



Paving the Way



2006 Annual Highlights

North Dakota Agricultural Experiment Station
NDSU Extension Service

NDSU

North Dakota State University



D.C. Coston
Vice President for Agriculture
and University Extension

North Dakota has made great strides in its 117-year history, and NDSU has played a key role in that growth.

The NDSU Extension Service and North Dakota Agricultural Experiment Station have provided knowledge and technology to support people's efforts to improve their lives and how they do their work.

Through research, education and a wise use of resources, we've helped pave the way to the future for citizens throughout the state — farmers, ranchers, small-business owners, parents, youth and community leaders, to name a few.

This publication provides a glimpse of our impact on the state and its residents in the past year. It also shows our commitment to continuing to assist North Dakotans as they face some big challenges.

For example, agriculture will remain an important underpinning of the state's economy. However, the future of North Dakota's agriculture depends on finding opportunities in rural areas to take advantage of the land's remarkable productivity and creativity of the state's farmers and ranchers.

We are well-positioned to conduct the research and offer the education to lead to those opportunities. We also understand the focus in the coming years must be on communities. Therefore, we will concentrate on developing the three essential attributes of a healthy community — a diverse and resilient economy, an effective and efficient infrastructure, and leadership.

On the cover (counterclockwise from top):

Wheat is swathed at NDSU's Research Plot No. 2 on campus. The plot has been planted to wheat for 125 years and is on the National Register of Historic Places. Plot No. 2 is a valuable resource for scientists interested in soil fertility, crop rotation and naturally occurring organisms that control plant diseases.

Youngsters in a Ward County youth gardening project show off some of the produce they raised. Story on page 11.

Cattle at the Carrington Research Extension Center were fed field peas to create juicier steaks. Story on page 7.

This publication was produced by NDSU Agriculture Communication.

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Graphic Designer: Deb Tanner

Photography: NDSU Agriculture and University Extension faculty and staff, Walhalla Mountaineer

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Support Grows for Oilseed Center of Excellence

Saying that value-added agriculture and energy are two growing industries in North Dakota, Gov. John Hoeven presented a \$2 million check to the NDSU Oilseed Development Center of Excellence.

The funds will be used to develop canola for biofuels, special lubricants and health-care products. Marketing and developing new product strategies also are a focus of the center.

"This new center will combine the innovation of NDSU and the productivity of North Dakota farmers to help supply our country's future energy needs," Hoeven said.

Archer Daniels Midland Co., Dakota Skies Biodiesel Inc. and Monsanto Corp. are private-sector partners in the project.

Ken Grafton, College of Agriculture, Food Systems, and Natural Resources dean, North Dakota Agricultural Experiment Station director and Oilseed Center of Excellence director, says the state's economy will benefit from the public-private partnership.

"Centers of Excellence are partnerships of higher education, researchers, the private sector and economic development efforts," says Joseph Chapman, NDSU president.

For more information:

Ken Grafton, (701) 231-6693, k.grafton@ndsu.edu



Kristi Tostenson, Agricultural and Biosystems Engineering research specialist, explains to Gov. John Hoeven how biodiesel is produced from canola oil.



NDSU's Beef Systems Center of Excellence is partnering with North Dakota Natural Beef LLC, which is opening a beef processing plant in Fargo. This is an architect's rendering of the plant once it is ready to open in summer 2007.

Beef Center of Excellence Moving Forward

NDSU's Beef Systems Center of Excellence is a step closer to reaching its goals.

The center is partnering with North Dakota Natural Beef LLC, which plans to open a beef processing and marketing operation in Fargo. The plant is scheduled to start operating in summer 2007. Initially, it will employ about 20 workers. It could have 100 by its fifth year of operation.

NDSU will have about 6,000 square feet of space co-located in the plant for research and educational meetings, a carcass cooler, taste panel area, test kitchen and offices for NDSU faculty and staff.

Center Director Ken Odde says the facility will help expand the state's cattle feeding and processing opportunities. NDSU beef experts say that's important because about 90 percent of the feeder cattle born in the upper Midwest are shipped out of the region for finishing, and beef producers have to transport their cattle 300 to 700 miles to slaughter plants.

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New Crop Cultivars Released Through Experiment Station

The North Dakota Agricultural Experiment Station is continuing its work of enhancing producer productivity through the release of new crop varieties. Various NDSU departments, Research Extension Centers across the state and the Main Experiment Station in Fargo work collaboratively in the development of new varieties.

Howard, a hard red spring wheat, has a level of scab resistance similar to Steele-ND and also is resistant to current races of stem and leaf rust, according to NDSU plant pathologists. In field trials, Howard showed good yield potential, test weight and protein content. It also has excellent milling and baking properties, according to Mohamed Mergoum, hard red spring wheat project leader.

Dakota Diamond, a white potato, can produce high yields under irrigated and nonirrigated production conditions, says Susie Thompson, NDSU potato breeder. During testing, it often averaged nearly 500 hundredweight per acre under nonirrigated conditions. Dakota Diamond also is suitable for long-term storage, which is a trait sought by chip processors and producers.

