2007

Endeavors 2006-07

ENDEAVORS

Highlights of University of Nebraska–Lincoln Agricultural Research Division research

2006-2007

ARD innovation has statewide impact

William Arthur Ward once said, "If you can imagine it, you can achieve it."

UNL's Agricultural Research Division, part of the University's Institute of Agriculture and Natural Resources, has a unique role: It is the state's only public entity charged with conducting agricultural research. ARD also ties Nebraska to a network of agricultural research at land-grant universities nationwide.

IANR scientists focus their research on issues of great importance to Nebraskans. They improve the quality of life for Nebraskans across the state, making important contributions to the state's agriculture, food industries, environment, the well-being of families, and community development. Research occurs in fields, feedlots, the natural environment, homes, yards, gardens, and cities and towns. ARD scientists provide new knowledge and seek answers to Nebraskans' problems and concerns.

In addition, many ARD scientists either teach students or educate Nebraskans through UNL Extension, ensuring we share the discoveries, knowledge and advancements made through agricultural research with Nebraska citizens and our students.

Hundreds of research projects are under way at any given time. This 2006-07 edition of Endeavors provides an update on just some of them. Within these pages, you'll get a taste of the breadth and depth of ARD's work in Nebraska.

For more information, visit the ARD Web site, *http://ard.unl.edu*

We also welcome your questions and comments. Please contact the ARD office, 207 Ag Hall, P.O. Box 830704, University of Nebraska, Lincoln, NE 68583-0704; phone, (402) 472-2045.

Mixing drier, bulkier materials with wet ethanol byproducts increases storage life, flexibility of feed

Wet by-products from ethanol production are tricky to store for later use as cattle feed because of their high moisture content and threat of spoilage, but mixing them with drier, bulkier feeds improves storability, IANR research shows.

Compressing wet distillers grains alone into silage bags results in splitting, as shown here, but UNL researchers have found that mixing them with drier, bulkier feeds improves storability.

UNL animal scientists' research resulted in formulas for mixing several widely available dry forages with wet distillers grains. Their findings could help feedlot managers and cow-calf producers purchase wet distillers grains during the summer when their plentiful supply can mean lower prices and safely store them for use later in the season or for winter feeding.

The relatively short shelf life of wet distillers grains has been a key obstacle to their use as feed in some situations. Feedlots need to have the material delivered frequently and use it within a few days to avoid spoilage; for smaller operations, that's not economically feasible. Cow-calf operators, meantime, have greatest use for the feed during the winter, but that's when supplies tend to be lower than during the summer.

At 65 percent moisture content, wet distillers grains alone cannot be stored in silage bags or bunkers like corn silage or bulkier feeds. Compressing them in bags to push out air and prevent spoilage splits the bags, and they're too wet to be compacted by tractors in bunkers.

UNL animal scientists experimented with mixing grass hay, alfalfa hay and wheat straw with the wet distillers grains to determine how much dry material would be needed for successful storage.

When bagging silage, IANR researchers found the following minimal levels of dry material: 15 percent for grass hay; 22.5 percent, alfalfa hay; and 12.5 percent, wheat straw.

Researchers also experimented with mixing dry distillers grains and wet corn gluten feed, another ethanol byproduct, with the wet distillers grains. A 50-50 blend of dry and wet distillers grain bagged up well, while a 60-40 mixture of wet corn gluten and wet distillers grains seemed to work.

Agronomy prof heads new energy center partnership with NPPD

University of Nebraska–Lincoln agronomy professor Ken Cassman heads up a new partnership for energy-related research.

Cassman heads the Nebraska Center for Energy Sciences Research, a partnership between UNL and the Nebraska Public Power District that will encourage collaboration on energy-related research among UNL faculty and with public and private energy-related organizations. The center will provide initial funding for promising research to develop renewable domestic energy resources, improve energy efficiency and create economic opportunities for Nebraska and beyond.

