

Letter

Center grant leads to new fertilizer technology

By **Laura Miller**
Newsletter editor

Maybe they couldn't build a better mousetrap, but a team of Iowa State University researchers definitely knows how to build a better fertilizer applicator.

A new technology, known as the Impellicone and fostered at Iowa State, has the potential to reduce the amount of nitrogen fertilizer typically used on crops. It was named a top new agricultural equipment design in 2004 by the American Society of Agricultural Engineers (ASAE).

"This is an example of something that could make the world a different place, all because the Leopold Center was willing to look at a problem," said researcher Mark Hanna, ISU Extension agricultural and biosystems engineer.

"This technology allows people to more uniformly apply fertilizer, and if

rates of application are reduced to take advantage of this uniformity, it's a win-win situation for everyone," he added.

Although preliminary tests were conducted earlier, work on the project began in earnest with the start of a three-year grant from the Leopold Center in 2000. The grant funded background research into a problem inherent in the application of anhydrous ammonia (NH_3) fertilizer: uneven distribution which can be one possible cause of over-application of nitrogen.

The Impellicone is a self-powered manifold or flow-divider system that more uniformly mixes and distributes the liquid and gas phases of NH_3 to multiple outlets across an applicator. The equipment gets its name from the cone-shaped impeller (rotor) that mixes and distributes the NH_3 .

APPLICATOR (continued on next page)



This research team developed a prototype for a new fertilizer manifold. Members are (left-right) Paul Boyd, Mark Hanna, Tom Colvin, Kyle Baumgartner, James Baker and Michael White.

Ecology initiative launches 17 projects

Work has begun on 17 new projects that are part of the Leopold Center's Ecological Systems and Research Initiative. Total first-year cost of the projects, some of which are multi-year efforts, is \$363,621.

The new projects were awarded funding in a competitive process that began in November 2003 with a call for proposals generating 40 concept papers.

The new projects run the gamut from winter grazing stockpiled forages to the creation of a new field school for farmers that focuses on weed ecology and management. Also funded will be triticale feeding trials for swine, part of the search for an alternative third crop for Iowa.

Several of the projects submitted were related to grazing, rotational grazing and forages. Jeri Neal, Ecological Systems and Research program leader, said that these projects will eventually be moved to a new ecology program area that is focused on

increasing the visibility of grazing and grass-based systems in Iowa agriculture.

A significant project in this area is an intensive effort to quantify phosphorus losses under a wide range of grazing management practices, especially those near riparian areas.

"This project, at \$113,000 over three years, is a large part of the ecology initiative's research budget," Neal said, "but if we [the Leopold Center] want to encourage rotational grazing, we need to have a much better understanding of how to manage our animals and pastures to minimize phosphorus losses."

The Center's ecology initiative has been working to develop partnerships and leverage funds for multi-state projects that could lead to significant changes in the landscape. Many of the new projects will complement those efforts.

See project descriptions on pages 8-9.

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More uniform application could reduce temptation to use higher settings

APPLICATOR (continued from page 1)

The Impellicone is licensed to CDS-John Blue Company, a manufacturer of agricultural equipment in Huntsville, Alabama. According to a company official, about 400 units, which cost between \$375 and \$500, have been sold since they went on the market in December 2003.

Hanna's "conservative estimate" is that the technology could result in a 5 percent reduction in applied NH_3 . In Iowa, that's 50 million fewer pounds of applied NH_3 for a savings to producers of approximately \$9 million.

Working with Hanna on the Leopold Center grant were Tom Colvin, professor and USDA collaborator at the National Soil Tilth Laboratory; James Baker, ISU professor emeritus of agricultural and biosystems engineering; Michael White, ISU Extension crop specialist in Warren County; former agricultural engineering graduate student Paul Boyd and Kyle Baumgartner, a junior in agricultural engineering from Strawberry Point.

Hanna said the team tested existing equipment in the field, measuring the amount of NH_3 coming from each outlet supplying a 28-ft. long applicator tool bar. They found that application using conventional equipment could under-apply by as much as 32 percent, which is one reason why farmers may be tempted to over-apply – to guarantee that individual plants receive the minimum recommended amount of nitrogen.

Other solutions to the distribution problem are either more complicated (one model requires changing parts to adjust rates) or more expensive, such as a second pump to re-pressurize the anhydrous ammonia between the nurse tank and the application toolbar (at a cost of \$6-\$10,000).

"We knew we needed to keep the cost low so that it would be used over a wide range of applications," said Boyd, now employed by the U.S. Army Corps of Engineers in Omaha. "Dr. Hanna challenged me to come up with an alternative design that we could test."

After several designs and months of testing – all funded by the Leopold Center grant, Hanna and Boyd had a prototype. Iowa State's Office of Intellectual Property and Technology Transfer and the ISU Research

Foundation helped them identify an industry partner and apply for a patent.

The ISU team then worked with engineers from CDS-John Blue to refine the commercial design. The equipment was tested in the field last summer.

"All of our customers are really excited about it," said Seth Ferguson, CDS-John Blue engineer. "They're looking at the benefit of better accuracy so there will not be as much streaking in their corn and more uniformity in their crops."

"We think that a typical corn grower will usually pay for this in 500 to 600 acres in one year," he added.

Denny Bell, who manages Fertilizer Dealer Supply in Jesup, said he sold several Impellicones last spring and has heard no complaints. The units went to individual farmers, rather than fertilizer dealers, but some people are taking a "wait-and-see" approach before purchasing the device.

Jerry Dove said he had read about the Impellicone in a farm magazine and



This is the Impellicone, licensed to CDS-John Blue and based on the ISU prototype. It went on the market in December 2003.

decided to try it on 550 acres he farms near Janesville. *Successful Farming* followed the research and was an early partner in the ISU project. Dove said he won't know how it helped until he checks his fields for nitrate levels after harvest.

"There are a lot of specialized ways to distribute and monitor anhydrous ammonia but the weak point has always been the manifold," Dove said. "This system seems to make a lot of sense. I'm anxious to do the stalk testing. I think we'll be pleased with the results."



