

2010 ANNUAL HIGHLIGHTS



North Dakota Agricultural
Experiment Station
NDSU Extension Service

NDSU NORTH DAKOTA
STATE UNIVERSITY



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Duane Hauck, D.C. Coston and Ken Grafton

Currently, North Dakota is an island of prosperity and optimism. One of the chief pillars of the state's economy is a vibrant and dynamic agricultural sector.


Production agriculture provides about 25 percent of North Dakota's gross state product. The entire agribusiness sector (production, processing, supply chain, transportation, etc.) accounts for almost 40 percent of the state's economic activity.

However, today's agriculture is not the same as it was 20 or 10 or five years ago. North Dakota's agriculture vies in a highly competitive world. Agriculturists in our state have been quick to adopt new technologies and techniques, to move aggressively into new and expanding international and domestic markets, and to hone their leadership and management skills.

As these transitions have occurred, they have drawn on the programs of the North Dakota Agricultural Experiment Station and NDSU Extension Service as major sources for innovation, new tools, new knowledge and support. The men and women in these organizations are deeply committed and dedicated to playing key roles in the further enhancement of North Dakota's economy and communities, and development of our state's youth and families.

Agriculture is an industry of the future in North Dakota. This industry will, and must, continue to change, and that change will be rapid. With support of the broad agricultural industry, in recent years, the state has provided significant new investments in the Experiment Station and Extension Service. This support has allowed us to attract additional outstanding scientists and staff, roll out new programs, and develop facilities that support world-class research and Extension programs to serve North Dakota.

This publication provides highlights of a number of the outstanding successes of the Extension Service and Experiment Station. Because of the long tradition of such successes and engagement with North Dakota and its citizens, we understand that the expectations for what we will accomplish in the coming years are great. We take these commitments seriously and look forward to working arm-in-arm with you to help assure that prosperity and optimism will continue for North Dakota.



U.S. Wheat and Barley

Scab Initiative Progress Continues

Fusarium head blight (FHB) re-emerged in the 1990s as a widespread and powerful fungal disease of wheat and barley crops across the U.S. This disease, also known as scab, was epidemic in North Dakota, Minnesota and South Dakota in 1993 and recurred in subsequent years that had wet conditions.

Economic losses to producers, the grain industry and agricultural communities were estimated to be more than \$2 billion in the spring grain region in the 1990s. These great losses necessitated regional collaborative research and educational responses.

However, the occurrence of scab across our region and the eastern U.S. led to a national awareness of the serious nature of FHB. It became evident that a national, multidisciplinary and multi-institutional research system was needed to win the war on scab.

Today, federal, state and private sector scientists across the country work closely with growers, input providers, millers and

food processors to meet the goal of the U.S. Wheat and Barley Scab Initiative (USWBSI). The goal is to develop as quickly as possible effective control measures that minimize the threat of scab to producers, processors and consumers.

About 20 North Dakota-based Research Extension Center, main Experiment Station, Extension Service and USDA-Agricultural Research Service scientists participate in the USWBSI each year. North Dakota scientists have succeeded in developing some of the nation's top FHB-resistant varieties, been key in determining successful ways to use fungicides for management, determined the effects of cropping practices on the disease, provided regional services in mycotoxin analyses, found new sources of resistance, and are pioneers in gene discovery and transformation.

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North Dakota is the
top U.S. producer
of barley





Researchers Fight to Control **Yellow Toadflax**

Researchers at NDSU's North Central Research Extension Center near Minot say an experimental herbicide they've been evaluating could be the answer to North Dakota's yellow toadflax problem.

Yellow toadflax is an ornamental plant that has escaped from yards and is invading pastures and rangelands.

"It has the potential to become a serious weed problem in North Dakota," says Brian Jenks, a weed scientist at the center.

In rangeland west of Minot, for example, yellow toadflax took over areas that leafy spurge, another noxious weed, once dominated.

"The weed can adapt to a wide variety of soil types and moisture conditions," Jenks says. "The plant reproduces by seed and underground rootstocks that make it very difficult to control."

He and the other researchers say that aminocyclopyrachlor, a herbicide being developed for weed control in rangeland, pasture and noncropland areas, appears to provide good control for yellow toadflax while causing very little damage to grasses.

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Nearly
90 percent
of North Dakota's land
is in farms and ranches



Experiment Engages Youth in Science



Do you take your drinking water for granted?

In October, North Dakota youth joined millions of young people nationwide in learning about water and why water quality is important. They became scientists for the third annual 4-H National Youth Science Day experiment called 4-H₂O.

The experiment demonstrated the powerful effects of carbon dioxide on aquatic animals, plants and other living organisms in streams, rivers, lakes and oceans. Youth learned about key characteristics they can use to observe water quality, such as color and odor. They discovered how higher levels of carbon dioxide result in warmer air temperatures, which, in turn, cause increased levels of algae growth in lakes and other water bodies, leading to changes in water quality. They also learned how to calculate the amount of carbon dioxide a family contributes to the atmosphere.

“Activities such as this are vital because they spark an interest in science in youth,” says Linda Hauge, NDSU Extension 4-H youth development specialist. “Science can be intimidating to young people. 4-H National Youth Science Day shows them it can be fun, and they can apply what they learned in their own community. An event like this also encourages youth to consider studying science in college and choosing it as a career.”

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Approximately

4,000

North Dakota youth participated
in the 2010 4-H National Youth
Science Day experiment



The Beef Cattle Research Center's feeding facility contains about
25,000
feet of wiring

A large industrial building under construction. A worker is on a scissor lift platform, working on the ceiling structure. The building has a high ceiling with exposed steel beams and skylights. The floor is concrete, and there are various pieces of equipment and materials scattered around.

Center's Impact

on Beef Cattle Far-reaching

NDSU is taking beef research to a new level.

The second, and final, phase of the Beef Cattle Research Center along 19th Avenue North west of campus is rapidly reaching completion.

The 180-head-capacity facility will advance researchers' work in meat science, genetics, animal health, nutrition, physiology, nutrient management, economics and food safety, enhancing already strong research programs in the university's Center for Nutrition and Pregnancy, and Beef Systems Center of Excellence.

Projects planned for the facility include a variety of nutrition and reproductive physiology research in growing cattle as well as pregnant and lactating beef cows.

