our mission

The mission of the Illinois Council on Food and Agricultural Research (C-FAR) is to secure additional resources to adequately fund relevant and high-quality research and related outreach programs that lead to profitable, consumer-sensitive, and environmentally sound food and agricultural systems in Illinois and the nation.

C-FAR will foster public confidence in food and agricultural research through public participation in planning and evaluating the process and impact of research activities.

C-FAR

Illinois Council on Food and Agricultural Research

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message from C-FAR

C-FAR BOARD CHAIRMAN TERRY WOLF (LEFT) PRESENTS GOVERNOR GEORGE H. RYAN WITH A TOKEN OF APPRECIATION FOR HIS SUPPORT OF C-FAR AND FOOD AND AGRICULTURAL RESEARCH.

Dear Friends,

It is a pleasure to introduce the Illinois Council on Food and Agricultural Research (C-FAR) 1999 Annual Report. This report captures C-FAR initiatives and progress as well as the opportunities seized during the past year. Every success we achieved resulted from a unified effort. From Governor Ryan to the Illinois General Assembly to the Illinois Department of Agriculture to the vast C-FAR membership to our university partners—all joined forces to continue making our food and agricultural sectors stronger through C-FAR. As the old adage goes, "We are only as strong as our weakest link," and there were no weak links in our chain of partners!

During 1999, a key achievement was securing the fifth year of funding—an appropriation of $15 million. Thanks to Governor Ryan and the Illinois General Assembly, this was a significant success for our state and its residents. As a result of this commitment and the tremendous effort of our volunteer-based organization, Illinois now ranks nineteenth in the nation for its investment in food and agricultural research. Before C-FAR investments started in fiscal year 1996, Illinois ranked twenty-sixth nationally, so the improvement has already been great.

With this success in mind, we also know that challenges and additional opportunities exist. The Food and Agriculture Research Act, the enabling legislation for C-FAR funding, specifies one intent of the act as "Illinois should be among the top ten agricultural states in State funding…." We concur—just as Illinois has successfully provided national leadership for many agricultural initiatives, we can and will do the same for food and agricultural research.

With an ever-increasing membership, we are strongly positioned to address the needs of our food and agricultural systems. The 60+ organizations, 30+ affiliates, and over 140 individual members have clearly expressed their dedication to C-FAR and, most importantly, to its mission and goals. Through this membership, in a unified partnership with our State of Illinois officials, we've demonstrated that Illinois can and is making a difference through its research programs. Sound, industry-driven research, coupled with leading researchers from throughout Illinois and the infrastructure to support their work, will propel our state to national stature. C-FAR stands ready to capture this opportunity.

We've demonstrated that Illinois can and is making a difference through its research programs.

Terry L. Wolf
Chairman of the Board

Kraig A. Wagenecht
Executive Administrator

1999 Highlights

Retreat: In February, about 160 C-FAR members, researchers, and university administrators met to review and update C-FAR's research focus areas. The result of the two-day event was a set of research recommendations that provide more direct guidance for researchers than the previous group of focus areas.

Poster session and reception: Keeping lawmakers and other state officials informed about C-FAR and C-FAR-funded research is a top priority for C-FAR leaders. In March, researchers lined the halls of the State Capitol with displays and information about their work. An evening reception offered an opportunity for C-FAR members to visit informally with legislators, staff members, and other leaders in state government. The poster session has been an annual event.

External grants review: Members of all five working groups attended full-day meetings in March to review and select external proposals to fund, review their respective Strategic Research Initiative (SRI), and review the new research focus areas that were identified at the February retreat. Over 110 members devoted their

who's who

Illinois Council on Food and Agricultural Research

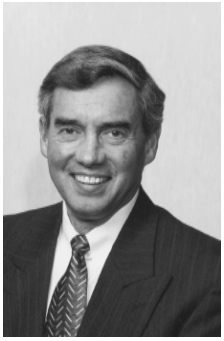
1999 Board of Directors

TERRY WOLF
CHAIR, HOMER

JEFF BROOKS
VICE CHAIR, PROPHETSTOWN

CONSTANCE LOCHER BUSSARD
SECRETARY-TREASURER/
LEGISLATIVE CHAIR, SPRINGFIELD

CAROL KEISER
MEMBERSHIP CHAIR, CARLINVILLE



JACK ERISMAN
RESEARCH CHAIR, PANA

W. LYLE ROBERTS, JR.
PAST CHAIR, BLOOMINGTON

Staff

KRAIG A. WAGENECHT
EXECUTIVE ADMINISTRATOR

LEANN M. ORMSBY
COMMUNICATIONS DIRECTOR

time and efforts at these meetings with the assistance of five scientific reviewers. This followed a considerable amount of "at home" time that members spent reviewing and completing evaluations of their respective working group proposals.

Semiannual meeting: More than 150 people attended the semiannual meeting at the Illinois Department of Agriculture in Springfield in August. Among agenda items discussed was the FY01 state appropriation that C-FAR would request. Members agreed to pursue $18 million, a $3 million increase over FY00. The C-FAR board of directors appointed a committee to investigate options for targeting $3 million to biotechnology and value-added research, two areas that have been identified by state officials as critical for Illinois.

Research evaluation process ad hoc committee: This committee met throughout the year to study how to best accomplish C-FAR's research goals and how C-FAR's membership can become more connected with research progress and the important outcomes that will positively impact the food and agricultural sectors of Illinois.

C-FAR Staff

Rhonda Hunter, Administrative Assistant
Barbara Haegele, Secretary
Amara Kennedy, Secretary

1999 Working Group Leadership

Working Group 1: Expanding Agricultural Markets
Len Corzine, Chair (Assumption)
Harold Wilken, Vice Chair (Danforth)

Working Group 2: Rural Economic Development
Steve Jurgens, Chair (Arthur)
Renee Hunt, Vice Chair (Rochester)

Working Group 3: Agricultural Production Systems
Steve Kasten, Chair (Centralia)
Brent Bidner, Vice Chair (Monticello)

Working Group 4: Human Nutrition and Food Safety
Theresa Stretch, Chair (Ashmore)
Carol Meyer, Vice Chair (Steeleville)

Working Group 5: Natural Resources
Susan Adams, Chair (Atlanta)
Robert Jones, Vice Chair (Chicago)

C-FAR Committees

Research Evaluation Process Ad Hoc Committee
The purpose of this committee is to provide guidance in research-related issues and decisions. Committee members: Gerald Carlson, Chair; Philip Shane; Frank Thorp; Gayle Goold; Don Holt; Derek Winstanley; Anthony Young; Danny Terry; Randy Winter; and George Fahey.

Rules and Procedures Committee
The purpose of this committee is to monitor C-FAR processes and, in consultation with the other committees, develop proposals for improvements as needed. Committee members: Jack Norman, Chair; Stephen Webel; and David Downs.

Nominating Committee
The purpose of this committee is to select a slate of candidates for the C-FAR board of directors to be voted on at the annual meeting. Committee members: W. Lyle Roberts, Jr., Chair; Renee Hunt; Dan Kelley; Karen Little; David Niekamp; and Linda Soltwedel.

University Contacts

George C. Fahey, Jr., Assistant Dean, Research Leadership, C-FAR, College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana-Champaign

Anthony W. Young, Associate Dean for Research, College of Agriculture, Southern Illinois University-Carbondale

J. Randy Winter, Chair, Department of Agriculture, Illinois State University

Danny E. Terry, Chair, Department of Agriculture, Western Illinois University

C-FAR members*

Organizational Members

Association of Illinois Soil and Water Conservation Districts

Audubon Council of Illinois

Business and Professional People for the Public Interest

Champaign County Farm Bureau

DeKalb County Lamb & Wool Producers, Inc.

Farm Credit Services of Illinois

Grain & Feed Association of Illinois

GROWMARK, Inc.

Horsemen's Council of Illinois

Horseradish Growers of Illinois

Illinois Agri-Women

Illinois Association of Drainage Districts

Illinois Association of Meat Processors

Illinois Beef Association - Checkoff Division

Illinois Beef Association - Dues Division

Illinois Chapter of the American Ostrich Association

Illinois Chapter of Organic Crop Improvement Association

Illinois Cooperative Council

Illinois Corn Growers Association

Illinois Corn Marketing Board

Illinois Crop Improvement Association, Inc.

Illinois Dietetic Association

Illinois Farm Bureau

Illinois Farm Business Farm Management Association

Illinois Farmers Union

Illinois Fertilizer and Chemical Association, Inc.

Illinois Forage and Grassland Council

Illinois Grape Growers and Vintners' Association

Illinois Lamb & Wool Producers, Inc.

Illinois Landscape Contractors Association

Illinois Milk Producers' Association

Illinois Nurserymen's Association

Illinois Pork Producers Association

Illinois Seed Trade Association, Inc.

Illinois Society of Professional Farm Managers & Rural Appraisers

Illinois Soil Testing Association

Illinois Soybean Association

Illinois Soybean Program Operating Board

Illinois Specialty Growers Association

Illinois State Beekeepers Association

Illinois State Horticultural Society

Illinois State University Agriculture Alumni Association

Illinois State Veterinary Medical Association

Illinois Stewardship Alliance

Illinois Sustainable Agriculture Society

Illinois Thoroughbred Horsemen's Association

Illinois Turfgrass Foundation, Inc.

Illinois Wheat Association

Institute of Food Technologists, Chicago Section

Kane County Farm Bureau

Lake Vermilion Water Quality Coalition

Macoupin County Farm Bureau

Madison County Farm Bureau

Mason County Farm Bureau

Mercer County Farm Bureau

Orr Research Center Corporation

Rural Partners

Southeastern Illinois Sustainable Agriculture Association

Southern Illinois University Agriculture Alumni Society

The Chicago Farmers

University of Illinois at Urbana-Champaign College of Agricultural, Consumer and Environmental Sciences Alumni Association

Affiliate Members

Central Illinois Agricultural Research Farms, Inc.

Illinois Farm Development Authority

Illinois Institute for Rural Affairs

Illinois State University Department of Agriculture

Illinois State Water Survey

Macoupin County Soil and Water Conservation District

Sangamon County Soil and Water Conservation District

Southern Illinois University at Carbondale - College of Agriculture

Southern Illinois University at Carbondale - Department of Animal Science, Food & Nutrition

Southern Illinois University at Carbondale - Department of Forestry

Southern Illinois University at Carbondale - Office of Economic and Regional Development

University of Illinois at Chicago - College of Pharmacy

University of Illinois at Springfield - Institute for Public Affairs

University of Illinois at Urbana-Champaign - College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign - College of Veterinary Medicine

University of Illinois at Urbana-Champaign - Department of Agricultural and Consumer Economics

University of Illinois at Urbana-Champaign - Department of Agricultural Engineering

University of Illinois at Urbana-Champaign - Department of Animal Sciences

University of Illinois at Urbana-Champaign - Department of Crop Sciences

University of Illinois at Urbana-Champaign - Department of Food Science and Human Nutrition

University of Illinois at Urbana-Champaign - Department of Human and Community Development

University of Illinois at Urbana-Champaign - Department of Natural Resources & Environmental Sciences

University of Illinois at Urbana-Champaign - Department of Veterinary Pathobiology

USDA - Rural Development

Western Illinois University - Department of Agriculture

Western Illinois University - Department of Family and Consumer Sciences

Individual Members

In FY99, C-FAR had more than 140 individual members.

* As of December 31, 1999

quotables

Research Directors at Illinois's Public Agricultural Research Institutions

"The C-FAR program has been most beneficial in expanding the research program at Southern Illinois University-Carbondale (SIUC). Prior to C-FAR funding, the College of Agriculture generated approximately $1 million in external grants. With the less than $2.5 million in C-FAR funds that came to SIUC in FY99, we were able to leverage and increase total external research dollars to nearly $7 million."

Anthony W. Young
Associate Dean for Research
College of Agriculture
Southern Illinois University - Carbondale

"C-FAR has a significant impact on the research programs in the Department of Agriculture at Illinois State University. If you were to take a tour of the University Farm, you would see the influence of C-FAR everywhere—through research projects initiated with C-FAR support, improvements in facilities to support research efforts, and increased research capacity made possible by C-FAR funding. There is no doubt that C-FAR benefits Illinois's citizens through its contributions to both short- and long-term research productivity of the faculty. C-FAR also strengthens our ability to compete for quality faculty members in a national market. The opportunity to compete for C-FAR funding is an attractive element of the recruitment package for our new faculty members."

J. Randy Winter, Chair
Department of Agriculture
Illinois State University

"This year, all university partners were asked to make an accounting of each and every project, both external and internal, funded by C-FAR. At the University of Illinois, 261 projects have been funded since 1996, exclusive of those funded under the Strategic Research Initiatives. An impressive array of outcome-oriented research has been or currently is being conducted on our campus. Major progress has been made in many areas of food and agricultural science. Many of the research findings have immediate practical application while other, more fundamental research works towards the long-term goal of providing pivotal information needed to sustain food and agricultural enterprises of the future. C-FAR, in conjunction with its research partners, can be justifiably proud of its many accomplishments to date."

George C. Fahey, Jr., Assistant Dean
Research Leadership, C-FAR
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana–Champaign

"With C-FAR's support and assistance, the Department of Agriculture at Western Illinois University has been able to embrace valuable research opportunities. C-FAR funds, along with matching funds from our university, are allowing us to strengthen our research efforts by hiring a faculty member in new crops and plant breeding, as well as developing an alternative agriculture research program. These efforts, in coordination with the other agricultural universities in Illinois, state agencies, and organizations, will allow us to address the critical needs of the food and agriculture sector and citizens of Illinois. Without C-FAR's support, these initiatives would not have come to fruition."