Souris, a white-hulled oat, has excellent resistance to prevalent races of crown rust, says Mike McMullen, NDSU oat breeding program leader. This new source of crown rust resistance is important because the other sources of crown rust resistance in other oat varieties appear to be breaking down as the races of rust change.

McMullen says Souris should provide North Dakota and regional oat producers with a disease-resistant, high-yielding, white-hulled cultivar with test weights consistently high enough for the premium oat markets.

Six Roundup Ready soybean varieties were released this year: RG6008RR (00.8 maturity), RG600RR (0.00 maturity), RG601RR (0.1 maturity), RG603RR (0.3 maturity), RG604RR (0.4 maturity) and RG607RR (0.7 maturity). All have good resistance to iron deficiency chlorosis, which has been a problem for soybean growers. The six varieties also have the RPS 6 gene for resistance to phytophthora root rot. The six new varieties also are high yielding and have good lodging resistance and high protein content, according to Ted Helms, NDSU soybean breeding program leader.

For more information:

Plant Sciences, www.ag.ndsu.nodak.edu/plantsci/

Entomology, www.ndsu.nodak.edu/entomology/

Plant Pathology, www.ndsu.nodak.edu/plantpath/

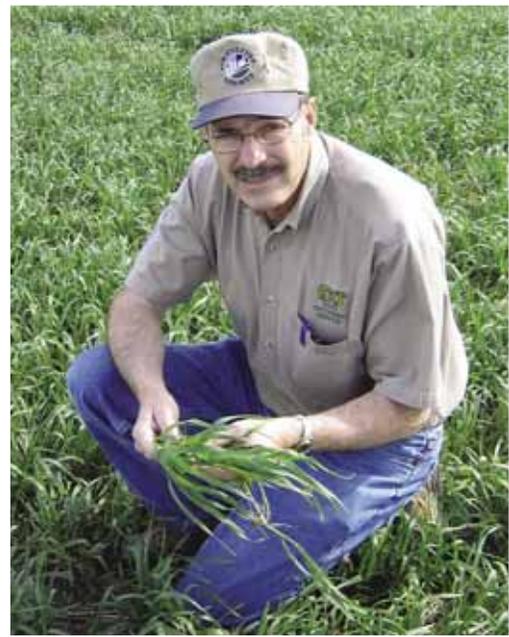
Soil Science, www.soilsci.ndsu.nodak.edu/index.html

Cereal and Food Sciences, www.ag.ndsu.edu/cereal-science/

Agricultural Experiment Station and Research Extension Centers, www.ag.ndsu.edu/research



Consumers are choosy about their fries, and that's why fry testing is an important part of NDSU's potato breeding project.



Dwain Barondeau, Hettinger County Extension agent and first detector network member, checks a wheat field.

Programs Promote Agrosecurity

NDSU is helping farmers and ranchers become less tempting targets for agroterrorism, vandalism and the spread of infectious diseases.

Extension developed programs to help farmers and ranchers understand where threats may come from, such as bioterrorists; activist groups protesting developments in the agricultural industry; and vandals who contaminate chemical spray tanks, shoot out tractor cab windows or steal anhydrous ammonia. The programs also help farmers and ranchers spot where they are vulnerable and develop a security plan.

Extension agents and specialists, agricultural producers and crop consultants are members of a first-detector network to watch for unusual or new diseases or pests, both introduced intentionally and occurring naturally or accidentally.

Researchers are converting radio frequency identification tags that track retail store inventory to trace cattle. The tags are being tested at the Dickinson Research Extension Center. Creating a high-frequency ear tag is part of a national cattle tracking effort.

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Extension's Horizons Program Helps Communities Add Housing

Twenty-seven North Dakota towns are gaining moderate-income housing as a result of Extension's Horizons program, which helps small communities struggling with poverty, shrinking population and dwindling resources.

With Horizons assistance, a group of community leaders convinced the 2005 Legislature to pass a law allowing towns of fewer than 5,000 residents to form housing authorities and issue bonds to pay for moderate-income, as well as low-income, housing. Most of the homes are one-story, senior-friendly townhouses.

Other Horizons results: A cell phone tower was erected near Ellendale, improving the area's telecommunication capabilities. Communities developed strategic plans for their futures, got young people involved in community decision making, encouraged more people to become leaders, and explored ways to help residents feel better about themselves and their communities.

Horizons is a partnership of Extension and the St. Paul, Minn.-based Northwest Area Foundation. Extension started its second Horizons program in fall 2006.

For more information: Lynette Flage, (701) 265-5200, lynette.flage@ndsu.edu

NDSU Research Relevant to Bacteria Outbreak

NDSU food safety research offers lessons for foodborne illness outbreaks such as the summer 2006 E.coli contamination of spinach that killed at least three people and sickened nearly 200 others in 26 states.

Food microbiologist Charlene Wolf-Hall and Veterinary and Microbiological Sciences lab technician Chitra Vijayakumar tested whether four common household products — lemon juice, bleach, and white and cider vinegar — mixed with water would remove E. coli from iceberg lettuce. The products all worked better than plain water, but did not eliminate the bacteria.

The study shows E. coli is very hard to remove because the bacteria get into the produce where surface washing can't reach it, Wolf-Hall says.