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The Leopold Center for Sustainable Agriculture seeks to identify and reduce adverse socioeconomic and environmental impacts of farming practices, develop profitable farming systems that conserve natural resources, and create educational programs with the ISU Extension Service. It was founded by the 1987 Iowa Groundwater Protection Act.

The *Leopold Letter* is available free from the Leopold Center at 209 Curtiss Hall, Iowa State University, Ames, Iowa 50011-1050; (515) 294-3711.

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Challenges come home to roost

Some scientists think that favorable, stable climate conditions that we have enjoyed the past 50 years may not be the norm. On my farm in North Dakota, we have seen dramatic fluctuations.

In his 1976 book, *The Genesis Strategy*, climatologist Stephen Schneider introduced the idea of scientific and social consequences of climate. He made a compelling case for the fact that the dramatic increase in global grain production between 1940 and the 1970s was due at least as much to favorable, stable climate conditions as it was to the development of new technologies. He also argued that these climate conditions were not the norm, and that we should plan for less favorable conditions in the future.

Schneider has since become one of the leading scientists in the study of climate change, arguing that greater climate instability will almost inevitably be part of our future. This is an issue that should be front and center in our considerations regarding sustainable agriculture which is, by definition, about the future.

The central question

The central question for sustainable agriculture is how to maintain productivity into the future. For several years, we at the Leopold Center have been trying to anticipate the changes that farming will likely face over the next 25 years, and how we can adapt farming practices. So far we have identified a number of changes that will challenge agriculture during that time frame. Among them are the depletion of fossil fuels, increased human population, persistent poverty and climate change.

I think about these and other challenges with respect to my own farm in North Dakota. Like most farmers, I hope I still have a little time to figure it all out but I'm not sure we have the luxury of time on our side.

When I became director of the Leopold Center, I planned to spend the first two weeks of August every year as my vacation and help bring in the crops on my farm. Harvesting

wheat, rye, flax and oats during the first two weeks of August has been almost as dependable as the sun rising in the east. The weather is almost always favorable for harvest – hot and dry – but this year has been different.

An unusual season

In fact, my farm's climate scenario has been out of kilter for nearly two years. During the spring and early summer of 2003 it almost never quit raining, which is unusual for North Dakota. Then it stopped raining July 2 and not another drop of rain fell on our farm until the ground froze in November. For the first time in the 70-year history of our farm, we had two fields of rye that never sprouted last fall due to the dry conditions.

Spring rains this year gave us good moisture for seeding in mid-April and things seemed to return to "normal." But by late May we began to experience almost nonstop precipitation. We had 14 inches of rainfall on our farm between Memorial Day and July 4th – our normal moisture total for an **entire** year!

It stayed cool and damp the rest of the summer. The two weeks I spent on the farm this August seemed like April – highs in the 60s, lows in the low 40s, light drizzle most days. Needless to say, we did not get much harvesting done,

and it continued to rain. As I write this in mid-September, we have had above normal temperatures with no forecast of frost until October. Ironically, September could be the only frost-free month in North Dakota this summer.

Anecdotes are real

I know this is all anecdotal and two seasons don't necessarily establish a trend. But as I meet farmers throughout the Plains, they all seem to be talking about how "abnormal" the weather is. On the farm, anecdotes are real.

This kind of climate instability is exactly what most climatologists have been saying that we need to anticipate and make plans to deal with. For me, figuring out how to modify my farming operation to cope with the challenges ahead is no longer a theoretical construct. And I probably need to figure it out now!

Given the tight operating margins most farmers face, we don't have room for many losses. It will be important to devise more resilient agricultural production systems that can absorb and survive more climate variability. The sustainability of my farm, and everyone else's, probably depends on it.




Photo courtesy the National Oceanic and Atmospheric Administration.

I think about these and other challenges with respect to my own farm in North Dakota. Like most farmers, I hope I still have a little time to figure it all out but I'm not sure we have the luxury of time on our side.

Board adds southeast Iowa farmer-educator

Jennifer Hoy brings more than 20 years of farming experience and a passion for sustainable agriculture to the Leopold Center Advisory Board. She was appointed in March to represent the State Soil Conservation Committee on the advisory board.

Hoy owns 522 acres in Van Buren County that have been farmed with continuous no-till since 1980. For the past four years, the farm has been operated with the assistance of her two sons, Ben Sherod, an agronomy student at Iowa State University, and Spencer Sherod, a student at Van Buren High.

A native of New York, Hoy came to Iowa in 1977 where she helped manage a 2,100-acre diversified crop and livestock farm. She was a full-time farmer until 2000, when she was hired to coordinate the Wapello County "Growing in the Garden" curriculum that reached 1,000 elementary students in Ottumwa. In May 2003, she became the Wapello County Extension Education Director.

Hoy has been active in the local Soil and Water Conservation District, hosting educational tours of various conservation practices on her farm and serving as district

commissioner since 1995. In 2001, she was appointed to represent southeast Iowa on the State Soil Conservation Committee.

"I am thrilled to be on the board," Hoy said. "Sustainable agriculture is near and dear to my heart and I know that I'll be working with other people who feel the same way.

"My particular perspective is as a natural resource conservationist, but one who still needs to make a living from the land," she said. "I think the Leopold Center can play a key role in agriculture by providing research-based information to Iowa and the rest of the country."

Hoy grew up on a pure-bred Angus farm in New York state where she was active in 4-H and a member of a horse judging team at SUNY-Alfred. She has a bachelor's degree in animal science from the University of Georgia and is working on a master's degree at ISU.



Jennifer Hoy

University of Iowa corn geneticist joins advisory board

Erin Irish, the newest member of the Leopold Center Advisory Board, has first-hand experience in ecosystems.

Irish, an associate professor in the University of Iowa Department of Biological Sciences, was appointed in July to succeed English professor emeritus Robert Sayre as one of two university representatives on the advisory board.

As a corn geneticist, Irish's research addresses the basic question of how plants grow. For her experiments, she plants and hand-pollinates about a half-acre of corn each summer.