Danny E. Terry, Chair
Department of Agriculture
Western Illinois University

research programs

Fiscal Year 1999

In 1995 the Illinois General Assembly and Governor Edgar passed the Food and Agriculture Research Act, the important enabling legislation that provides the framework for C-FAR funding and research activity. In FY99 the C-FAR appropriation was $15 million.

Funds are allocated to three C-FAR research programs:

Strategic Research Initiatives (SRIs)

Team-based research efforts providing a targeted, multidisciplinary, and multi-institutional approach for addressing major issues and concerns of the Illinois food and agriculture industry and consumers.

Internal Competitive Grants Program

Funds allocated directly to the University of Illinois at Urbana-Champaign, Southern Illinois University-Carbondale, Illinois State University, and Western Illinois University for food and agriculture research. Each university sponsors an internal competitive grants program to solicit creative, innovative, high-quality research that addresses C-FAR priorities.

External Competitive Grants Program

As stipulated in the enabling legislation, a minimum of 15% of the total C-FAR appropriation is allocated for an external competitive grants program open to qualified researchers at nonprofit institutions, organizations, or agencies in Illinois. The C-FAR working groups assist in evaluating and selecting the proposals for funding.

C-FAR members are committed to the success of these research programs, and they volunteer many hours of their time providing valuable direction in how to use the C-FAR investment. The connection between Illinois's food and agricultural community and research institutions provides the strength and unique value of the C-FAR organization. Member participation follows a "working group" design with research organized into the following five focus areas:

- Expanding agricultural markets
- Rural economic development
- Agricultural production systems
- Human nutrition and food safety
- Natural resources

SRI Strategic Research Initiatives

In 1998, C-FAR established Strategic Research Initiatives (SRIs) to implement a targeted, multidisciplinary, and multi-institutional approach to addressing major issues and concerns of the Illinois food and agriculture industry and consumers. In FY99 and again in FY00, $5 million was allocated to the SRI effort. The five research initiatives include Information Systems and Technology ($775,000), Rural Community Development ($900,000), Swine Odor and Waste Management ($1,250,000), Food Safety ($775,000), and Water Quality ($1,300,000). Food and agriculture researchers at the University of Illinois at Urbana-Champaign, Southern Illinois University-Carbondale, Illinois State University, Western Illinois University, and other research entities in Illinois are coordinating their efforts to develop practical outcomes.

Information Systems and Technology

Sally Thompson, SRI leader, University of Illinois at Urbana-Champaign

More innovative risk-management tools, interactive resources, and timely information are coming online in response to the Information Systems and Technology Strategic Research Initiative (IT-SRI). The initiative targets four areas: farm and agribusiness tools, water quality and natural resources, community and consumer interests, and research tools.

The IT-SRI launched more than 30 projects last year involving over 60 researchers from the University of Illinois, Illinois State University, Southern Illinois University-Carbondale, Western Illinois University, Illinois Scientific Surveys, and American Farmland Trust. IT-SRI activities and projects are reported on the Internet (http://web.aces.uiuc.edu/sriit).

The Web and other technologies offer ways to do more with information—not only to make information more available, but also to make it available in creative and integrated ways that add value. By providing inputs, users can obtain informational outputs that are directly relevant to them.

Many producers are already using the new online *Plant Management and Crop Development Bulletin* (http://www.ag.uiuc.edu/cespubs/pest/) to stay current on scouting reports, pest predictions, and management advice. Interactive tools are planned to assist in related decision making. For example, the weed identification and herbicide decision tool, which matches herbicide options to weed management goals, was available for use by farmers last spring.

Several IT-SRI websites developed and used by the agricultural community last year are being combined into a centralized Farm Decision Outreach Central (FARM.DOC) site designed to provide Illinois farmers with more comprehensive risk-management information and analysis. FARM.DOC (http://web.aces.uiuc.edu/farmdoc/) will offer an integrated framework for six key areas: the supply and demand outlook, farm financial performance evaluation benchmarks, crop insurance information, marketing alternatives, major commodities' production costs, and legal information.

More than one million hits per month on the Nutrition Analysis Tool (NAT) prove how interested the public is in nutrition. The only free nutrition tool on the Internet, NAT (http://web.aces.uiuc.edu/food-lab/) is being further developed to offer additional user-friendly features and cover a

broader range of food options, including ethnic, specialty, convenience, and diet foods, as well as functional foods valued for health-promoting effects. A key goal of project developers is to help Illinois citizens make more informed choices, improve their nutrition behaviors, and consequently, improve their health.

One of the new IT-SRI activities for FY00 is development of an interactive online agronomy handbook. Published for three decades, the *Illinois Agronomy Handbook* is valued for its Illinois-specific crop production information. Publishing the handbook online will allow for inclusion of video, interactive databases, and other Web-based tools that can provide instantaneous and relevant information to producers, Extension specialists, and crop consultants. For instance, customized fertility and herbicide recommendations, replanting dates, and seeding rates could be figured online from information farmers provide. The site will include an e-mail expert service.

The IT-SRI goal is to improve the availability, integration, delivery, and use of information throughout the global food and agricultural systems, with special focus on Illinois. Funding is provided by C-FAR, with additional support from U of I Extension and the U of I Functional Foods for Health (FFH) Program. Most of the activities the IT-SRI undertakes are supported by other organizations and funding sources as well. Many IT-SRI projects receive support from stakeholder groups and other agencies in the form of in-kind contributions. IT-SRI projects have been presented at several public events, such as Global Soy Forum, InfoAg99, and U of I Agronomy Day.

In FY00 and beyond, the IT-SRI will focus on combining and developing activities funded in FY99 into more integrated and comprehensive information systems. Each of the initiative areas represents integrated programmatic combinations of projects that were funded separately in FY99, augmented with new activities in FY00. The integration and prioritization of future activities was one of the key IT-SRI accomplishments in FY99.

The researchers involved with this SRI work closely with members of C-FAR's working group 1, Expanding Agricultural Markets.

Rural Community Development

Raymond Lenzi, SRI leader, Southern Illinois University-Carbondale

The Rural Community Development Strategic Research Initiative (RCD-SRI) focuses primarily on the Illinois Farming Alternative and Rural Revitalization Methods (I-FARRM) project, an applied research and technical assistance project that aims to directly impact the Illinois agricultural and rural economy. The I-FARRM project is significantly affecting areas as diverse as corn, soybeans, aquaculture, and wineries. I-FARRM comprises four distinct projects and utilizes teams of researchers to reach its goals.

The four component projects of I-FARRM are the Rural Development Opportunities (RDO) project; the Increasing Farm Income and Improving Rural Areas Through the Production, Marketing and Processing of High Value Agricultural Commodities (VALUE) project; the Rural Enterprise and Alternative Agricultural Development (READI) project; and the Rural Economic Development Tool Box (EDTB) project.

These projects and the project researchers at the University of Illinois at Urbana-Champaign, Southern Illinois University-Carbondale, and Western Illinois University have made significant contributions in the areas of research publications, outreach and research technical assistance, and economic development impacts of SRI research.

Publication achievements from this SRI include:

- Six fact sheets about specialty corn and soybean opportunities have been produced, and more are in development.
- A book about new generation agricultural cooperatives is scheduled for publication by the end of 2000.
- A study on Illinois farmland, use, price, and profits has been conducted.
- A winery business plan template has been developed.
- A rural community foundation handbook and template have been developed.
- A geographic information systems (GIS)-based siting model for wineries and vineyards has been developed. (GIS is a computerized approach to mapping and siting.)
- Twenty-two business research plans and feasibility studies have been developed for agri-enterprise business startups and expansions.

Outreach and research technical assistance achievements include:

- More than 2,000 farmers and rural entrepreneurs have attended educational seminars, conferences, and workshops where SRI research results were shared. These meetings have been held throughout Illinois, including Carbondale, Effingham, Macomb, Eureka, Champaign, Springfield, Bloomington, and Ullin.

- More than 150 visits have been made to farmer entrepreneurs to provide information about research results and to provide applied and customized research and technical assistance.
- The I-FARRM website (http://www.siu.edu/~i-farrm/index.htm) has received several thousand hits.

Economic development impacts from efforts of the Rural Community Development SRI include:

- Eight fishery and winery startups and expansions. Over a 10-year period, the estimated sales for these eight businesses are more than $22 million.
- More than $10 million in total investments have been secured through business plans and feasibility studies.
- Approximately 100 to 125 jobs have been or are expected to be created.

The researchers involved with this SRI work closely with members of C-FAR's working group 2, Rural Economic Development.

Swine Odor and Waste Management

Michael Ellis, SRI leader, University of Illinois at Urbana-Champaign

Issues relating to swine odor and waste are of major concern to the general public and are proving to be an important element in the future evolution of the Illinois swine industry. The swine industry is an extremely important sector of agriculture in the state, contributing over $1 billion annually to the economy. Illinois ranks fourth in the nation in terms of the size of the industry.

The overall objective of the Swine Odor and Waste Management Strategic Research Initiative (SO&WM-SRI) is to support the continued development of an environmentally sustainable, socially acceptable, and economically viable swine industry within Illinois through a broad-based, integrated program of research relating to swine odor and waste. This goal is being addressed through a multidisciplinary program involving a team of more than 25 scientists from the University of Illinois, Illinois State University, Southern Illinois University, and the Illinois State Water Survey.

Although a limited amount of research in the waste management area was under way at institutions in Illinois before the SRI was conceived and put in place, this initiative has allowed for the assembly of a team of scientists with all of the skills to attack a complex and involved problem in an integrated manner.

A total of 27 projects were funded in the first year, and these were in five research areas: (1) Odor Control and Management, (2) Systems Design and Management, (3) Swine Nutrition, (4) Waste Processing and Handling, and (5) Legal Issues and Community Considerations. Scientists from a wide array of backgrounds and with a range of expertise and experience are involved in the initiative, including crop and animal scientists; agricultural, mechanical, chemical, and environmental engineers; analytical chemists; sensory analysis specialists; economists; social scientists; a lawyer; and an atmospheric physicist.

During the first year of the SRI, a variety of projects were carried out in the five research areas. In the area of Odor Control and Management, efforts focused on developing appropriate procedures for sampling and measuring odor from swine operations, a primary challenge for successful research in this area. Researchers developed a computer model for predicting the dispersion of odors around swine operations. They also tested a range of technologies, including dedusters, wet scrubbers, oil spraying, catalytic converters, and lagoon covers, for reducing dust and odor emissions from swine units.

The Systems Design and Management group developed a database of published research and information and implemented systems for information delivery, including a website (http://sowm.outreach.uiuc.edu). In addition, the group developed and tested computer models for predicting nutrient and odor outputs from units and for comparing the economics of various odor-reduction strategies. A research center was established at the University of Illinois to carry out primary testing of odor-reduction technologies.

The Swine Nutrition Program focused on reducing phosphorus excretions through the use of an enzyme (phytase) that increases phosphorus availability in corn and soybean meal; corn varieties with high phosphorus availability were developed. In addition, how the protein component of the diet affects odor production was evaluated. A number of waste-processing technologies have been evaluated, including composting and digestion. A database of federal and state laws relating to swine waste and odor has been compiled. Information available to the general public on these issues has been reviewed.

This SRI is still in its infancy, but there have been a number of notable outcomes: development of methods to sample and quantitatively measure swine odor; an increased understanding of the link between dust and odor; development and initial evaluation of a number of promising odor-reduction and waste-processing technologies; practical approaches to reducing phosphorus output from swine operations; development of a literature database relating to swine waste and odor, including a compilation of federal and state laws; and an improved awareness of the sources and types of information available to the general public on these issues.

Perhaps the major success of the SRI to date is the increased communication and collaboration between the scientists involved, which has led to improved awareness of the issues, increased focus of the research, and enhanced efficiency of the overall research

program through a sharing of key resources.

The researchers in this SRI work closely with members of C-FAR's working group 3, Agricultural Production Systems.

Food Safety

Jeanette Endres, SRI leader, Southern Illinois University-Carbondale

Clare M. Hasler, Functional Foods leader, University of Illinois at Urbana-Champaign

The Food Safety Strategic Research Initiative (FS-SRI), established originally as the Food Safety and Functional Foods SRI, has the following mission and vision: "To promote multidisciplinary research that leads to the production of safe and healthful foods. Information about food safety and functional foods will be disseminated through outreach programs enabling the public to make informed choices about foods for optimal health. Consumers will have confidence that the foods they ingest will be safe and provide health-promoting benefits."

During FY99, research, education, and outreach activities for this SRI involved 14 researchers from the Illinois Institute of Technology; six academic units from the University of Illinois at Urbana-Champaign (UIUC) (Agricultural Economics, Animal Sciences, Commerce and Business Administration, Food Science and Human Nutrition, Microbiology, and Veterinary Medicine); Southern Illinois University-Carbondale (SIUC); Western Illinois University; Silver Oaks Communications (Moline, Illinois); and Consumer Insights (St. Louis, Missouri).