Cassman was head of UNL's agronomy and horticulture department from 1996 until 2004 when he returned to the faculty to concentrate on his crop production ecology research and teaching. Before joining UNL, he worked with the International Rice Research Institute in the Philippines and was on the faculty at the University of California, Davis.

Cassman's interest in the energy center is tied to his work as an agronomist, which has focused on ensuring local and global food security while improving soil and environmental quality. At UNL, his work has expanded to consider the energy efficiency and environmental impact of corn-ethanol production systems and crop yield potential to ensure adequate corn supplies.

Nebraska has several advantages in the renewable energy arena, such as wind power and biofuels, which have the potential for long-term economic benefit for Nebraska. NPPD is providing $5 million over five years in startup funding. This money will be leveraged to attract additional research support from agencies and foundations. The goal is to use the NPPD funding as a foundation for elevating energy science research and its impact in Nebraska.

Water Optimizer to be enhanced, expanded

A UNL computer program that helps farmers facing limited water supplies to make irrigation decisions will be expanded and enhanced under a new grant from the U.S. Department of Agriculture.

The $885,000 grant will allow IANR researchers to refine and improve the Water Optimizer, a tool that enables producers with limited water to evaluate what crops to grow, how many acres to irrigate and how much water to apply. Improvements will make the Water Optimizer more versatile and more widely applicable.

The first version of Water Optimizer, released by UNL in 2005, is useful but limited in scope. It covers the principal crops in Nebraska but doesn't address all of the critical risk-management issues surrounding limited water.

The project has several goals:

- improve the tool's usefulness for crops grown in the semiarid High Plains, including canola, camelina, crambe, brown mustard, chickpeas, dry beans and sunflowers
- improve the tool's geographic coverage area to additional counties in Nebraska and irrigated areas in Colorado and Kansas
- develop the capability to evaluate risk-management alternatives on a "whole-farm" basis, as well as field by field
- develop the capability to determine the best strategies for managing multiyear water allocations.

UNL's Water Optimizer is undergoing further refinement to make it a more effective, versatile tool for farmers looking to more effectively use irrigation water.

UNL scientists helping to identify ethanol co-products' potential in dairy cow, swine diets

With U.S. ethanol production expanding, the need to use the industry's growing supply of co-products continues to rise.

To help producers discover and identify corn distillers grains' potential feed value, University of Nebraska–Lincoln animal scientists are studying the nutrient composition and availability of this co-product of the ethanol industry.

UNL animal scientists hope to help producers discover and identify the potential that distillers grains have for improving herd profitability and ultimately milk production on dairy farms and the feed value of dried distillers grain in swine diets.

With feed sources being the highest cost of production on a dairy farm, there is a huge potential for distillers grains – wet and dry – as well as wet corn gluten feed.

So far, scientists have found as much as 30 percent of the dairy cow's diet dry matter can be replaced with distillers grains and still maintain milk production, fat production and milk protein production, and, in some cases, a higher milk yield.

Scientists also are studying how rations will be balanced so that forages, soybean meal and corn can be replaced with distillers grains.

Eventually, dairy nutritionists will formulate diets with high amounts of distillers grains not only in Nebraska but nationwide.

Future studies will look at nitrogen and phosphorus excretion.

The Nebraska Corn Board helps fund this research.

IANR animal scientists also are studying the feeding value of swine diets that contain

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Research provides glimpse into Sandhills' past

Nebraska's Sandhills, a region of gently rolling sand dunes blanketed with prairie grasses and wetlands that cover a quarter of the state, provide ideal habitat for wildlife and livestock. During medieval times 800 to 1,000 years ago, however, the region was a swirling desert, far worse than the Dust Bowl of the 1930s.

UNL scientists outlined their discovery of weather conditions that existed the last time the dunes were on the move about 1,000 years ago in the journal Science. If those conditions return, the tranquil, verdant Sandhills could once more turn into an unlivable wasteland.

This research indicates a historically unprecedented, large-scale shift in wind direction that cut off moisture to the region during the growing season. Researchers believe dune development was part of a larger climate shift during the Medieval Warm Period that created a mega-drought in much of western North America.