She also has been getting a closer look at another ecosystem. She and her husband, a small animal veterinarian in Coralville, have begun to restore a 40-acre pasture in Cedar County to oak savannah. To do this, they have been digging or burning invasive species of plants, then planting seeds of native species that they have collected by hand in the surrounding area.

"This experience makes me conscious of the balance that must be maintained between generating the wealth of our state through agriculture, and preserving the natural state of our land, water and air, as well as the native species," she said.

She said that when she moved to Iowa from the East Coast in 1990, she was amazed at the amount of land under cultivation. "I am very aware of how precious open land is in this state," she said.

Irish grew up in Ohio and has a bachelor's degree in biology from Hiram College in Ohio. Her Ph.D. is from Indiana University, and she received fellowships to continue her post-doctoral work at Yale University and the University of Pennsylvania. She teaches introductory biology and graduate-level classes at the University of Iowa.

Her research projects have been funded by the National Science Foundation and the U.S. Department of Agriculture. Results of her work have appeared in numerous scientific journals and presented at conferences throughout the U.S.

Retiring board member Robert Sayre had served since 1994.



Erin Irish

New Center Progress Report summarizes 22 completed grant projects

If you're looking for ways to control weeds with cover crops, compost manure, or find local sources for prairie seed, check out the Leopold Center's latest publication.

These topics and more are covered in the *2004 Center Progress Report* that features summaries of 22 projects funded by the Center and completed in 2002 and 2003. For the first time, there are several completed projects in one of the recently created research categories, the Marketing and Food Systems Initiative.

The Leopold Center has published this report each year since 1992. The 2004 edition examines Center-supported

research and education projects that run the gamut from local foods to black walnut trees, winter grazing and manure management. Researchers worked on problems of beef and swine production, horticultural crops, and soil and water quality. They also explain in the report how their work will help Iowa farmers.

Summaries of the research and education projects that finished their work in 2002 and 2003 are contained in an illustrated, 82-page paperback. The summaries are condensed from longer, more detailed final reports submitted by the principal investigators. The research

and demonstration projects were carried out on Iowa farms, at Iowa State University's outlying research farms, and in urban/suburban areas of the state.

Projects are organized by category: Agriculture and communities, Crop systems, Ecology, Livestock systems, and Marketing and food systems.

To receive a copy of the *2004 Center Progress Report*, contact the Center at (515) 294-3711, or leocenter@iastate.edu. Individual summaries also are posted on the Center's web site at: www.leopold.iastate.edu [go to Research/Programs, then to Completed Grants].

Farmers learn how to grow markets as well as products

By Laura Miller, Newsletter editor

Mark and Connie Tjelmeland know how to grow a prairie.

They've turned 17 acres on their Story County farm near McCallsburg into a thriving prairie with seed from the nearby Doolittle Prairie, one of Iowa's last remnants of native prairie. Each September the Tjelmelands harvest local eco-type prairie seed, which is preferred over non-native varieties because plants are easier to establish and can better withstand diseases and insect pests.

But the Tjelmelands weren't as sure about marketing their prairie.

Thanks to a team of business and agriculture students at Iowa State University, the Tjelmelands are now pilot testing the sale of potted prairie plants in two central Iowa locations. Next spring, they hope to launch a major expansion of their prairie products business to meet an emerging niche market.

The Tjelmelands and other central Iowa producers participated in an experimental marketing class taught by associate professor Kay Palan in the ISU College of Business. The three-credit class was supported by a \$15,200 grant from the Leopold Center's Marketing and Food Systems Initiative.

Student teams worked with niche farmers

The class paired student teams with entrepreneurial farmers who had a unique product for a niche market. After meeting with the farmers, the student teams worked on a specific marketing problem, gathered and analyzed information, and presented their proposals to the farmers at the end of the semester.

"This has really been a boost for us," says Connie Tjelmeland. "Our background is in production and it was just so daunting to think about doing the marketing that we knew we needed for our nursery business. It will be very helpful having this information."

Randy Dreher, an agricultural business student from Adair, said he learned a lot about the local eco-type niche market, as well as sharpening his interviewing techniques. Dreher and three other students on the team conducted nearly 80 telephone and in-person interviews with nursery businesses, retail store owners, landscaping companies and consumers.

"We found that people are willing to plant local eco-type prairie seed but they don't really know what it is, so education is really important to develop the market potential," Dreher said. He found one landscaper who paid \$50 to ship specialty grass seed from Portland, when the Tjelmelands could supply it locally.

The class roster included 13 marketing students from the College of Business, three food science students from the College of Family and Consumer Sciences, and seven students from the College of Agriculture.

The students were assigned to teams, each working with a new farm niche market business. Among the businesses represented were an organic dairy in southwest Iowa, a family-owned apple orchard near Cambridge, a Jasper County winery, an herb farm near Van Horne, a Brooklyn company that creates biocomposites from locally grown kenaf, and the Story County local eco-type prairie growers.



Connie Tjelmeland (at left and above) explains to a class of ISU students what she hopes to accomplish in her prairie business. As a result of student work, the Tjelmelands have redesigned labels for their eggs and will use the prairie marketing plan next spring.

Palan said the idea to use business expertise to help Iowa producers seems like "a natural" for the business college, even though it hadn't been done before with food and fiber producers.

"When you think about being a land grant university, it seems like this is something we should be about, helping small Iowa farm businesses succeed," Palan said. "It really is a win-win situation for the students as well as the businesses because our students need the practical experience."

Students met as a group once early in the semester. Each team met with the producer to develop a formal business proposal that included the scope of the project, steps and a timeline. The proposals were approved by Palan as well as the producer. All projects involved some data-gathering, from telephone surveys to scouring business publications for information about niche markets.

Students give class high marks

Josh Riessen, a senior in marketing and finance from Urbandale, said he learned a lot about marketing and agriculture. He worked with Naturally Iowa to look at the potential market for "natural" dairy products in the Des Moines metropolitan area.