C-FAR's Food Safety working group, in conjunction with experts in food safety and functional foods, worked with SRI leader Jan Endres, professor and associate director for the SIUC College of Agriculture Soy Center, and Clare M. Hasler, executive director of the U of I Functional Foods for Health (FFH) Program, to develop the following food safety and functional foods objectives:

Food Safety

- Establish validated, simple, and cost-effective tests and tools to ensure the safety of food products
- Develop techniques for *Salmonella* detection and control for use by Illinois producers
- Develop Hazard Analysis Critical Control Points (HACCP) training materials for consumers, retailers, and noncommercial facilities to enable them to identify potential food-handling practices that will help prevent foodborne illness
- Establish kiosks in food safety to determine their future effectiveness at the retail level
- Market an educational curriculum for school children on food safety
- Help establish a FoodNet through partnerships with the Illinois departments of public health and agriculture
- Update the American Dietetic Association (ADA) position paper on food safety, and provide the dietetics community with current information from research within the SRI
- Distribute food safety media kits to 100% of the Illinois Dietetic Association's (IDA) local districts

***Functional Foods*—**These are foods or food ingredients that provide health benefits beyond basic nutritional needs and may reduce chronic disease risk and promote health.

- Reduce mammary cancer in animal models through multidisciplinary research on SRI-identified functional foods (soy, grapes, conjugated linoleic acid [CLA] in beef and milk)
- Enable health professionals to identify soy as a complete protein, and recommend using soy as part of an integrated dietary approach to lowering cardiovascular disease
- Educate an Illinois target population with the goal that 10% will be able to identify three functional foods and associate one health benefit with each of them

- Market a functional food guide pyramid
- Distribute functional food media kits to 100% of the IDA's local districts

In the two years since the FS-SRI was established, significant achievements and progress are already visible. Curriculum and food safety outreach activities have gained considerable attention throughout the state. Public service announcements (PSAs) have aired on television networks, and a delightfully entertaining educational kiosk has been developed and displayed at several public events. In addition, HACCP's efforts to ensure food quality and safety have been coordinated with the Illinois departments of public health and agriculture.

Functional foods research has demonstrated that grape juice can significantly reduce mammary tumors in mice, has made notable progress toward the goal of sampling beef and milk around the state of Illinois for CLA content, and has established models to study soy's effect on bone health and anticancer benefits. Functional foods media/education kits, which include a 14-minute video and color overheads, have been distributed to over 175 Illinois dietitians and Extension educators. In addition, the FFH website has been updated to include new consumer health information on functional foods.

The researchers involved with this SRI work closely with members of C-FAR's working group 4, Human Nutrition and Food Safety.

Water Quality

SRI team leaders:

James Westervelt, University of Illinois at Urbana-Champaign – Modeling

Robert Hoeft, University of Illinois at Urbana-Champaign – Best Management Practices

George Czapar, University of Illinois Extension – Best Management Practices

Mark David, University of Illinois at Urbana-Champaign – Mass Balance

During 1999 the Water Quality Strategic Research Initiative (WQ-SRI) focused primarily on developing a carefully considered program. Several dozen researchers representing universities, state agencies, and industry availed themselves of the opportunity to attend nearly a dozen separate meetings to collectively shape the WQ-SRI. Research interests covered watershed management, nitrogen mass balance, phosphorus runoff, drinking water, economic impacts of best management practices, tile drainage, development of water-quality simulation models, social issues, state and local policies, and testing and evaluation of best management practices. The research community realized early that the available funds would be inadequate to meet all of the goals and objectives of the participating scientists. The challenge to focus and shape the SRI persisted, and at the close of the fiscal year, most of the FY99 funds had not been allocated.

Research efforts that were funded in FY99 included a suite of projects jointly funded by the IT-SRI—these covered Web-based outreach, Illinois GIS data assembly, foundation work for a joint software design and development project, and demonstrations using the Department of Natural Resources (DNR) Pilot Watersheds. Another SRI-funded project developed reference conditions for numeric nutrient criteria and standards that will be completed by the State Water Survey. In the spring of 1999, another project was undertaken to investigate factors affecting phosphorus loss from agricultural soils.

Funds were also allocated in the spring to three teams: $550,000 for mass balance, $550,000 for modeling, and $270,000 for best management practices. These funds combined FY99 funds with the new FY00 funds. The teams self-organized and allocated funds to individual projects during the fall of 1999. The focus areas for each of these teams is expected to be as follows:

- **Modeling:** decision support system toolbox development, tile modeling at the watershed scale, tile modeling at the farm scale, and erosion modeling.
- **Best Management Practices (BMP):** tile management BMP effectiveness and site-specific farming BMP development.
- **Mass Balance:** study nitrogen movement on Illinois agricultural landscapes through assembling a number of nitrogen-tracking experiments at a small number of sites.

The researchers involved with this SRI work closely with members of C-FAR's working group 5, Natural Resources.

internal and external research projects

C-FAR research projects, excluding the SRIs, are typically funded as one- or two-year efforts. Funding is based on a fiscal year from July 1 to June 30. Emphasis is placed on providing valuable outcomes that can be immediately utilized by the Illinois food and agriculture community and consumers. Dissemination and outreach efforts are highly encouraged.

The majority of C-FAR research funds are allocated to the four food and agriculture research universities in Illinois on a percentage basis per the enabling legislation: University of Illinois at Urbana-Champaign (82%), Southern Illinois University-Carbondale (11%), Illinois State University (4%), and Western Illinois University (3%). Each university solicits requests for proposals (RFPs) as part of an internal competitive grants program to select innovative, high-quality research that addresses the needs of the Illinois food and agriculture community and consumers as defined by C-FAR.

In order to encourage and support research efforts from state agencies and organizations outside of the four universities, an external competitive grants program solicits RFPs from non-profit research entities within the state. A minimum of 15% of the C-FAR allocation is dedicated by legislation to support these research projects.

The following sections provide a report on the internal and external research projects that were completed in 1999, as well as an accounting of the research projects that were funded for FY00.

crop systems

Molecular Approaches to Development of High-Oil, High-Oleic Corn Hybrids

High-oil, high-oleic-acid corn benefits the grower due to its premium price. Research suggests that oleic acids are healthier for human consumption, and they also have desirable characteristics for cooking. This project focused on developing genetic progenies that segregate for oil and oleic acid concentrations in the maize kernel. The ultimate objective was to develop high oleic acid and high oil through antisense or co-suppression technologies. To date, a number of significant quantitative trait loci (QTL) for oil and fatty acid concentrations were identified in selected progenies.

Torbert R. Rocheford, John W. Dudley

Crop Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Development of Corn Inbreds with Unique Genes for Resistance to Gray Leaf Spot

The least expensive and most environmentally responsible control for gray leaf spot of corn is genetic resistance. This project allowed development of resistant inbred lines with agronomically acceptable characteristics. Seven resistant lines were selected for testing based on yield and disease resistance. The resistance in these lines was not great enough to completely control the disease in all situations; however, it is good enough to protect yield in most conditions in Illinois. Hybrids will be available to farmers shortly.

A C-FAR External Competitive Grants project

Donald G. White, John W. Dudley

Crop Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Conversion of Corn By-Products into High Value Activated Carbon

Ethanol, a corn-derived fuel, reduces air pollution, raises octane, and helps reduce the nation's dependence on imported oil. Gasoline blended with ethanol burns cleaner, thereby reducing carbon monoxide emissions by up to 25% while maintaining vehicle performance. The objective of this study was to develop commercial-grade activated carbon from corn stillage to enhance the overall economics of ethanol production. Improving the economics of ethanol production would expand current markets for Illinois corn and would strengthen the Illinois ethanol industry as a whole. Several types of carbon were developed in this study. Perhaps the most promising from a commercial standpoint was a high surface-area carbon that performed very well in an automotive emissions control application. This study has shown that an activated carbon made from corn stillage compares favorably with the commercial wood-based carbon by up to 30% in higher absorption capacity.

A C-FAR External Competitive Grants project

Anthony A. Lizzio

Illinois State Geological Survey

Champaign, Illinois

Molecular Markers Associated with Resistance to Gray Leaf Spot of Corn

Investigators have identified an inbred line of corn that has high levels of resistance to gray leaf spot but poor agronomic characteristics. When used in a breeding program, this inbred strand contributes resistance to agronomically superior, but gray leaf spot susceptible, inbreds. Newly developed resistant inbreds have yields as high as commercially grown inbreds in hybrid combinations; however, they are not as resistant to gray leaf spot as the original source of resistance.

Donald G. White, John W. Dudley

Crop Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Evaluation of Yield Potential and Fertilizer Reduction with Variable Rate Technology

Corn producers who use variable rate technology (VRT) can potentially reduce total fertilizer input through fostering a more efficient use of nutrients applied. Use of VRT would increase profits and reduce the levels of nitrogen and phosphorus that are applied as commercial fertilizers and ultimately run off into surface and ground waters. Based upon project results, VRT for nitrogen fertilizer should be considered if any of the following conditions exist within a cornfield: variation of soil types within a field for both nonirrigated and irrigated fields, variation of soil depth within a field for both nonirrigated and irrigated fields, variation of initial soil fertility within a field for both nonirrigated and irrigated fields, or irrigated fields in which the irrigation system does not apply irrigation water to the entire field.

Kevin D. Baker
Agriculture
Illinois State University

Reducing Nitrogen Runoff in Corn

Differences in herbicide resistance, nitrogen use efficiency, nitrogen content, plant growth and composition, and grain yield of GDH (glyceraldehyde-3-phosphate dehydrogenase)-transgenic corn under field conditions were evaluated in five locations with three rates of nitrogen application. As a result, 10% more nitrogen was harvested from the transgenic crop. Maturity dates were 3 to 5 days later for GDH transgenics than for nontransgenics, but this difference was sufficient to explain only about 2% of the yield and harvested nitrogen gain. Greenhouse studies evaluated transgenic corn growth improvements consequent on *gdhA*. Early growth was evaluated. Root mass, shoot mass, height, nitrogen content, and free amino acid composition were increased by *gdhA* expression. Therefore, crop yield, nitrogen content, and efficiency of nitrogen utilization is expected to be improved under field conditions. Residual mineral nitrogen in the soil leachate was determined to be lower in *gdhA*-transgenic plants than in the controls.

David A. Lightfoot
Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale

Assessing Agronomic and Economic Impact of Landscape Waste Application to Corn

The long-term objective of this project was to determine the agronomic and economic impacts of continuous urban leaf waste application to agricultural cropland. Raw urban leaf waste from the town of Normal, Illinois, has been applied annually since 1995 to 18 plots at the Illinois State University Farm. Leaves have been applied at depths of 3, 6, and 9 inches. Six additional plots received no leaves and served as control plots. Since 1996, corn has been planted uniformly in all 24 plots with fertilizer applications designed to generate yields of 150 bushels per acre. Following the removal of each crop, yields were computed, grain moisture content was measured, and soil tests were conducted.

There were no significant differences in measures of organic matter, phosphorus, potassium (K), magnesium (Mg), calcium (Ca), soil pH, cationic-exchange capacity, nitrate, and base saturation percentage of K, Mg, and Ca among treatments in 1995. Analysis of currently available data has indicated that there have been significant increases in organic matter, potassium, magnesium, nitrate, and calcium associated with leaf applications since 1995. It was also apparent that soil pH and cationic-exchange capacity had increased, while there was no evidence that base saturation percentage of K, Mg, or Ca had been affected and only weak evidence that leaf application could affect yield and moisture content of grain. In 1996, 1997, and 1999, there were no significant differences in yields. However, in 1998, plots with no leaves generated higher yields than plots with 9 inches of leaves. In 1998 and 1999, there were no differences in the moisture content of harvested grain, but in 1997, grain from plots with 9 inches of leaves had higher moisture levels than grain from plots with no leaves. Leaf application may also enhance soil moisture retention, even at depths of 5 feet. Results of this project indicate that leaf application to cropland can be mutually beneficial to municipalities and corn producers.

Rick C. Whitacre, Kerry W. Tudor, Wilbur W. Chrudimsky
Agriculture
Illinois State University

Corn Starch Yield Calibrations with Near Infrared Reflectance Spectrophotometry (NIR)

Extractable starch content of dry corn ranges from 54% to 71%. These low percentages come from corn dried with drying air in excess of 100° Celsius. However, that drying temperature is commonly used in the grain industry because efficiency for a dryer with a given airflow increases as drying temperatures increase. Thus, elevator managers are uncertain of whether to run

their dryers at a high temperature to maximize fuel efficiency or to sacrifice fuel efficiency to improve starch extractability. This research formulated calibrations for predicting extractable starch using NIR (near infrared reflectance) and NIT (near infrared transmittance) technology. The final report provides elevator managers and purchasers of corn for wet milling a tool for making decisions about optimal drying temperatures.

Marvin R. Paulsen, Steven W. Mbuvi
Agricultural Engineering
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Transformation of Sterols from Soybeans

Cardiovascular disease (CVD) is the number one killer of human adults in developed nations of the Western world. More than 960,000 Americans die of CVD each year, accounting for 42% of all deaths in the United States. One in four Americans have CVD. Heart disease and stroke account for almost 6 million hospitalizations each year and cause disability in almost 10 million Americans aged 65 years and older. This project worked to develop a process that uses microorganisms to transform phytosterols present in soybeans and other oil-seed crops into phytostanols. Consumption of phytostanols interferes with the uptake of cholesterol in food and leads to lower blood cholesterol levels. Certain microorganisms have been described that are able to transform phytosterols into phytostanols. This research attempted to identify those microorganisms that could efficiently transform soybean phytosterols into phytostanols on an industrial scale to increase the supply of phytostanols for use as food additives or supplements. Microorganisms have been identified that transform phytosterols in soybeans into phytostanols. Currently the investigators are working to isolate and determine their taxonomy and to learn how they metabolize soybean phytosterols. These microorganisms will be used to develop a process for producing phytostanols by large-scale industrial fermentation of soybeans.