The youngest dunes, about 1,000 years old, exist on the Sandhills southeastern edge. Scientists analyzed these young dune formations and identified the circumstances that created them. Using a computer program that calculates sand drift under differing conditions, they discovered that the modern southerly wind flow would create asymmetrical dune crests oriented southwest to northeast, not the symmetrical dunes oriented northwest to southeast as is the case with these young dunes.

By working backward from the dunes' pattern, they determined that the winds that created them must have come from the southwest out of what is now west Texas and New Mexico, a desert area that would not have brought moisture to Nebraska. As the area dried, fewer plants survived, wetlands dried up and the soil retained less moisture. These conditions heated the land surface, further strengthening the southwesterly wind flow in a kind of intensifying feedback loop. As the drought worsened, grasses died off completely, allowing sand to blow in the strong wind.

The research is part of UNL's Sand Hills Biocomplexity Project.

Nebraska's Sandhills, now a region of gently rolling sand dunes blanketed with prairie grasses and wetlands that provide ideal habitat for wildlife and livestock, once were little more than a swirling desert.

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0, 5, 10 and 15 percent corn distillers grains for growing/finishing pigs. Diets will contain corn, soybean meal and corn distillers grains at those concentrations.

While there is tremendous potential in feeding corn distillers grains to swine, there also are a lot of questions as corn distillers grains are not widely used in swine diets. To help answer those questions, scientists will look at growth rate, feed intake, feed efficiency and a number of post-harvest variables, such as back fat, dressing percentage, carcass lean and other carcass composition criteria Results also will be evaluated through economic analysis.

The Nebraska Pork Producers help fund this research.

Paul Kononoff, UNL dairy nutrition specialist, looks at feed containing distillers grains as part of research to help producers identify feed value potential.

New grant supports organic farming research

A $750,000 grant is helping UNL expand organic farming research and education, enhance collaborations with growers and develop science-based information for organic food production.

The grant, from the U.S. Department of Agriculture's Cooperative State Research, Education and Extension Service, will fund Improving Organic Farming Systems across Nebraska Agroecoregions, which aims to lay the foundation for long-term organic farming efforts at UNL.

Goals include establishing the University's first certified organic research plots, launching focused research, incorporating organic farming concepts into UNL Extension and classroom education, and developing an ecological index of different farming methods.

One certified plot already has been established near Sidney, with others to follow near Concord, Mead and Clay Center. Scientists will use these plots to examine priority concerns for organic producers, such as weed management, crop varieties and soil fertility. Each site will focus on different aspects of organic production while the network will enable collection of statewide information.

Organic certification takes three years and researchers will use each site's transition as a learning experience. Documenting issues that arise during the conversion to organic farming should provide information for farmers looking to make the change.

Organic growers supported the grant, and local and state organic producer advisory committees will guide research. Scientists also will conduct studies on cooperating certified organic farms.

Wildlife researchers will focus primarily on birds in extensive field studies to develop a Healthy Farm Index, a tool for landowners to measure their farm's ecological health. After identifying the birds, insects and soil factors associated with different farming scenarios, researchers will devise a preliminary index that relates different land covers to birds and biodiversity to measure farm health and sustainability.

Rural Poll reflects reservations about newcomers

It's not easy for newcomers to settle into rural Nebraska communities, whether they're moving from a few miles away or arriving from another country.

That was the finding of the 2006 Nebraska Rural Poll, which explored respondents' views about newcomers to their communities and Latin American immigration to rural Nebraska.

Sixty-four percent of respondents said they're aware of recent Latin American immigrants living in their communities. Only 14 percent of respondents said Latin American immigration had been good for rural Nebraska, with 56 percent disagreeing. Among Latino respondents, 70 percent felt immigration had been good for communities, and 14 percent disagreed.

Ninety-four percent of respondents agreed that immigrants should learn to speak English within a reasonable amount of time. Eighty-two percent of Latino respondents also held that view.