"This facility will focus research efforts on areas that will improve the efficiency of beef cattle production and gather new data on relationships between feed intake and physiology, animal health, behavior and nutrient requirements," says Greg Lardy, head of the Animal Sciences Department. "It also will give our students, staff and faculty the opportunity to work in a state-of-the-art facility."

Phase 2 includes a feed-handling center, specialized feeding equipment, cattle-handling equipment, fencing and pens. The 2009 North Dakota Legislature provided \$2.6 million for this phase.

The specialized feeding equipment will give NDSU a distinct advantage in beef cattle research because feed intake can be measured and controlled while providing a variety of diets to cattle in the same pen. Only three other units in North America have similar equipment.

"We are very excited about what advances will be made in the beef cattle industry as a result of having a facility of this caliber," Lardy says. "It will play an important role in North Dakota's beef cattle industry for a long time to come."

For more information: Greg Lardy, (701) 231-7660, gregory.lardy@ndsu.edu

The Beef Cattle Research Center's
feed alley is the length of

1

football field

Program Gears Kids Up for Kindergarten

Chrissa Prestriedge wasn't sure what would happen when son Drew started kindergarten.

"He's incredibly shy," says the Dickinson mother of three. "He didn't want to play with other kids."

Then she heard about Gearing Up for Kindergarten and signed them up in fall 2009.

Gearing Up for Kindergarten is a 16-week school readiness program developed by NDSU Extension Service educators. They began it as a pilot project in 2006-07 in partnership with Extension's statewide network of Parent Resource Centers. Now it's offered at 30 sites throughout the state (the number varies each year).

The program provides separate sessions where children learn school readiness skills (playing with

others, taking turns, sensory and motor development, reading, math and science) while parents learn about parenting styles, children's brain development, guidance and discipline, children's learning styles and the importance of raising a reader. Parents and children also do learning activities together.

By the end of the program, Drew was playing with other children in the program, and when he sees other kids out in public, he now talks to them.

Fargoan Roxane Salonen, who also participated in the 2009-10 program with son Nicholas, says, "I think it helped him feel more ready for kindergarten, and especially since this was his first classroom experience, gave him confidence he might not have had otherwise. It also helped him realize that learning is fun."

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About
1,000
families have completed
Gearing Up for Kindergarten

Biofuel Crop Study **Yielding Results**

Tall wheatgrass is emerging as the best perennial grass to grow under dryland conditions in western North Dakota for biofuel production, studies at five NDSU Research Extension Centers show.

The Carrington, Central Grasslands (Streeter), Hettinger, North Central (Minot) and Williston centers are in the midst of a 10-year study to evaluate 10 cool- and warm-season perennial grasses and grass mixtures for criteria such as biomass yield potential and quality in two harvest scenarios: annual and biennial. The grasses also are being tested under dryland and irrigated conditions.

Tall wheatgrass and grass mixtures containing tall wheatgrass appear to have the highest concentrations of cellulose and lowest concentrations of lignin, which make them ideal for ethanol production from fermentation. Tall wheatgrass seems to have low ash content as well, which makes it good for ethanol production through direct combustion.

The studies also indicate that overall, test plots harvested annually have higher yields than those harvested every other year.

The biennial harvest yields varied greatly by location. For example, the Carrington plots harvested biennially yielded 30.3 percent less than those harvested annually, while at all but one other center, the biennially harvested plots produced 19 to 20 percent less yield. North Central was the exception; its biennially harvested plots produced 15.4 percent less than the plots harvested annually.

“The question that bears further investigation is what is the economic advantage of a biennial harvest over an annual one,” says Paul Nyren, Central Grasslands director. “There would be the obvious harvest cost savings, but would this offset the loss in total yield?”

The study continues through 2016.

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24 percent
of North Dakotans work in
production agriculture or
agriculture-related industries



Growing Weeds

at the Carrington Research Extension Center

Growing weeds on purpose is not something most North Dakota producers would be fond of doing, but that is what is happening at the NDSU Carrington Research Extension Center.

“The CREC Weed Arboretum has about 60 living weeds available for viewing,” says Greg Endres, NDSU Extension Service area agronomist. “People can identify weeds by looking at them, which is the first step in effective weed management. The next step is to consider using cultural, chemical, mechanical or biological controls and then choose the best combination if necessary.”

Along with formal and informal education during tours, photos and weed samples are shown during winter meetings.

The weed arboretum was established 17 years ago and is the only NDSU living weed exhibit. Endres got the idea for it after attending a national agronomy meeting in Texas in 1993.

The arboretum has most of the weeds that are listed as noxious weeds in North Dakota, such as salt cedar, purple loosestrife and yellow toadflax.

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Producers Battle Weather Extremes



North Dakota producers coped with weather extremes in 2009-10 with NDSU's help.

A wet spring delayed planting in 2009. Then a cool growing season slowed the growth of crops such as corn, soybeans, wheat and barley and prevented some corn from reaching maturity, causing it to discolor during drying. Wet conditions later in the summer put harvesting behind schedule and caused mold to grow on corn in the field.

Heavy snowfall and a fast snowmelt in spring 2010 led to flooding primarily in the Red River Valley for the second year in a row, and some parts of the state experienced excessive rainfall, which caused problems for producers.

Throughout the 2009 and 2010 growing seasons, Extension specialists held weekly crop conference calls to discuss growing conditions and problems and provide county Extension agents with information they could use to help producers. The specialists also developed publications, fact sheets and other educational material with information and options for producers, and updated NDSU's flood information website.

To combat the corn problems in 2009, the NDSU Plant Diagnostic Laboratory tested moldy corn to identify the mold type and check for toxins. Extension specialists led informational meetings with representatives of agencies and organizations affected by moldy corn and discolored kernels, such as producer groups, grain elevators and grain inspectors, and developed a publication that addressed the issues.

Extension specialists and agents provided producers with information on drying and storing grain through educational presentations statewide, news releases, radio interviews, newsletter articles, special mailings, individual consultations and material on the Web.

In 2009, about 2,000 producers attended the presentations, and another 550 received individual assistance. Web pages were viewed 11,000 times and an online corn-drying presentation was viewed about 5,000 times.

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Educators Prepared to Teach About Personal Finances

An NDSU Extension Service program has made North Dakota high school teachers better prepared to teach their students about personal finance.

