

# crop AND/OR FORAGE

SYSTEMS CONTINUED



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

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

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

## Organic farming demonstration projects (eastern Iowa) • 3 years

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

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

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

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

*C. Brummer, ISU agronomy*

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



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





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

## LIVESTOCK MANAGEMENT

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

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

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

### Chariton Valley Beef (CVB) Industry Initiative • 3 years

*J. Sellers, Lucas County Extension, Chariton*

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

### Complementary grazing systems for beef cattle production • 3 years

*K.J. Moore, ISU agronomy*

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

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

*J. Harmon, ISU agricultural and biosystems engineering*

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

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

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

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

### NEW Evaluating pork production systems for niche markets • 3 years

*D. Stender, Cherokee County Extension*

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



COMPETITIVE

### Growing dairy heifers in southwest Iowa • 3 years

*R. Sanson, Clarinda*

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

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

*D. Lay, ISU animal science*

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

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

*D. Busby, Southwest Area Extension Center, Lewis*

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





## NUTRIENT MANAGEMENT

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

*A.P. Mallarino, ISU agronomy*

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



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

*R. Killorn, ISU agronomy*

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

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

*W. Powers, ISU animal science*

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

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

*K. Delate, ISU horticulture and agronomy*

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

### **Livestock and the environment project in Sioux County • 2 years**

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

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

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

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

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



**NEW Optimizing solid manure application by improving distribution • 3 years**

*M. Hanna, ISU agricultural and biosystems engineering*

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

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

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

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

**Reducing anhydrous ammonia application by optimizing distribution • 3 years**

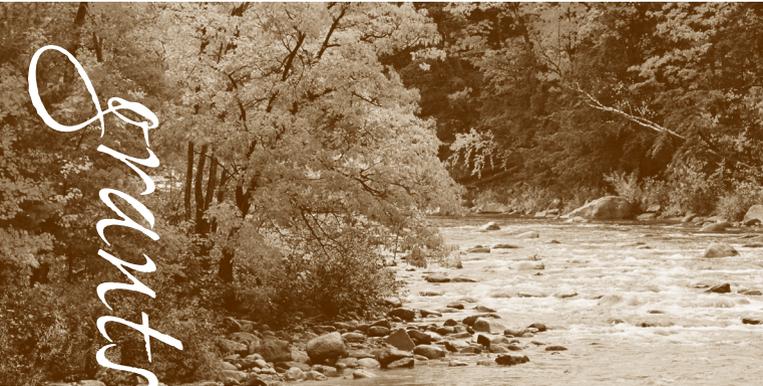
*M. Hanna, ISU agricultural and biosystems engineering*

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

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

*C. Hinrichs, ISU sociology*

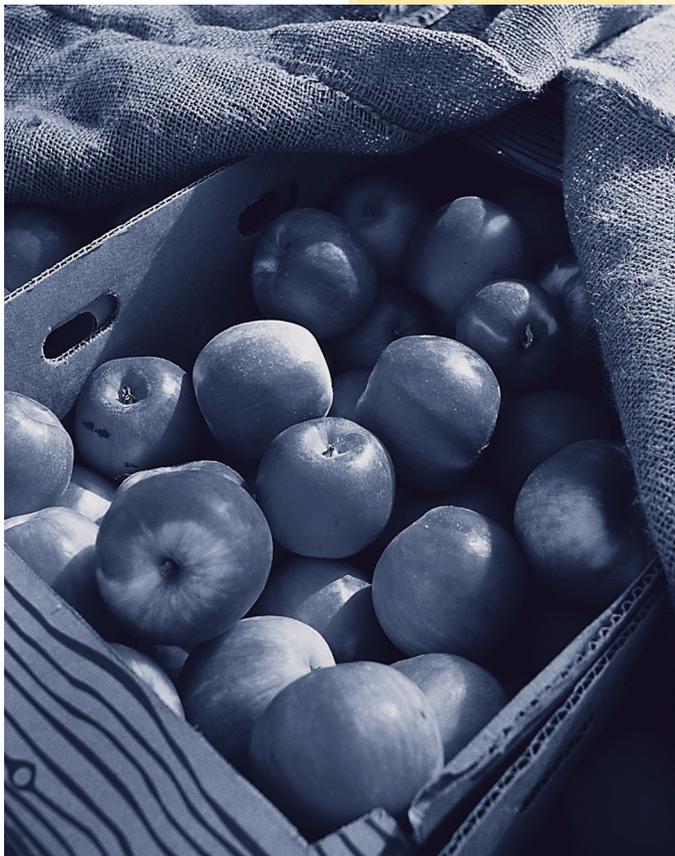
Swine producers in two Iowa watersheds—Raccoon River and Iowa River—have been interviewed about why farmers make the choices they do regarding their manure management systems. Questioning focused on how farmers view manure in their overall farming system, how farmers select a manure handling system for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