However, a significant split showed up on another language-related question: whether rural communities should communicate important information in Spanish as well as English. Only 20 percent of non-Latinos agreed with that statement, and 69 percent disagreed. Among Latino respondents, 76 percent felt important information should be communicated in both languages.

On the newcomer question, only 31 percent of respondents agreed that newcomers to their communities improve the quality of life. One-fourth disagreed, and 44 percent had no opinion.

About 18 percent of respondents agreed new residents have been bad for their community. Forty-six percent of respondents disagreed with that statement, and 37 percent neither agreed nor disagreed.

Results are based on 2,482 responses, from about 6,200 randomly selected households in Nebraska's 84 rural counties.

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Economic study measures benefits of increasing storage of recreation water in Lake McConaughy

The long-term economic benefits of leaving more water in Lake McConaughy for recreational purposes may in some circumstances offset the costs of compensating irrigation and power interests for one year of reduced supplies, IANR research shows.

Several years of drought have left Lake McConaughy, Nebraska's largest reservoir, at historic lows.

A UNL agricultural economist set out to determine how declining lake levels have affected the region's recreation industry and whether short-term water management strategies to reduce that impact could be "economically justifiable." Those strategies would make less water available to irrigators or hydro power interests for one year by holding back more water in the reservoir. This one-year holdback could increase the lake's water level for recreational use for several years to come, depending on how quickly the reservoir refills.

Several years of drought have left Lake McConaughy at record low levels. UNL research has found that leaving more water in the reservoir for recreational purposes might pay off overall for the state.

The research found that lakeside businesses reported steady declines since the drought began in 2001 and that recreational use of McConaughy in 2004 was 32 percent below the most recent 10-year average.

The research considered several scenarios for increasing the amount of water in McConaughy for recreation, finding that reducing irrigation or hydro power releases when the reservoir is low would under some circumstances increase recreation benefits enough to offset the costs quantified in the study.

The study envisions one year of reduced releases, with the impact of more water in the lake being felt over several years with increased recreational use.

Such a "reservoir augmentation program" could take a variety of forms, including periodic purchase of water by recreation-related interests, the purchase of storage rights or the purchase of a long-term insurance policy in which McConaughy water owners would agree to a modified set of release rules in return for a periodic premium payment.

Sorghum, millet research connects UNL with U.S., global researchers in cooperative program

Better marketing strategies in Niger are increasing farm income, while in the U.S. farmers have access to improved hybrids, including varieties that can withstand attack by greenbugs, a major sorghum pest.

These are a few of the many agricultural improvements here and abroad made possible by the International Sorghum and Millet Collaborative Research Support Program, or INTSORMIL, headquartered at the University of Nebraska–Lincoln. Thanks to a $9 million, five-year cooperative agreement from the U.S. Agency for International Development, its work will continue and will continue to be based at UNL.

The cooperative agreement's official title is the Sorghum, Millet and Other Grains Collaborative Research Support Program. Because the long-standing program is internationally known as INTSORMIL, officials plan to continue using that name – its name since inception.

For nearly 30 years, INTSORMIL has provided life-sustaining aid to some of

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UNL researchers turn agricultural wastes into fabrics

Suits and dresses made of chicken feathers or rice straw might just be the norm someday.

An IANR textiles research team has found a way to turn these agricultural waste products into conventional-looking fabrics. The feather-based fabric will resemble wool, while the rice straw fabric will look and feel more like linen or cotton.

While both fabrics are in early development and may not reach the market for several years, researchers hope their findings will spark interest in using agricultural byproducts as textile fibers.

This not only would add value to agricultural crops, but it would make the fiber industry more sustainable and reduce the use of petroleum-based synthetic fabrics.

With millions of tons of chicken feathers and rice straw available worldwide each year, these agricultural wastes represent an abundant, cheap and renewable alternative to petroleum-based synthetic fibers. The fibers also are biodegradable and the development could be a boon to the nation's rice and chicken farmers.

Rice fabrics, composed mostly of cellulose, are the most developed of the two and are capable of being spun into fabrics using common textile machinery.

