

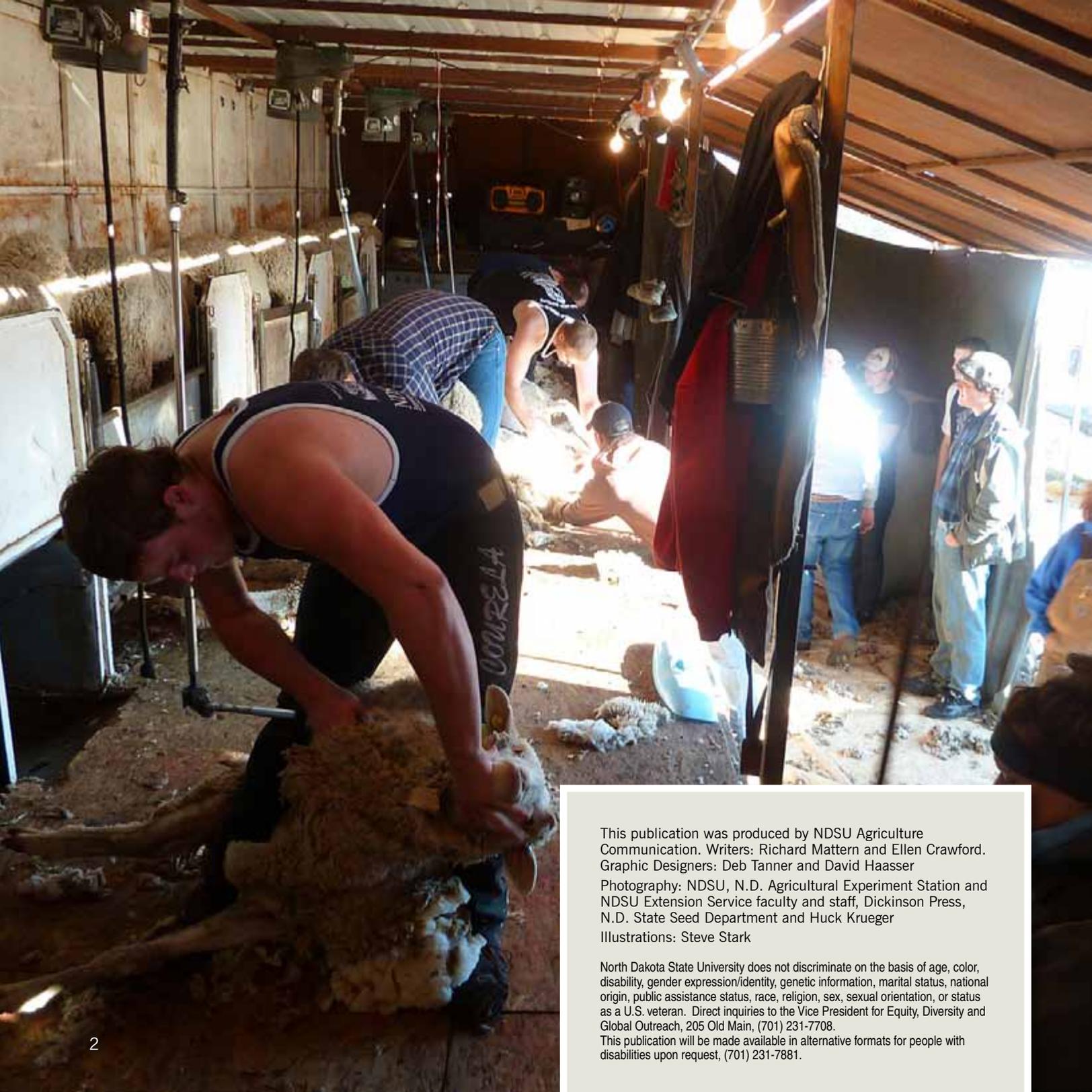
2012 Annual Highlights

North Dakota Agricultural Experiment Station
NDSU Extension Service



NDSU NORTH DAKOTA
STATE UNIVERSITY





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Ken Grafton



Chris Boerboom

Welcome to NDSU Agriculture and Extension

We are pleased to bring to you the latest accomplishments from the North Dakota Agricultural Experiment Station and the NDSU Extension Service in this edition of Annual Highlights!