John D. Haddock, Microbiology
Brian P. Klubek, Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale

Mapping SDS Soil and Site Factors

Soybean sudden death syndrome (SDS) is one of the soilborne diseases, and the definitive factors that influence the disease in the field have not been fully

identified. Reports indicated that SDS reduced soybean yield by more than 3.7 million bushels in 1996, and the loss was estimated to be three times higher in 1997, costing an estimated $60 million nationally. This project was designed to evaluate the impact of SDS on soybean yield, to compare the selected soil and environmental factors collected from the SDS symptomatic and nonsymptomatic areas, and to identify factors that cause the spread of the disease.

Results indicate that SDS disease is inversely related to soil macroporosity and proportionally related to moisture content at field capacity. In general, waterlogged areas with poor drainage and/or compaction were more vulnerable to the disease. Results also indicate that for every 10% increase in the SDS disease index (incidence x severity), there will be an approximately 7% decrease in soybean yield. Actions can be taken to correct some of the soil and environmental factors that are favorable to the disease, such as increasing soil macroporosity, loosening compact soil layers, and providing better surface and internal drainage of the soil profile.

S.K. Chong, Y. Luo, E.C. Varsa, O. Myers, P. Gibson, D. Lightfoot, and M. Schmidt

Plant, Soil and General Agriculture

College of Agriculture

Southern Illinois University-Carbondale

Hydrogenation of Soybean Oil by a Novel Low Temperature

The aim of this research was to develop a novel low-temperature process for hydrogenating soy oil. Such a process will prevent the production of undesirable trans isomers and cyclic aromatic fatty acids. Since these compounds have been shown to be hazardous to human health, it is essential that a new method of hydrogenation be developed to maintain current levels of soy oil consumption and encourage increased consumption in the future.

Shashi B. Lalvani

Mechanical Engineering and Energy Processes

Hea-Ran Ashraf, Bruce Jacobson

Animal Science, Food and Nutrition

College of Agriculture

Southern Illinois University-Carbondale

Development of Novel Oat Varieties in the Management of Human Celiac Disease

Oat cultivars were screened to determine if differences occur in their potential for inducing human celiac disease. The prolamin proteins (avenins) in oat seeds cause people to develop the disease. Two oat lines were found (Potaroo from Australia and Whitestone from North Dakota) that displayed little or no cross-reaction in the screening assay, indicating that these cultivars have a low tendency to induce human celiac disease.

Donald P. Briskin, Fredric L. Kolb, Crop Sciences

Margaret C. Gawienowski, Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Program in Agrigenomics

Objectives of this project included identifying molecular markers to differentiate weedy Amaranthus species and intraspecies hybrids in order to aid in the development of weed management strategies. In addition, investigators sought to provide a clearer understanding of the genetic and biosynthetic mechanisms involved in the accumulation of sugars in maize kernels with the goal of incorporating a gene that would increase the sugars in more varieties of sweet corn. This grant supported the Biotechnology Center to develop high throughput DNA fragment analysis methods. This program has enabled several investigators to perform genetic analysis on species with limited tools for marker genotyping (fruits, vegetables, weeds, soybeans).

Harris A. Lewin, Animal Sciences

Hans P. Blaschek, Food Science and Human Nutrition

Schuyler S. Korban, Natural Resources and Environmental Sciences

Torbert R. Rocheford, Lila O. Vodkin, Crop Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Automated Disease Diagnosis in Food Crops I and II

Each year, approximately 8% to 16% of Illinois's soybean yield is lost to disease at a cost of $200 to $400 million. Even greater soybean losses result from weed pressure, costing about $400 to $600 million annually. Purchasing an upgrade to a PCR (polymerase chain reaction) fluorimeter accelerated the process of improving crop resistance to soybean cyst nematode and sudden death syndrome and facilitated increases in yield and health benefits (functional food components) in new soybean varieties. This new equipment was used to facilitate marker-assisted selection for disease resistance, disease organism detection in roots, and weed science. This equipment also allowed for the screening of thousands of plant lines with molecular markers within a single season. This capacity is necessary to support selection in several breeding programs. Investigators worked to rapidly detect and quantify root pathogens in field samples and to evaluate new herbicide-resistant weeds.

The ability to select for resistant cultivars increased from 10,000 per year to 100,000 per year, making new resistant soybean cultivars available to growers sooner. It was determined that the susceptibility of Roundup®-resistant soybeans to SDS is caused by linkage drag, not the gene or its physiology. Improving crop resistance to soybean cyst nematode, sudden death syndrome, and herbicide injury in new soybean varieties will save grower losses of soybean yield by approximately 4% to 8% per year, worth $100 to $200 million.

A C-FAR External Competitive Grants project

David A. Lightfoot, J. Russin, B. Young
Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale

Automated Disease Protection in Food Crops

Automated equipment was purchased to increase productivity of the soybean breeding program. Researchers used a PCR fluorimeter to detect the major gene for soybean cyst nematode (SCN) resistance, Rhg1. This team has screened 15,000 plant lines for this gene, most by the conventional microsattelite markers. Selections were made for the SIUC breeding program, Dekalb genetics, and Limagrain. Selection for Rfs1, the major gene for SDS resistance, can be accomplished using a new marker, SIUC-SATT122. The marker correlates 97% of the time with SDS resistance. It will be used to combine high-yield potential with resistance to SDS and SCN through the selection of rare recombinants. The marker SIUC-SATT122 is being adapted for use with the fluorimeter.

David A. Lightfoot
Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale

New Genes for Sustainable Agriculture

Transgenes are used to improve crop plants and to promote positive modifications to current crop production systems. Researchers focused on genes capable of improving yield by improving plant disease resistance, yield, quality, nitrogen partitioning, nitrogen relations, and desiccation tolerance. New genes are needed to improve food-crop productivity and sustainability. The strategy for crop improvement has been to identify weed genes that can improve food crops. Two genes are being studied at SIUC: the gene that regulates nitrogen partitioning (gsr), and the gene that increases general root resistance to disease (rrd). Information from this study is being used by the seed industry to generate genetically modified soybean and corn that have higher values for end products and users. As a result, a price premium of $0.5 to $1 per bushel should accrue to growers.

A C-FAR External Competitive Grants project

David A. Lightfoot
Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale

animal systems

Early Weaning and Limited Intake to Improve Beef Quality

Researchers sought to identify the mechanism for repartitioning beef cattle's maintenance requirements through programmed feeding of the animals. Programmed feeding requires cattle to be more efficient in feed conversion, thus allowing more nutrients to be used for growth and finishing. A programmed-feeding regimen affects internal organ weight, demonstrating the ability to repartition the maintenance requirements of the growing animal (since the internal organs account for the largest percentage of maintenance). Restricting the feed given to developing replacement heifers affected the total voluntary intake during a readjustment period, allowing producers to raise replacement heifers that require less feed to satisfy maintenance requirements in the pasture.

Dan B. Faulkner, Robert S. Wells, Animal Sciences

Michael A. Mazzocco, Agricultural and Consumer Economics

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Improving the Quality and Consistency of Illinois Beef Cattle

Consumption of beef has declined primarily due to inconsistent quality of beef products. A National Cattlemen's Beef Association study concluded that producers lose up to $270 per cattle marketed due to quality and uniformity problems. The "Beef 2000" program was developed to educate producers and beef-industry leaders about strategies for improving the quality and consistency of beef production. Eight intensive three-day training sessions were held with over 250 of Illinois's leading producers attending. One hundred percent of the participants responded that they gained base production knowledge they can apply to improve the quality of the beef they are producing. A new program, "Farm to Plate," was initiated as a result of the training programs. "Farm to Plate" provides a venue for Illinois's producers to gather carcass data on their cattle, information that was previously difficult for most producers to get. Markets for high-quality beef are rapidly growing, and Illinois is in a unique position to assume leadership in high-quality beef production because of the state's abundant feed resources. Producers with improved cattle (through genetic enhancements and production practices) can gain premiums for their cattle of $50 to $150 per animal.

A C-FAR External Competitive Grants project

Douglas F. Parrett, Dan B. Faulkner

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Ultrasound Measures of the Effects of Production System/Genetics on Marbling Deposition

This research demonstrates ultrasound technology's effectiveness in determining the relative differences in marbling within a pen of cattle. This technology will allow beef producers to evaluate whether the premium for quality grade being offered justifies feeding the cattle for longer periods of time. Based on corn costs and the projected feed required per unit of gain, producers will be able to compare the premium with the projected increase in costs. Data collected will help the beef industry see the relationship between the increased cost of production and the consumer's ability to differentiate between steaks of different marbling levels.

A C-FAR External Competitive Grants project

Larry L. Berger, Paul M. Walker

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Reducing Beef Costs by Extending the Grazing Season

Illinois producers currently outspend Iowa producers at a rate of $113 per cow, according to Standardized Performance Analysis (SPA) records. Nearly 60% of these cow costs are feed related. Producers must find more economical ways to feed cows utilizing non-harvested forages to reduce labor and feed costs. Two cooperators, both comparing stockpiled fescue with conventional overwinter corn crop residue plus hay feeding, were able to complete all phases of this study, including comparison of body weight and condition score, nutritional value, and economic impact between control and test groups. Cows from both the control and test groups performed equally well in terms of body weight and condition score, as measured both at the beginning and end of the overwinter season. Significant differences, however, were seen in the economic comparison. Control cows feeding on corn crop residue and hay required supplements to meet their nutritional needs. The supplementation raised the feeding cost to $0.504 per day as compared to a cost of only $0.185 per day for cows feeding on stockpiled fescue. This generates nearly a three-fold economic advantage.

Teresa L. North, Dean Oswald, Roger Staff, Gary Bullen, Mike Roegge

Agriculture

Western Illinois University

Estrus Synchronization and Fertility Enhancement in Beef Cows

Administering melengestrol acetate (MGA) to beef cows during the 10 days immediately before Syncro-Mate B (SMB) treatment improved their estrus synchronization rate. In herds with a high estrus-cycling rate and a high pregnancy rate, MGA treatment will improve the pregnancy rate.

Darrel J. Kesler, Dan B. Faulkner, Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

Theodore F. Lock, Veterinary Medicine

University of Illinois at Urbana-Champaign

Minimizing Protein in Calf Milk Replacers to Decrease Cost and Nitrogen Excretion

The objective of this project was to determine the minimum amount of crude protein necessary to support adequate growth and health of dairy calves so as to minimize the amount of nitrogen excreted daily by the calves. Diets containing 22% crude protein met the objective.

James K. Drackley

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Investigating Myosin Protease, a Potential Regulator of Efficiency and Meat Quality

The purpose of this project was to find a new proteolytic enzyme that might be important in muscle protein breakdown. Two new enzymes from pig muscle were isolated. This finding opens a new avenue of research into the mechanisms of muscle protein turnover with the ultimate aim of reducing the cost of feeding livestock by minimizing protein turnover in muscle.

Jan E. Novakofski

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Ovarian Granulosa Cell Health: Subfertility in Cattle

Researchers hypothesize that the functional health of the ovarian follicle and its cells may be a factor in the subfertility of older animals. In this proposal, the granulosa cells of the ovarian follicles in aged cows were studied to determine if these cells react differently to hormonal stimuli than those in younger animals. Granulosa cells from slaughterhouse cows are being processed for *in vitro* culture. The cells are being processed for apoptosis assays that will identify the potential ovulatory propensity of the ovaries from the different age groups. *In situ* hybridization and other histological analyses are planned to further indicate ovarian endocrinology and health.

H. Dee Woody, Todd Winters

Animal Science, Food and Nutrition

College of Agriculture

Southern Illinois University-Carbondale

A New Male Fertility Assay

An assay was developed for bull sperm that measures the ability of sperm to bind to eggs. The question that continues to be explored is whether egg-binding ability is related to the actual fertility of bulls and boars.

David J. Miller, Roger D. Shanks
Animal Sciences
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Methods to Increase Embryos and Litter Size in Swine

Variability in swine litter size is related to ovulation rate, embryonic mortality, and uterine capacity. Methods for improving litter size by increasing ovulation rate have generally not resulted in greater numbers of pigs. However, the drugs used to increase ovulation rates have been reported to produce embryos of different sizes and suboptimal quality. These factors lead to a greater number of embryos, which may be disadvantaged because they challenge the pig's uterine capacity. This research focused on developing methods to induce superovulation of pigs using porcine follicle-stimulating hormone (FSH). This natural hormone has a relatively short half-life, and the eggs produced using this drug were evaluated for their ability to develop and produce live fetuses. Preliminary results have provided information on the preparation, frequency of administration, and dose required to induce estrus and superovulation in prepubertal gilts. The number and frequency of abnormalities produced with these treatments were also observed.

Robert V. Knox
Agriculture
Illinois State University

The Ecology of *Salmonella* Transmission on Swine Farms

The objectives of this study were (1) to identify the stages of production during which swine are at the greatest risk for becoming infected with *Salmonella,* (2) to identify the reservoirs of *Salmonella* on Illinois swine farms, (3) to determine the relative importance of each *Salmonella* reservoir as a source for transmission to swine, and (4) to determine the role of management and housing factors in modifying the risk of transmission of *Salmonella* to swine. Samples were collected from swine, other domestic animals, wildlife, insects, and the environment. Results indicated that boot samples had the highest prevalence of infection, followed by cats, mice, flies, and roaches. Feed samples had a low prevalence of *Salmonella.*

Ronald M. Weigel, Richard E. Isaacson
College of Veterinary Medicine
University of Illinois at Urbana-Champaign

Cytokines, Leptin, and Energy Balance in Immunologically Challenged Pigs

The hypothesis of this research was that cytokines secreted by immune cells induce fat cells to secrete leptin, which subsequently acts in the brain to decrease food intake and increase energy expenditure. Therefore, increased production of leptin may be partially to blame for the decreased food intake and growth performance of pigs exposed to pathogens. Stimulation of the immune system by lipopolysaccharide increased plasma leptin in mice. Cytokine tumor necrosis factor-alpha induced leptin secretion by acting directly on fat cells. These findings are a first step toward determining how cytokines regulate leptin gene expression.

