Report to Iowa Senators and Representatives in the United States Congress

From Iowa CARET Representatives and

Iowa State University
Agriculture is the centerpiece of Iowa’s economy and society. The future of the state depends on a strong agricultural economy. Iowa State University is a committed resource for Iowa’s future. Through research, extension and teaching in agriculture, Iowa State is becoming the best at fulfilling the mission of the land-grant university.

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WHAT IS CARET?
The Council for Agricultural Research, Extension and Teaching (CARET) is a national grassroots organization created in 1982 by the Division of Agriculture, which is part of the National Association of State Universities and Land-Grant Colleges or (NASULGC). CARET’s mission is to enhance national support and understanding of the land-grant university system’s food and agricultural research, extension and teaching programs to achieve a better standard of living for all people. CARET delegates are chosen by land-grant universities to be representatives of their states’ land-grant programs.
Ensuring profitable producers

SOYBEAN DISEASE RESEARCH TARGETS PLANT’S GENES
Identifying genes essential for the soybean plant’s defense against three major diseases is the goal of a $2.1 million research project led by Iowa State. The information resulting from the research will help improve soybean cultivars for disease resistance by accelerating plant-breeding programs and by enabling the engineering of new disease resistance traits. Nationally, soybean yield losses linked to diseases are estimated to cost farmers more than 400 million bushels every year. Even though soybeans are the nation’s second most economically important crop, scientists know little about specific genes defending the soybean plant against diseases. The ISU project will focus on genetic resistance against three important soybean pathogens: soybean mosaic virus, Asian soybean rust and soybean cyst nematode.

WIRELESS SENSOR NETWORK MAY PROTECT SWINE WORKERS
ISU agricultural engineers developing a wireless hydrogen sulfide detection system for use in swine housing show more research is needed on a multi-point detection system to adequately monitor the toxic and flammable gas. This project seeks to quantify the distribution of hydrogen sulfide that workers and swine in pork facilities are exposed to during different operating conditions. A network of sensors is placed in deep pit swine facilities and used to collect data during normal operating conditions, as well as during pit agitation and pumping events. Data will be used to identify the distribution of hydrogen sulfide concentrations that occur within the growing area of a swine facility. Results will be used to make recommendations to increase worker and animal safety.

EGG INDUSTRY CENTER CREATED TO SUPPORT PRODUCERS AND PROCESSORS
An Egg Industry Center was established last year in the College of Agriculture and Life Sciences. Iowa leads the nation in egg production and processing,
accounting for more than $1.8 billion in total sales and $475.7 million in annual value-added activity. Nearly 7,600 Iowans are employed by the egg production and processing sector. The center will seek science-based answers on developing more efficient and environmentally friendly production practices, growing existing markets, exploring new uses and new markets and enhancing nutrition for the benefit of consumers. The Iowa Egg Council made a $2 million gift commitment to establish the endowed egg industry program.

**Virus’ Gene Could Be Key to Its Control**

Iowa State is part of an international collaboration that has found a gene in all members of the largest, and most destructive, family of plant viruses that is essential to its reproduction. Without this gene, the virus is harmless. Small mutations to the gene in effect “killed” the virus. Plants inoculated with the mutant virus were healthy because the virus was unable to multiply. Work continues on discovering the gene's function during infection. This research is important to agriculture because 30 percent of all plant viruses are in this “potyvirus” family. These include the potato virus Y, a new strain of which has tormented potato growers in Europe and North America, wheat streak mosaic virus that threatens wheat production in Nebraska and elsewhere, and soybean mosaic virus in Iowa which discolors the beans, reducing their market value. Major fruits and vegetables also often are devastated by potyviruses.

**Iowa State Shares Fertilizer Research With Producers**

A daylong program shared the latest Iowa State research on poultry manure last July. With the increasing cost of fertilizer, ISU is looking at how to best utilize poultry manure as a resource for the crop production system. Nine years of research data at Iowa State shows poultry manure is an effective fertilizer that, when applied properly, also is environmentally friendly. Three nitrogen treatments were investigated — 150 and 300 pounds per acre of nitrogen from poultry manure, and 150 pounds per acre of commercial fertilizer. The key finding was that poultry manure applied at the 150-pound-per-acre rate resulted in lower nitrate and phosphate concentrations in subsurface drainage water when compared with equivalent application rates of commercial nitrogen fertilizer.
**RESEARCH PROGRESSES TO IMPROVE ETHANOL PRODUCTION**