The 2012 growing season was one that really surprised most people: Warm, dry weather occurred throughout much of the state, yet crop yields exceeded the expectations of many. Also, although the moderate winter and spring resulted in a great calving season, the summer drought, hay and water shortages, and falling prices created challenges for many ranchers. In a similar light, many of our research and Extension activities also exceeded our expectations, and we continue to address current challenges faced by North Dakotans.

Record yields of North Dakota-developed crop varieties; valuable Extension programs for Ag, 4-H'ers, families and communities; and moving forward on our new and critically important soil health initiative are just a few examples of how the Ag Experiment Station and the NDSU Extension Service work on behalf of the citizens and stakeholders in the state.

Your Ag research and Extension Service programs continue with great success. This year's highlights publication identifies a few of the many activities that occurred this year.

2012 also marks the 150th anniversary of the Morrill Act, which established the state land-grant universities such as NDSU. This year also marks the 125th anniversary of the Hatch Act, the federal legislation establishing the state Experiment Stations.

We cherish and honor our legacy established 150 years ago to work on solving problems affecting the needs of our great nation, and we continue to do so. Our ties to our stakeholders remain strong, and we greatly appreciate the support that we receive throughout the state to continue our research and Extension missions.



Ag Experiment Station Greenhouse Complex NEARS COMPLETION

Construction of the Agricultural Experiment Station Research Greenhouse Complex that began in 2008 is less than a year away from being finished. The Biosafety Level 3 (BSL-3) facility is the last phase that will complete the complex. The facility will be the only plant-based BSL-3 in North Dakota. It consists of one lab, two growth rooms, a growth chamber area and a misting chamber area.

“NDSU plant pathologists will be able to study the interaction of important pathogens with their host plants, allowing for the development of an efficient and durable disease management practice before the pathogen arrives in the region,” says Robert Brueggeman, assistant professor in Plant Pathology. “This is essential considering it can take several years to develop commercial varieties with acceptable genetic resistance.”

Pathogens such as wheat and barley stem rust race TTKSK (Ug99) are a reminder that developing and identifying resistant varieties against plant diseases is critical. The BSL-3 facility will allow NDSU researchers to stay on the cutting edge of basic research and become leaders in the discipline.

“The BSL-3 facility will bolster our basic research capabilities, allowing us to conduct pioneering molecular

research that will bring national and international recognition to the NDSU plant pathology research programs,” Brueggeman says.

Due to the negative impacts these pathogens can have on the environment, taking the proper safety steps becomes essential.

“Showering is one procedure to keep pathogens or insects from traveling on people,” says Julie Hochhalter, greenhouse manager. “As an extra precaution, all materials exiting a BSL-3 must be decontaminated and tested to indicate nothing has survived the decontamination process.”

Other research that will be conducted in the greenhouse includes plant research in the areas of plant science, plant pathology, entomology and food science.

For more information:

Ken Grafton, (701) 231-7655, k.grafton@ndsu.edu

Robert Brueggeman, (701) 231-8362,
robert.brueggeman@ndsu.edu

Julie Hochhalter, (701) 231-5577,

julie.a.hochhalter.1@ndsu.edu

www.ag.ndsu.edu/greenhouse





INTERNSHIP

Provides Glimpse of Extension Agent's Role

Lucas Schmaltz spent 10 weeks of his summer vacation learning what being an Extension agent is all about.

The NDSU senior from Rugby was one of two students interning in NDSU Extension Service county offices in 2012.

“The internship program allows students interested in an Extension career to get a feel for what will be expected of them if they do get a job in the Extension field,” says Ransom County Extension agent Brian Zimprich, Schmaltz’s mentor. “It also gives these students a chance to work under an experienced agent for a couple of months to learn about the job and what some of the responsibilities are that go along with the job. If a student takes an Extension job after going through the intern program, they will have a better understanding of the job when they walk into their new office on the first day.”

Schmaltz served as a counselor and mentor at the Western North Dakota 4-H Camp near Washburn, assisted Extension agents and 4-H ambassadors at the Extension Youth Conference in Fargo, helped with 4-H livestock shows and judged some 4-H exhibits at the North Dakota

State Fair, answered questions that came into the Ransom County Extension office from the public, accompanied Zimprich and two youth to a livestock judging camp in Iowa, attended educational meetings for livestock producers, visited farms, scouted crops for pest and production problems, and helped conduct 4-H day camps and a showmanship clinic in Ransom County.