This doesn't mean people should stop eating fresh produce, she adds. The message is people should heed the Food and Drug Administration's warning to stop eating a particular fruit or vegetable until it is declared safe.

For more information: Charlene Wolf-Hall, (701) 231-6387, charlene.hall@ndsu.edu, www.ag.ndsu.nodak.edu/safety-1.htm



Veterinary and Microbiological Sciences lab technician Chitra Vijayakumar pours a household product on lettuce.



Extension Helps Producers Cope With Drought

2006 was a tough year for farmers and ranchers in parts of the state hit by severe drought conditions.

To provide options, Extension specialists hosted educational meetings at nine locations in south-central and southwestern North Dakota. The specialists discussed range and forage issues, livestock management, economics and other topics.

"We provided information to help farmers and ranchers as they went through the process of making some tough decisions," said Greg Lardy, Extension beef cattle specialist in the NDSU Animal and Range Sciences Department.

Extension and North Dakota Agricultural Experiment Station faculty and staff also made drought information available on the Web. Major topics addressed included crop and livestock production, drought maps, weather information, family and financial concerns, services and horticulture.

Also on the Web site are two database services: FeedList and Feedlots. FeedList helps feed sellers connect with buyers. Feedlots gives producers needing to place their cattle in a feedlot an opportunity to connect with feedlot operators that have additional capacity.

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



4-H Ambassadors help clean the Cando Public Library as a service-learning project. Service learning allows 4-H members to give back to the community by identifying a community need and creating a project to meet that need.

NDSU Diagnostics Lab Pinpoints Plant Problems

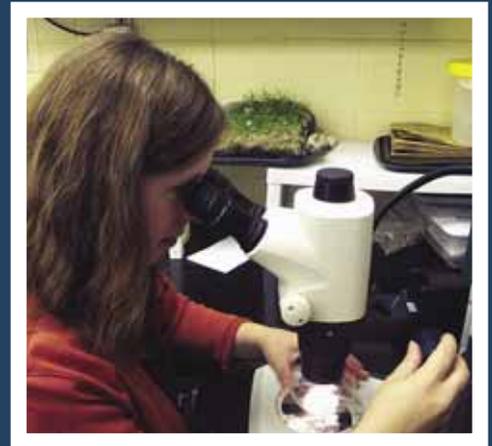
Offering producers and others a convenient, affordable way to diagnose plant-related problems is what we do, says Kasia Kinzer, plant pest diagnostician at the NDSU Plant Diagnostic Lab.

The lab, on the NDSU campus, identifies weeds, mold, insects, plant diseases and disorders, and makes management recommendations. The lab was set up for use by Extension Service agents, but it's now used by many others, such as crop consultants, greenhouse managers, co-ops, elevators, chemical company representatives, elevators and homeowners.

Extension agents can submit information and images directly to the lab using the Internet, which leads to a quicker diagnosis of the problem.

The lab also is part of a national network to monitor pests and pathogens. In the past, diagnosing a problem could take months, especially if it was a new disease. With the network in place, other resources from throughout the region can be used to diagnose the problem quickly.

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www.ag.ndsu.nodak.edu/diaglab/.



Got Milk? These Kids Do

North Dakota youngsters have been boning up on calcium.

During the 2005-06 school year, about 750 fourth-graders and their parents from 13 counties learned the importance of including calcium-rich foods in their diets through "Banking on Strong Bones," a five-week Extension program.

Extension staff visited classrooms to encourage students to consume at least three servings of milk, cheese or yogurt daily; introduce them to MyPyramid, the new food guidance system; and teach them how to read nutrition labels on beverage containers, make healthful drink choices and keep bones strong through physical activity.

Another 5,000 students, teachers and administrators in those schools learned some of the same lessons through educational promotions and activities in the school libraries and cafeterias.

Surveys the fourth-graders and their parents completed indicate the program had a big impact. For example:

- After the program, about 66 percent of the students reported drinking three or more glasses of milk the day before taking the survey, compared with 50 percent prior to the program.
- About 24 percent said after the program they'd choose soda pop instead of milk, down from 37 percent who preferred pop before the program.



- 56 percent of the parents reported positive changes in their child's eating habits after the program, and 91 percent said they give their children three or more servings of dairy products daily. Extension staff will take the program to twice as many counties in 2006-07.

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Field Peas Make Ribeye Steaks Juicier and More Tender

Consumers searching for a juicier and more tender steak may want to consider purchasing beef that was fed field peas.

A collaborative research project was initiated by the Carrington Research Extension Center and the NDSU Animal and Range Sciences Department.

"It was determined, with a high degree of confidence, that field peas used as a feed grain in feedlot finishing rations increased the juiciness and tenderness in ribeye steaks," says Vern Anderson, Carrington REC animal scientist.

Field peas are an energy- and protein-dense feedstuff with energy content slightly higher than barley and similar to corn. Peas most often are fed as a protein source. However, feeding this grain legume will increase the energy density of most diets because field peas contain more energy than many common protein supplements, such as oilseed meals or crop-processing coproducts.

"This finding has huge implications for the pea industry, with expected increased demand for beef feeding," Anderson says. "The ultimate benefactor is the consumer, who will experience more satisfaction from exceptional quality meat."