"It was a pretty heavy research project for us," Riessen said. "I grew up here and had no clue how dairy products get to our supermarkets. Now I have a pretty good understanding of where all this comes from and how it works."

Gloria Hutchinson, a senior in marketing from Geneseo, Illinois, said she enjoyed using what she had learned.

"So often you sit in class and you wonder how you'll ever use the information," she said. "With this class, you know you're doing something good for someone. It was more than just a report at the end of the semester."

The Leopold Center grant has been renewed and the experimental course will be offered again in Spring 2005. Palan is now interim associate dean in the College, so marketing professor John Wong will handle course responsibilities.

Aging of landowners is a driving force

Trends in Iowa farmland ownership will change landscape

By Mike Duffy, Associate director

Iowa's elevated farmland values appear to be persisting at record levels. The 2003 ISU Land Values Survey showed record high values, and surveys since then confirm that the upward trend is continuing. At the same time, another ISU Extension survey found some significant changes have occurred in Iowa farmland ownership over the past 20 years.

The driving force behind almost all of the changes is the aging of Iowa's farm owners. In 2002, 24 percent of all farmland in the state was owned by people over the age of 74. This is double the amount reported in 1982 when 12 percent of the farmland was owned by people in this age category.

Nearly half, 48 percent, of the farmland in Iowa is owned by people over the age of 65. In 1982, 29 percent of the land was owned by people over 65.

An aging population

So how does the aging population affect farmland ownership patterns in Iowa? One of the biggest changes is in how the land is owned. There were significant declines in sole ownership and significant increases in farmland owned as joint tenants and held in trusts. The amount of land held by a husband and wife remained essentially unchanged.

As aging farmland owners die, they pass the land on to their heirs. In 1982, owners indicated they would transfer 85 percent of the farmland within the family. Often this means there are multiple heirs and they appear to be holding on to the land rather than selling it.

Multiple heirs are spurring other trends in Iowa farmland ownership. For one thing, the amount of farmland owned by people who do not live in Iowa has increased steadily, rising from 6 percent in 1982 to 19 percent in 2002.

The change in ownership patterns also has led to a change in residency for farmland owners. The amount of farmland owned by those who actually live on the farm decreased significantly from 57 to 47 percent from 1982 to 2002. There was a corresponding increase in the percent of farmland owned by someone who does not live on a farm at all. In 1982, 37 percent of the land was owned by someone who did not live on a farm and by 2002 this had risen significantly to 45 percent.

More rented land

With aging farmland owners and multiple heirs, Iowa is seeing an increase in rented farmland. Excluding land in government programs, the amount of land that is rented increased from 43 to 59 percent from 1982 to 2002. A major shift also occurred in how the land is rented. In 1982, rented land was equally divided between crop share and cash rent. By 2002 more than two-thirds (69 percent) of the leased farmland was under a cash rent arrangement.

Another notable trend occurred in how farmland is financed. Currently almost three-fourths, 74 percent, of Iowa's farmland is owned without debt. This compares to the 62 percent of the farmland that was debt free in 1982. From 1982 to 2002, the amount of farmland held under a contract also decreased significantly from 18 percent to 4 percent.

A final trend that is likely associated with the aging of farmland owners is the increase in the size of tracts of farmland

owned. In 1982, 40 percent of Iowa's farmland was owned by people who had 80 acres or less. In 2002, land holdings in the 80-acre-or-less category had dropped significantly to just 13 percent. At the other end of the spectrum, land held by those with over 600 acres increased significantly from 5 to 16 percent from 1982 to 2002.

The amount of land held by males or females remained unchanged between 1982 and 2002. Females currently own 47 percent of the farmland. This percentage is almost identical when considering only leased farmland. In that case, women own 46 percent of the land.

Given the increases in out-of-state ownership and the age of the owners, one would have anticipated an increase in the amount of land under the care of a professional farm manager. There was an increase in farmland acres using a professional farm manager but this increase was not statistically significant.

More changes ahead?

So where does this leave us? Is this just a set of interesting statistics or does it provide us with a glimpse of the future? Do we want to try and make any corrections, if possible?

Whether or not we want to make changes is a value judgment and the subject of another column. The changes coming, however, are significant and do have implications for how Iowa's land will be used in the future.

The average U.S. life expectancy is 77. That means with average life expectancy, we could expect almost one-fourth of Iowa's farmland to change hands in the next few years. It actually may take longer for this to occur, but land will be transferred as aging owners die.

The answers to the survey questions lead me to believe that the trends we have seen for the last 20 years will continue. The amount of land anticipated to be transferred within the family remained approximately the same from 1982 to 2002. Of the farmland going to the family, there was a significant shift between willing and giving as a means of dispersal. But, in total, land going to the family remained at roughly three-quarters of the total for the two time periods. Land that was anticipated to be placed in a trust increased significantly from 6 to 13 percent between 1982 and 2002.

If these trends continue, we will see more land rented using a cash rent arrangement over the next several years. We also will see more land owned by people who live out-of-state and they will own a larger share of the land.

Policy implications

Two immediate issues face the state's policy makers. One is the impact of the current government programs that are attached to the land due to payments based on production. The payments have increased rents and land values in Iowa. As more land is owned by people outside the state, the benefits of the higher rents and values will leave the state. Rent, in general, will leave the state as the ownership shifts to non-resident owners.

Second, the shift to cash-rented land could make it harder for young people to enter farming. Crop-share renting has been a traditional way for the owner and operator to share the pro-

FARMLAND

(continued on next page)

Iowa farmland by the numbers

- 48** Percentage owned by people over age 65
- 19** Percentage owned by people outside Iowa
- 45** Percentage owned by people not living on a farm
- 59** Percentage rented
- 69** Percentage of rentals with cash-rent agreement
- 16** Percentage of land owned by people with more than 600 acres

FARMLAND

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duction risks, and loss of that option may make entry more difficult for beginning farmers.