“My internship through the NDSU Extension Service was an irreplaceable experience,” says Schmaltz, who is considering a career as an Extension agent.

Because the internship and agents-in-training programs have proven to be effective in recruiting and preparing future Extension agents, NDSU Extension is asking the 2013 state Legislature for funding for five internships and four agent-in-training positions. The State Board of Agricultural Research and Education, which oversees budgeting and policymaking for the North Dakota Agricultural Experiment Station and NDSU Extension Service, ranked this request the No. 1 funding priority for Extension.

For more information: Lynette Flage,
(701) 780-8229, lynette.flage@ndsu.edu

What your mother ate while pregnant could have an impact on your health.

Chung Park, a professor and researcher in NDSU's Animal Sciences Department, and his research team have found a possible link between a pregnant woman's diet and her daughters' risk of developing breast cancer.

Park, who has been studying breast cancer for more than 15 years, says his latest research indicates that getting high doses of lipotropes during pregnancy may decrease the daughters' chances of getting breast cancer.

Lipotropes are essential nutrients that play key roles in modifying metabolic and genetic pathways. They're found in a variety of foods, including eggs, meat, fish, beans, milk and leafy vegetables. They're also available as dietary supplements.

The team conducted the research on two groups of rats and their female offspring. One group of rats was fed a control diet; the other received a high-dose lipotrope diet. The offspring were injected with a tumor-causing substance.

Park found that tumor development was delayed in the offspring from rats on the high-dose lipotrope diet. Those offspring also showed a significant decrease in the incidence of tumors, and tumor numbers and size, and the high-dose lipotropes did not affect mammary development.

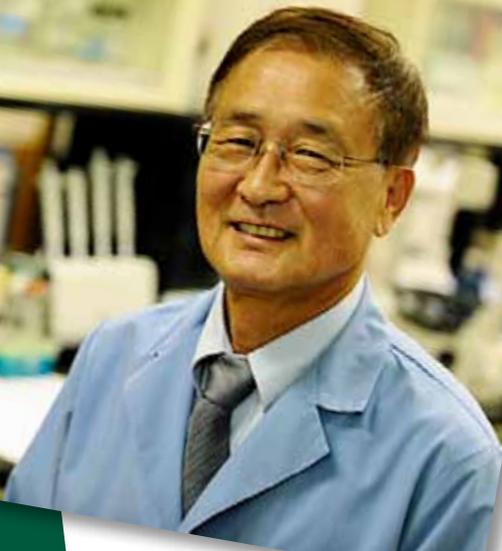
"This study demonstrated for the first time that maternal high-dose lipotropes are associated with reduced mammary tumor risk in the offspring," he says. "These findings may be a critical step in understanding the mechanisms between intrauterine dietary intervention and breast cancer risk, and may be useful in developing potential clinical strategies to reduce breast cancer."

Park and his team, which consists of two postdoctoral fellows, a lab technician and a graduate student, have received grants from the National Institutes of Health and the Northern Canola Growers Association. These grants will allow them to continue their investigations into maternal nutrition and the health of offspring, and how they relate to breast cancer.

The researchers hope their work eventually will lead to the development of a dietary supplement to help prevent breast cancer, says Mark Walters, the team's lab tech.

For more information: Chung Park,
(701) 231-7670, c.park@ndsu.edu

Researcher Finds New Diet/ Cancer Link



Soil Health and Land Management Research Remains High Priority

Good soil health is necessary to maintain or improve North Dakota's economic prosperity and minimize environmental impacts caused by land management practices, according to a soil health advisory group formed by NDSU.

The soil health initiative is being spearheaded by the North Dakota Agricultural Experiment Station and NDSU Extension Service.

Since 2011, three faculty and three scientists/specialists have been added to the NDSU School of Natural Resource Sciences and Research Extension Centers at Langdon, Carrington, Minot and Hettinger to address issues related to soil health and land management. Additionally, six support staff positions have been created and mostly filled at Research Extension Centers across the state as part of this initiative.

"The soil health initiative is a very high priority," says Ken Grafton, vice president for Agricultural Affairs, Agricultural Experiment Station director and College of Agriculture, Food Systems, and Natural Resources dean. "We will be addressing ways for landowners to manage their resources for agricultural, recreational and wildlife needs by addressing salinity and sodicity problems and fertility management."

Saline and sodic (accumulated sodium) soils affect about 12.6 million acres of agricultural land in North Dakota.