For more information:

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Karl Hoppe (left) and Vern Anderson, of the Carrington Research Extension Center, prepare steaks for groups that hold meetings at the center during the summer. Steaks from pea-fed cattle came out on top in a taste test during field days.



A researchers studies sunflowers at the Carrington Research Extension Center as part of a national project to combat sclerotinia.

Carrington Center Plays Big Role in Sclerotinia Research

Carrington Research Extension Center scientists have made headway against sclerotinia, a fungal disease that can cause millions of dollars in broadleaf crop losses annually.

Researchers helped identify sunflower and other crop germplasm with improved levels of sclerotinia tolerance, which seed companies are starting to incorporate into hybrids.

Scientists also evaluated fungicides to determine their effectiveness against sclerotinia in canola, sunflowers and field peas. Research indicates some experimental products have greater ability to control the disease than fungicides on the market.

Producers say higher-tolerance varieties and the development of more effective fungicides will improve production and give them more crop rotation options.

The center has about 20 sclerotinia trials per year. Many are collaborative efforts including geneticists and pathologists from NDSU and other universities, and the U.S. Department of Agriculture's Agricultural Research Service research facilities throughout the U.S. The research is part of the USDA/ARS-led National Sclerotinia Initiative.

Center Director Blaine Schatz says the Carrington REC is an ideal location for such research because North Dakota is the only state growing all of the crops in the initiative — sunflowers, canola, dry edible beans, soybeans and the cool-season pulses, primarily field peas and lentils. Plus, the center has a sophisticated misting system that gives scientists a consistent level of sclerotinia for their research.

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Participants (above) view wheat plants at a Best of the Best meeting. NDSU President Joseph Chapman (right) addresses the audience at the scab update summit.



Best of the Best and Scab Summit Highlight Wheat Research and Marketing

For the past four years, wheat producers have been able to get the latest information on production technologies and marketing strategies through a series of "Best of the Best" meetings.

"The momentum is there to continue to build on the series," says Joel Ransom, NDSU Extension agronomist for cereal crops. "The programs were well attended. In Mohall, we packed the largest place we could find."

At the meetings, wheat producers had an opportunity to learn more about wheat research, promotion, disease and weed control, fertilizer use, marketing tools, wheat management and farm budgets.

The North Central Research Extension Center near Minot hosted a scab update summit for industry and government leaders.

The summit:

- Reviewed the management support system for producers that has emerged from research through NDSU and other organizations
- Described knowledge gaps and emerging understandings
- Explored strategies for addressing the gaps

"Crop losses in 2005 could have been much greater if some management strategies for farmers developed through NDSU research and Extension efforts had not been in place," said D.C. Coston, vice president for Agriculture and University Extension.

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NDSU Farm Management Specialist Tracks Producer Income

Farm income is volatile and there is a story behind each year, says Andrew Swenson, Extension farm management specialist. "Often, wide differences exist between regions and farm types because of weather and market prices."

Swenson has been tracking farm income for many years through producers who participate in the North Dakota Farm Business Management

Education program. "We use the information that the program provides for research purposes and to track the state of agriculture in North Dakota."

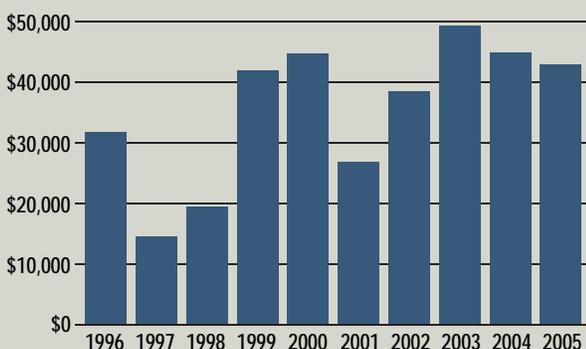
The median acreage (2,000 acres) and gross sales per farm (\$281,667) have been increasing, but so has the cost of living expenses. Swenson notes that off-farm income also has been increasing.

Swenson says there have been some interesting farm income trends during the past 10 years.

- Overall financial performance in 2005 was down for the second consecutive year, but the median net farm income of \$42,286 was the fourth highest in the past 10 years because some crops produced very high yields. Beef cattle prices also were high.
- Profit declined in 2001 because of lower government subsidies, higher crop production costs and low commodity prices. Conversely, producers in 2002 had lower production costs and higher prices, and saw a 37 percent increase in profit.
- Median net farm income reached a 10-year high in 2003 at \$49,181.

For more information: Andrew Swenson, (701) 231-7379, andrew.swenson@ndsu.edu

N.D. Median Farm Income 1996 to 2005



Research Extension Center Construction Progress



Dickinson (top left) dedicated a new, 10,000-square-foot office complex, while staff and others broke ground on an agronomy research laboratory and greenhouse at North Central near Minot (bottom). The architect's drawing (top right) shows a nearly 3,000-square-foot office building addition planned for Central Grasslands near Streeter.

Extension's Rural Leadership North Dakota Program Making a Difference

Several communities have benefited from Extension's Rural Leadership North Dakota program.