In June and August 2010, the Extension Service held sessions at 13 sites throughout the state to train teachers to use the National Endowment for Financial Education's High School Financial Planning Program (HSFPP).

"This training helps teachers meet the 2009 state Legislature's mandate that North Dakota high schools must offer a personal finance curriculum beginning in the fall of 2010," says NDSU Extension family economics specialist Debra Pankow, one of the trainers.

More than 30 educators who teach business, economics, family and consumer sciences, marketing, math and related subjects attended the four-hour training sessions.

They received the HSFPP curriculum, including an instructors manual, student guide and ordering information for free classroom materials, and learned how to use it. They also had access to lesson plans, including PowerPoints and worksheets, designed to meet the North Dakota requirement, and networked with other teachers, sharing effective teaching ideas, best practices and other resources.

In addition, Pankow presented the HSFPP materials at Invest ND, a weeklong academy for educators the North Dakota Securities Commission puts on every summer, and sent two newsletters to educators and other professionals to alert them about the new personal finance requirement.

"In uncertain economic times like these, if you aren't practicing sound money management habits, you are not going to fare well," she says.

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Exercise Not Just for Humans

Exercise isn't good just for humans. It may be good for pigs, too.

Researchers in NDSU's Animal Sciences Department discovered pregnant gilts (young female swine) that were allowed to do some physical activity spent more time on their feet than gilts that didn't have opportunities to exercise.

This could indicate the gilts that exercised were more comfortable standing and less likely to have

sore feet and legs, meat scientist Eric Berg says.

"We know in human work that resistance training, and even just walking, can improve joint health," he adds.

This study involved eight gilts. Four were allowed to move, one at a time, at their own pace, around the outer ring of the Animal Nutrition and Physiology Center's swine wing. They were able to exercise for 30 minutes three times per week from the 40th to 104th day of pregnancy. The researchers attached pedometers to record the animals' steps and monitored the number of laps they made.

Researchers learned the exercise also impacted the offspring. For instance, blood flow from the mother to her babies during pregnancy was greater in gilts that exercised. That allowed more nutrients to reach the offspring, which could give them greater stores of energy to withstand conditions such as cold weather, animal reproductive physiologist Kim Vonnahme says.

Plus, the reproductive organs of females born to gilts that got exercise were heavier. This could be linked to greater fertility in those females, Vonnahme says.

In addition, the study indicated that the mothers' exercise could have a positive impact on their offspring's muscle development, which could translate into leaner cuts of meat at the grocery store, Berg says.

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North Dakota has
180,000
hogs



Studying the Genetic Information of **Dry Beans**

North Dakota is the leading producer of dry beans in the U.S. The production value to the state during the last three years has been \$270 million per year.

To ensure the crop continues to be successful and provide valuable income to the producers, NDSU scientists working in the areas of breeding, production, disease resistance, weed protection and nutrition are continually looking for additional tools to aid their efforts.

The most powerful tool to come along recently is in the area of genome sequencing. A completed genome sequence is a list of all the genetic information that controls all the traits of a crop. The most important traits are those associated with production and nutrition.

NDSU has been an important partner for the last year in a national project to sequence the dry bean genome. Phil McClean, Genomics and Bioinformatics Program director, and Rian Lee, research associate, both in the Department of Plant Sciences, are providing the DNA that is being sequenced and bioinformatics support to better understand the final sequence.

“This sequencing project is a collaborative effort involving research groups at NDSU, Purdue University, Hudson-Alpha Institute for Biotechnology, the Department of Energy Joint Genome Institute (DOE-JGI) and the U.S. Department of Agriculture’s Agricultural Research Service Soybean Genomics and Improvement Lab,” McClean says.

The project is funded in part by a \$1 million grant from the USDA National Institute of Food and Agriculture and by internal DOE-JGI funds.

The goal of the project is to provide a draft sequence of the genome. The sequence will be used to develop tools that will assist plant breeders and geneticists to improve the crop. Specific traits of interest are yield, disease resistance and nutritional value.

Because the dry bean market in North Dakota is dominated by pinto and navy beans, genomic tools specific to these market classes will be developed. The project team is targeting a 2012 release date for the finished sequence.

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More than
3,900

gardeners participated in spring
gardening meetings

As the appetite for horticultural information grows, NDSU Extension Service horticulturists and agents responded with 20 spring gardening meetings, often called Gardening Saturdays, in 2010. The meetings, often held on Saturdays throughout the state and region, have been a huge success.

As many as 24 horticultural topics are covered during the events. Subjects have included square foot gardening, lawn care, tree selections and maintenance, annual and perennial flower selections, landscape design principles, propagation techniques, fruits and vegetables for the home gardener, hardy roses, ornamental grasses, beekeeping, container gardening, home winemaking, growing grapes for winemaking, terrarium construction, houseplant care, and selecting and solving common horticultural problems. Participants also can get information from various vendor booths set up at each event.

The events also drew excellent scores from those attending. On an evaluation scale of 1 to 5, with 5 the best score, the totals were close to or at 5 at every location. Comments from participants included: "Gardening Saturday makes for a very good day no matter which sessions one attends." "The variety of subjects was nice, and all of the speakers were very informative and personable."

NDSU Extension personnel were event coordinators and instructors. Key instructors included NDSU horticulturist Ron Smith, research specialist Barb Laschkewitsch and Extension agents Leslie Lubenow, Steve Sagaser, Todd Weinmann, Jackie Buckley, Mike Rose, ElRoy Haadem, Sheldon Gerhardt, Bill Hodous, Andrea Bowman, Craig Askim, Rick Schmidt and Julie Kramlich. Several of the events also benefited from the expertise provided by the 2007 legislative investment in a new horticultural position at Bismarck, which was filled by Tom Kalb.

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Spring Gardening Meetings Attract Crowds





Greenhouse Construction Continues

Work on the approximately \$32.5 million greenhouse on the west side of the NDSU campus is progressing at a rapid pace.

When completed, the state-of-the-art facility will have about 100 separate environmentally controlled chambers. These chambers will allow top-ranked scientists to do cutting-edge research.

“The facility will bring a new era of research to NDSU,” says D.C. Coston, vice president for Agriculture and University Extension. “Scientists will be able to do very precise, high-quality research to benefit producers and the state’s economy.”