Rodney W. Johnson, Joseph Lee Beverly, Brian N. Finck
Animal Sciences
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Heat Stress Reduction in Sows by Using Conductive Cooling Pads

This study focused on determining whether conductive cooling pads could reduce heat stress in sows. The conductive cooling pads were made from copper pipe 13 mm in diameter that was looped back and forth at intervals of about 75 mm to cover an area about 150 mm wide by 900 mm long. Cool water (18°C) was pumped through the pipe at a rate of 4 L/min to keep the outer surface cool. The cool pad was

placed on the floor so the sows could lay on it to keep cool. However, the sows were not forced to lay on the cool pad. During the heat stress period, the conductive cooling pads reduced the gilt's heat production by 12%, respiration rate by 34%, and moisture production by 52%. In most cases, the use of the cool pads significantly reduced the onset of panting. The cooling pads have relatively low initial and operating costs and, with proper engineering design, could be an affordable alternative for swine producers to reduce heat stress in the sow herd. Proper design and application are important in order for this system to operate efficiently without creating other problems, such as moisture condensation, in the facility.

This study also demonstrated that the metabolic rates of pigs have gradually changed over time: on a per weight basis, the metabolic rate of modern pigs is 42% higher than for pigs raised in 1959. This comparison is important because the 1959 data is still being used to design ventilation systems in swine facilities.

Gerald L. Riskowski, Agricultural Engineering

Paul C. Harrison, Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

A Dynamic Model to Describe Amino Acid Flow and Requirements in Lactating Sows

This project is focused on constructing a dynamic model based on the protein content of swine diets as related to amino acid flow and requirements of lactating sows. The model predicts ideal nutrient requirements based on various scenarios of pig and mammary gland growth. After completing the nutrient analysis, amino acid composition data will be added, enabling this model to describe amino acid flow and to predict amino acid requirements in lactating sows.

Robert A. Easter, Michael Grossman

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Female Swine: Factors Affecting Reproduction Efficiency

Reproductive failure in females is a significant problem for swine producers in terms of resource allocation and can cost an individual producer thousands of dollars per year in lost production and time. This study showed that females from male-dominated birth litters (67% or greater males) exhibited lower rates of successful breeding as measured by the pregnancy rate and the number of times the female had to be bred to achieve pregnancy. We were also able to show that gilts from male-dominated birth litters had fewer teats than those gilts from birth litters not dominated by males. In addition, it was observed that female aggression during gestation was not affected by the proportion of males in the gilt's birth litter. It costs a producer $100 to $150 for every female that is selected to go into the breeding herd that has to be culled due to reproductive failure. If only 10% of all reproductive failures are related to selecting gilts that come from male-dominated litters, a producer with a thousand sows would save between $3,300 and $4,950 per year just by not selecting these females.

Robert D. Arthur, Tom Rosenthal

Animal Science, Food and Nutrition

College of Agriculture

Southern Illinois University-Carbondale

Lee Drickamer

Biological Sciences

Northern Arizona University

Swine Odor Control in Lagoons

Laboratory studies established the conditions required to permit duckweed growth on diluted swine waste, and this research was followed by a field study. A Lemna baffle system was installed on the first cell of the three-cell lagoon system. The system performed well in terms of eliminating objectionable odors, and duckweed was grown on selected cells. No objectionable odors could be detected once the system had been operating for about two days. One

significant finding of the field study is that when swine manure was gradually deposited in the lagoon, it was not necessary to operate the pump providing fresh water flow to the surface in order to control odors. It also was not necessary to grow duckweed on the surface for odor control. The algae-rich water from the third stage formed a self-sustaining, high-oxygen water layer on the lagoon that prohibited odorous compounds from being released to the air above the lagoon surface. The information obtained provides the basis for design of similar odor-control systems for medium- and large-scale swine operations.

Charles B. Muchmore, Mechanical Engineering and Energy Processes

Richard Steffen, Plant, Soil and General Agriculture

College of Agriculture

Southern Illinois University-Carbondale

Integrated Systems Approach for Evaluating Swine Waste as a Feedstuff and as a Soil Amendment

This study demonstrated that composting of livestock waste is a viable alternative to direct-land application of unprocessed manures. The solids separated from liquid swine slurry can be successfully extruded, producing a wholesome, disinfected livestock feed. Combining solid-liquid separation with aeration can significantly improve the environmental quality of the resulting effluent, and pretreatment of liquid swine waste with chemical conditioners (flocculants) significantly enhances the ability of mechanical separators to remove separable solids. Both composting and solid-liquid separation are best management strategies that are compatible with the Illinois Livestock Facilities Management Act and accepted by environmentalists and the general public. Both practices can be economical for producers and result in value-added products to generate alternative income for farmers.

A C-FAR External Competitive Grants project

Paul M. Walker, Ken Smiciklas, Tim Kelley

Agriculture

Illinois State University

Enhancing Research Capacity: Completion of Phase I

This project completed the funding for the addition of a swine reproduction and surgery facility at the Illinois State University Farm. The project resulted in the construction of a building designed to efficiently accommodate swine reproductive management research including ultrasound checking as well as manure management research. The building also contains a surgery facility that meets IACUC standards to expand researchers' ability to conduct studies that require minor surgery.

Robert V. Knox

Agriculture

Illinois State University

987P pilus Adhesin of *Enterotoxigenic Escherichia coli*

Enterotoxigenic E. coli (ETEC) are non-invasive pathogens that cause acute diarrhea in neonatal pigs, lambs, and calves; fatal diarrhea in infants in developing countries; and traveler's diarrhea. ETEC colonize the host's intestinal epithelium by means of fimbrial adhesins such as 987P that constitute a

major virulence factor. This research demonstrated that two copies of the fas gene cluster encoding the 987P fimbriae are present in cells. The chromosomal regions that contain fas genes were identified.

Richard E. Isaacson
Veterinary Pathobiology
College of Veterinary Medicine
University of Illinois at Urbana-Champaign

Technology for the Handling and Analytical Measurement of Individual Embryos

A microfluidic system capable of transporting individual, pre-implantation mouse embryos through a network of channels to selected locations was designed, built, and tested. Embryos can be spatially retained and then released or moved to a new location via flow manipulation.

Matthew B. Wheeler, Animal Sciences
College of Agricultural, Consumer and Environmental Sciences
David J. Beebe, Richard L. Magin, Electrical and Computer Engineering
College of Engineering
University of Illinois at Urbana-Champaign

Recombinant Vaccines for Prevention of TGE and PRRS

Two recombinant swinepox virus (SPV) vectored vaccines were developed: one contains a gene from transmissible gastroenteritis (TGE) virus, and the other contains a gene from porcine respiratory and reproductive disease syndrome (PRRS) virus. Pigs vaccinated with these vaccines developed antibodies against TGE and PRRS viruses, respectively.

Deoki N. Tripathy, C. Lichtensteiger, Lawrence D. Firkins
College of Veterinary Medicine
University of Illinois at Urbana-Champaign

Development of an Animal Disease Reporting System for Illinois

A database to receive animal disease information from the veterinary diagnostic laboratories in Illinois was created and the methods of importing data developed. Investigators can now plot the animal disease data on maps that interactively display other information, such as animal population densities, streams, rivers, lakes, wetlands, highways, public water sources, soil types, rainfall, and ambient temperatures. The system allows animal health professionals to monitor more closely the presence of disease in Illinois animal populations and develop more effective strategies for control and eradication of these diseases.

John J. Andrews, Richard D. Hull, Craig L. Flowers
College of Veterinary Medicine
University of Illinois at Urbana-Champaign

Alternatives to Antibiotics in Animals

Bacteria invade tissue by attaching at a chemically recognizable site on the tissue. In many tissues, this site is a simple sugar molecule. If it is determined what sugar binds which bacteria, it will be possible to use the sugar to "deactivate" the bacteria-tissue binding and prevent infection without the use of antibiotic. Mannose and N-acetyl-D-galactosamine were identified as sugars capable of binding to all bacterial species tested in the horse. Mannose is less expensive than most antibiotics and is proving to prevent intentionally induced bacterial infections in mares. This technique can be adapted to many species and tissues.

Sheryl King, Animal Science, Food and Nutrition
College of Agriculture
Lynn Nequin, Physiology
School of Medicine
Southern Illinois University-Carbondale

Equipment Needs for CACES Central Laboratory Animal Care Facility

This grant supported procurement of equipment for the Laboratory Animal Care Facility in the College of Agricultural, Consumer and Environmental Sciences (ACES) at the University of Illinois at Urbana-Champaign. Funds allocated to this project were used to purchase equipment that will be used to provide low-cost and efficient service to all ACES faculty who utilize laboratory animals in their research.

Neal R. Merchen, Animal Sciences

Tonja M. Henze, Agricultural and Consumer Economics

Keith W. Singletary, Food Science and Human Nutrition

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Particle Imaging Velocimetry (PIV) to Study Ventilation Patterns in Livestock Buildings

A quantitative method was developed for measuring aerosol concentration and transportation in ventilated air spaces. This measurement method is part of a larger study of aerosol spatial distribution, ventilation effectiveness, and aerial-contaminant control strategies.

Yuanhui H. Zhang, Gerald L. Riskowski

Agricultural Engineering

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Automated Animal Identification, Data Collection, and Online Retrieval

An automated system for collecting animal weights at the Swine Research Center was developed. The system combines electronic identification of individual animals and automated weight recordings using a microprocessor. Data may be sent via modem to a server where it will be stored for retrieval by researchers.

Michael Ellis, Bill A. Fisher, Joseph W. Blackmon

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

nutrition and food safety

Soy and Osteoporosis

This project evaluated the effects of soy protein and soy isoflavones on bone health using female rats as the model. Both soy protein and soy isoflavones were effective in protecting against bone loss for young and old animals.

Elizabeth H. Jeffery, Food Science and Human Nutrition
Janice M. Bahr, Animal Sciences
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Role of the Intestine in the Blood Lipid Lowering Effect of Soy

The effects of soy protein, amino acid composition of proteins, and nonprotein components of soy (isoflavones, for example) on blood lipid levels are being determined. Factors identified as being significant to this process are cholesterol absorption efficiency, apolipoprotein synthesis, and signal transduction.

Neil F. Shay, Randall S. Frey
Food Science and Human Nutrition
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Isolated Soy Protein: Improving Nutritional Status in Dialysis Patients

Over 700,000 individuals in Illinois live every day with kidney and urinary disease. As kidney function declines, many body processes become unbalanced and contribute to impaired nutrient utilization, which often leads to a decrease in food intake and malnutrition. Researchers conducted an intervention study to evaluate the potential for soy protein in renal patients' diets. Positive results from this study will result in an additional dietary management tool for individuals receiving dialysis, thus improving their quality of life. Isolated soy protein is a readily available source of high biological value protein that can be easily incorporated into dietary patterns.

Sara Anderson, Carol Boushey, William Banz, Trish Welch
Animal Science, Food and Nutrition
College of Agriculture
Southern Illinois University-Carbondale

Standardized Analysis of Health-Promoting Components in Vegetables

Cancer is the third most common cause of death in the United States, but at least 50% of cancers are considered preventable through dietary choices. Epidemiological data show that a diet high in crucifers (broccoli, Brussels sprouts, cabbage, radish, etc.) can lower one's risk for cancer. There are many fresh vegetables, foods, and supplements on the market that contain crucifers, but few of them are defined in terms of their ability to protect against cancer. One objective of this project was to develop methods to standardize analysis of health-promoting components in cruciferous vegetables. Researchers sought to develop standardized analytical tools for measuring glucosinolates, measuring their breakdown products, and providing purified breakdown products that can be used to further medical research on whether and how these compounds decrease our risk for cancer.

This project involved (1) developing a method for measuring glucosinolates in vegetables; (2) publishing a manuscript surveying over 60 varieties of vegetables, including 50 varieties of broccoli; (3) developing a method for measuring glucosinolate breakdown products; and (4) developing a method

for isolating breakdown products from crushed seeds of crucifers (for example, broccoli). Producers can now evaluate 50 different strands of broccoli and choose which varieties to grow based on their efficacy as cancer-preventing agents. Most of these are commercial varieties that have already been chosen for their acceptable growing qualities. In addition, the analyses developed are available to those searching for good quality control in their products. Researchers are prepared to perform analyses for the industry, as well as to carry out technology transfer, teaching the methodology and selling the standards that have been prepared.

A C-FAR External Competitive Grants project

Elizabeth H. Jeffery, Food Science and Human Nutrition

Mosbah M. Kushad, Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

Matthew A. Wallig, Veterinary Pathology

College of Veterinary Medicine

University of Illinois at Urbana-Champaign

Alteration of Oilseed Lipid, Protein, and Carbohydrate Using Antisense Technology

The objective of this research was to alter plant fatty acid biosynthesis in *Arabidopsis thaliana* and to determine how this change affected the levels of the major storage components, carbohydrates, lipids, and proteins. Investigators successfully generated transgenic plants containing various constructs designed to alter expression of different acyl carrier protein isoforms. In leaf, for example, overexpression of acyl carrier protein-1 altered fatty acid composition.