NDSU personnel have been awarded more than \$6.2 million to work on soil health and land management-related topics, including:

- Tile drainage and subirrigation
- Soil salinity and sodicity research and Extension efforts in eastern North Dakota
- Impact of increased dust and road use on wetlands due to energy development in western North Dakota
- Impacts of climate and erosion on soil change and implications for North Dakota soil quality
- Multiple land use issues: beef production and wildlife habitat

The Soil Health Advisory Group had its first meeting with soil health and land management faculty and specialists in September. The group provided insightful guidance for prioritization of soil health research and Extension Service efforts directed by NDSU and other collaborators.

The initial meeting also provided networking opportunities among state and federal agencies, retail partners, commodity groups and NDSU to increase the awareness and importance of soils to North Dakota's vitality. The advisory group will meet every six months.

"Through the soil health initiative, producers will be better suited to adapt to changes in soil conditions, climate, cropping systems and environmental situations," Grafton says.

For more information: Ken Grafton, (701) 231-7655, k.grafton@ndsu.edu
Abbey Wick, (701) 231-8973, abbey.wick@ndsu.edu
www.facebook.com/SoilHealth

The Soil Health and Land Management Team at a Glance

The soil health and land management team is collaborating and working on projects across the state. Team members include:

Ann-Marie Fortuna – research soil health professor, School of Natural Resource Sciences

Abbey Wick – Extension soil health assistant professor, School of Natural Resource Sciences

Chris Augustin – area Extension soil health specialist, North Central Research Extension Center, Minot

Naeem Kalwar – area Extension soil health specialist, Langdon Research Extension Center

Jasper Teboh – soil scientist, Carrington Research Extension Center

Ben Geaumont – wildlife and range science research assistant professor, Hettinger Research Extension Center

Jeffery Stackhouse – wildlife and rangeland research technician, Hettinger Research Extension Center

Matthew Danzl – forage agronomy research specialist, Central Grasslands Research Extension Center, Streeter

Md Saidul Borhan – soil health technician, Department of Agricultural and Biosystems Engineering Department



Tile Drainage Improves **SOIL HEALTH AND PROFITS**

North Dakota farmers say a high priority for them is more information about tile drainage water management, according to a regional education needs assessment. Farmers identified crop response to subsurface drainage, design guidelines for subsurface water management systems, reclaiming salt areas and environmental impacts of subsurface drainage water as educational needs.

To meet those needs, NDSU researchers held tile drainage meetings in 10 North Dakota counties and provided plot tours at the NDSU tile drainage research site.

"The NDSU tile drainage research site is unique because it is the only replicated research site in a multistate region comparing tilled and nontilled crops," says Hans Kandel, Extension agronomist. "In addition to measuring yield, plants are evaluated for disease and other growth characteristics."

At the meetings, producers surveyed felt that tile drainage would increase yields.

"For example, for a 120-bushel-per-acre corn crop, the increase would be about 10 bushels per acre," Kandel says. "At \$7 per bushel (October 2012 prices), the increase would be \$70 per acre. The life expectancy of a tile drainage system likely is more than 50 years, so the return is substantial."

NDSU also is working with Extension specialists from South Dakota State University and the University of Minnesota to provide two-day drainage design workshops.

For more information:
Hans Kandel, (701) 231-8135,
hans.kandel@ndsu.edu





Preserving, Improving **WATER QUALITY** a Priority

Water is vital for humans and livestock, and NDSU researchers and Extension specialists are educating North Dakotans about water quality and how to preserve and improve it.

Researchers are nearing the end of two studies on water from tile drainage outlets. One study involved collecting water samples weekly from April to December 2008 at 18 sites in Cass County and taking samples again in 2012 to see how the water quality has changed. They're doing similar testing throughout the Red River Valley at eight sites identified as having salt-affected soil.

"There's a large variation in the quality, and not where you'd expect to find it, either," Extension water quality/irrigation specialist Tom Scherer says.

The results of tests on the salt-affected soils will be particularly helpful in combating excess saline in soils, Extension water quality associate Roxanne Johnson says. Salt accumulations eventually can reach levels toxic to vegetation such as crops.

The region's prolonged wet spell caused water tables to rise, pulling salt with them. The water then evaporated, leaving the salt behind. Previous research indicates that tile drainage can reduce the level of salt in soil

through time, and once the salts are gone, they won't be replenished. Preliminary results from the current research echo those findings.