The current situation and the potential trends make it even more imperative that farmland owners have an estate plan. This is especially true if one of the siblings has stayed behind to farm the land, while others moved away. Too often there are disputes and hard feelings when land is transferred without a well-conceived estate plan. In some cases, the farming heirs have to quit because they don't have the financial resources to buy out the other heirs who want their share of the estate.

There are always some events that might change these trends. One is that the record land values continue and the subsequent desire to receive the money outweighs the reasons for holding the land. If this happens, we could expect to see more land changing hands via the real estate market.

Another possibility is that the succeeding generation will not have the same affinity or feeling for the land as the second generation. In other words, the land today is being passed on to those who either grew up on it or still have some non-monetary attachment to the land. Their children may not have the same affection for the land and as it is passed to them, the land will again be transferred via the market rather than within the family.

No one knows what direction farmland values will take; however, odds are that the current trends will continue, and even accelerate, for the next several years. These trends have definite implications for the future of farmland ownership in Iowa as well as the sustainability of Iowa's family farms.

Mike Duffy is associate director of the Leopold Center and research program leader for the Center's policy initiative. As an extension economist, he has conducted the annual Land Value Survey since 1985 and is professor-in-charge of the Beginning Farmer Center at ISU.



More information is available in the publication, *Farmland Ownership and Tenure in Iowa 1982-2002: A Twenty Year Perspective*, on the ISU Extension web site at: <http://www.extension.iastate.edu/Publications/PM1983.pdf>

Hoops prove their worth

After more than a decade of research at Iowa State University, the use of hoop barns for hog production appears to meet sustainable agriculture's triple bottom line of being economically viable, socially acceptable and environmentally sound.

It is estimated that more than 3,000 hooped buildings are now being used on Iowa farms for livestock housing, mostly hogs, although research has shown they're also appropriate for beef and dairy cattle, horses, sheep, ostrich and emu, as well as storing hay, grain and machinery.

The benefits and challenges of using hoop barns and deep-bedded systems for livestock production were discussed during a national conference and international symposium September 14-15 in Ames. The Leopold Center was a major sponsor of the conference with the ISU College of Agriculture, Iowa State University Extension, U.S. Department of Agriculture, National Pork Board, Iowa Farm Bureau Federation, Iowa Pork Producers Association and Iowa Pork Industry Center.

The conference attracted 232 people from 10 countries interested in learning about this popular alternative system noted for its low capital cost, competitive returns, and versatility. Sixty researchers from Australia, Canada, The Netherlands, Ukraine, Sweden, Morocco, Korea and across the United States attended the second-day symposium.

"We're looking for a low-cost way to raise pork because it's getting to be just too expensive for consumers," said Allan Simonsson from the Swedish University of Agricultural Sciences. He said Sweden produces about 80 percent of the pork that's consumed there, with consumption levels about twice that of beef.

Eddie Pitzer, who works for the North Carolina Department of Agriculture, said he also came to the conference to learn more about low-cost alternatives for his state's pork producers. "We're interested in the niche markets, and to offer something for small producers who aren't interested in integration," he said.

Former ISU sociology professor Clare Hinrichs, now at Pennsylvania State University, encouraged participants to consider more than the economic and commercial aspects of hoop barns. In her research, some of it funded by the Leopold Center, she said producers who use hoops are spontaneously identifying some of the same animal welfare issues noted by consumers.

"Most hoop producers identify with the animal welfare benefits of this system and get personal satisfaction from it," she said. "I encourage you to anticipate the growing importance of animal welfare in consumer decisions about meat purchases and consumption."

Another speaker addressed the animal welfare issue directly. Don Lay heads the USDA-Agricultural Research Service's Livestock Behavior Research Unit at West Lafayette, Indiana, and conducted some of the early hoops research at ISU. In his observations of 120 pigs, those raised in hoops had less abnormal behavior, lower concentrations of plasma cortisol (a measure of stress), fewer leg injuries and more play behavior than those raised in conventional structures.

Lay said more research needs to be done because the differences could be attributed to numerous factors including the type of bedding used, pig density or temperature differences. "There are thousands of variables that are different in

HOOPS

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A look at 2004 Ecology Initiative Projects

See more project listings on page 9.

Assessment of triticale varieties for swine feeding performance and tolerance to late planting, year 1 of 2, **\$12,219**, L. Gibson, J.L. Jannick, and M. Honeyman, ISU Agronomy and ISU Research Farms (2004-E27) Two winter and two summer triticale feeding trials will be conducted to evaluate pig performance (hooped housing). Investigators have seen both economic and environmental advantage from growing triticale in Iowa, but lack information on feeding performance.

Developing ecologically sound and profitable fertilizer and manure phosphorus management strategies, year 1 of 3, **\$27,500**, A.P. Mallarino, ISU Agronomy (2004-E29) Evaluate long-term impacts of a strictly response-based, low input phosphorus fertilizer management program for corn and soybean; assess early plant availability of poultry manure phosphorus; and use the Iowa P-Index to estimate field phosphorus loss under alternative phosphorus management practices. The project investigator will use this data to develop improved management guidelines for phosphorus.

Developing potatoes with horizontal resistance to the Colorado potato beetle, year 1 of 3, **\$7,233**, D.G. Fisher, Maharishi University of Management (2004-E36) Continue ongoing research to develop potatoes with horizontal resistance to the Colorado potato beetle. The investigator theorizes that a process of recurrent mass selection can be used to accumulate resistance while preserving high yield.

Economically optimal enterprise mix for Iowa farms, year 1 of 1 (begins Dec. 2004), **\$15,000**, J.D. Lawrence, ISU Economics (2004-E1) Develop a computer model to incorporate price and production risk for alternative crop and livestock enterprise when a certain set of farm constraints (labor, capital, solvency, land characteristics) are 'imposed' on Iowa family-sized farms with and without government programs. The model should be useful in evaluating the strengths and weaknesses of diversified farming operations under different economic and resource conditions.

Establishment of a field school for weed ecology and management, year 1 of 3, **\$34,350**, M. Liebman and R.G. Hartzler, ISU Agronomy (2004-E6) Collect data for weeds and pests for both large and small field plots in two-, three- and four-year rotations and organize an interactive farmer-practitioner focused field school that targets weed ecology and management, with an emphasis on decision-making skills and capacities and easily adaptable, broadly applicable techniques and models.