Iowa is home to the most fuel ethanol plants in the nation. Researchers in the Center for Crops Utilization Research have been investigating ways to improve ethanol production. One way to increase the efficiency of ethanol plants would be to utilize the corn fiber as well as starch. Researchers showed that lignocellulosic material, like corn fiber, could be reduced to sugars with a wood-rot fungal process with a subsequent anaerobic yeast process to ferment the released sugars to ethanol. Another project demonstrated the opportunity to improve the energy and water efficiencies in dry-grind ethanol plants and to produce a high-protein feed product for non-ruminants by cultivating a fungus on excess thin stillage, the liquid left over after the ethanol and coarse solids are removed. The fungi remove waste products from yeast fermentation making possible the direct recycle of the water recovered, reducing energy input into the ethanol process by avoiding the need for evaporating the stillage.

**SORGHUM GOOD CANDIDATE FOR ETHANOL PRODUCTION**

Research on sweet sorghum showed a strong potential as a cellulosic feedstock for ethanol production. Sweet sorghum varieties and management practices were evaluated over several years and one consistently produced high biomass and sugar yields. A related study demonstrated that solid-state fermentation, or ensiling, is an effective means of preserving sweet sorghum biomass. Both direct-cut biomass and residue after mechanical extraction of juice fermented rapidly under anaerobic storage conditions and required no additional treatment to enhance fermentation. These studies demonstrated that sweet sorghum has excellent potential as a biomass feedstock for ethanol production in Iowa. Research of sorghum for biomass continues with variety trials and evaluating other types of sorghum under varied cropping systems.

**FEED ALTERNATIVE REDUCES MICROBIAL POPULATIONS IN LAYING-HEN INTESTINE**

An Iowa State study found that feeding dried distillers grains with solubles (DDGS) from ethanol production to laying hens had beneficial effects in reducing the populations of pathogenic bacteria in the hen’s intestine. The use of DDGS in chickens’ diets has previously been shown to reduce ammonia emissions of the laying hen. The Iowa Egg Council funded this study to learn the underlying mechanisms for the ammonia reduction.
TECHNOLOGY DISCOVERED TO INCREASE LEVELS OF CORN STARCH

An Iowa State researcher has developed technology that allows corn plants to produce more starch and also modified starch. Martha James, a collaborator in the department of biochemistry, biophysics and molecular biology, is working to produce the two different types of corn starch modifications. One starch modification would allow each corn kernel to produce more starch. Another modification would allow corn starch to be used commercially and industrially more easily and less expensively. Increasing the amount of starch could have benefits beyond the farm. “We hope it will address the food versus fuel debate,” James said. “So this technology may help lessen the competition between them.” James also is researching another modification that will change the structure of the starch so it could bypass processing before it can be used in various commercial and industrial applications. “What we're doing is attempting to modify the structure of the starch in the corn plant so it can be harvested and used directly without having to undergo any post-harvest treatment,” said James.

RESEARCHER DEVELOPS ETHANOL PROFITABILITY TOOL

A researcher has developed a tool to determine what market conditions are needed for ethanol producers to make a profit. David Peters, an assistant professor of sociology, was asked about the profitability of ethanol plants under current market conditions and decided to create a spreadsheet that would allow anyone to figure it out. Peters expects this calculator will be useful for several different groups. “This is a tool for local communities, investors, policy makers and anyone else who wants to better understand how these ethanol plants are doing,” said Peters. “Of course investors are very interested in calculating profitability,” he said. “But communities that have plants, or are considering plants, also want to know if they'll make money. The communities invest a lot in local infrastructure and want to know if the plant will be profitable.”
Most undergraduate and graduate students enrolled at Iowa State come from Iowa. Total enrollment was 26,856.

The Council for Agricultural Research, Extension and Teaching (CARET) includes the direct employment and value added produced within these industries, plus the related spinoff activity that they stimulate in the remainder of Iowa’s economy, from crop farming; cattle ranching and farming; dairy cattle and milk production; poultry and egg production; hog and other animal production; forest nurseries, forest products and timber tracts; logging; fishing; hunting and trapping; support activities for agriculture and forestry; food and beverage manufacturing; ethanol and other basic organic chemical manufacturing; fertilizer manufacturing; pesticide and other agricultural chemical manufacturing; and farm machinery and equipment manufacturing. The sum of economic impact values for the five congressional districts does not sum to the state total. Each region’s values are obtained from a unique input-output model built specifically for that region.

