded operations. Valen noted that this change redirected $200,000 of the college's annual food budget back to the local economy. Valen suggested ways to surmount obstacles to develop similar local food projects that can be "win-win" for all stakeholders. "Developing a locally grown food project takes time," said Valen. "Those involved have to be patient and take the steps necessary to build cooperation and trust."


Gary Valen

Kamyar Enshayan, a natural sciences adjunct professor at the University of Northern Iowa, Cedar Falls, spoke about the progress of a Leopold Center-funded project to identify food systems that enable UNI and Allen Hospital in Waterloo to invest more of their food dollars in Iowa. Enshayan

shared some preliminary data documenting food service purchases at UNI, emphasizing the importance of relationship building to create a local food system that involves food service directors, buyers, growers, and consumers.

The discussion that followed covered many of the advantages and challenges of institutional buying of locally produced food. Scheman Building chef Chris Palar spoke about the Scheman staff's interest in developing a locally grown menu option for its conference customers. This interest stems from their involvement in serving locally grown foods at the Leopold Center's tenth anniversary conference last July, as well as from a Center-sponsored Iowa Local Food Systems conference in December 1997. The Ames-based Field to Family Community Project plans to link more growers with Palar as he develops this locally grown menu option.

A number of participants agreed that growers need to organize to make institutional buying of locally grown foods a reality. Growers can use a cooperative or food brokerage service to provide food service directors with quantity information and specifications for the produce and meats they offer. Other issues raised included development of an Iowa-grown food directory World Wide Web site; assessment of food purchases by type of food service and consumer (student, conference participant, hospital patient); preferences and needs; food safety; and development of relationships between growers and independent restaurants.

The Center disseminated lists of participant addresses and phone numbers to attendees to encourage networking. A follow-up meeting in May helped stakeholders to set priorities and establish a communication framework..

The Leopold Center has funded several food system projects in the past two years, and it plans to include food systems as a priority topic in the next competitive grant request for proposals, to be issued later this summer.

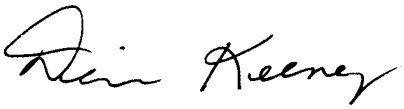
BIOTECHNOLOGY

(continued from page 3)

plants should not be eligible for the organic certification process.

Strong emphasis on two row crops, corn and soybeans, has served Iowa well in many respects, but it has increased our problems with water quality and soil erosion. This emphasis has compromised ecological and economic diversity and homogenized the landscape. So far, the contributions of agricultural biotechnology have done little if anything to alter Iowa's dependence on its two-crop system or to develop environmentally supportive cropping systems. A viable third crop would help stabilize family farms and provide biodiversity on the landscape. It seems to me that biotechnology's current direction will cause more rather than less specialization and will favor large farms with major sources of capital. Unfortunately, genetically altered crops that could support a sustainable agriculture may never be developed if only short-term corporate profitability is considered.

There is nothing inherently wrong with biotechnology. But if the tail of private enterprise continues to wag the dog, the result may be many missed opportunities at best, and some potentially serious ecological, economic, and social missteps at worst.



Dennis R. Keeney

Center publishes 1998 Progress Report

The seventh annual Leopold Center progress report (CPR), which summarizes 13 research projects completed in 1997, is now available. The 75-page illustrated book takes a look at Center-funded research efforts in four areas: education, grazing and forage management, livestock management, and soil and water quality.

The Center's efforts to reach all parts of the state are reflected in a number of the projects covered. Among them are the Mahaska County livestock manure/crop nutrient management demonstration, an Adams County farm demonstration of intensive grazing and forage management on highly erodible land, the animal manure/municipal yard waste composting project in Wright County, the intensive rotational grazing management education/demonstration for northeast Iowa dairy and beef producers, and the collection of forage crop germplasm throughout Iowa.

Berseem clover, municipal sludge, and a Swedish swine production system are featured in other research project recaps.

The 1998 CPR is available at no charge to interested individuals; just phone, fax, or e-mail the Center to receive a copy.

Aldo Leopold remembered

The 50th anniversary of Aldo Leopold's death was commemorated April 21–22 by the Leopold Center on the ISU campus. Leopold, the pioneer ecologist and native Iowan for whom the Center was named, was the subject of two presentations by Curt Meine, a conservation biologist, writer, and historian who wrote the definitive *Aldo Leopold: His Life and Work* (1988). The April 21 discussion illuminated how influences from Leopold's personal life influenced his work as a conservationist, educator, and writer; the April 22 presentation addressed how Leopold's famous "land ethic" can be interpreted and applied in the future.

In conjunction with these presentations—and coinciding with the April 22 nationwide observance of Earth Day—a chinkapin oak tree was planted in Leopold's honor on the ISU campus near Curtiss Hall, where the Leopold Center is housed. These events were sponsored in part by the ISU departments of animal ecology, agronomy, the Brenton Center, the Committee on Lectures, entomology, forestry, horticulture, sociology, zoology, and genetics. Other contributing organizations included the Iowa Conservation Education Council, the Iowa Environmental Council, Story County Conservation Board, Iowa Arboretum, ISU Extension–Story County, Iowa Association of Naturalists, Iowa Natural Heritage Foundation, Nature Conservancy–Iowa Chapter, Practical Farmers of Iowa, and Trees Forever.