Chicken fibers, composed mostly of keratin, offer the potential for developing fabrics that are lightweight, and offer better shock absorption and superior insulation.

UNL textile scientists Yiqi Yang (right) is developing fabrics made from such agricultural waste products as chicken feathers and rice straw.

The fabrics will be able to withstand normal washing and ironing and could become environmentally friendly fabrics used in carpets, automobiles, building materials and a host of other everyday applications – potentially at less cost and sometimes superior properties than their synthetic counterparts.

This research builds on earlier work turning cornhusks into fabrics with properties similar to linen or cotton.

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the poorest nations in the world. At the same time, it has improved sorghum and millet hybrids for U.S. farmers and has brought more than $80 million to the University.

Having access to sorghum and millet strains from Africa and other countries has helped U.S. plant breeders develop new sorghums and millets for this country. In addition, much of the U.S.'s sorghum research is funded through INTSORMIL. INTSORMIL works in Africa, Central America, Eurasia and the U.S.

Scientists from six U.S. land-grant universities – UNL, Kansas State University, Mississippi State University, Purdue University, Texas A&M University, and West Texas A&M University – and the U.S. Department of Agriculture's Agricultural Research Service have collaborated with scientists in the INTSORMIL host countries.

Because of INTSORMIL involvement, Mali, Africa, has one of the strongest sorghum research programs in the world today.

The center of origin for sorghum and pearl millet is in Africa so breeders are able to bring back germplasm from native types and from improved types with desirable characteristics and enter them into their breeding programs back in the U.S.

Sorghum and pearl millet are important food staples, especially in semiarid regions, because of their drought-tolerant characteristics.

In the U.S., sorghum is used mainly as livestock feed. Nebraska ranks third in sorghum production.

UNL among leading institutions in GMO trials

The University of Nebraska–Lincoln was among the leading U.S. institutions in permits for genetically modified crop field trials in 2005, according to information published in a scientific journal.

The April 2006 issue of the journal Nature Biotechnology featured a chart titled "Field Trial Permits by Top U.S. Institutions." The chart featured the top 10 private companies and public institutions that obtained U.S. field trial approvals for transgenic crops in 2004 and 2005 as well as the percentage of overall U.S. trials in 2005 for each.

UNL ranked fourth overall and first among U.S. universities and public agencies with 30 field trial permit approvals, or 3 percent of all 2005 U.S. field trial approvals for genetically modified crops. Monsanto, by far the U.S. leader, accounted for 509 field trial permits or 54 percent of all U.S. trials in 2005. Syngenta was second with 37 or 4 percent of U.S. trials; ArborGen was third with 36 or 4 percent overall.

Other institutions in the top 10 for 2005 and their number of field trial permits were: fifth, Bayer CropScience, 19; sixth, Pioneer, 17; seventh, University of Arizona, 15; eighth, University of Florida, 14; ninth, U.S. Department of Agriculture, 13; and 10th, Michigan State, 12, according to the chart.

In 2004, UNL was fifth overall with 14 field trial permits behind Monsanto, ArborGen, Syngenta and USDA.

Nature Biotechnology listed the source of data featured in the chart as Cropnosis, International Service for Acquisition of Agri-Biotech Applications. The Cropnosis Web page describes the private company as "a leading provider of market research and consultancy services in the crop protection and biotechnology sectors."

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Designer: Anne Moore
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Entomologists studying oxalic acid for control of varroa mites in bee colonies

The varroa mite is a major pest of honeybees worldwide, but its control often is difficult because the two organisms are so closely related.

Varroa mites are a significant pest of honeybees. UNL entomologists are working on strategies to reduce their populations in bee colonies.

While some strategies to control the mites do exist, they are labor intensive, and mites have become resistant to many available chemical treatments.

IANR entomologists are studying a natural product to reduce mite populations in bee colonies. Oxalic acid is a chemical found in plants, such as rhubarb, turnips and broccoli, which makes the vegetation nonpalatable to insects.