The North Dakota Legislature has appropriated more than \$20 million for the project. The State Board of Agricultural Research and Education is requesting an additional \$7 million, and NDSU will raise the additional capital needed.

“The investment in the greenhouse facility will assist researchers in developing crops with greater yields, higher quality, superior disease resistance, and advanced disease, weed and insect control,” Coston says.

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N.D. Agricultural Experiment Station Releases New Crop Varieties

NDSU crop breeders continue to develop and release new crop varieties to bolster profits and give producers more opportunities to compete in a global market.

Tioga is a new durum variety that is well-adapted to the entire durum-producing region of the state. It has shown excellent yield potential, as well as very good yield stability, and has very good test weight. NDSU cereal chemists have given Tioga a quality rating of excellent based on agronomic, milling and spaghetti processing performance.

Decade hard red winter wheat is a cooperative release by Montana State University and the North Dakota Agricultural Experiment Station. Decade's development was a result of 10 years of testing by MSU and the NDSU Williston Research Extension Center.

Decade is very high yielding and has winter hardiness to survive the harsh conditions of western North Dakota and eastern Montana. Decade also has excellent milling and baking qualities.

ND1005T is a specialty soybean release for the food-grade soybean and tofu industry.

NDSU variety releases have had a huge impact on North Dakota's economy. For example, in 1997, fusarium head blight (scab) cost North Dakota's farm economy \$176 million. Since then, NDSU has released hard red spring wheat varieties, such as Alsen, Glenn and Faller, that are more scab resistant. The releases also have higher yields and are highly regarded by millers, processors and bakers.

In 2010, the top two hard red spring wheat varieties planted in North Dakota were Glenn (25 percent) and Faller (15 percent).

"As each new variety is released, scab resistance and yields are increased, which brings more profits to North Dakota producers," says Frayne Olson, Extension crops economist and marketing specialist. In 2010, Faller generated about \$33.5 million more in gross income than Alsen.

Durum is another example. In 2010, the top eight varieties planted to durum by North Dakota producers were NDSU releases.

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North Dakota is the nation's
top producer of

15

commodities

A Bismarck area couple with a community-supported agriculture operation are realizing their goal of owning a business while having time to spend with their family, thanks to assistance from the NDSU Extension Service.

Glenn Muske, Extension's new rural and agribusiness enterprise development specialist, helped the couple learn more about operations like theirs, which have become a popular way for consumers to buy locally grown food directly from the farmer. He also provided advice as they voiced their ideas and helped them set goals and find ways to market their operation.

A consortium of North Dakota dairy producers is exploring new ways to market milk, such as turning it into butter, ice cream, yogurt or even a type of cheese not usually found in grocery stores, and a restaurant owner is finding sources of locally raised beef to serve in his establishment, also with Muske's help.

He connected the dairy consortium with experts at NDSU and from across North Dakota and big dairy states such as Wisconsin, and helped them identify avenues they could explore. He researched regulations that affect the restaurant owner's plans and helped find producers and inspected facilities that could provide the beef.

"We've not had anyone to focus on this important and growing area for many years, so we are very excited to have him on board," says Kathleen Tweeten, director of the NDSU Extension Center for Community Vitality.

Muske is based in Bismarck. Extension created his position with support from the 2009 state Legislature.

Other assistance he provides aspiring and existing rural and agribusiness enterprises includes startup tips and information on networking, recordkeeping and taxes. He also trains Extension educators how to assist these enterprises and helps communities find ways to attract new businesses, plus retain and expand existing businesses.

"I also support the ongoing youth entrepreneurship efforts currently supported through a partnership of several agencies, both private and public," he says.

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NDSU Provides Agribusiness Development Expertise

During 2010, more than 7,000 people learned about NDSU's efforts to help North Dakotans improve their lives, overcome challenges, adopt new technologies, spur productivity, solve problems, recognize opportunities, market their products, meet customer demand and protect the environment.

Field days, tours, demonstrations and other educational events at NDSU's Research Extension Centers provided opportunities for researchers and Extension faculty to share information on topics such as:

- New crop varieties
- Better production methods
- Weed control
- Soil health
- Grazing intensity
- Cattle nutrition and genetic disorders
- Irrigation
- Manure management
- Precision agriculture
- Hardy fruit production
- Biofuel development

Also during field days, Extension water quality experts answered people's questions about their wells, water supplies for their livestock, testing water for contaminants and how to read test results. They also provided free basic water quality screening for nearly 60 people who brought water samples. Another 15 people bought a bacterial test kit with a sterile bottle they could use to collect a water sample and send it to a laboratory for more in-depth testing.

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Beef cattle contribute
\$600 million

to North Dakota's agricultural
income annually

North Dakota dairy cows produce
420 million
gallons of milk annually

Research Extension Centers Share Knowledge



North Dakota has

88,000
sheep

Dried Distillers Grain Research Shows Promise



Producers can include high levels of distillers dried grains plus solubles (DDGS) in feed for some ruminants, such as lambs, NDSU researchers discovered.

“This research has demonstrated that including DDGS at levels up to 60 percent of the dietary dry matter is possible without causing toxicity-related problems,” says Bryan Neville, a ruminant nutrition technician in NDSU’s Animal Sciences Department.

Research at other institutions indicated that feeding such levels of DDGS could lead to sulfur toxicity and decreased average daily gain.

DDGS are a coproduct of ethanol production. NDSU is a leader in research on converting bioenergy production coproducts into livestock feed, food for humans and materials such as adhesives, lubricants and nutraceuticals.

“The NDSU research at the Hettinger Research Extension Center and Department of Animal Sciences has shown that lambs do not develop sulfur toxicity and grow similarly to lambs fed more traditional diets,” says Christopher Schauer, animal scientist and director of the Hettinger center. “These findings lay the groundwork for lamb producers to be able to feed greater amounts of DDGS, potentially decreasing feed costs.”

NDSU research on feeding DDGS to steers also has not led to sulfur toxicity.

“However, average daily gain and feed intake were decreased compared with animals fed lesser amounts of DDGS, making such feeding practices less desirable to cattle producers,” Schauer says.

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NDSU Advances Pulse Crop Research

NDSU plays a key role in improving dry pea, lentil and chickpea varieties for pulse crop growers in North Dakota and around the world.