Graduates used the skills they learned to improve the quality of life in their communities. For example:

- Watford City gained a community playground and multifamily housing units for the elderly, retirees and young professionals just starting a family.
- Dawson is attracting tourists with a visitor center/museum of the area's history.
- Hannaford's old elementary school became a multipurpose building with a library, fitness center, craft room, technology center, and space for start-up businesses and community events.
- New England residents are swimming in a new pool.

RLND is ensuring the state has willing, effective and innovative leaders with the right skills to overcome challenges and guide North Dakota into the future. Participants attend 10 workshops throughout the state and take a six-day study tour to Washington, D.C., during this two-year program. They learn to think critically and creatively, work with people, communicate effectively, use technology, shape rural policy and find innovative ways to fund local and regional development.

Volunteers build a community playground at Watford City.



"I have been greatly encouraged through the RLND program by its willingness to help rural America when we are losing that attention on the national level," said 2003-05 class member Patricia Patrie, who farms with her family near Bowdon. "We have one of the best places to live on this earth, and it would be a disgrace to let its infrastructure collapse because of changing economics."

For more information: Marie Hvidsten, (701) 231-5640, marie.hvidsten@ndsu.edu, www.ag.ndsu.nodak.edu/rlnd/



NDSU Researchers Study Weed Resistance to Herbicides

Weeds cause major crop losses in North Dakota each year. For example, weeds reduce wheat and barley yields in North Dakota an estimated 25 percent.

But some weeds are developing resistance to certain herbicides, according to Mike Christoffers, geneticist and assistant professor in the Plant Sciences Department. In North Dakota, herbicide resistance has been confirmed in wild oats, green and yellow foxtail, kochia, eastern black nightshade, redroot pigweed, waterhemp, wild mustard and marshelder. Researchers suspect ragweed and horseweed also have developed resistance in North Dakota.

Christoffers and other NDSU geneticists are using molecular genetic techniques to identify the mutations that cause herbicide resistance. Their main focus is wild oats. From seed collected in 1964, Christoffers was able to determine that the frequency of wild oats without any resistance to six common herbicides has decreased considerably since then.

"We are identifying mutations in certain genes that alter the herbicide enzyme in such a way that the herbicide no longer binds well enough to kill the weed," Christoffers says.

"Our genetic testing for resistance will give producers a quick confirmation that the lack of control is due to resistance rather than some other cause of herbicide failure. The testing also will allow us to quickly predict what alternative herbicides will work on a case-by-case basis."

For more information: Mike Christoffers, (701) 231-1054, michael.christoffers@ndsu.edu

Oakes Irrigation Research Site studies continue to indicate North Dakota has the potential to grow high-value crops, particularly vegetables such as cabbage, carrots and onions, under irrigation. Yields this season averaged 26 tons per acre for fresh-pack carrots (foreground), 462 hundredweight per acre of onions grown from seed (center), 111 bushels per acre for barley (background), and 41 tons per acre of cabbage for the fresh market and 56 tons per acre for slaw.

For more information: Walt Albus, (701) 742-2189, walter.albus@ndsu.edu, www.ag.ndsu.nodak.edu/oakes/oakes.htm



Annie's Project Empowers Women on the Land

Today's farm is a complex business — not just a lifestyle. Annie's Project is a multistate program coordinated in North Dakota through the NDSU Extension Service to enthuse and empower farm women to take a major interest in contributing to and managing the agricultural business.

The course is six three-hour sessions that cover financial management,

marketing, human resources, legal issues and computer technology related to farming. Participants discover the resources available via the Internet and in their own communities.

The course also provides group support through discussion sessions and social

interaction. After the program, many participants create network groups in their communities to continue discussing common issues.

"Annie's Project provided me with a good foundation into the world of farming," said Sue Hendrickson of Colfax. "This was important to me because a few years ago I married a farmer and had no background in this business. The sessions were a great environment to network with others in similar situations and an opportunity to learn from each other. It was well worth my time."

The program started in Illinois in 2003. North Dakota/Minnesota held its first program in 2006 with 135 women. That's expected to double in 2007.

"If another person gains a better understanding and is more enthusiastic in creating a successful business, then this has a snowball effect," says Jed Fluhrer, a Cass County Extension agent. "This generates confidence and contributes to a more vibrant and successful community as a whole."

For more information: Jed Fluhrer, (701) 241-5700, jedediah.fluhrer@ndsu.edu, www.extension.iastate.edu/annie/



Ethanol Industry Growth to Impact N.D. Agriculture, Research

The rapid growth of the ethanol industry likely will have far-reaching impacts on North Dakota agriculture and NDSU research, university experts believe.

For producers, ethanol plants will be a new market for their corn and other grains or an incentive to add corn to their crop rotation.

"The breeding program at NDSU is a key to what happens," says Al Schneider, Plant Sciences Department chair. For example, researchers have developed germplasm for industry use that allows corn to be planted earlier and mature earlier, and be more drought and heat resistant.

"It's a great opportunity for us to expand our research agenda," says Ken Grafton, North Dakota Agricultural Experiment Station director and dean of NDSU's College of Agriculture, Food Systems, and Natural Resources. He wants NDSU research to take a more holistic approach by also focusing on developing corn hybrids specifically for ethanol production and helping ethanol plants be more effective.