Nicki J. Engeseth

Food Science and Human Nutrition

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Functional Foods Characteristics of Resistant Starches

Resistant starch is a carbohydrate fraction that escapes digestion by mammalian enzymes in the small intestine and becomes available for bacterial fermentation in the large bowel. It has a role in improving colonic health similar to that of dietary fiber. The presence of resistant starch reduces the accumulation of potentially carcinogenic end products of protein fermentation. Resistant starch is an effective substitute for traditional dietary fibers used in the human diet.

George C. Fahey, Jr., Avinash R. Patil, Hussein Shaaban Hussein

Animal Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Identification and Characterization of Estrogen Ligands from Foods

The objective of this project was to evaluate the potential estrogenic and anti-estrogenic effects of extracts obtained from cabbage, fermented cabbage, acidified Brussels sprouts, and condensation products of indole-3-carbinol. Extracts are both estrogenic and anti-estrogenic depending on the dosage.

William G. Helferich, Food Science and Human Nutrition

College of Agricultural, Consumer and Environmental Sciences

John A. Katzenellenbogen, Chemistry

University of Illinois at Urbana-Champaign

Development of a Novel Rheometric Method for Extruded Food

This project generated models that are effective in predicting the flow of food materials through extruders.

James F. Faller

Food Science and Human Nutrition

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Creating Dietary Change via Computer Technology and the Stages of Change Theory

Emerging behavior theories indicate that individuals pass through a specific series of stages (precontemplation, contemplation, preparation, action, and maintenance) on their way to achieving and maintaining behavioral change. This project focused on identifying spe-

cific eating practices and characteristics that reflect an individual's readiness to make dietary changes. Researchers collected information from roughly 500 women and men, aged 20 to 80, representing diverse backgrounds. Volunteers completed a comprehensive nutrition assessment.

Information collected indicated that 14% were in the precontemplation stage for eating five servings of fruits and vegetables every day, 17% in the contemplation stage, 27% in preparation, 10% in action, and 32% in maintenance. People are doing more about reducing fat intake than improving fruit and vegetable intake: 53% of respondents were in the maintenance stage for avoiding high-fat foods and only 6% were precontemplators. The proportion of people in these stages differs substantially when evaluated by gender, income, and education. These results provide a tool for classifying individuals in their appropriate stage of change with regard to diet. Thus, nutritional educators can refine their educational messages to consumers and help them make changes to reduce their risks for heart disease and some cancers.

A C-FAR External Competitive Grants project

Carol Boushey, Kathleen Welshimer, Sara Anderson

Animal Science, Food and Nutrition

College of Agriculture

Southern Illinois University-Carbondale

Technology-Assisted Nutrition Education in an Intergenerational Setting

Project objectives are to provide access to the Internet, to teach computer skills as a tool for accessing nutritional information on the World Wide Web, and to enable participants to make informed and healthful dietary choices. This project targets older adults, minorities, low-income populations, and children. Computers were purchased and set up in the Douglass Center Annex in Urbana, Illinois. Two groups have gone through training—one group of children and one group of older adults. The Nutrition Analysis Tool (NAT) was used to teach the elements of nutrition and healthy lifestyles to both age groups.

A C-FAR External Competitive Grants project

James E. Painter, Food Science and Human Nutrition

Cheryl A. Barber, Program Development

Paul Schneider, Academic Outreach

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Food Packaging Research Program

This project focuses on the distribution and correlation of statistical data about the needs of Illinois's packaging industry. These data will allow for better targeting of the "market" for in-state industry and will facilitate tailoring of the program to better suit those industries that will be potential future employers of University of Illinois graduates in this area.

Scott A. Morris

Food Science and Human Nutrition

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Expansion of Study on Household Food Practices and Food Safety Concerns in West-Central Illinois

The objectives of this research were to identify the knowledge and practices of high-risk population groups (children, pregnant women, lactating women, senior citizens, low-income families, and people with debilitating diseases); to collect, evaluate, and develop visual informational materials for these groups; and to develop a website for dissemination of materials. Over 1,200 individuals from high-risk population groups were surveyed as to their safe food handling knowledge, practices, and behaviors, and safe food handling problem areas were identified. Articles were written for publication and five public service announcements (PSAs) were developed: one for preschool children, one for third to sixth graders, one for teenagers, one for low-income people, and one for senior citizens. A website was developed to link resources for different population groups to general safe food handling resource and research sites. The PSAs and website will be announced, released, and used by the Illinois Department of Public Health during their National Food Safety Month promotion. They also have been submitted to the FDA to be reviewed and released for National Food Safety Month promotional efforts.

Martha J. Barclay, Karen Greathouse, Family and Consumer Sciences

Teresa North, Agriculture

Western Illinois University

rural economic development

Automated and Autonomous Vehicles for Agricultural Field Operations

The program for the development of automatic and autonomous vehicles has addressed several basic and applied issues related to agricultural equipment automation. Basic analyses have included the dynamics of steering systems and posture sensors for guidance. Applied issues have evaluated the potential of several commercial sensing systems and a commercial mechanical guidance system. Improvements in these areas vis-à-vis field conditions have been made.

John F. Reid, Timothy S. Stombaugh, Noburu Noguchi
Agricultural Engineering
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Evaluation of Site-Specific Management

Getting the most economic return from investments in precision farming requires an understanding of what causes yields to vary within a field over a number of years and under different crops. The purpose of this research was to identify site and soil factors responsible for yield differences observed in a Franklin County, Illinois, production field. Consistently higher crop yields have been obtained from soils in fields located in southern Illinois that have a greater depth to the claypan. This effect was apparently related to the increased amounts of plant-available water and enhanced soil rooting volume for water and nutrient exploitation. Lower yields were generally associated with depressed areas where excessive soil moisture led to reduced stands and poor crop growth. By understanding the factors that cause yields to be consistently higher or lower than the field average, action can be taken to correct the problems that result in lower yields, for example, improving soil drainage or decompacting compressed soil layers. Higher yielding areas may be made more productive through enhanced seeding rates or use of higher fertilizer rates.

E. C. Varsa, S. K. Chong
Plant, Soil and General Agriculture
College of Agriculture
Southern Illinois University-Carbondale
S. A. Ebelhar
Dixon Springs Agricultural Center
University of Illinois at Urbana-Champaign

Uncertainty and Investment in Precision Technology

This project calculated option values for investing in precision technologies to assess the impact of price uncertainty and sunk costs on the decision to invest in the new technology on corn and soybean farms in Illinois. Results indicate a wide range of farms over which soil quality or heterogeneity of soil leaves the technology unprofitable when evaluated using conventional cost analysis. The research also identified a class of farms for which the quality and distribution of soils make adoption of the technology profitable only if the option value to sunk costs are ignored.

Alex E. Winter-Nelson, Madhu Khanna, Carl H. Nelson
Agricultural and Consumer Economics
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Evaluation of Precision Farming Adoption Rates and Profitability Impacts

The introduction of precision farming technologies and practices is revolutionizing how farmers and other stakeholders look at crop production. One significant preliminary result of this study was the development of a Web-based calculator, which will allow the user to estimate his or her own cost for providing variable rate application of fertilizers. This calculator is being tested locally and will become available on the Web. Research was undertaken to develop models of the investment and operating costs, capacities, and prices charged and paid for services, such as variable rate fertilizer application. The most recent surveys of farmers and dealers were designed to help estimate the amount of precision-farming services used in selected Illinois areas.

One of the potentially most expensive services a dealer can offer is variable rate application (VRA) of fertilizer or lime. In a recent survey of Illinois fertilizer and chemical dealers, the range of 1997–1998 VRA acreage for 84 respondents providing such data was from less than 1,000 acres to more than 10,000 acres per plant site. These data, broken down in acreage categories and reported in Table 1, include phosphate, potash, and lime. Table 2 shows the range of per acre charges for the same set of respondents to the Illinois dealer survey. They reported charging from $12.00 to $0.35 per acre for VRA of potash and phosphate, with an average charge of $5.11. These survey data indicate that for dealers providing VRA service, many were doing so at levels that underutilized the capacity of most variable rate technology (VRT) trucks, and there appeared to be no "standard" charge per acre for the VRA service. For some of those dealers who responded, it may be true that they are purposely covering (or not covering) part of the cost of providing VRA service from other internal sources of sales revenue.

Table 1.
VRA Acreage for Each Dealer Plant Site, 1997–1998 (Illinois Survey Data)

VRA Acreage per Retail Site	Number of Respondents
Less than 3,000	31
3,000–5,999	26
6,000–8,999	11
9,000–11,999	6
12,000 or more	10

Table 2.
Dealers' Charges for VRA, 1997–1998 (Illinois Survey Data)

Per Acre Charge for VRA	Number of Respondents
less than $3.00	18
$3.00–$4.99	35
$5.00–$6.99	29
$7.00–$8.99	17
$9.00 or more	8

Patrick D. O'Rourke
Agriculture
Illinois State University

Estimation and Calibration of Farm Risk Measures and Assessment Risk Management Products

All individual farms from Farm Bureau Farm Management historic records with at least 10 years of production data have been collected, as have National Agricultural Statistics Service data aggregated at the county level (over 30,000 records total). The data have been detrended, and distributions fitted to firm-level corn-, soybean-, and wheat-yield records. Procedures for recovering expected price distributions from current market prices on futures and options also have been developed to use in generating revenue distributions.

Bruce J. Sherrick
Agricultural and Consumer Economics
College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

Expanding the Commercial Grape and Wine Industry in Illinois

The Illinois grape and wine industry has grown considerably with the help of funds provided by C-FAR. Researchers used these funds to establish contacts with wineries and winemakers throughout the state and to help the Illinois Grape Growers and Vintner's Association (IGGVA) organize its membership. Cultivar trials were established at four regional sites in the state: St. Charles (North), Urbana (Central), New Salem (West Central), and Dixon Springs (South). Each location has about 25 cultivars planted in a replicated design. These plants will be grown for a minimum of five years to assess their hardiness, adaptability, fruit production, and wine quality. Researchers helped organize two different grower meetings on grape culture and attended and spoke at growers' meetings in numerous counties as well as in five other states. Handouts were prepared and distributed at most of these meetings. In addition, a website providing end users with information on grape growing, wine making, grape resources, and personnel was established.

A C-FAR External Competitive Grants project

Robert M. Skirvin, Alan G. Otterbacher, Natural Resources and Environmental Sciences

Kenneth D. McPheeters, Agricultural and Consumer Economics

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

The Use of Tissue Culture to Select New Dwarf Fruit and Ornamental Plants

Regenerated apple plants from leaf discs were prepared. They will reach their mature size by 2001, at which time they will be compared to the standard clones from which they were derived to determine their degree of dwarfism. A seedling screening method to separate dwarf- and standard-sized apple clones was developed. Seedlings were transferred to soil and will be planted at the University of Illinois Hartley Arboretum in spring 2000, where they will be examined for growth habit when they reach their mature size.

Robert M. Skirvin, Margaret Norton, David J. Williams

Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Weed Management Systems for Pumpkin

The Illinois Fruit and Vegetable Industry Advisory Committee identified weed management in pumpkin crops as a top research priority. This research project took two approaches to solve weed management problems and reduce labor costs. The first approach involved evaluating new herbicides (Authority®, Frontier®, and Raptor®) in both research-farm and working-farm studies. Authority® controlled pigweeds but caused pumpkin injury. The other two herbicides controlled pigweeds with only minor damage to pumpkins. The second approach modified pumpkin cropping systems to control pigweed and nightshade. The cropping systems used banded applications of clomazone and ethylfluralin, plastic mulch, and rye cover crops with strip tillage. Pumpkin yields were poor in the rye mulch, possibly due to soil compaction or nitrogen tie-up. These cropping systems can be immediately adopted by farmers to control pigweeds because they do not rely on new herbicide registrations.

John B. Masiunas, Mosbah M. Kushad, Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Catherine E. Eastman, State Natural History Survey

Improved Propagation Efficiency for Illinois Nurseries

The workload of a nursery is typically heaviest during the growing season. During the winter months, there are fewer tasks to accomplish and nurseries often lay off a high percentage of their workers and operate with a skeletal staff. This seasonality in staffing is problematic to nursery owners since they are unable to retain good employees throughout the year and must go through the process of hiring and training new personnel every spring. This project developed an innovative propagation technique with the potential to distribute nursery workloads more evenly over the entire calendar year. A number of nurserymen, both in Illinois and throughout the country, have adopted this technique. This should allow nursery owners to hire and retain good employees throughout the entire calendar year and provide additional stability to existing business operations.

Paul Henry, John Preece

Plant, Soil and General Agriculture

College of Agriculture

Southern Illinois University-Carbondale

natural resources

Water Quality of Subsurface Drainage from Alternative Cropping Systems

Water flow and water quality in subsurface drainage have been monitored since August 1996 in three fields, each under different crop management: no-till, conventional-till, and certified organic management. Mean nitrate-N concentrations in water samples collected between August 1996 and May 1998 are 8.6 mg N/L for the no-till crop, 9.2 mg N/L for the conventional-till crop, and 2.6 mg N/L for the organic system.

A C-FAR External Competitive Grants project

Gregory F. McIsaac, Natural Resources and Environmental Sciences

Richard A. Cooke, J. Kent Mitchell, Agricultural Engineering

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Enhanced Wetlands: Drainage Channel Communities for Watershed Management

Phytoremediation has been proposed as a method for diminishing the environmental impact of pesticides and herbicides. This project examined native Illinois aquatic plants, in particular those that grow in a flowing shallow-water environment (drainage channel plants), to determine the rate of uptake of herbicides. Of the eight plant species tested, *Ceratophyllum* (hornwort) was the most effective at herbicide uptake by a wide margin.