Using oxalic acid to treat varroa mites could help struggling beekeepers keep their hives healthy and stay economically profitable. In many states, insect-pollinated crops are a significant part of agriculture. Because of the varroa mite, beekeepers have been unable to meet the bee colony demands on these farms.

Entomologists are testing oxalic acid's chemical efficacy and ways to use it. Since the mites and the bees are both arthropods, what kills the mites can kill the bees. Toxicological studies are being fine-tuned to find the dose necessary to kill mites, but not bees.

Entomologists also are looking at ways to eliminate mites in mail shipments and ways to eliminate mites in colonies in the winter when there are no broods and the mites are attacking adult bees.

Oxalic acid eventually will become a low-cost, effective and sustainable way to deal with the mite parasite. Entomologists also will teach beekeepers how to use the chemical.

UNL scientists working on national team to boost wheat quality, disease resistance

UNL wheat breeders and geneticists are part of a national scientific team working to harness genetic technologies to improve U.S. wheat quality and disease resistance.

A $5 million U.S. Department of Agriculture grant is funding the collaborative research by University and government scientists in 17 states. UNL will receive $162,750 for its portion of the study.

Results of this effort will change how wheat breeding is done and ultimately help increase U.S. wheat global competitiveness and production efficiency. The four-year project aims to implement new molecular technologies called Marker Assisted Selection. Markers are genes or DNA segments that serve as molecular signposts, pinpointing a specific spot on wheat's genetic map.

UNL agricultural scientists are part of a multistate effort to implement genetic technologies that enhance wheat breeding. Here, Ismail Dweikat (left) and Stephen Baenziger, the UNL plant breeders and geneticists working on the project, review a gel image of molecular markers for a population of wheat used in the University's wheat breeding program.

While there are many known molecular markers for wheat chromosomes, scientists often don't know whether they are associated with a useful gene. This research will identify markers associated with specific desirable genetic traits and verify those associations. Once that's done, wheat breeders can use the markers to more quickly and precisely select wheat lines that contain specific characteristics.

Researchers will focus on developing markers for complex genetic traits, such as those influencing yield, that wheat growers and industry have identified as top priorities.

The UNL team will focus on environmentally sensitive genetic traits, such as grain yield, test weight and kernel size, as well as how drought influences certain traits. Nebraska's varied, often extreme growing conditions and its location at the northern end of the nation's winter wheat growing region make it a good location for this research. Involvement in this research also will enhance Nebraska's breeding program. Nebraska's breeding lines will be analyzed for molecular markers at the USDA's genotyping laboratories. That means future breeding efforts will be much more marker-based and precise.

New technologies helping producers deal with drought

New Web-based technologies being developed at UNL are giving farmers and ranchers better tools to contend with drought.

A partnership between the UNL-based National Drought Mitigation Center and UNL's Department of Computer Science and Engineering is bringing together the expertise of climatologists and computer scientists to bring cutting-edge computer technologies to producers' age-old decision-making processes.

UNL computer scientists have created the National Agricultural Decision Support System (http://nadss.unl.edu) to host a variety of tools that help producers assess drought and other crop-production risks. There, producers can tap into a variety of weather data to help them make decisions about their operations.

The drought mitigation center (http://drought.unl.edu) also has a variety of online decision-support tools in various development stages, including:

- Drought Impact Reporter, which allows users to enter information about drought's specific impacts across the United States
- Vegetation Drought Response Index, which uses satellite and climate data for a square-mile-by-square-mile analysis of drought conditions
- Continued improvements in the

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IANR study will reduce phosphorus levels in livestock manure to limit runoff

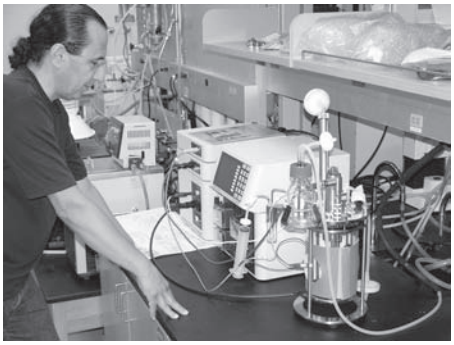
Manure phosphorus can help produce a healthy crop, but land application of excessive amounts can increase the potential for water pollution. UNL researchers are working to solve this problem.