Greg Lardy, Extension beef cattle specialist, says increased ethanol production means more distillers grain, a byproduct, will be available to feed livestock. Grafton hopes this will lead to expanding North Dakota's cow-calf and cattle feedlot operations.

NDSU research shows distillers grain is an excellent source of energy and protein for beef and dairy cattle, and sheep, and the feed ration can include up to 20 percent on a dry-matter basis.

North Dakota produced about 39 million gallons of ethanol in 2006, using 14 million bushels of corn. The 126,000 tons of distillers grain created is enough to feed about 177,000 head of cattle if it is 15 percent of the feed ration. However, the state has only about a third of that number of beef cattle on feed.

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Greg Lardy, (701) 231-7660, gregory.lardy@ndsu.edu



Children Have Fun Through Gardening

"It was cool working in the garden," says Zack Borgen, one of the participants in an NDSU Extension Service youth gardening project in Ward County.

The students from Minot's Roosevelt, Sunnyside and Lincoln Elementary schools in Minot were involved in the summer community learning center program.

"The youth learned about gardening as a lifetime hobby and discovered the nutritional benefits of eating fruits and vegetables," says Trisha Jessen, NDSU Extension Service Family Nutrition Program agent at Minot. "Another one of our goals was to promote an active lifestyle by getting the youngsters off the couch, computer or video games and using active games to teach gardening lessons."

Jessen supervised the project along with Holly Arnold, also an Extension Family Nutrition Program agent at Minot.

The students also learned basic food safety and preparation concepts by preparing their garden produce. Surplus food was donated to food pantries, so students gained a better realization about hunger in America and responsibility.

"I enjoyed getting to plant a garden and getting to see it grow and getting to say to myself that I helped take care of the wonderful garden," says Summer Pedersen, one of the students.

Wyatt Smith said what he enjoyed the most was tasting different kinds of lettuce and watering the plants.

A harvest party was held in August. Students and parents picked the produce, which was divided up and sent home.

For more information: Trisha Jessen, (701) 847-6450, trisha.kirk@ndsu.edu

North Dakota Ethanol Industry – September 2006



Source: North Dakota Corn Growers Association

- Existing Plants (39 million gallons per year total)
- Plants Under Construction (350 million gallons per year total)



A woman expresses her creativity at the Chalk Festival on Walhalla's Main Street. The festival is one of several events that resulted from NDSU Center for Community Vitality workshops to help rural communities energize themselves by creating an environment for arts and cultural activity. (photo courtesy of Walhalla Mountaineer)

Animal Research Aids Human Health

Scientists in NDSU's Center for Nutrition and Pregnancy are studying the effect of pregnant ewes' nutrition on their fetus's health, and the resulting impacts on lambs and their growth. Researchers say this is significant for livestock producers.

Joel Caton, center co-director, says research shows pregnant females can have low birthweight offspring if fed 60 percent below or 40 percent above optimum nutrition requirements. Such undernourishment can occur during summer droughts, and the overnourishment may happen with pen-fed animals.

The fetus's under- or overnourishment changes the amount of the lamb's fat and muscle cells. Center scientist Kim Vonnahme says this could affect newborn females' ability to reproduce later in life. Low birthweight offspring also are at higher risk for birth defects, diseases and death.

Vonnahme says this research also can help answer questions about human nutrition and reproduction. Studies show about 20 percent of human pregnancies are significantly at risk nutritionally. While poor nutrition can impact the offspring, it may contribute to health problems, such as obesity, in mothers as well.

Center research is a collaborative effort that includes scientists from the USDA's Agricultural Research Service facilities in Dubois, Idaho, and Grand Forks; the Rowett Research Institute for Nutrition in Scotland; and the University of Wyoming. Other NDSU researchers involved include Dale Redmer, Larry Reynolds, Carrie Hammer, Justin Luther and Anna Grazul-Bilska.

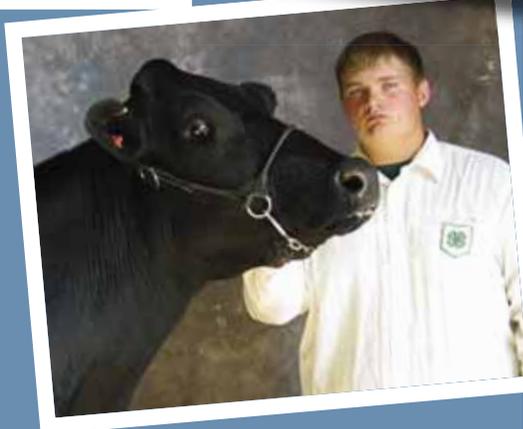
Caton says doing research incorporating human issues allows the center to obtain funding from agencies such as the National Institutes of Health. NDSU has one of the few animal and range science departments in the U.S. to receive such funding.

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About 1,830 4-H'ers participated in activities and competition at the 2006 North Dakota State Fair. The State Fair gives youth an opportunity to showcase their work and test the knowledge and skills they've gained through 4-H.