Grapes, pheasant, sweet corn education outreach effort, year 1 of 1, **\$2,100**, J. Kuntz and M. Moore, Mahaska County Agriculture and Rural Development (MCARD) (2004-E19) Provide documentation and outreach materials for a three-year demonstration project where ducks, pheasants, and sweet corn have been integrated into vineyard establishment.

Integrating hunting and grazing – Loess Hills and south central Iowa on-farm management experiences, year 1 of 1, **\$12,833**, J.L. Pease, A.L. Major, ISU Natural Resource Ecology and Management (2004-E43) Four landowners are cooperating in this on-farm work to measure activities of 13 target species of birds in rotationally grazed warm and cool season grass pastures. The investigators are collecting real-life data in an attempt to validate prior experimental work on managing forages to benefit both livestock and wildlife.

Integration of natural seed treatments in organic and open-pollinated corn systems, year 1 of 2, **\$25,000**, S. Goggi and K. Delate, ISU Seed Science Center and ISU Horticulture/Agronomy (2004-E28) Screen plant essential oils for antimicrobial properties for seed and soil-borne corn pathogens, and establish trials to test the efficacy of identified natural seed treatments. Investigators hope to find effective biological seed treatments for alternative cropping systems (specifically those with sustainable, organic and open-pollinated corn).

Iowa pawpaw trial maintenance, year 1 of 3, **\$1,750**, P. O'Malley, ISU Extension (2004-E23) In 1999 and 2000, plantings were established near Columbus Junction and Nashua to assess viability of pawpaws for upper Midwest production. This project will provide production maintenance and record keeping for previously established Iowa pawpaw trials, and begin fruit evaluation phase of the trials.

Quantifying the role of riparian management to control nonpoint source pollution of pasture and cropland streams, year 1 of 3, **\$113,276**, J. Russell and R.C. Schultz, ISU Animal Science and Natural Resource Ecology and Management (2004-E24) Comprehensive study, both on-farm and on research farms, the sediment and phosphorus losses for a number of management variations on cattle grazing systems in and around riparian areas. The investigators are refining ongoing research to get better data on phosphorus movement as associated with pastures and grazing systems.

Sustainable design

The Leopold Center's Ecology Initiative helped the Iowa State University College of Design and its Department of Landscape Architecture bring David Orr to campus in September to discuss sustainable systems. Best known for his work on environmental literacy in higher education, Orr spent the day meeting with students, and Leopold Center staff and faculty working on ecology projects. Orr directs the environmental studies program at Oberlin College in Oberlin, Ohio.



2004 Ecology Initiative Projects

Forage double-cropping demonstration, year 1 of 3, **\$5,000**, I. Lamb, S. Barnhart, M. Honeyman, Iowa Native Lands, ISU Agronomy and Agricultural Research Farms (2004-E39) Research plots of cool season legume crops (alfalfa and medium red clover) will be interseeded with warm season native prairie species to collect management and forage quality evaluation data. The investigators are looking for forage alternatives with improved diversity that require fewer management inputs and still retain high-quality performance.

EcoFair, (work completed) **\$2,750**, Maharishi University of Management (2004-E40) This grant provided speaker fees and travel expenses for Chris Maser, who presented a keynote address at the annual eco-fair.

Survey of mycorrhizal symbioses at Neal Smith National Wildlife Refuge, year 1 of 2, **\$20,000**, I. Lamb, P. Drobney, L. Tiffany, Iowa Native Lands, Neal Smith Wildlife Refuge, and ISU Department of Ecology, Evolution and Organismal Biology (2004-E18) Conduct a preliminary survey of mycorrhizal (root fungus) associations in remnant and reconstructed prairies at Neal Smith National Wildlife Refuge to establish baseline data and experimental protocols for future investigation of this biological component of the soil. The symbiotic relationships between plants, soil and fungi and their contributions to plant and soil vitality are poorly understood, and investigators offer this as a starting point for understanding soil functionality in perennial plant systems.

The role of herbaceous woodland perennial diversity for improving nutrient uptake capacity of riparian areas, 1 year, **\$18,000**, C. Mabry McMullen and J.R. Thompson, ISU Natural Resource Ecology and Management (2004-E4) Quantify the nutrient uptake capacity of understory perennial herbaceous plants and compare nutrient uptake capacity of well-established understory to that of degraded woodland understory. The absence of herbaceous spring perennials in the grazed majority of Iowa riparian forests has been associated with nutrient loss, and investigators believe that nutrient retention could be significantly enhanced by native herbaceous perennials.

Using the past to plan the future: Retrospective assessment of landscape and land use change in Clear Creek Watershed, year 1 of 1, **\$12,998**, L.A. Schulte, A. Rayburn, and L. Merrick, ISU Natural Resource Ecology and Management, (2004-E38) Investigate landscape and land use change in Clear Creek watershed at four time periods using three ecological and social measures: land cover, stream sinuosity, and housing density. Investigators theorize this can provide an understanding of the effects of land management decisions.

Variations in water and nutrient cycling and soil properties during agricultural landscape restoration, year 1 of 5, **\$25,000**, H. Asbjornson, M. Helmers, M. Liebman, L. Schulte, and R. Kolka, ISU Natural Resource Ecology and Management, Agricultural and Biosystems Engineering, and Agronomy (2004-E14) Examine differences in nutrient, water and carbon storage and output for selected annual and perennial plant communities and then provide educational opportunities about the results. The investigators theorize that we can reduce nutrient loads, improve water management, and maintain or improve agricultural productivity by strategic integration of perennial plants in agricultural landscapes.

Winter grazing of stockpiled grass-legume forages to reduce costs of developing beef heifers, year 1 of 1, **\$28,612**, J. Russell, ISU Animal Science (2004-E35) Evaluate cow performance, feed requirements, and costs for maintaining pregnant two-year cows with grazing stockpiled grass-legume forage versus feeding hay with corn gluten supplementation. The project is collecting a third year of data and hoping for a more severe winter after having two mild winters that may have affected the accuracy of recommendations from the first two years of work.