Grants

COMPETITIVE





## PEST MANAGEMENT

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

### **Soil amendment effects on crop-weed interactions • 3 years**

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

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

### **Statewide manure management education workshops • 3 years, ending 2000**

*G.A. Miller, ISU agronomy*

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

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

*J. Dekker, ISU agronomy*

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

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

*M. Gleason, ISU plant pathology*

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

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

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

*J. Obrycki, ISU entomology*

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



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

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

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

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

C.A. Martinson, ISU plant pathology

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

## Ecological impact of herbicides associated with transgenic soybeans on spider mites

• 2 years

L. Pedigo, ISU entomology

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



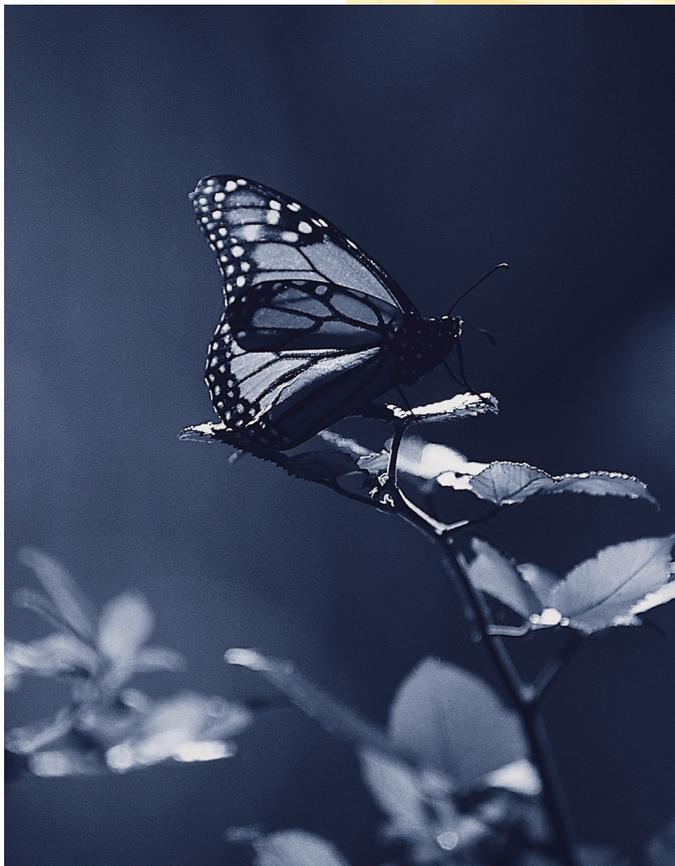
COMPETITIVE



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

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





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

*J. Obrycki, ISU entomology*

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

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

*L.P. Pedigo, ISU entomology*

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

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

*M. Gleason, ISU plant pathology*

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

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

*M. Gleason, ISU plant pathology*

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

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

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

*M. Owen, ISU agronomy*

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



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

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

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

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

*J. Obrycki, ISU entomology*

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

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

*G. Munkvold, ISU plant pathology*

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

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

*J. Obrycki, ISU entomology*

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



Grants

COMPETITIVE

# SOIL AND WATER QUALITY

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

A. Mallarino, ISU agronomy

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

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

R. Kanwar, ISU agricultural and biosystems engineering

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



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

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

A. Van der Valk, ISU botany

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

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

R. Kanwar, ISU agricultural and biosystems engineering

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

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

T. Fenton, ISU agronomy

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

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

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

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



## FINAL REPORT PENDING

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

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

## FINAL REPORTS FILED FOR 13 PROJECTS

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

### Agriculture and communities

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

### Crop management

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

### Livestock and pest management

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



*providing funds for programs  
dealing with sustainable agriculture*

# support

## HOW THE LEOPOLD CENTER SERVES IOWA AND IOWA STATE UNIVERSITY

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