Growing Grapes for the North Dakota Wine Industry

Now in its third year, NDSU researchers are growing grapes for the state's emerging wine industry.

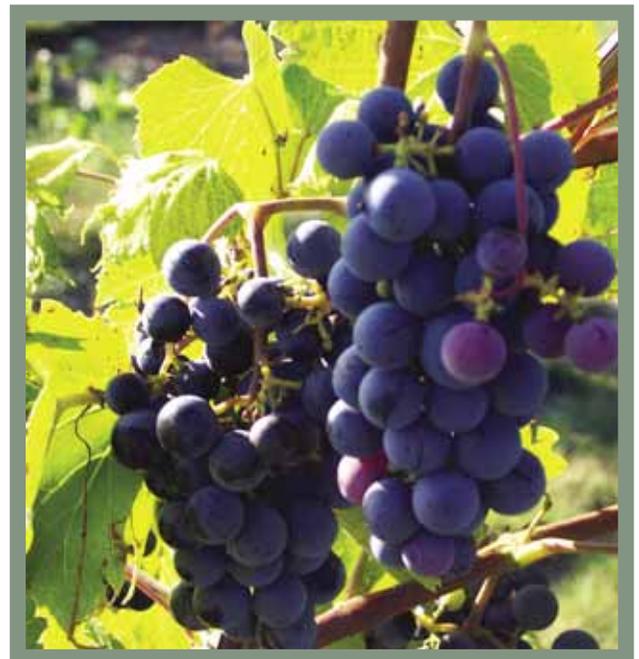
"We are evaluating grape cultivars for commercial production based on their winter hardiness, early maturity and wine quality characteristics," says Harlene Hatterman-Valenti, high-value crops program supervisor in the Plant Sciences Department. "We also are studying cultural practices that may foster hardiness by top-grafting more tender vines onto harder rootstocks and reviewing different trellis systems that may hasten fruit maturity by increasing sunlight exposure to the berry clusters."

NDSU's vineyard research is being conducted at Absaraka, Carrington and Williston. Hatterman-Valenti and Lisa Gray, research specialist in the high-value crops program, are working with Extension specialists, Experiment Station personnel and grape growers in the state to develop production practices for this new commercial crop.

Sixteen grape cultivars are being evaluated for winter hardiness. Included in the trial are hardy juice and jelly grapes, but many of the cultivars are considered wine grapes. Juneberries and raspberries also are being investigated as part of the high-value crops program, and next year blue honeyberry will be added. Various production practices are being researched to assess fruit yield and quality for the fresh market and wine industry.

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NDSU Researchers Developing Better Strains of Wheat

The Wheat Germplasm Enhancement project at NDSU involves several research efforts to improve wheat germplasm through traditional genetic methods using efficient, modern tools.

“Our ultimate objective is to provide North Dakota growers with improved and varied germplasm to meet current needs and provide opportunities for new or alternative uses of this important crop,” says Shahryar Kianian, associate professor in the NDSU Plant Sciences Department and leader of the Wheat Germplasm Enhancement project.

The research includes:

- **Fusarium head blight (FHB) research**

This is a collaborative effort with NDSU’s wheat breeding programs (durum, hard red spring wheat and hard white spring wheat). The research is directed at identifying and tagging novel FHB-resistant sources and using these molecular tags in cultivar improvement.



Kiran Oberoi, Plant Sciences Department graduate research assistant, observes the operation of the Span8 robot dispensing system.

- **The Wheat Coordinated Agricultural program**

This program encompasses a large group of research programs from across the U.S. that are identifying and tagging genes important to wheat improvement. NDSU researchers are focusing on disease and insect resistance in hard red spring and hard white spring wheat, and grain quality in durum wheat. Researchers also are working toward identifying and tagging other important characteristics, such as grain quality and productivity, in advanced breeding lines to incorporate multiple desirable characteristics in a given cultivar.

- **The Wheat Genomics project**

The genomics project focuses on the development of tools to provide a better understanding of the wheat genome. These tools will allow researchers to quickly identify natural or induced variations in genes that affect critical traits, such as disease resistance, grain quality or overall productivity. The genes then can be moved quickly, by traditional methods, to germplasm adapted to North Dakota.

The projects are funded by the U.S. Wheat and Barley Scab Initiative, U.S. Department of Agriculture and National Science Foundation.

Kianian also says the NDSU High Throughput Genotyping Center, funded by a National Science Foundation grant, is operational.

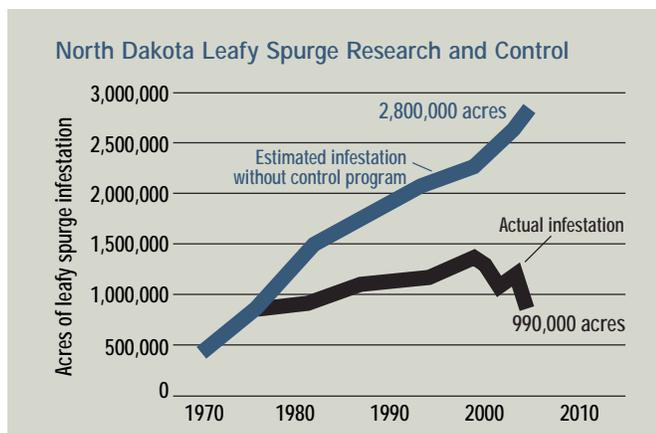
The center has state-of-the-art equipment for DNA genotyping and a custom robotic system that can extract DNA from various tissue samples and biological contaminants from other sources. These resources will allow scientists to process many more samples quickly and address certain genetic problems more precisely.