A $500,000 grant from the U.S. Department of Agriculture's Cooperative State Research, Education and Extension Service to the Nebraska Corn Board is funding UNL research to reduce phosphorus in manure and in distillers grain and corn gluten feed and develop improved manure handling practices.

Phosphorus concentrations in ethanol byproducts are much higher than in corn. When the byproducts are fed to beef cattle, manure phosphorus excretion is increased. Researchers are looking at ways to remove phosphorus in distillers grain and corn gluten feed to allow animal diets with less phosphorus.

They are studying adding the enzyme phytase during ethanol production, which would remove phosphorus from the organic compounds, and may produce a value-added product such as inositol. Inositol and its phosphates are highly valued in the nutrient supplement market and pharmaceutical industry as a fat-solubilizing agent.

Researchers are looking at composting manure as a way to reduce manure mass or bulk to decrease transport costs and allow better nutrient distribution. They also will address nitrogen loss during the composting process.



Chemical Engineer Hossein Noureddini studies adding the enzyme phytase during ethanol production, which would remove phosphorus from the organic compounds. This is just one way UNL researchers are working to reduce phosphorus in manure and in distillers grain and corn gluten feed.

Scientists also are looking at management practices to reduce phosphorus runoff, including setback distances and vegetative filter strips for manure application near water or conduits to water. Watershed models are being used to develop criteria for improved targeting of best management practices to parts of the watershed with greater potential for runoff phosphorus loss. They also hope to reduce phosphorus runoff by educating producers and consultants on these improved practices.

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U.S. Drought Monitor, a weekly national map that the drought center produces through a partnership with the U.S. Department of Agriculture and the National Oceanic and Atmospheric Administration. Plans are to make the monitor a more interactive tool that producers and others can use to get more specific, local information.

- Vegetation Outlook, which will provide projections of general vegetation conditions several weeks in advance
- Drought Risk Atlas, which will provide users a comprehensive picture of the history, frequency, intensity, duration and trends of droughts over the past century.

Drought has plagued the region for several years, but new work by the National Drought Mitigation Center and UNL computer scientists is providing new tools to producers and others for dealing with the crisis.

In 2005, the U.S. Department of Agriculture's Risk Management Agency provided more than $7 million toward the UNL-based projects.

IANR entomologists set aphid thresholds, offer insight to biocontrols

Severe soybean aphid infestations can easily reduce soybean yields by up to 20 percent in farmers' fields.

Since aphids can grow to economically damaging populations in a short period of time, IANR entomologists focused on the problem and have developed research-based soybean aphid management guidelines and biocontrol information specific for Nebraska.

For the aphid, science-backed economic thresholds average about 250 aphids per plant and populations on the increase.

The team of entomologists is now examining those thresholds in specific arenas, such as irrigated and early or late-planted fields. In addition, they also are looking at yield loss mechanisms, including photosynthesis changes, along with plant growth and other factors.

Soybean aphids like these can reduce yields by 20 percent. UNL entomologists continue to work on efforts to control the pest.

Providing this science-based information protects soybean yields and allows soybean growers to avoid unnecessary production expenses from unwarranted insecticide applications.

Entomologists also discovered some soybean varieties are resistant to soybean aphids. Others can negatively impact the biology of the pest. The chemical composition of the plant can cause slower reproduction and death.

Resistant soybeans could mean eliminating treatment all together, which not only would save money but would be more sustainable and better for the environment.

Entomologists also found the minute pirate bug plays an important role as a biological control agent.

Odor Footprint Tool offers information about livestock odors' whereabouts

University of Nebraska–Lincoln biological systems engineers are developing tools that will help producers and communities better plan for livestock odors' indiscriminate distribution.