- Researchers have identified 25 superior pea breeding lines from among new lines tested at six NDSU Research Extension Centers. The best of the superior lines will be included in the centers' variety trials, which compare these lines with commercially available varieties.
- Preliminary results from the North Central Research Extension Center's ascochyta blight research on chickpea lines grown from seed supplied by the Syria-based International Center for Agricultural Research in the Dry Areas indicate a few of the lines have some resistance to the fungal disease, says Shana Pederson, NDSU's assistant pulse crop breeder. Resistant lines suited to North Dakota's growing conditions will become part of NDSU's pulse breeding program.
- Producers are able to select the best pulse crop varieties for their area through NDSU researchers' evaluation of the most widely grown varieties at various locations throughout the state. This project tests six pea varieties at 21 sites, 10 lentil varieties at 15 sites and eight chickpea varieties at four sites.
- NDSU is collaborating with international pulse breeding teams, the U.S. Department of Agriculture's Human Nutrition Lab and human pulse crop nutrition researchers elsewhere in the world to develop the nation's first pulse crop quality and nutrition lab.

"Pulse crops could be a food-based solution to provide the most bioavailable forms of minerals and vitamins to help those suffering from malnutrition and for millions of those in Western countries who are vegetarians," says Dil Thavarajah, an assistant professor of pulse quality and human nutrition at NDSU who will set up the lab.

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North Dakota
leads the U.S.
in producing lentils and dry peas

New Plant Pathologist Tackles Job

Michael Wunsch has plunged into the newly created role of plant pathologist at the NDSU Carrington Research Extension Center.

Since joining the center in June 2010, he has managed the field trials to evaluate fungicides for their ability to control diseases including white mold in dry beans and soybeans, sclerotinia head rot in sunflowers and sclerotinia stem rot in canola. He also is evaluating the effects of crop

rotations on barley and soybean diseases and the relative disease susceptibility of entries in the center's soybean, lentil and hard red spring wheat variety trials.

"Of our plant pathology research, the work that will perhaps have the greatest immediate impact on North Dakota agriculture is our research on soybean white mold management," he says. "Little or no information is available on the susceptibility of soybean varieties adapted to North Dakota to white mold or on the efficacy of different fungicides for the management of white mold in soybeans."

NDSU added the plant pathologist's position at the center with support from the 2009 North Dakota Legislature.

Wunsch also holds Extension responsibilities. He has provided producers with recommendations on cultural and chemical control for diseases such as soybean cyst nematode, white mold in soybeans, anthracnose in dry beans and lentils, ascochyta in peas, dry bean rust and wheat streak mosaic virus. In addition, he was involved in educational events such as the LaMoure County soybean plot tour; plot tours at Wishek and Dazey; and the Carrington Research Extension Center's pulse day, field day and row crop tour.

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Program Eases High School-to-College Transition

North Dakota students have a better idea of how to handle the often rocky switch from high school to college.

During the 2009-10 school year, 853 high school seniors and 250 parents attended a program called “Are You Ready? The College Transition.” The NDSU Center for 4-H Youth Development collaborated with the NDSU President’s Council on Alcohol and Other Drugs, Region V Children’s Services Coordinating Committee, Fargo public schools and North Dakota Higher Education Consortium for Substance Abuse Prevention to offer the program at 15 sites throughout North Dakota.

Seniors and their parents learned how to manage the normal conflicts that result from the high school-to-college transition, increase their communication skills and create a plan for students to use when faced with conflicts or issues.

Students also received advice on financial planning, making new friends while keeping old friends, getting along with roommates, dating, values, diversity, making healthy choices, stress, personal safety, alcohol and drugs, and how to be successful academically. Parents learned how to stay connected with their son or daughter while enabling their child to take a big step toward independence.

“Easing that transition from high school to college is important because today’s high school seniors are at risk for a number of mental and physical health problems when they enter college, including binge drinking, depression and suicide,” says Sharon Query, NDSU 4-H youth development specialist.

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Horizons Offers Communities Hope



The Horizons program has armed 15 more North Dakota communities with strategies to combat challenges such as poverty, a declining economy and loss of residents.

With help from Horizons, a partnership between the NDSU Extension Service and St. Paul, Minn.-based Northwest Area Foundation, residents of Dunseith, Fessenden, Fordville, Fort Yates, Hannaford, Lakota, Leeds, Marion, McClusky, Minnewaukan, Napoleon, Rolla, Sheldon, Tolna and Underwood spent 18 months in 2009-10 exploring their perceptions about poverty. They also completed a leadership development course, developed a vision and strategic plan for their community and put parts of these plans into action.

Here are some of the results of their efforts:

- Fessenden has a new café and a pet-grooming service.
- Leeds revived its adult education classes, established a preschool program and refurbished the community swimming pool.
- McClusky's shut-ins can get hot meals delivered to them.
- Napoleon has a new drug store and café.
- Tolna created a fishing area north of town, which led to the development of a camping area and a bait shop opening.

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Producers have a new way to select soybean varieties based on resistance to iron deficiency chlorosis.

R. Jay Goos combined his roles as a researcher and professor in NDSU's School of Natural Resource Sciences to develop a system that rates soybean varieties with a grade. This grading system is used along with a numerical scale that rates varieties from 1 to 5.

"A farmer might have a hard time visualizing the difference between a chlorosis score of 1.7 and 3.2, but all farmers can recognize the difference between an A minus and a D," he says.

Iron deficiency chlorosis (IDC) is a widespread problem for soybean growers in North Dakota. IDC can cause soybeans to turn yellow early in the growing season and become stunted, leading to severe yield losses. The iron fertilizers available to producers are ineffective or too expensive to correct the problem fully.

"Fortunately, soybean varieties differ widely in resistance to IDC," Goos says.

Goos and his research team screen and rate about 400 commercial varieties and 100 NDSU breeding lines for IDC resistance each year.

"Our ratings have been called the 'gold standard,' and many farmers use our ratings when selecting varieties," Goos says.

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New Soybean Rating Makes the Grade





The Operation: Military Kids (OMK) Bravo Camp that Dane and Trey Haugen of Dickinson attended in July 2010 was nothing like any camp they've experienced.

Besides being fun, camp activities helped the boys develop strategies for coping with a family member's military deployment. That's good information for them because their father is in the North Dakota Army National Guard, and he already served one deployment.