"In general, we have noticed there is a decrease in the amount of salinity in the soil," Scherer says.

Also in 2012, Johnson and Scherer offered free water quality screening on samples people brought to the NDSU Research Extension Centers' field days. They tested 78 samples and talked with up to 300 people concerned about the quality of the water they use on their lawns or gardens or give to their livestock.

In addition, Johnson continued to help producers learn how to comply with the federal Oil Spill Prevention, Control and Countermeasure program (aimed at preventing oil spills in U.S. waters) and protect ground water supplies through nutrient management on tiled fields.

"We're trying to get the message out how to manage fertilizer placement and timing to reduce loss through the tile," she says.

For more information: Roxanne Johnson, (701) 328-7240, roxanne.m.johnson@ndsu.edu
Tom Scherer, (701) 231-7239, thomas.scherer@ndsu.edu
www.ag.ndsu.edu/waterquality



Justin Smith Morrill, U.S. senator from Vermont

Morrill Act of 1862

“This bill proposes to establish at least one college in every State upon a sure and perpetual foundation, accessible to all, but especially to the sons of toil, where all of needful science for the practical avocations of life shall be taught, where neither the higher graces of classical studies nor that military drill our country now so greatly appreciates will be entirely ignored, and where agriculture, the foundation of all present and future prosperity, may look for troops of earnest friends, studying its familiar and recondite economies, and at last elevating it to that higher level where it may fearlessly invoke comparison with the most advanced standards of the world.”

– Justin Smith Morrill, U.S. senator from Vermont who sponsored the Morrill Act

NDSU Continues Land-grant Mission

In 2012, NDSU celebrated the 150th anniversary of the Morrill Act, a major landmark in the history of education.

NDSU exists because of the foresight of Vermont congressman Justin Smith Morrill, who championed a bill that became known as the Morrill Act. The act, which President Abraham Lincoln signed into law in 1862, granted each state 30,000 acres of federal land for every senator and representative. Each state was to sell the land and use the proceeds to establish a college to provide an education in agriculture and mechanical arts, as well as liberal arts and sciences.

NDSU, established in 1890, and the other universities throughout the U.S. that resulted from this legislation are called land-grant institutions. Two other early pieces of legislation—the Hatch Act of 1887, which created agricultural experiment stations, and the Smith-Lever Act of 1914, which created the Cooperative Extension System—supplemented the land-grant universities’ mission.

“Their traditional strengths in agricultural research and Extension have helped prairie farmers meet the challenges

of prairie farming and rural life in a vast land,” says Tom Isern, an NDSU distinguished professor of history. “With diversification, modernization and globalization of the regional economy and society, including the advent of the digital age, the land grants serve as engines propelling the Plains states to global leadership.”

Mark Jennings, who grows crops on some of the land his great-grandfather homesteaded near Washburn, is one of those “prairie farmers” helped by North Dakota’s land-grant university.

“NDSU gives you information and resources you can’t get anywhere else,” he says. “You get an independent, third-party analysis. I think it definitely has helped North Dakota agriculture immensely.”

Ken Grafton, vice president for Agricultural Affairs, dean of NDSU’s College of Agriculture, Food Systems, and Natural Resources, and director of the North Dakota Agricultural Experiment Station, says that having a land-grant university is vital to North Dakota. For instance, NDSU research results in \$300 million being added to the economy every time the university releases a new wheat variety because of improved yield or traits.

For more information: Ken Grafton,
(701) 231-7655, k.grafton@ndsu.edu





4-H Camp Builds SKILLS, FRIENDSHIPS, FUN



The Western North Dakota 4-H Camp near Washburn is an important element of the NDSU Extension Service's 4-H youth programming.

"4-H camping is a positive force in youth development because it provides a way for youth to learn life skills related to belonging, mastery, independence and generosity that's different from 4-H's other delivery methods," says Brad Cogdill, Center for 4-H Youth Development chair.

The camp, nestled among the trees along the Missouri River between Fort Mandan and the Lewis and Clark Interpretive Center, allows youth to experience the outdoors and gain an appreciation for North Dakota scenery in a historical setting while making friends and learning new skills.