Institute of Agriculture and Natural Resources engineers are using odor emission and dispersion research to develop resources that assess where livestock odors will cause the most problems, which can help create buffer zones of varying sizes and shapes around livestock operations.

Such tools as odor roses, directional setback distance curves and odor footprints are being produced for six regions in Nebraska.

These resources, the result of computer modeling and other IANR research, are known collectively as the Odor Footprint Tool. The tool's resources will help livestock producers plan new or expanded livestock facilities to reduce odor impact and help county zoning officials evaluate proposed construction of livestock facilities.

The odor footprints reveal areas expected to be affected by livestock odors more often than the locally selected standard with an aerial view format.

The directional setback distances simplify the process of evaluating plans and options by considering the maximum separation distance in each of four main directions around a site. This is done to the north, south, east and west of the site, or to the northeast, southeast, northwest and southwest of the site, giving a good idea of the expected reach of odor impact in each direction.

The odor rose focuses on weather factors, such as prevailing wind direction and atmospheric conditions, that will determine the directions of greatest odor impact.

The Nebraska Department of Agriculture, U.S. Department of Agriculture National Research Initiative, Nebraska Pork Producers and the Nebraska Environmental Trust fund this research.

Research seeks to improve potential of soybean oil for biodiesel use

UNL researchers are working to modify the fatty acid profile of soybean oil for biodiesel.

A team of researchers in UNL's Plant Transformation Core Facility within the Center for Biotechnology is investigating three fatty acid profiles in genetically modified soybeans to see how they fare as biodiesel feedstock.

The first oil they developed was from high oleic acid soybeans. These beans had 85 percent to 91 percent higher oleic acid content, compared with 15 percent to 20 percent in conventional varieties and lower saturated fatty acids.

The second is a high-oleic acid oil with elevated amounts of stearic acid, or saturated fat. This may enhance the ignition quality but will reduce the fuel's cold flow property.

The third type is a high-oleic acid, high-ricinoleic soybean oil. Collaborating with a Canadian company, the researchers are essentially making castor oil in soybean plants. Brazil already is making biodiesel out of 100 percent castor oil. The U.S. government is not in favor of castor plants since the byproduct is ricin, a potential bioterrorism agent.

UNL researchers are not yet sure if castor oil-producing soybeans will be beneficial in biodiesel production, but it is worth investigating.

endeavors glimpses at ARD research

- The School of Natural Resources' new home will help make its research, extension and teaching efforts more cohesive. SNR faculty and staff, once divided among many buildings across both City Campus and East Campus, moved into the former Clifford Hardin Nebraska Center for Continuing Education in 2006. Funded by U.S. Department of Agriculture and state money, the $16.5 million renovation provides 150,500 square feet of office, lab and classroom space, as well as an auditorium with a new audio-visual system and a large lobby with an outreach mall and store.
- A new Water Resources Advisory Panel will share its thoughts and opinions on water resources issues and offer UNL advice and assistance in the Water Resources Research Initiative. A major goal of that initiative is strengthening the University's ties with state and federal agencies responsible for water resources in Nebraska, as well as with the natural resources districts, irrigation districts, agricultural business organizations and others with ties to Nebraska water issues. The panel includes representatives from state government, environmental organizations, agricultural groups and irrigation providers.
- An expansion of the feedlot at the Agricultural Research and Development Center near Mead provides more research space for the animal science department. The expansion increased from 100 to 150 the number of pens. The expansion will allow for both more research projects and also larger experiments.
- Nebraska counties where a Wal-Mart is located have experienced on average a slower growth in standard of living than counties without the world's largest retailer, a preliminary University of Nebraska–Lincoln study shows. The UNL study compared how growth in household income from 1979 to 2002 differed between 19 counties with Wal-Marts and 74 without, after controlling for other economic variables that determine household income. The study by a UNL agricultural economist found that the average annual growth in median household income, adjusted for inflation, in the 19 counties with a Wal-Mart was $142.62 below the average annual growth in median household income in the 74 counties without a Wal-Mart from 1979 to 2002.