Richard A. Larson, Gerald K. Sims

Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Assessing the Effects of Constructed Wetlands and Water Table Management on Mercury in Illinois Aquatic Ecosystems

Total mercury concentrations in agricultural drainage water, particularly during the winter, are low in comparison to concentrations in other Illinois surface waters. Higher mercury values were noted in the spring under peak-flow conditions, suggesting that surface soil water contains more mercury than deeper groundwater. Total mercury concentrations increased between the inlets and outlets of the wetlands by factors of 3 to 15. Findings suggest that constructed wetlands will not be large mercury exporters due to the decoupling of peak-flow events (spring) and methylation of mercury (summer) in Illinois.

Robert J. M. Hudson

Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Sustainable Development: A Decision Model to Improve Planning

Researchers developed the planning tool, Rapid Resource Appraisal (RRA), to assist Illinois communities in writing science-based, executable, and economically viable sustainable development plans for watersheds. RRA is a series of education, communication, and information-gathering activities completed by a planning committee as members learn about the human and ecological resources and activities in their watershed. This process is also useful in transforming a committee from a collection of individuals with separate causes to a cohesive group committed to a common vision and plan. RRA is being used in almost all watershed planning efforts in Illinois and elsewhere. The publication that describes RRA is now part of the *Resource Planning Guidebook* produced by the Natural Resources Conservation Service and distributed to all of its offices throughout the United States.

Richard L. Farnsworth, Agricultural and Consumer Economics

Sonya Salamon, Human and Community Development

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

A Reliable Soil Test for Potassium

This project allowed a comprehensive characterization of iron-reducing bacteria in soils. This type of study is significant in that global positioning systems (GPS) greatly enhance the potential for precision farming, but the success of such efforts depends heavily on soil tests. Potassium (K) is a major nutrient required for plant growth, but the use of GPS to manage K fertility of soils is jeopardized because tests for K are often unreliable. This problem is due, in part, to the interaction between iron and K.

Joseph W. Stucki

Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Microbial and Organic Matter Contributions to the "Rotation Effect"

The project objective is to identify the general effects of crop rotation and fertilization practices on soil microbiology and labile organic matter. The organic matter that contributes most to soil productivity is relatively young in age. Simple bacterial to fungal ratios do not provide conclusive information about soil condition. Measures of substrate utilization are sensitive to field management and tillage history but are difficult to relate to soil condition in a predictive manner.

A C-FAR External Competitive Grants project

Michelle M. Wander, Natural Resources and Environmental Sciences

Susanne Aref, Statistics

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

WFSAP Conference: Agriculture's Changing Role in the Global Ecosystem

This grant provided the funding necessary to hold the World Food and Sustainable Agriculture Program.

Daniel S. Anderson, David W. Onstad, Deborah A. Cavanaugh-Grant

Natural Resources and Environmental Sciences

College of Agricultural, Consumer and Environmental Sciences

University of Illinois at Urbana-Champaign

Fiscal Year 2000:

internal competitive grants program

The C-FAR Internal Competitive Grants Programs at the University of Illinois at Urbana-Champaign (UIUC), Southern Illinois University-Carbondale (SIUC), Illinois State University (ISU), and Western Illinois University (WIU) support research projects on the following topics in FY00 (July 1, 1999 through June 30, 2000):

FY00 Projects	Principal Investigator
Research Focus: Expanding Agricultural Markets	
Direct-Marketing Alternatives for Southern Illinois Farmers	Livy Coe, SIUC
Impact of Low-Phytic-Acid Corn on Phosphorus Levels in Aquaculture Effluent	Kerry Tudor, ISU
Ornamental Grass Evaluations for Illinois	Thomas B. Voigt, UIUC
Refining Soybean Oil Using Supercritical Fluids and Membrane Technology	William E. Artz, UIUC
Round-up® Ready Gene Transfer from Transgenic to Nontransgenic Soybeans	Shuxian Li, UIUC
Research Focus: Rural Economic Development	
Evaluation of Oxy-diesel as an Alternative Fuel in Agricultural Machinery	Alan C. Hansen, UIUC
Characteristics of Successful Rural Agribusiness Entrepreneurs	Rick Whitacre, ISU
Economic Development Trends in Rural Illinois	Miguel Gomez, ISU
Spring Frost Protection of Grapevines by Dormant Oil Application	Imed Dami, SIUC
Real-Time Responses of Illinois Farms in an Economic Downturn: Strategic Directions and Financial Market Response	Paul N. Ellinger, UIUC
The Enhanced Child Development Laboratory Research Database Program	Brent A. McBride, UIUC
Research Focus: Agricultural Production Systems	
Agricultural Pests and Pesticides: Background for Decision Making	Richard A. Weinzierl, UIUC
Analysis and Development of Risk-Management Tools for Illinois Crop Farmers	Bruce J. Sherrick, UIUC
Development of a Universal Soybean Genome Map	Theodore Hymowitz, UIUC
Accurate Estimates of Seed Transmission of *Erwinia Stewartii* Necessary to Modify Quarantine Restrictions on Illinois Corn and to Gain Wide Acceptance of a Seed Health Test of Stewart's Wilt	Jerald K. Pataky, UIUC
A Confocal Laser Scanning Microscope	Roberto Docampo, UIUC
Effects of Tillage, Plant Nutrition, and Seed Treatment on Reduction of Soybean Sudden Death Syndrome (SDS)	She-Kong Chong, SIUC
Enhancement of Soybean Co-inoculation for Optimal N2-fixation and Maximizing Yields	Brian P. Klubek, SIUC
Enhanced Production by Increasing Level of Disease Resistance in Soybeans	Schuyler S. Korban, UIUC
Establishing Pregnancy at a Predetermined Time in Dairy Cows with Ovarian Cysts	Darrel J. Kesler, UIUC
Establishing Guidelines for Plasticulture of Strawberries in Illinois	Jeff D. Kindhart, UIUC
Evaluating Drying Effects upon Corn Quality	Kevin Baker, ISU
Improving the Ileal and Fecal Digestion of the Corn- and Soybean-Meal Diet in Growing Pigs Using Feed Enzymes, Steeping, and Particle Size Reduction	Vince M. Gabert, UIUC
Internet-Based Management Tools for Evaluation of Precision Farming Practices for Farm Supply Dealerships	Patrick O'Rourke, ISU

FY00 Projects	Principal Investigator
Investigation into the Immune Response and Potential for Vaccine Development Against Cattle Lice	Carl J. Jones, UIUC
Manipulating Prepartum Nutrient Intake to Improve Transition Success in Dairy Cows	James K. Drackley, UIUC
Mechanisms Behind Reduced Severity of Soybean SDS Following Delayed Planting	John Russin, SIUC
Molecular Markers for Parasitic Ability of Soybean Cyst Nematode	Gregory R. Noel, UIUC
Utilization of Ruminal Nitrogen and Fiber Interactions to Optimize Milk Production While Reducing Nitrogen Waste Excretion in Dairy Cattle	Ken Griswold, SIUC
Weed Management in Strip Tillage Corn	Bryan Young, SIUC
Identification of Resistance to Soybean Cyst Nematode in Glycine Tomentella	Glen L. Hartman, UIUC
Regulation of Protein Accretion in Pigs with Viral and Bacterial Pneumonia	Rodney W. Johnson, UIUC
Physiological-Biochemical Basis for SDS Resistance in Soybeans and Other Species	Richard A. Larson, UIUC
Research Focus: Human Nutrition and Food Safety	
Effects of Soy Protein Feeding on Diabetic Nephropathy	John W. Erdman, UIUC
Trust, Credibility, and Other Social Variables in Communicating Food Safety	Napoleon K. Juanillo, Jr., UIUC
Can Soy Components Prevent Prostate Enlargement and Mammary Cancer in High-Risk Individuals?	Andrzej Bartke, SIUC
Determining the Effect of Dietary Forage Level and Linoleic Acid Concentration on the Conjugated Linoleic Acid (CLA) Level in Beef	H. Dee Woody, SIUC
Effects of Soy and Genistein on Estrogen Receptor Beta Signaling	Paul Cooke, UIUC
Soy and Osteoporosis	Elizabeth H. Jeffery, UIUC
Taste Perception and Food Intake in Older vs. Younger Women	Karen M. Chapman-Novakofski, UIUC
Research Focus: Natural Resources	
Aquatic Plant Impoundments for Agrochemical Contaminant Management	Gerald K. Sims, UIUC
Enhancement of Agronomy Research Capacity	Ken Smiciklas, ISU
Mechanisms and Evolution of a Novel Example of Herbicide Resistance	Patrick J. Tranel, UIUC
Modeling Herbicide Degradation in Soils: An Integrative Modeling and Experimental Study	Robert J. M. Hudson, UIUC
Regulating the Biosynthesis of Important Tryptophan Pathway Derived Products	Jeffrey E. Brotherton, UIUC
Genotoxic Synergy between OP Insecticides and Environmental Arylamines	Elizabeth D. Wagner, UIUC
On-Site Nitrogen and Chlorophyll “Quick-Tests” to Improve Nitrogen Fertilizer Efficiency in Illinois Vegetable Production	John M. Swiader, UIUC
Passive Subsurface Bioreactors for Enhanced Edge-of-Field Water Treatment	Richard A. Cooke, UIUC
Small Mammals and Corn-Soybean Agriculture: Emerging Trends and Management Issues	Richard E. Warner, UIUC

Fiscal Year 2000:

external. competitive grants program

The C-FAR External Competitive Grants Program supports projects on the following topics in FY00 (July 1, 1999 through June 30, 2000):

FY00 Projects	Principal Investigator
Research Focus: Expanding Agricultural Markets	
Composite from Recycled Plastics and Agricultural Fibers	Poo Chow, UIUC
Exploration of Wheat Kernel Hardness and Protein Levels in Search of Added Value	Dennis R. Thompson, Illinois Crop Improvement Association, Inc.
Hydrogenation of Soybean Oil by a Novel Low-Temperature Electrochemical Process	Shashi B. Lalvani, SIUC
Influence of Corn Hybrid on Dry Milling and Extrusion Product Performance	Kent D. Rausch, UIUC
New Genes for Sustainable Agriculture II	David A. Lightfoot, SIUC
Ultrasonic Detection of Intramuscular Fat in Swine	John P. Carlson, WIU

FY00 Projects	Principal Investigator
Research Focus: Rural Economic Development	
Creation of a Strategic Profit Model for the Illinois Beef Industry	Dan B. Faulkner, UIUC
Future for Wheat in Illinois	Phillip R. Eberle, SIU
Grassland Management School in the Grand Prairie Region of Illinois	David B. Bowman, UIUC
Grow Illinois Ag: A Proposal to Inventory and Grow Innovative Illinois Enterprises	Kyle L. Harfst, SIUC
Market Research to Support the Development of the Illinois Aquaculture Industry	Susan T. Kohler, SIUC
Research Focus: Agricultural Production Systems	
A New Enzyme for Reducing Damage Caused by Oxidative and Drought Stress	Andrew J. Wood, SIUC
Effect of Sire Marbling EPD on Premium Required to Feed Steers for a Quality Market	Larry L. Berger, UIUC
Efficiency Gains with Corn-Containing Transgenes for Improved Nitrogen Utilization	Edward C. Varsa, SIUC
Improving the Quality and Consistency of Illinois Pork	Floyd K. McKeith, UIUC
Research Focus: Human Nutrition and Food Safety	
Blocking Breast and Colon Cancer Metastases by Soy	Keith W. Singletary, UIUC
Comparative Effects of Soybean Constituents on Cardiovascular Risk: In Porcine	William Banz, SIUC
Genetic Analysis of *Salmonella* Isolates from Swine Production Units	Ronald M. Weigel, UIUC
Impact of Soy Components on Quality of Life During Aging	Andrezej Bartke, SIUC
Improved Food Package Quality and Safety Using Nondestructive Ultrasonic Sensing	Scott A. Morris, UIUC
Innovative Non-solvent Process for Textured Soy Protein	Karl E. Weingartner, UIUC
Research Focus: Natural Resources	
Corn Fertilizer Nitrogen Management to Optimize Water Quality	Kenneth D. Smiciklas, ISU
Dependable Low-Cost Pollination Systems for Sustainable Fruit Production	Stewart M. Jacobson, UI at Springfield
Enhancing Disease Resistance in Apples via Genetic Engineering	Schuyler S. Korban, UIUC
Modeling Nitrogen Dynamics at the Watershed Scale	Gregory F. McIsaac, UIUC
Processed and Unprocessed Manures' Effect on Crop Yield, Soil, and Groundwater	Paul M. Walker, ISU
Verification of Nitrogen Fertilizer Recommendations for Illinois Corn Production	Fred E. Below, UIUC
Water Quality of Subsurface Drainage from Alternative Cropping Systems	Gregory F. McIsaac, UIUC