In 2012, more than 400 youth attended camps in which skilled staff helped them build a robot; create a movie; use hand-held Global Positioning Satellite units; learn to groom, clip, wash and show livestock; go horseback riding, swimming and canoeing; develop archery and hunter safety skills; and get creative with arts and crafts. In other camps, youth from military-connected families developed resiliency skills and formed lifelong bonds with other military youth. Camp attendance increases each year.

"The best thing about camp is everything," Morton County camper Kelsie Schaff reported.

Other campers agree. Camp evaluations showed that:

- 96 percent learned new skills
- 94 percent made new friends
- 75 percent are more willing to participate in other activities at home as a result of their 4-H camp experience

The camps are open to all youth ages 6 to 18. Youth do not need to be a 4-H member.

The camp has three rustic sleeping cabins that can house about 30 people each; the main lodge, which has seating for about 200 and a kitchen equipped for large-scale food preparation; a barbecue pit and campfire ring; riding arena; and amphitheater-style chapel.

To sustain this program into the future, the State Board of Agricultural Research and Education supports Extension's request for state funding to renovate the cabins and main lodge, add a multipurpose camp building and improve outdoor program amenities.

For more information: Brad Cogdill,
(701) 231-7259, brad.cogdill@ndsu.edu
www.ndsu.edu/4h/camp



Extension Helps COMBAT DIABETES

Diabetes continues to be a growing problem in the U.S.

About 26 million people were diagnosed with the disease in 2011, and an estimated 79 million have pre-diabetes. In North Dakota, more than 37,000 live with the disease.

Through a program called Dining With Diabetes North Dakota Style, NDSU Extension agents team up with certified diabetes educators or registered dietitians to provide North Dakotans suffering from or at risk of developing diabetes with information to help them make the lifestyle changes they need to manage the disease.

“The key to treating diabetes is preventing complications through managing blood sugars,” says Abby Gold, Extension’s nutrition and wellness specialist. “For those who have pre-diabetes, the disease is preventable rather than inevitable.”

Dining With Diabetes (DWD) is designed to help people particularly in rural areas who lack access to health education services. This hands-on, community-based program gives people information on the best approaches to achieve good health when living with diabetes. Classes feature recipe demonstrations, taste testing and goal setting.

“This program empowers participants to make healthier food choices and become more physically active,” Gold says.

About 120 people participated in the program in the past year.

Participants report that the program helped them become more physically active, eat more healthfully and take a more active role in their health care. For example, of a group of 46 people who completed the four-session program in 2012:

- 60 percent increased the number of days they ate recommended amounts of vegetables
- 25 percent began consuming healthful oils four or more days of the week
- 70 percent improved their knowledge of how to prevent diabetes and its complications

“The DWD program is a great opportunity for our diabetes patients to learn more about managing their diabetes,” says Tera Miller, diabetes prevention and control director for the North Dakota Health Department’s Division of Nutrition and Physical Activity.

For more information: Abby Gold,
(701) 231-7478, abby.gold@ndsu.edu



Extension Provides **LIVESTOCK STEWARDSHIP** Expertise



Emergency responders are trained to deal with injured humans but not livestock hurt while being transported. That's about to change.

NDSU Extension beef quality specialist Lisa Pederson and Extension veterinarian Charlie Stoltenow have developed a bovine emergency response plan. It outlines what first responders should do if they are faced with injured livestock. NDSU Extension plans to hold training sessions for first responders.

Stoltenow and Pederson wrote the plan with assistance from colleagues at West Virginia University, Iowa State and the University of Tennessee and advice from the North Dakota veterinarian's office and North Dakota pork producer organizations.

To further help North Dakota producers enhance their livestock care and husbandry at a time when they face an increasing demand for accountability in animal welfare issues, NDSU Extension hired Gerald Stokka as NDSU's first livestock stewardship specialist. He is a former Pfizer Animal Health veterinary operations team member. The 2011 Legislature provided funding for the new position.

His initial efforts have included speaking to producer groups and Extension agents about what livestock stewardship is, why it is important and what he hopes it will accomplish.

"The term 'stewardship' means the careful and responsible use of something entrusted to one's care," Stokka says. "We have extended that definition to include 'and leaving behind a better place for the next generation.' We intend to bring an understanding to what is entrusted to us. It is not just the livestock, but the land and environment they are in, the air they breathe and how we—people and livestock—fit in the food production industry."

Other Extension livestock stewardship efforts have included developing a DVD on cattle handling for auction markets and a cattle-handling video available on YouTube for producers.