Based on July 1, 2007 estimates from the U.S. Census Bureau.

**FOOD CHAIN LINKS GATE TO PLATE**

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**LINKS TO IOWA STATE UNIVERSITY**

**Education**

Most undergraduate and graduate students enrolled at Iowa State come from Iowa. Total enrollment was 26,856.

**Extension**

ISU Extension serves families, producers and businesses throughout Iowa. One example is the numbers shown here of rural and urban youth who participate in 4-H.

**Alumni**

Iowa State has more than 200,000 alumni around the world, and more than 19,000 College of Agriculture and Life Sciences alumni living in Iowa. About 70 percent of College of Agriculture and Life Sciences graduates stay in Iowa for their first jobs.

* includes the direct employment and value added produced within these industries, plus the related spinoff activity that they stimulate in the remainder of Iowa’s economy, from crop farming; cattle ranching and farming; dairy cattle and milk production; poultry and egg production; hog and other animal production; forest nurseries, forest products and timber tracts; logging; fishing; hunting and trapping; support activities for agriculture and forestry; food and beverage manufacturing; ethanol and other basic organic chemical manufacturing; fertilizer manufacturing; pesticide and other agricultural chemical manufacturing; and farm machinery and equipment manufacturing. The sum of economic impact values for the five congressional districts does not sum to the state total. Each region’s values are obtained from a unique input-output model built specifically for that region.
### Congressional Districts

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### Links to Iowa State University

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Iowa State University
**SIMPLE SALMONELLA TEST COULD SPEED DETECTION**

Iowa State researchers have developed a technique for testing for the presence of salmonella that may give investigators better, faster answers. The approach can tell investigators if produce is contaminated with salmonella in about two hours, compared with current methods of detecting salmonella that take one to seven days. Besides the time savings, researcher Byron Brehm-Stecher said it’s easy and inexpensive. The process begins with testing the food, in most cases produce, with a strip of adhesive tape applied to its surface, then carefully removing it to take a sample of whatever is on the skin. That sample is then put on a slide and soaked in a soapy mixture that contains a genetic marker that binds with salmonella and gives off a fluorescent glow when viewed under ultraviolet light. Use of this genetic marker approach is called Fluorescent In-Situ Hybridization, or FISH.

**RESEARCHERS AIM TO IMPROVE NUTRITIONAL QUALITY OF BEEF**

Experts in molecular genetics, biochemistry, meat science and animal breeding are working on a project to identify cattle genetics that lead to desired nutritional traits in beef. The study’s ultimate goal is to help improve human health through the beef people eat, said James Reecy, associate professor of animal science. Reecy and colleagues at Iowa State, the University of California-Davis and Oklahoma State University plan to develop genomic tools, or DNA markers, that will allow beef producers to identify animals that produce meat with enhanced nutrient levels so that a person might be able to get an entire recommended daily allowance of some nutrients from one serving of beef.

**TENUOUS LINK FOUND BETWEEN SUBSIDIES AND SWEET INTAKE**

Eliminating corn subsidies would do little to decrease the consumption of sweeteners in foods, according to the analysis by Iowa State economists. Beginning in the 1970s, companies began substituting cheaper high-fructose corn syrup for the more expensive sugars made from cane and beet sugar, and farm subsidies did make the substitute much more competitive. Critics have charged that the cheap corn-based sweetener used in many snack foods and beverages has contributed to rising U.S. rates of obesity and diabetes. The study found that countries with no comparable commodity programs had increasing rates of sweetener consumption similar to those in the United States. Also, the farm share of the value of sweetened food items is so small, at roughly 5 percent or less, that the effect of sweetener ingredient prices has become much less important over time.
HELPING IOWANS BECOME SAVVY HOMEBUYERS

The Iowa Mortgage Help initiative, the Iowa Finance Authority's enhancement of the Iowa Foreclosure Hotline, received more than 12,000 calls last year from homeowners seeking help with their mortgages. “Because buying a home is a complicated process, pre-purchase education can help people avoid costly mistakes that can lead to mortgage delinquencies or foreclosures,” said Mary Yearns, housing specialist with Iowa State University Extension. Extension offers an online homeownership education program called A Place of Your Own. Some 676 Iowa households completed the course in 2008. It meets USDA Rural Development's requirement that first-time homebuyers complete an educational course about homeownership to be eligible for loans. Lenders can even help pay for the $45, five-lesson course for their clients.