At camp, the boys learned to use a global positioning system to find "mission" bags with materials and instructions for their camp activities, which focused on communication and coping skills. The boys discovered that working together can overcome obstacles and learned how to identify and discuss their thoughts and feelings during a family member's deployment.

"The camp counselors were the most outstanding counselors that we have ever met," says their mother, Tess Haugen. "They interacted with the kids in such a unique way, with so much patience, kindness and understanding."

Trey and Dane were among 185 youth from military families who attended three overnight and six day OMK camps throughout North Dakota and the Military Youth Institute in Fargo in summer 2010.



A team consisting of OMK and county Extension staff, local partners and Joint Family Support Assistance Program's military family life consultant led the camps.

OMK is a collaborative outreach effort involving the U.S. Department of Defense, U.S. Department of Agriculture's National Institute of Food and Agriculture and local communities to support youth from military families impacted by the stress of deployment. NDSU's Center for 4-H Youth Development joined the effort in 2009.

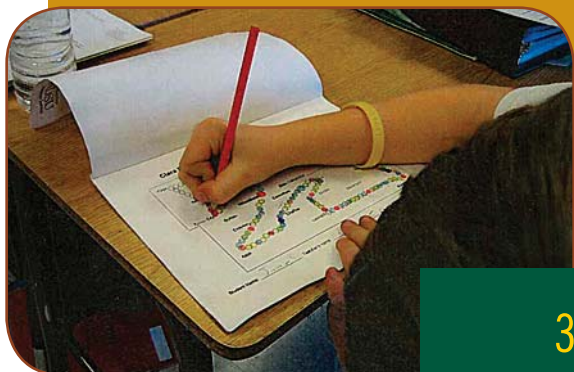
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Camps Develop Kids' Coping Strategies



N.D. Children

on the Move to Better Health



Childhood obesity has more than tripled in the U.S. in the last 30 years.

Obese children face a higher risk of cardiovascular disease, diabetes, strokes, cancer and osteoarthritis.

To combat this trend, the NDSU Extension Service developed “On the Move to Better Health,” a five-week, school-based program for fifth-graders.

The program curriculum aims to increase the amounts of fruits, vegetables and calcium-rich foods in children’s diets and improve their fitness habits. Parents receive newsletters and participate in goal-setting and other family-based activities to help children reach those goals.

Of the children completing the program:

- 63 percent reported increasing their daily amount of physical activity
- 58 percent reported drinking less soda pop
- 55 percent reported increasing the amount of fruits and vegetables they eat
- 54 percent reported drinking more milk and eating more dairy products
- 54 percent reported choosing more healthful snacks

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3,781

children and their families
participated in “On the Move to
Better Health” from 2007 to 2010

Achieving Agricultural and Wildlife Outputs

Conservation Reserve Program grasslands provide adequate nesting cover for a variety of grassland birds, including ring-necked pheasant and upland nesting waterfowl.

“In fact, CRP grasslands have been found to be a positive factor that has helped increase populations of both pheasants and numerous waterfowl species,” says Ben Geaumont, Hettinger Research Extension Center range scientist. “Many landowners are finding an added value associated with the presence of pheasants on their land.”

In 2006, Hettinger REC personnel began a research trial on post-CRP lands that evaluated the potential of a multiple-land use strategy to achieve both agriculture and wildlife outputs. From 2006 through 2010, the nesting success and density of ring-necked pheasants and ducks, as well as the ability of the system to sustain a cow-calf operation, was monitored. Results from the ongoing study suggest that a similar management strategy does have the potential to maintain both agricultural and wildlife outputs.

Both pheasants and ducks selected areas of permanent cover for nesting and avoided areas devoted to the production of corn and

barley. The season-long grazing treatment, targeting a 50 percent disappearance of vegetation, provided grazing for cattle from June 1 through approximately Jan. 1 and provided adequate nesting cover for the ducks and pheasants. Densities of pheasant and duck nests tended to generally be higher on idle CRP, while the nesting success was higher within the season-long pasture.

“Our data comes in a timely fashion because CRP acres continue to expire, and landowners are forced to make decisions regarding the future use of their lands,” Geaumont says. “The Farm Service Agency is offering a general sign-up for those landowners interested in enrolling or re-enrolling their land in CRP. However, the general sign-up is open to the entire country on a competitive basis. Due to the competitive nature of the general sign-up and the limited federal dollars available, numerous landowners likely will find themselves looking for alternatives to CRP because their lands may not be accepted back into the program. Finally, and perhaps most importantly, our data demonstrates that, under proper management, cattle, pheasants and ducks can coexist.”

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Farms and ranches provide
food and habitat for

75 percent
of North Dakota's wildlife

Improvements Enhance Research Extension Centers

Improvement projects at four NDSU Research Extension Centers will enhance the efficiency of their work.

All four projects were supported with funding from the 2009 state Legislature.

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The North Central Research Extension Center near Minot gained a 2,800-square-foot, \$536,000 addition to the headquarters building. It includes a library, small meeting room, additional offices and rest rooms, and a research document room. The project also gives the center more parking space.



A 10,000-square foot, \$1.68 million addition is under construction at the Williston Research Extension Center. It includes laboratories to allow the center to conduct research during the nongrowing season on all dryland and irrigated crops, as well as horticulture, soils and water quality. The addition also will provide new and upgraded seed cleaning and handling facilities to process more than 20 different crops grown in this region, plus additional office space.



The Langdon Research Extension Center is going green. Construction is nearly complete on a geothermal heating and cooling system at the headquarters building. This \$172,000 project will provide the center with an environmentally friendly source of energy, and reduce heating and cooling costs at the center by 50 percent.

The Dickinson Research Extension Center is remodeling and expanding the White House office building. Grounds and parking lot improvements have been completed.

Program Dispels Food Preservation Myths

The growing popularity of gardening is rekindling interest in home canning.

Recipes for preserving the garden's bounty are everywhere, from the Internet to your grandmother's cookbook. However, many of those recipes haven't been tested for safety, and food preservation guidelines have changed. Processing home-canned food improperly can lead to botulism, a potentially deadly form of food poisoning.

To dispel myths about food preservation and provide home canners with information on the latest food preservation, Morton County Extension educators presented "Food Preservation: It's Not Like Grandma Used to Do." The program's five lessons reached more than 300 people in Morton, Oliver and Burleigh counties in 2010.