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NDSU Research Makes Dent in Leafy Spurge

A multipronged research program NDSU began more than 20 years ago to control leafy spurge is paying off.

Infestations of this hard-to-kill, invasive weed were held to about 994,000 acres in 2005, the North Dakota Department of Agriculture reports. That’s down from 1.14 million acres in 2004 and the peak of 1.5 million acres in 2000 and 2001. First found in North Dakota in 1909, leafy spurge acreage doubled every 10 years from 1950 to the mid-1980s.



NDSU’s program also is a model for integrated weed control programs around the world, says Plant Sciences professor Rod Lym, who has spent his 27-year NDSU career working to understand and control leafy spurge.

NDSU began its integrated control research program in 1979. Researchers from Entomology, Animal and Range Sciences, Plant Pathology and Botany studied various approaches, including livestock grazing, herbicides, insects and seeding competitive grasses. Agribusiness and Applied Economics researchers calculated the weed’s economic impact on the state.

The researchers discovered that integrating biocontrol agents with herbicides, or grazing with herbicides and/or biocontrol insects, provides better control than using just one method. Also, their herbicide research led to the establishment of a standard chemical treatment. As a result of their biological control research, 11 insect species that feed on leafy spurge have been released in North Dakota. The *Aphthona* spp. flea beetles have been the most successful, dramatically reducing leafy spurge in many parts of the state.

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www.ag.ndsu.nodak.edu/invasiveweeds/lspurge1.htm

Cyber Challenge Changed Eating, Exercise Habits

Extension's online Food and Fitness Cyber Challenge helped adults make some significant changes in their eating and exercise habits.

The interactive six-week program educated participants about the importance of including fruits and vegetables in their diets and getting physically active. A new lesson each week covered topics such as portion sizes, healthy snacks, beverage choices and how to read nutrition labels. Participants used a daily log to record the number of minutes they spent on physical activity and the amount of fruits and vegetables they ate.

About 250 people registered for the spring 2006 program, up from 65 in the 2005 pilot program.

Based on surveys they took before and after the pilot program:

- 60.5 percent reported eating one to two servings of fruits and vegetables per day after the program, compared with 39.5 percent before.
- 100 percent reported walking regularly after the program, compared with 79 percent before.
- 4 percent watch three or more hours of TV each day following the program, down from 15 percent prior to the program.

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These Bismarck-Mandan area women accepted Walk North Dakota's challenge to walk 200 miles in eight weeks. About 2,500 people have participated in the Extension-sponsored fitness program since it started in May 2004. They've logged 721,877,811 steps, or 360,939 miles.

Researchers Determining Oat Hay Quality

Oat hay acreage in North Dakota has averaged more than 125,000 acres during the last four years. However, producers looking for oat varieties that produced the best quality oat hay had little to go by.

"The feeling was that early maturing oat varieties produced the best quality oat hay," says Dwain Meyer, Plant Sciences professor. "However, our research during the past few years shows that Paul, a later-maturing variety, had the highest forage yield and overall quality. We've determined that forage quality is highly impacted by the variety selected."

Paul oats is a hull-less oat variety released by NDSU in 1994.

Meyer notes that an experimental line, ND000461, being developed by Mike McMullen, Plant Sciences associate professor, also shows promise as an oat hay variety.

The testing for cattle digestibility during the study was completed in the Animal and Range Sciences forage quality lab using standard wet-chemistry techniques. The Animal and Range Sciences Department is conducting tests using live cattle.

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Diabetes Nutrition Facts Surprise Extension Program Participants

Participants say one message they took home from Extension's pilot diabetes education program is food that's good for you can be easy to prepare and taste good, too.

One hundred nineteen adults age 20 to 80 from Foster, Grand Forks, Richland, Cass and Walsh counties completed Dining with Diabetes: North Dakota Style. They attended four weekly 2½-hour sessions and a follow-up class three months later to learn how to better manage diabetes. Lessons included making good food choices, portion control, meal planning and how to read food nutrition labels. Extension agents teamed up with local dietitians, nurses and certified diabetes educators to present the information.

Jane Edwards, Extension nutrition and health specialist, says this educational effort is important because the number of North Dakotans with diabetes is rising — 3.6 percent in 1994 to 6.7 percent in 2005.

Program participants reported some of what they learned surprised them. For example:

- You need to look at total carbohydrates, and not just the sugar level on nutrition labels
- The amount of fats and sugars in foods
- Heart disease and diabetes go together
- The different kinds of food diabetics can eat

Edwards says the program will expand to other counties in 2007.

For more information: Jane Edwards, (701) 231-7478, jane.u.edwards@ndsu.edu



Duane Hauck, D.C. Coston and Ken Grafton

Agriculture and University Extension at North Dakota State University

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.

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