Also, on April 23, three swamp white oaks were planted in honor of Leopold in Burlington, Iowa (Leopold's birthplace) by the students of James Madison Middle School. The Burlington chapter of Trees Forever helped to coordinate the event.

News and notes

The new **Wallace Foundation Learning and Outreach Center** at the Iowa State University Armstrong Research Farm near Lewis, in southwestern Iowa, was dedicated in mid-March.

Named for seed corn pioneer Henry A. Wallace, the center houses ISU Extension and Experiment Station offices, the Wallace Foundation for Rural Research and Development, and the Precision Beef Alliance.

The facility also houses an Innovation Center that will serve as an incubator for new value-added agricultural businesses.

The Center and its programs grew out of a concern for the rapidly shrinking farm population in this part of the state during the 1980s, according to coordinator Jill Euken.

Villisca farmer Dave Williams, a Leopold Center advisory board member and a director of the Wallace Foundation for Rural Research and Development, points out that southwestern Iowa's agriculture is relatively diverse because much land in that part of the state is not suitable for row crops. He adds, "The strength of the Wallace Foundation Research Farm can be traced to the involvement of many people. The committee included a banker, a librarian, machinery and fertilizer dealers, and others."

The Armstrong Farm is the site of several Leopold Center-sponsored research projects.

***

Leopold Center director **Dennis Keeney** testified on land use issues this past winter at the Iowa State Capitol before the Commission on Urban Planning, Growth Management of Cities, and Protection of Farmland. The commission, established in a 1997 Iowa House Concurrent Resolution to assess, via surveys and public hearings, the status of Iowa's farmland and natural areas over the past 20 years, will make recommendations concerning urban planning, growth management of cities, and protection of farmland.

(continued next page)

NEWS AND NOTES (CONT.)

In April, Keeney gave the D.C. Smith Memorial Lecture at the UW–Madison Agronomy Dept. on "Sustainable Agriculture: What Land Grant Colleges of Agriculture Can Learn."

Keeney also gave a presentation on "Translating the Leopold legacy for Iowa agriculture" at the Salinas, Kansas, Land Institute's May 31 commemoration of the 50th anniversary of Aldo Leopold's death.

Copies of these presentations are available on request.

***

Bugs in the system: Redesigning the pesticide industry for sustainable agriculture, recently published by Earthscan of London, was edited by former Leopold Center visiting scientist William Vorley and director **Dennis Keeney.** Vorley and Keeney contributed introductory and closing chapters for the volume, which contains contributions by noted economists, environmental scholars, agricultural scientists, and industry consultants on many facets of pest management, the pesticide industry, and sustainable agriculture.

The 222-page paperback may be ordered from Iowa State University Press, 2121 South State Ave., Ames, IA 50014, (515) 292-0155. Cost is $29.95.

Calendar of Events

June 9–July 28—The 2nd annual Master Conservationist training program, sponsored by the Leopold Center, the Story County Conservation Board, ISU Extension, and other state and county-based organizations and businesses, will be held on eight Tuesday evenings. Credits and CEUs available through Iowa State University. Contact Nan Geske, Story County Conservation Center, Ames (515) 232-2526.

June 24–26—Forests, Fishing, Farming, and Folklore Youth and Family Camp, Iowa 4-H Education and Natural Resources Center, Madrid. Contact Field to Family project staff (515) 232-7162.

July 1—Leopold Center Advisory Board meeting. Contact Center for details.

July 19–22—Animal Production Systems and the Environment: An International Conference on Odor, Water Quality, Nutrient Management, and Socioeconomic Issues (Des Moines). Contact ISU College of Agriculture (515) 294-1823.

July 29—Planned Grazing and Watershed Connections Tour, Dallas County. Contact Becky Harris (515) 342-2917.

Summer 1998—For a complete listing of Practical Farmers of Iowa field days featuring on-farm research, contact Rick Exner (515) 294-1923.

Sept. 1—Tour of alternative swine systems research, Rhodes Farm. Contact Denise Schwab, ISU Extension (515) 484-2703.

Sept. 2—Specialty Food Market Bus Tour (travels from Decorah to Minneapolis, Minnesota). Contact Tom Frantzen, Practical Farmers of Iowa (515) 364-6426.

Sept. 21-24—Nonpoint-source monitoring workshop, Cedar Rapids. Contact Lynette Seigley or Carol Thompson (319) 335-1575; lseigley@igsb.uiowa.edu or cthompson@igsb.uiowa.edu.

Sept. 26—Aububon County Family Farms Fall Festival, contact Donna Bauer (712) 563-4084.

LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE
IOWA STATE UNIVERSITY
209 CURTISS HALL
AMES, IOWA 50011-1050

LEOPOLD CENTER

LEOPOLD
Letter