Each lesson focused on a particular type of food or preservation technique, such as making jams and jellies or salsa, freezing fruits and vegetables, and canning produce. That allowed people to attend sessions only on the kinds of foods they planned to preserve. Participants received information through PowerPoints and demonstrations and were able to examine new food preservation equipment and learn how to use it.

Eighty-seven percent of the participants said after the program that they plan to follow recommendations in NDSU Extension material when canning, and 80 percent said they plan to use a research-tested recipe.

Morton County Extension educators reached even more people through displays at a library, shopping mall and county fair. They also distributed more than 6,000 food preservation publications and worked with the producers of a local TV program to spread the word about food preservation and the dangers of using untested canning recipes. Viewers were urged to contact their county Extension office or go to NDSU Extension's food and nutrition website for more information on food preservation.

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Learning Can Be Fun

More than
600

Sioux County youth benefited
from Extension programming

Sioux County youth have been engaged in fun projects such as making catapults and shooting arrows.

They may not realize it, but they've also learned about math and concepts such as velocity, energy, force and gravity.

Those fun projects are county Extension agent Sue Isbell's way of making sure the kids are exposed to science, engineering and technology.

"Our kids are so low in their math and reading skills because they lack confidence," she says.

During the 2009-10 school year, she worked with students monthly on the catapult-making project at Standing Rock Elementary School in Fort Yates. In summer 2010, she invited the same students to a day camp. With assistance from Bob Pieri, a professor in NDSU's Mechanical Engineering Department, she helped the kids make more catapults and trebuchets, a type of catapult that uses the energy of a raised counterweight to throw a projectile.

Isbell also took the catapult-building project to elementary students in Selfridge and Cannon Ball. Plus she spent two weeks in Fort Yates, a week in Cannon Ball and one Saturday a month year-round in Selfridge teaching youth about archery and giving them a chance to shoot at three-dimensional wildlife targets as well as stationary targets.

Also in 2010, one of Isbell's 4-H members attracted national attention to Sioux County's 4-H program. High school senior Samantha Jo Ridley became the first recipient of the National 4-H Council's 4-H Youth in Action Award. She was honored for embodying the spirit of the 4-H movement while overcoming obstacles and leading efforts to make her community and world a better place.

"She is one of the most amazing young people," Isbell says. "She's always pushing herself to succeed. She is a true leader in her community and for 4-H."

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Land-grant Universities Join

Winter Cereals Sustainability in Action Initiative



NDSU, University of Minnesota and South Dakota State University have joined Ducks Unlimited and Bayer CropScience to enhance the Winter Cereals: Sustainability in Action research and education initiative.

The universities will be working toward new winter wheat varieties with improved characteristics such as winter hardiness, high yield, disease resistance and good milling qualities.

The initiative hopes to expand the use of winter wheat as a cropping option for producers and nesting habitat for waterfowl. The initiative promotes a stewardship model for improving the agricultural productivity of farmland while retaining and improving the habitat values important to North America's waterfowl and other wildlife. Winter cereals provide spring nesting cover as well as additional cropping options to growers.

"NDSU is excited to be a partner in this effort," says D.C. Coston, NDSU Agriculture and University Extension vice president. "Recently, production of winter wheat has been increasing in North Dakota, so providing producers with new and enhanced techniques and technologies will be important for seeing this part of the industry continue to grow."

Also involved in the project is John Lukach, NDSU area Extension agronomy specialist. Lukach will be working on the WCSIA project at the NDSU Langdon Research Extension Center. Lukach is responsible for planning, coordinating and conducting winter cereal research, as well as developing and coordinating production and soil management educational materials, meetings, tours and other activities.

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Extension Helping Stamp Out Hunger

NDSU Extension is part of a statewide effort to make sure North Dakotans have an adequate supply of nutritious food.

Extension is collaborating with the North Dakota Department of Agriculture, Creating a Hunger Free North Dakota Coalition, Lutheran Social Services' Great Plains Food Bank, Dakota College at Bottineau's Entrepreneurial Center for Horticulture, Northern Plains Sustainable Agriculture Society, North Dakota Farmers Market and Growers Association, Pride of Dakota companies and Healthy North Dakota on the Hunger Free North Dakota Garden project. It encourages gardeners to plant an extra plot and donate the fruits and vegetables to their local food pantry.

Here are other ways NDSU has helped address the state's hunger issue:

- Extension educators have helped establish community gardens in several counties. These gardens have improved community members' diets, provided new activities for families and helped people save on food costs.
- About 1,250 people learned about new fruit and vegetable production technologies at workshops Extension

educators conducted throughout the state in spring 2010.

- More than 1,200 youth participated in Junior Master Gardener projects in 34 counties in 2010. These projects teach youth how to grow vegetables to sell and for local food pantries, help them understand the value of native crops and evaluate new produce varieties.
- Researchers at Research Extension Centers evaluate vegetable and fruit varieties, and thousands of gardeners tour demonstration plots at the centers each year.
- NDSU and United Tribes Technical College established a two-acre research and demonstration plot to promote improved diets and new economic opportunities.
- About 500 North Dakota gardeners are part of an NDSU Extension program that helps them to grow and evaluate new vegetable varieties.

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Spring Wheat, Durum Nitrogen Recommendations Updated

The old North Dakota nitrogen recommendations for spring and durum wheat were developed during the 1960s and early 1970s. These recommendations relied on a “yield goal” that required the grower to relate the nitrogen rate with some yield he or she hoped to achieve. From that rate, the grower was encouraged to subtract a 2-foot depth soil nitrate analysis and a modest nitrogen credit if the wheat would follow a legume crop.

New recommendations were issued Dec. 1, 2009, as a result of a review of 50 site-years of nitrogen rate studies conducted from 1971 to 2005, and about 50 additional site-years of studies conducted from 2005 to 2009 throughout North Dakota.

“In contrast to the previous approach, the new recommendations are based on the ‘return to nitrogen’ concept that came out of a review of Corn Belt nitrogen recommendations several

years ago,” says Dave Franzen, Extension Service soil science specialist. “The return to nitrogen approach considers the relationship of wheat yield to nitrogen rate, soil test nitrogen, credits from previous crops (legumes, sugar beet leaf color), the relationship of wheat grain protein to nitrogen rate, and the cost of nitrogen. The results showed that with higher wheat grain prices and low nitrogen costs, profitable nitrogen rates were higher than situations where wheat grain prices were lower and/or nitrogen costs were higher.”