Two policy projects begin

Two projects in the policy initiative are underway with the start of the federal Conservation Security Program (CSP). One project will evaluate farmers' acceptance of the new program, and a second project will look at how state and county programs can integrate their work along CSP objectives.



Animal behaviorist Don Lay (left) and Anna Johnson from the National Pork Board listen to questions during a breakout session.

HOOPS

(continued from page 7)

these systems and we need to look at all of their effects on animal welfare," he said.

John Maltman, a swine specialist for Manitoba Agriculture, Food and Rural Initiatives in Canada, said hoop barns have been used at one farm in Manitoba for 17 years, with few modifications. Tests showed that only the top 18 inches of clay soil under the hoops had a limited amount of phosphorous, and there was very little movement of nitrogen deeper into the soil.

The first Iowa research on hoops was conducted in 1993 by Mark Honeyman and funded by a Leopold Center grant. In 1997, the Center brought together researchers from several colleges and departments to work on an Alternative Swine Production Systems Initiative, which became known as the Hoop Group.

The Center provided primary funding for the Hoop Group from 1997 through 2002. Additional support came from the Iowa Pork Producers Association and the Iowa Agriculture and Home Economics Experiment Station. In 2002, Center staff worked with Senator Tom Harkin to obtain the first of three special USDA grants that allowed the team to continue its work.

The latest USDA grant provided funds for the national conference and international symposium and development of a producer manual. Published by the Midwest Plan Service at ISU, the *Hoops Manual* includes publications on hoop barns for grow-finish swine, gestating swine, cold-weather farrowing, beef cattle, dairy cattle, and other multiple uses.

Presentations from the conference and symposium are available on the web at: <http://www.abe.iastate.edu/ABLS/>

Spencer Award presented at Iowa State Fair

It was a suitable venue — the Pioneer Livestock Pavilion at the Iowa State Fair — for Iowa Governor Tom Vilsack to honor two of Iowa's pioneers in sustainable agriculture, Dick and Sharon Thompson of Boone.

Speaking to a standing room-only crowd gathered for a charity steer show fundraiser, Vilsack reminded the audience of the fair's roots 150 years earlier before he presented the 2004 Spencer Award for Sustainable Agriculture to the Thompsons.

"The concept of sustainable agriculture is consistent with the Iowa State Fair," Vilsack noted, adding that agriculture has helped sustain two of Iowa's biggest assets — its people and its productive land.

"I'm very happy to present this award to someone who has been committed to sustainable agriculture for a very long time," he said. "Throughout the years, the Thompsons have tested

their alternative methods and have worked with countless researchers at Iowa State University. They are truly leaders in their community."

Vilsack presented a plaque and \$1,000 check to the Thompsons. They were joined in the dusty show ring by many members of their immediate family including two sons who farm in Boone County. The Thompsons said they plan to use the award money to help pay for tours and publish their annual *Alternatives in Agriculture* report.

Dick Thompson used the program as an opportunity to encourage the 4-H and FFA members who were in the audience.

"It's nice to be a winner here today, but not everything I've done has been a winner," he said. "You can't give up, you must stay in the game or try something different."

Leopold Center advisory board chair Marvin Shirley, who operates a



Governor Vilsack (standing, left) listens as Marvin Shirley (holding microphone) explains the purpose of the Spencer Award.

farm in Dallas County, said the Thompsons are a good example of sustainable agriculture in practice. The two previous winners of the Spencer Award were farmers, and it also honors a northwest Iowa farm family.

The Leopold Center administers the Spencer Award, one of the largest sustainable agriculture awards in Iowa.

NEWS & NOTES

Road to freshness Leopold Center research will be featured in a Japanese television program, "Wonderful Space-ship Earth." The show's producers planned to send a film crew to visit the Leopold Center and a local supermarket in late September. They were interested in the Center's work on prototypes for food labels that indicate how long a product took to reach the store after harvest. The marketing research, conducted by Iowa State University's Business Analysis Laboratory and Rich Pirog of the Leopold Center, shows that 20 percent of consumers are willing to pay 30 percent more for locally grown produce and meat. To see the most recent report, Ecolabel Value Assessment Phase II: Consumer Perceptions of Local Foods, go to the Center's web site, www.leopold.iastate.edu [look under Publications/Center staff papers].

Pirog's work in "food miles" also was featured in the Summer 2004 newsletter of the Hunger and Environmental Nutrition group of the American Dietetic Association.

Marketing RFP In July, the Center's Marketing and Food Systems Initiative issued its second RFP, or Request for Preproposals, which is the basis for competitive grants from the Center for

targeted work. The Leopold Center received ideas for projects ranging from training for farmers who want to tap emerging markets to research about Iowa's food heritage. Center staff and advisory board members evaluated the 33 preproposals to determine which should be developed into full proposals and potentially receive funding.

Great response Thanks to the many people who returned a readership survey about the Leopold Center newsletter. There's been a good response both to the written surveys and to the on-line version. We're in the process of analyzing the information, which will be used to improve *The Leopold Letter* and better meet the diverse interests and needs of our readers. Look for a report in an upcoming newsletter.

Model farming A new Internet-based simulation program that was unveiled at a field day in July can show a farm's impact on the environment. The program, called I-FARM, was developed as part of a three-state project that seeks to develop integrated farming systems with both animals and crops. The Leopold Center is an Iowa partner for the project, Re-Integrating Crop and Livestock Enterprises in Three Northern States.

I-FARM is located on the web at: <http://evo.ae.iastate.edu>

Board assignments Leopold Center director Fred Kirschenmann has joined the governing boards for the Food Alliance and Silos and Smokestacks National Heritage Area. The Food Alliance is a third-party certifier for sustainable agricultural practices and products and operates a Midwest affiliate in Minneapolis. Silos and Smokestacks oversees a National Park Service program covering 37 northeast Iowa counties.