EXTENSION WEBSITE HELPS FAMILIES EAT BETTER FOR LESS

The cost of living — measured by the Consumer Price Index — rose during 2008 at the fastest pace since 1991 and the food index jumped 6 percent in the 12 months ending in July 2008. With food representing a significant share of consumer spending, about 14 percent, this price increase during 2008 has taken a bite out of consumers’ purchasing power. Spend Smart Eat Smart, at www.extension.iastate.edu/foodsavings, is one way Iowa State University Extension is helping families save money and eat healthy. The interactive website strives to build skills and knowledge through smart tips; game-like activities about planning, shopping and preparing meals; and weekly blog entries for conversations with extension nutrition specialists.

IOWA STATE RESEARCHES HERBAL REMEDIES

Scientists from Iowa State University and the University of Iowa joined forces in 2002 to establish the Center for Research on Botanical Dietary Supplements. The center, funded by the National Institutes of Health, conducts research to understand the range of bioactivities and toxicities of medicinal herbs and to learn more about their positive or negative effects on human health. Research focuses on Echinacea, Hypericum (St. John’s wort) and Prunella (self-heal). The USDA-ARS North Central Regional Plant Introduction Station on the ISU campus collects and grows these plants as well as preserves these germplasm collections within the U.S. National Plant Germplasm System. The center cautions consumers that the herbal remedies vary in potency and that Echinacea and Hypericum, for example, interfere with the systems our bodies use to process and use drugs, such as those that treat high blood pressure and AIDS or even those to prevent pregnancy, so doctors should be informed when taking them.
STRIPS PLANTED TO PERENNIALS HELP TO HOLD SOIL IN FIELDS
Perennial prairie strips planted at critical points in fields of corn and soybeans have minimized soil erosion, even during periods of heavy rainfall. The Leopold Center-funded project was given a challenging test during Iowa’s 2008 flood year. Preliminary data from a three-month period from April to June 30 found the average sediment loss from watersheds with no prairie strips was 8.5 tons per acre, compared with an average one-half ton/acre sediment loss on the watersheds with prairie plantings. The period included 10 runoff events that produced measurable sediment loss including a rainfall of 4-5 inches one morning. The project involves 14 small watersheds within the Neal Smith National Wildlife Refuge in Jasper County that are managed as restored prairie and for row-crop production. Native grasses have been planted in strips representing 10 or 20 percent of the total drainage area in each watershed.

PONDS PROVIDE BIG PUSH IN SEQUESTRING CARBON
Research led by Iowa State finds that ponds around the globe could absorb as much carbon as the world’s oceans. Constructed ponds and lakes on farmland in the United States bury carbon at a much higher rate than expected; as much as 20-50 times the rate at which trees trap carbon. In addition, ponds were found to take up carbon at a higher rate than larger lakes. The research estimated there are 304 million natural lakes and ponds in the world, covering an area of 4.2 million square kilometers, twice the area previously thought. Ponds capture carbon in two main ways: algae and plants take carbon dioxide out of the air as they grow and the carbon remains in the pond when the plants die and water run-off brings in carbon from surrounding farmland soil.

IOWA STATE UNIVERSITY
Iowa State is part of the first nationwide project to quantify emissions of ammonia, hydrogen sulfide and particulate matter from swine, poultry and dairy operations. The $14.6 million project is funded by the National Pork Board, the National Chicken Council, the National Milk Producers Federation and the United Egg Producers, via a nonprofit organization called the Agricultural Air Research Council. The study is led by Purdue University and is overseen by the U.S. Environmental Protection Agency. The study is being conducted at 21 sites in nine states. Data collection in Iowa began in 2007 at a swine gestation and farrowing operation and will continue until mid-2009.