C-FAR. impact

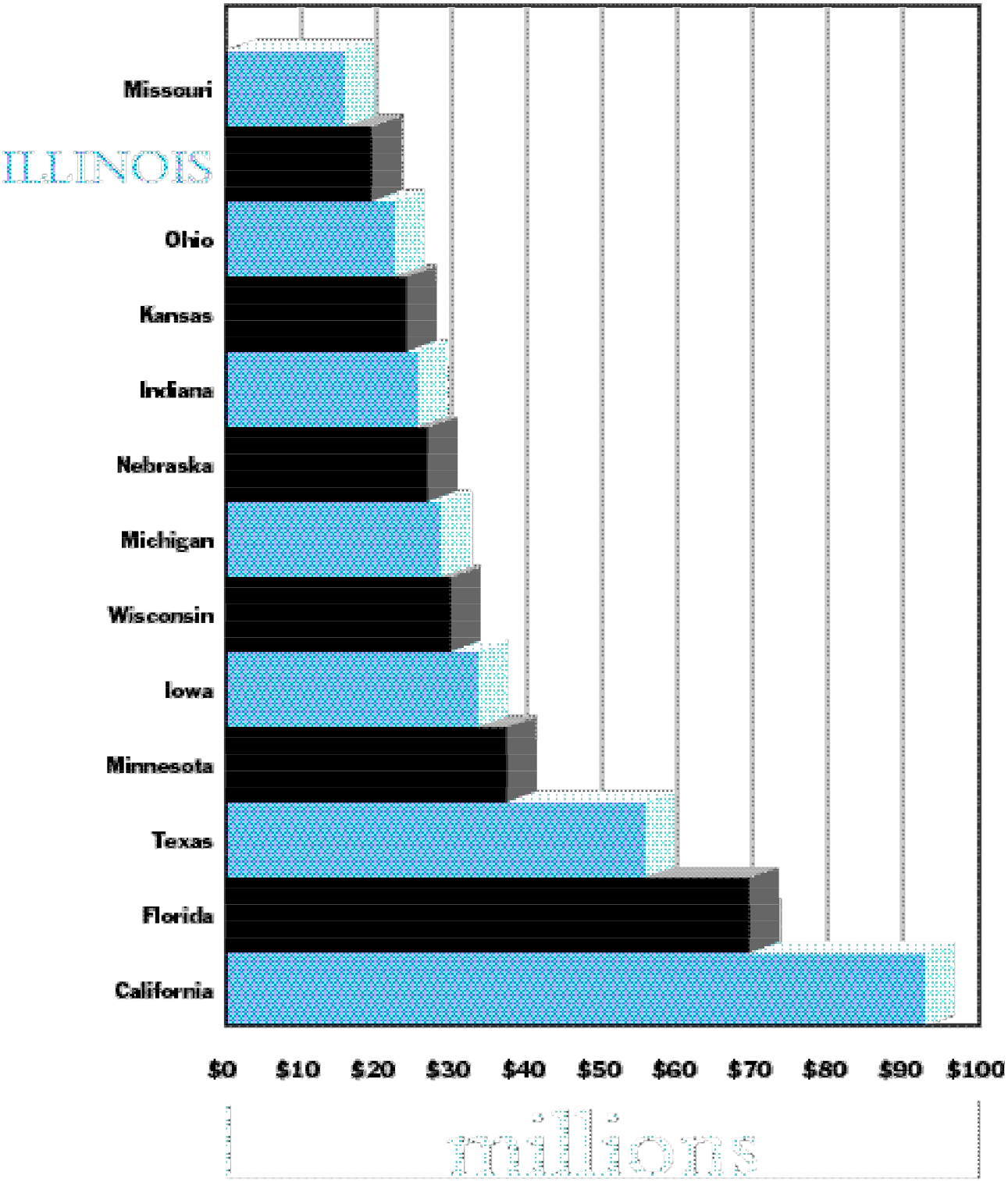
investment making large impact on Illinois food and agriculture

In 1995, Illinois ranked twenty-sixth in the nation in food and agricultural research funding. No meaningful partnership existed between the food and agricultural industry and the public research being carried out at Illinois universities. Research was often not geared to support the needs of the industry or consumers and there was no significant collaboration among university programs.

C-FAR was established to address the critical need for increased funding in food and agriculture research within Illinois and to provide a coordinated, targeted approach to addressing the issues of primary concern and importance to the citizens of Illinois. C-FAR efforts resulted in an appropriation of $3 million in FY96 as a result of the Food and Agriculture Research Act. Each subsequent year, the appropriation has increased by $3 million, with the FY00 appropriation, approved by the Illinois General Assembly and Governor Ryan, reaching $15 million. As stated in the enabling legislation for C-FAR funding, "Illinois should be among the top 10 agricultural states in state funding." This recognition and action by the State of Illinois to address the needs of the food and agriculture community have served to greatly improve the well-being of Illinois and its citizens. **Today, C-FAR and its constituents continue to make substantial impacts** on food and agricultural systems and the general health of citizens in Illinois. C-FAR also serves as a national model on how to build an effective connection among state government, the food and agricultural sector, and public research.

As stated in the enabling legislation for C-FAR funding, "Illinois should be among the top 10 agricultural states in state funding."

Comparison of Selected Agricultural States' Annual Research Expenditures (FY98)



SOURCE OF DATA IS THE INVENTORY OF AGRICULTURAL RESEARCH, USDA/CREES (LAND GRANT INSTITUTIONS), WHICH REFLECTS FY98 EXPENDITURES OF STATE FUNDS FOR FOOD AND AGRICULTURAL RESEARCH BY LAND GRANT INSTITUTIONS.

FY99 C-FAR University Expenditure Report by C-FAR Research Focus Area
Funds Directed to Universities for Internal Programs
(July 1, 1998 – June 30, 1999)

C-FAR Research Objectives	Expenditure Areas	UIUC	SIUC	ISU	WIU	Total
Expand markets for agricultural products	Equipment	40,662	14,631	0	0	55,293
	Materials/Supplies	39,670	19,418	0	0	59,088
	Personnel	360,312	10,710	0	0	371,022
	Services/Contracts	83,723	3,488	0	0	87,211
	Transportation	13,413	1,176	0	0	14,589
Promote economic development in Illinois	Equipment	6,622	404	0	0	7,026
	Materials/Supplies	7,718	20,115	33	0	27,866
	Personnel	357,492	14,106	13,741	5,837	391,176
	Services/Contracts	17,831	0	152	500	18,483
	Transportation	8,584	152	37	0	8,773
Increase agriculture's capacity to meet changing world food demands	Equipment	120,267	83,695	45,730	1,610	251,302
	Materials/Supplies	302,315	48,251	30,380	920	381,866
	Personnel	1,416,194	179,522	48,584	23,432	1,667,732
	Services/Contracts	109,784	48,230	12,212	2,231	172,457
	Transportation	57,706	6,580	0	0	64,286
Improve human nutrition, food quality, and food safety	Equipment	48,422	7,308	0	0	55,730
	Materials/Supplies	155,629	10,484	0	88	166,201
	Personnel	643,237	41,188	0	26,622	711,047
	Services/Contracts	129,571	5,360	0	73	135,004
	Transportation	24,031	253	0	0	24,284
Advance sustainable use of natural and human resources	Equipment	57,987	2,001	0	0	59,988
	Materials/Supplies	62,195	16,156	1,741	5,851	85,943
	Personnel	628,635	105,451	22,007	55,339	811,432
	Services/Contracts	56,808	18,637	295	25,411	101,151
	Transportation	20,903	4,479	0	1,471	26,853
Subtotals ($)		4,769,711	661,795	174,912	149,385	5,755,803
Indirect Cost		0	0	12,487	9,337	21,824
Research Support		70,023	40,650	5,902	2,288	118,863
C-FAR Administrative Office		207,977	N/A	N/A	N/A	207,977
1% Member Expense	Per Legislation	N/A	N/A	N/A	N/A	100,500**
Awards/Obligated Funds for FY00 Research		1,479,886	18,660	68,918	35,655	1,603,119
Total FY99 Expenditures ($)		6,527,597	721,105	262,219	196,665	7,808,086*

* Expenditures reflected above include allocations in FY99 and may also include funds from a previous fiscal year.
** $19,500 was transferred to the External Competitive Grants Program.

FY99 C-FAR External Programs Expenditure Report
by C-FAR Research Objective
(July 1, 1998 – June 30, 1999)

C-FAR Research Objectives	Expenditure Areas	External Competitive Grants Program ($)
Expand markets for agricultural products	Equipment	58,612
	Materials/Supplies	6,669
	Personnel	103,404
	Services/Contracts	10,655
	Transportation	6,122
Promote economic development in Illinois	Equipment	10,902
	Materials/Supplies	22,745
	Personnel	62,534
	Services/Contracts	21,121
	Transportation	8,741
Increase agriculture's capacity to meet changing world food demands	Equipment	56,345
	Materials/Supplies	25,627
	Personnel	58,837
	Services/Contracts	17,562
	Transportation	2,305
Improve human nutrition, food quality, and food safety	Equipment	40,134
	Materials/Supplies	22,421
	Personnel	129,186
	Services/Contracts	40,741
	Transportation	2,758
Advance sustainable use of natural and human resources	Equipment	8,629
	Materials/Supplies	17,567
	Personnel	169,232
	Services/Contracts	37,667
	Transportation	11,382
Subtotals		951,898
Indirect Cost		30,467
Awards/Obligated Funds for FY00 Research		1,357,971
Total FY99 Expenditures		$2,340,336

*Expenditures reflected above include allocations in FY99 and may also include funds from a previous fiscal year (i.e., second-year support for 2-year projects starting in FY98).

FY99 C-FAR Expenditure Summary Report by SRI
(July 1, 1998 – June 30, 1999)

C-FAR Strategic Research Initiatives	Expenditure Areas	Totals ($)
Food Safety and Functional Foods	Equipment	21,642
	Materials/Supplies	62,317
	Personnel	196,546
	Services/Contracts	86,323
	Transportation	12,973
	Coordination	131,804
Information Systems and Technology	Equipment	46,292
	Materials/Supplies	28,722
	Personnel	343,956
	Services/Contracts	97,658
	Transportation	7,316
	Coordination	71,048
Rural Community Development	Equipment	25,093
	Materials/Supplies	12,142
	Personnel	419,882
	Services/Contracts	101,924
	Transportation	18,399
	Coordination	24,913
Swine Odor and Waste Management	Equipment	114,863
	Materials/Supplies	84,012
	Personnel	359,867
	Services/Contracts	40,312
	Transportation	11,538
	Coordination	62,848
Water Quality	Equipment	—
	Materials/Supplies	—
	Personnel	8,499
	Services/Contracts	372
	Transportation	411
	Coordination	42,885
Subtotals		2,434,557
Indirect Cost		73,728
Awards/Obligated Funds for FY00 Research		1,787,186
Total FY99 Expenditures		$4,295,471*

* $704,529 of FY99 Water Quality SRI funds were not awarded as of June 30,1999.

Illinois Food and Agriculture Research Act: FY00 Allocations
(July 1, 1999 – June 30, 2000)

C-FAR Research Objectives	UNIVERSITY ALLOCATIONS					External Competitive Grants Program	Per Legislation and SRIs	Total Allocations
	UIUC 82%	SIUC 11%	ISU 4%	WIU 3%	Total University Allocations			
Technologies and expanding markets for agricultural products	416,733	30,000	6,134	15,000	**467,867**	386,229		**854,096**
Alternative systems and economic vitality in Illinois	574,058	36,000	156,102	13,298	**779,458**	410,406		**1,189,864**
Increase agriculture's capacity to address changing world food and agricultural demands	2,155,722	313,965	42,045	35,720	**2,547,452**	430,501		**2,977,953**
Enable consumers to make informed choices from the food supply	918,734	95,501	0	0	**1,014,235**	542,371		**1,556,606**
Foster sustainable use of natural resources	1,193,753	102,500	50,000	100,000	**1,446,253**	469,993		**1,916,246**
Research Support	96,840	56,000	0	4,400	**157,240**			**330,124**
Research Discretionary	590,957	172,884	25,148	41,153	**830,142**			**657,258**
Indirect Cost	0	0	13,971	10,479	**24,450**			**24,450**
Strategic Research Initiatives								**5,000,000**
Food Safety							775,000	
Information Systems and Technology							775,000	
Rural Community Development							900,000	
Swine Odor and Waste Management							1,250,000	
Water Quality							800,000[2]	
Functional Foods Commitment							470,000	
SRI Review Panel Expenses							30,000	
C-FAR Administrative Office	200,900	26,950	9,800	7,350	245,000			**245,000**
FY98 C-FAR Administrative Expense	67,903	N/A	N/A	N/A	67,903			**67,903**
1% Member Expense	N/A	N/A	N/A	N/A	N/A		150,000	**150,000**
IDOA Fee	N/A	N/A	N/A	N/A	N/A		50,000	**50,000**
Total ($)	**6,215,600**	**833,800**	**303,200**	**227,400**	**7,580,000**	**2,239,500[1]**	**5,200,000**	**15,019,500[1]**

1. An additional $19,500 was allocated to the FY00 External Program due to redirecting unspent funds from the FY99 1% Member Expense Fund.
2. The Water Quality allocation of $800,000 is in addition to $750,691 of FY99 funds that rolled over to FY00.

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FOOD AND AGRICULTURAL LEADERS, STATE OF ILLINOIS OFFICIALS, RESEARCHERS, CONSUMERS AND SUPPORTERS FROM ACROSS ILLINOIS HAVE JOINED FORCES THROUGH C-FAR TO ENSURE THE ADVANCEMENT AND SUCCESS OF THE STATE'S NUMBER ONE INDUSTRY.

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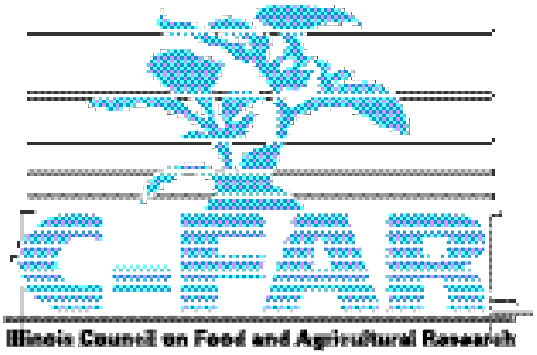

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