For more information:

Lisa Pederson, (701) 328-9718, lisa.pederson@ndsu.edu
Gerald Stokka, (701) 231-5082, gerald.stokka@ndsu.edu



UPGRADED SHEEP UNIT

Aids Research and Extension

On an ordinary-looking farmstead west of the NDSU campus, researchers are hoping to find answers to improve sheep production, not just in North Dakota but throughout the U.S.

Extension Service specialists use the NDSU Sheep Unit to share the researchers' findings with producers and others in the sheep industry through open houses, field days, tours and other educational programs, and students in NDSU's animal sciences courses receive hands-on experience in working with livestock. In addition, the unit has hosted artificial insemination schools and major events such as the 2007 International Katahdin Expo.

"We try to do projects here that are producer-friendly, that let us disseminate the information that producers can put into use immediately in their sheep operations," Sheep Unit manager Skip Anderson says.

Current research projects include evaluating a commercially available pregnancy detection and litter size test and a recently approved product designed to improve out-of-season breeding. The Sheep Unit also is breeding for sheep that lamb naturally out of season. These genetics ultimately will be made available for sheep producers in the region to purchase.

"Identifying which ewes are pregnant and the litter size is very important because the ewes' nutrient requirements are drastically different during late gestation and lactation," NDSU Extension sheep specialist Reid Redden says.

The Sheep Unit recently completed a multiyear remodeling project that included upgrading the lambing facility and ventilation in the main barn (built in the 1940s), regrading and landscaping the pen area to improve drainage, adding a fence line feeding system to improve efficiency, reroofing the main barn, and replacing windows and lighting.

The unit is home to 300 mature breeding ewes and about 15 rams in four purebred flocks: Hampshire, Columbia, Katahdin and Dorset.

Anderson has three goals for the unit: continue to be a leader in research that directly affects producers, use new technology to produce efficient and healthy sheep, and continue to provide a place for students to receive hands-on experience.

For more information: Skip Anderson, (701) 356-3295, steven.e.anderson@ndsu.edu
Reid Redden, (701) 231-5597, reid.redden@ndsu.edu



NDSU Fighting Glyphosate-resistant Weeds

Glyphosate-resistant weeds such as waterhemp, common ragweed, horseweed (marestail) and kochia continue to increase in North Dakota, especially in the eastern half.

Research is being conducted at NDSU by several Extension and research personnel in Fargo and at Research Extension Centers across the state to reduce glyphosate-resistant weeds in North Dakota cropping systems and maximize herbicide activity through the use of adjuvants.

“Glyphosate-resistant weed control has improved when pre-emergence herbicides, followed by nonglyphosate postemergent herbicides, have been applied, especially in conjunction with the use of alternative herbicide-resistant crop varieties such as LibertyLink,” says Jeff Stachler, NDSU and University of Minnesota Extension agronomist.

“However, the adoption of pre-emergence herbicides in North Dakota has been slow,” says Rich Zollinger, NDSU Extension weed specialist. “Currently, pre-emergence herbicides are applied only on 4 percent of the soybean acreage and 8 percent of the corn acreage.”

Waterhemp control was improved by 43 percent in Roundup Ready sugar beets when a preplant incorporated herbicide, such as Ro-Neet SB, was applied and Betamix plus Nortron plus Outlook was applied postemergence in combination with glyphosate, compared with three applications of glyphosate alone.

“Common ragweed was the first confirmed glyphosate-resistant weed species in North Dakota,” Stachler says. “It was discovered in a single soybean field in Traill County in

2007. After the 2010 growing season, glyphosate-resistant waterhemp was confirmed in several fields in Richland County. The number of fields having glyphosate-resistant common ragweed continues to increase and now includes Cass County.”

After the 2011 growing season, glyphosate-resistant kochia was confirmed in at least single fields in Dickey, Pierce and Stutsman counties. Glyphosate-resistant horseweed (marestail) was confirmed in a single field in Cass County. Glyphosate-resistant waterhemp continues to spread and was confirmed in several fields in Cass, Ransom and Traill counties. Glyphosate-resistant common ragweed also continues to increase.