RESEARCH FINDS WETLANDS AID NITRATE REDUCTIONS

Iowa State researchers play a key, supporting role in the ongoing effort to reduce hypoxia in the Gulf of Mexico through a cooperative effort to decrease the loss of nitrate and phosphorus from Iowa farm fields. The effort earned a national recognition. A partnership between the Iowa Department of Agriculture and Land Stewardship, the Iowa office of U.S. Department of Agriculture’s Farm Service Agency and the Iowa Farm Bureau Federation received a Gulf Guardian Award from the U.S. Environmental Protection Agency last year. In announcing the award, the EPA said Iowa farmers, landowners and conservation agencies have a three-part strategy to address Gulf hypoxia. This strategy includes research to develop technologies for wetland and drainage systems to reduce nutrient transport from cropped lands, construction of nitrogen-removal wetlands through the Iowa Conservation Reserve Enhancement Program and development of pilot demonstrations. Iowa State monitoring has shown 40 to 70 percent reductions in nitrate after tile drainage is intercepted and channeled into targeted wetlands.
Preparing tomorrow’s leaders

GLOBAL RESOURCE SYSTEMS MAJOR FIRST IN THE NATION
Iowa State will soon offer the first undergraduate program in the nation that allows students to choose an international region to study and become technical experts on that region. Beginning in August 2009, Global Resource Systems gives students the ability to take control of their academic career by picking which region to specialize in. “Solving complex resource problems on a global scale requires a wide range of knowledge, skills and technical expertise,” said David Acker, the associate dean of academic and global programs in the College of Agriculture and Life Sciences. This major will give students the understanding of complex global resource systems and turn them into experts on the region’s human, natural, biological and financial resources. This major will attract those who are interested in addressing issues in developing nations and those who want to work for companies with global connections.

IOWA STATE PROFESSOR HONORED FOR TEACHING EXCELLENCE
Iowa State professor Richard Schultz received one of six regional USDA Food and Agriculture Sciences Excellence in Teaching Awards last year. Schultz, a natural resource ecology and management professor, has been with Iowa State for 30 years and teaches courses in ecology, soils and watershed management with an emphasis on field laboratory applications. He said his goal is to help students develop “field smarts.”

ISU CENTER TO IMPROVE NUTRITION OF STAPLE BEAN DIETS IN AFRICA
The Center for Sustainable Rural Livelihoods is helping the people of Africa improve their lives. The Center’s Service Learning Program collaborates with Makerere University in Uganda. Iowa State students travel to local schools to teach about agriculture and help the primary school children plant and grow gardens. This program helps Iowa State students understand the complex issues of crop production, hunger, poverty, health and how these impact education on the lives of the Ugandan school children. The center has been awarded a grant from the U.S. Agency for International Development to enhance nutritional value and marketability of common beans in Uganda and Rwanda. The research is expected to significantly improve yields and quality of bean varieties, enhance nutritional value and marketability of beans and increase marketing and consumption of beans and value-added bean products.
Agricultural Research, Extension and Teaching at ISU

**ACADEMIC DEPARTMENTS**
- Agricultural & Biosystems Engineering
- Agricultural Education & Studies
- Agronomy
- Animal Science
- Biochemistry, Biophysics & Molecular Biology
- Ecology, Evolution & Organismal Biology
- Economics
- Entomology
- Food Science & Human Nutrition
- Genetics, Development & Cell Biology
- Horticulture
- Natural Resource Ecology & Management
- Plant Pathology
- Sociology
- Statistics

**CENTERS AND INSTITUTES**
- Agricultural Marketing Resource Center
- Beginning Farmer Center
- Biosafety Institute for Genetically Modified Agricultural Products
- Center for Agricultural and Rural Development (CARD)
- Midwest Agribusiness Trade Research and Information Center (MATRIC)
- Food and Agricultural Policy Research Institute (FAPRI)
- Center for Agricultural Law and Taxation
- Center for Crops Utilization Research (CCUR)
- Center for Integrated Animal Genomics
- Center for Sustainable Rural Livelihoods
- Community Vitality Center
- Egg Industry Center
- Food Safety Consortium
- Iowa Beef Center
- Iowa Pork Industry Center
- Leopold Center for Sustainable Agriculture
- Midwest Grape and Wine Industry Institute
- Plant Sciences Institute*
- Seed Science Center
- U.S. Pork Center of Excellence

**REGIONAL CENTERS**
- North Central Regional Aquaculture Center
- North Central Regional Center for Rural Development
- North Central Regional Plant Introduction Station
- Rural Policy Research Institute (RUPRI)

**ISU EXTENSION PROGRAMS**
- Agriculture and Natural Resources
- Center For Industrial Research and Service
- Communities
- Continuing Education and Communication Services
- Families
- 4-H Youth Development

*affiliated institute