Due to the large number of sites reviewed, researchers clearly saw that where one statewide recommendation was available before, the state needed to be divided into three recommendation regions because of their different climates and soil.

“In addition to the different recommendations for the three state regions, the large amount of data allowed us to investigate grower tillage practices in the west and east on nitrogen recommendations,” Franzen says. “The analysis showed that plots where growers were long-term no-till/one-pass seeding for six years or more required 50 pounds per acre less nitrogen to produce similar yields and protein than those growers who were conventionally tilling the soil using chisel plows, field cultivators, disks or plows.”

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Wheat accounts for
half
of North Dakota’s crop acreage

Leadership Short Course Benefits Communities

Three western North Dakota communities are reaping the benefits of their residents attending a shorter version of the NDSU Extension Service's leadership development program called Rural Leadership North Dakota.

Seventeen people from Watford City, Stanley and Dickinson participated in five five-hour sessions in Watford City during February, March and April 2010. They learned many of the same leadership skills taught in the traditional 18-month RLND program: developing effective communication skills, understanding individuals' behavior styles, managing conflict, identifying community assets and creating community networks.

These short-course participants also started 15 projects to enhance their communities, including a community garden, wellness center, an affordable housing initiative, a healthful cooking class and social networking opportunities for citizens.

This is the second short course RLND has offered. More are being planned.

"The short-course program is an excellent opportunity for North Dakotans to add to their leadership skills as they increase the quality of life in their communities through their community project," says Marie Hvidsten, RLND director.

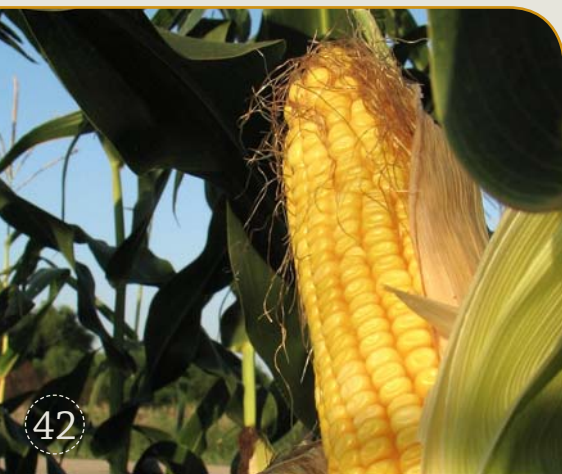
RLND teaches people from farms, ranches and rural communities to become productive leaders and helps them develop the skills to overcome challenges facing rural North Dakota, such as population loss and economic decline. Participants of the 18-month program attend eight in-state seminars, a six-day study tour to Washington, D.C., and a seminar in Manitoba, where they learn about Canadian agriculture, trade, water and cultural issues. They also develop a project to benefit their community.

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55

people have graduated
from the RLND program



NDSU Hosts Multistate Bioeconomy Conference

NDSU is a leader in the growing effort to promote agriculturally based solutions to global climate change and the development of sustainable energy supplies.

In December 2009, NDSU's Bioenergy and Product Innovation Center (BioEPIC) joined a 12-state alliance that simultaneously broadcast a daylong "Growing the Bioeconomy: Solutions for Sustainability" conference. The conference host sites shared information through high-speed communication systems.

North Dakotans viewed the broadcast on their computers, at broadcast sites NDSU hosted or through corporate-sponsored sites. They also could participate in the "Advances and Breakthroughs in Biofuels" session held on the NDSU campus. At that session, industry experts discussed advances in corn-based biofuels, ethanol production and thermochemical decomposition of biomass in bio-oil production.

Other conference topics included greenhouse gas emissions from biofuel systems, production of biomass crops, bioenergy economic and policy issues, and the potential role of biochar (a coal-like material from the chemical decomposition of condensed organic substances) in carbon sequestration.

"This was an opportunity for people in North Dakota to participate in a regional conference where information on cutting-edge technology for agricultural-based solutions to climate change and energy supplies was shared by national experts and industry leaders, and they were able to do it with only limited travel," says Ken Hellevang, BioEPIC co-director.

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Agricultural production and
manufacturing is North Dakota's
largest industry



NDSU and USDA/ARS Partner to Establish

Biomass Testing Lab

Igathi Cannayen, an assistant professor and bioprocessing engineer in the Department of Agricultural and Biosystems Engineering, and Cole Gustafson, professor and biofuels economist in the Department of Agribusiness and Applied Economics, have received \$450,000 from the North Dakota Renewable Energy Council and the U.S. Department of Agriculture's Agricultural Research Service in Mandan to establish the first dedicated biomass testing laboratory in North Dakota.

The lab will be centrally located at the USDA/ARS site in Mandan.

"Creation of the lab is timely for several reasons," Gustafson says. "First, NDSU has established 10-year yield trials using more than 50 different varieties of biomass. Production from these trials will be evaluated for both energy content and densification for shipping. Second, engineers are striving to develop new biomass harvesting, processing and

transportation machines. Information on the physical properties of biomass will help the industry design optimal equipment."

Biomass product characteristics will be important in developing new market standards and grades, which in turn will facilitate commercialization. Information on biomass densification will aid in planning for infrastructure and roads that may be needed to support the industry.

The lab is expected to become fully operational in two years.

The Biomass Testing Lab will complement similar testing facilities on the NDSU campus, including the Plant Diagnostic, Soil Testing and Veterinary Diagnostic labs.

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North Dakota State University

Agriculture and University Extension at North Dakota State University

The North Dakota Agricultural Experiment Station consists of seven Research Extension Centers placed strategically throughout the state and the Main Station in Fargo. We work to develop techniques and technologies to enhance the production and use of food, feed, fiber and fuel from crop and livestock enterprises.

The NDSU Extension Service provides the people of North Dakota with the research-based information they need to succeed in today's increasingly complex world and be prepared for the future. We have offices serving all of North Dakota's 53 counties and Fort Berthold.

If you would like more information on the programs in this publication, contact the faculty and staff listed. If you would like more information about our other programs or have questions, comments or suggestions, please contact one of us.

D.C. Coston
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