Ethics in agriculture Leopold Center director Fred Kirschenmann wrote about the development of agricultural ethics in *Agroecosystems Analysis*, a monograph published by the American Society of Agronomy, Crop Science Society of America and the Soil Science Society of America. His paper, Ecological morality: A new ethic for agriculture, includes a list of study questions. To receive a copy, contact the Leopold Center, 209 Curtiss Hall, Ames, IA 5001 or e-mail leocenter@iastate.edu

FROM THE FIELD : Dick and Sharon Thompson

Thompsons create legacy in sustainable agriculture

By Laura Miller
Newsletter editor

Other people will tell you much more about the impact that Dick and Sharon Thompson have had on Iowa's sustainable agriculture community than what you'll hear from this quiet couple.

But in nearly 50 years of farming, they have helped Iowa take tremendous strides toward what they prefer to call "an alternative agriculture." Leading by example, they have

- conducted on-farm research for nearly two decades,
- helped found Practical Farmers of Iowa (PFI), and
- welcomed 8,600 visitors from 59 countries to their 300-acre farm in Boone County.

The Thompsons farmed conventionally for 10 years. In 1968, they began to explore alternative methods to reduce synthetic inputs such as pesticides and chemical fertilizer, livestock hormones and antibiotics.

Now they use a ridge-till system and five-year rotation of corn, soybean, corn, oats and hay with fall rye cover crops to reduce erosion, manage weeds and reduce nitrogen losses. The only applied fertilizers are livestock manure and biosolids from the city of Boone

Since they began using alternative methods, they have doubled soil organic matter and cut soil loss by more than half. One of the biggest lessons, however, has been the role of animals in agriculture.

"Our most important community activity is demonstrating the importance of animals on every farm, especially the cow," Dick explains. "Sixty years ago every farm had some cows, there was a need for oats and hay for feed, there

were chores to keep all members of the family busy. Including the cow in the farm operation keeps the farm and communities in balance."

Dick has a master's degree in animal husbandry from Iowa State University and uses a low-input rotational grazing system, selling beef to Coleman's Natural Foods. The hog enterprise, managed by their youngest son Rex, markets "natural" pork to Niman Ranch.

By their calculations, they have averaged a net income of \$113 per acre since 1988, compared to a conventional corn-soybean system that showed a loss of \$42.24 per acre (not including government support payments). The calculations do not include profits or losses for livestock operations. A major portion of the profit is from increased crop and residue income.

"It's pretty dramatic," Dick says, "and many people at first don't believe me."

The Thompsons began to collaborate with the Rodale Institute in 1984, and received additional support from the Henry A. Wallace Institute for Alternative Agriculture. They have participated in other crop and livestock research projects conducted by the Leopold Center, Agricultural Research Service, Iowa State University, National Soil Tilth Lab and the Michael Fields Ag Institute. Each year they publish a 200-page report, *Alternatives in Agriculture*, with findings from their own experiments and observations.

"When we started to modify our farming practices, we found ourselves on the outside of the establishment with no handle on the outside of the door," they write in their 2004 report. "We were given the impression that our observations were not valid since they had not been scientifically and statistically examined.

"By conducting research right on our



Sharon and Dick Thompson helped found PFI in 1985 and remain active in the organization.

own farm, we found that the door to the establishment has been reopened. This type of research is especially valuable to a farmer who wishes to test an idea that does not interest the academic community."

They like to use the term alternative agriculture because it's less threatening than sustainable agriculture. The inevitable question from other farmers is, "Do you mean I'm not sustainable?" "I tell them that no, it's just another way to farm," Dick says.

In addition to hosting PFI field days and educational programs, the Thompsons traveled throughout the United States, Canada, Mexico, France, Italy and Australia to share information about their production system.

"We try to stay positive, and show people the facts rather than opinions," Sharon says. "We've probably had more impact across the oceans than across the road."

The Thompsons have four children and 11 grandchildren. Their youngest son Rex manages their hog enterprise and Roger also farms nearby. Renae (Van Zee) lives in Ankeny and Ryan lives near Ogden.

Center explores Iowa's "Geography of Taste"

A new paper looks at Iowa's geographical and agricultural history to identify traditional foods that may present opportunities for generating additional income for Iowa farmers who help grow them. Rich Pirog, program leader for the Center's Marketing and Food Systems Initiative, has written "A Geography of Taste: Potential for Development of Place-based and Traditional Foods in Iowa." The paper is available on the Center's web site or by contacting the Center at (515) 293-3711, leocenter@iastate.edu

"We are embarked on two large-scale experiments. One is premised on the notion that conservation is something a nation buys. The other is premised on the notion that conservation is something a nation learns." - Aldo Leopold (1937)



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Letter

HIGHLIGHT EVENTS

Mark your calendars

October 7 – Voices of Iowa Farm Women, 7 p.m., Brunner Gallery, Scheman Building, Iowa State University, Ames. The role of women in agriculture will be explored in an 18-minute film featuring the oral histories of several Iowa farm women and a panel discussion. The event is sponsored by the Women, Food and Agriculture Network and Practical Farmers of Iowa. The Leopold Center will host a reception afterwards.

October 28 – Charlevoix Lamb, 3:30 p.m., 2020 Agronomy, Iowa State University, Ames. The Center's Marketing Initiative and the Midwest Agribusiness Trade Research and Information Center (MATRIC) will host this program about lamb raised in the Charlevoix region along the St. Lawrence River in Quebec. This area will be the first place-protected food region in North America.

*"What you design is a portrait of you and your values. Your designs need to be contingent upon the local ecology, not irreversible and not indestructible."
- Author and ecologist David Orr. More on page 8.*



Virtual hoops

Joe Hynek (right), a mechanical engineering graduate student at Iowa State University, demonstrates a new computer application that models the flow of air and gas concentrations inside a hoop building. Glasses help viewers see the projected image in three dimensions. The program was developed by the ISU Virtual Reality Application Center and featured at a national hoops conference in Ames. More on page 7.