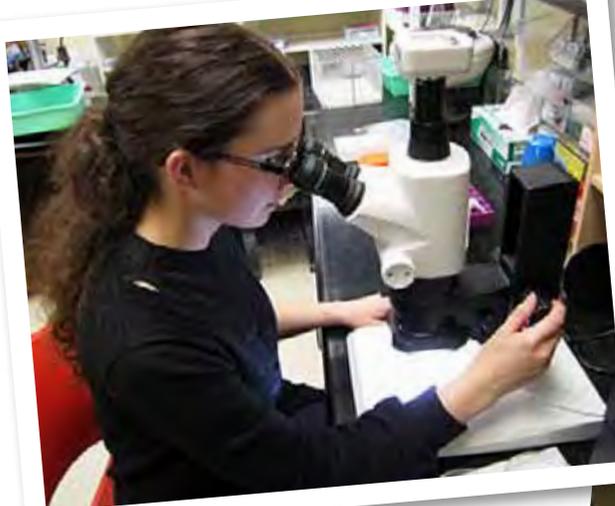
To nearly eliminate glyphosate-resistant weeds, NDSU researchers recommend using the proper rotation of herbicide mechanisms of action, adopting zero weed tolerances (no weed seed production), managing weeds along field perimeters and in areas of reduced crop canopy, using pre-emergent herbicides on all crops, adding the correct adjuvant in herbicide combinations of conventional herbicides with glyphosate, rotating herbicide technology crops, applying postemergence herbicides to small (1- to 3-inch) weeds, applying herbicides in the correct spray volume, reducing sprayer travel speeds and maximizing cultural weed controls.

For more information:

Jeff Stachler, (701) 231-8131, jeff.stachler@ndsu.edu

Richard Zollinger, (701) 231-8157, r.zollinger@ndsu.edu

Plant, Vet Diagnostic Labs Provide **VALUABLE SERVICE**



Do you suspect one of your cattle has anthrax? Do you wonder what caused those black blotches on your ash tree leaves?

NDSU's veterinary and plant diagnostic labs have the answer.

The Veterinary Diagnostic Lab (VDL) staff processed 9,273 cases in 2011 (the latest data available). The caseload ranged from alpacas to zebras, although cattle, horses, dogs and cats accounted for the bulk of the cases. Most of the cases were submitted from North Dakota and Minnesota, but lab staff also received cases from 30 other states and Canada.

"The laboratory is fortunate to have a highly dedicated and skilled staff with a great deal of experience in performing tests related to animal disease diagnosis," says Neil Dyer, VDL director.

That caseload also included 709 requests for the lab's toxicology section to test 1,926 feed samples.

"Our toxicology section is recognized as a national resource in mycotoxin analysis and continues to expand veterinary testing into additional areas of need," Dyer says.

As a member of the National Animal Health Laboratory Network, the VDL also is involved in the surveillance of diseases such as bovine spongiform encephalopathy, West Nile virus, avian influenza and chronic wasting disease.

The Plant Diagnostic Laboratory (PDL) has helped identify plant problems for more than 40 years.

"Our goal is to provide economical, unbiased plant and pest diagnostic services to agricultural professionals, the horticulture/turf/forestry industries, homeowners and individuals in North Dakota," says Kasia Kinzer, PDL director.

The lab processed more than 3,000 samples in 2011 and more than 2,000 through October 2012. Most of the samples came from within North Dakota, although the lab staff also tested samples from about a dozen other states and Canada.

Notable problems diagnosed in 2012 include soybean cyst nematode, root rots and other drought-related complications. Common problems in 2011 included ash anthracnose (the cause of the black blotches), Dutch elm disease and home molds.

For more information:

Neil Dyer, (701) 231-7521, neil.dyer@ndsu.edu,
www.vdl.ndsu.edu/

Kasia Kinzer, (701) 231-7854, kasia.kinzer@ndsu.edu,
www.ag.ndsu.edu/cpr/diagnostic-lab



Research Extension Centers Drawing NATIONAL AUDIENCE

NDSU's Research Extension Centers are sharing knowledge about the latest agricultural production techniques and technologies far beyond the state's borders.

For example, the Hettinger REC's 2012 shearing and wool classing schools attracted about 40 sheep producers and others in the sheep industry from Indiana, Michigan, Montana, South Dakota, Tennessee, Utah and Wyoming as well as North Dakota.

"The sheep flock at the NDSU Hettinger REC is one of the few university flocks in the U.S. that has the sheep numbers required to conduct schools of this size and to draw a diverse audience from across the nation," says Christopher Schauer, center director.

In September, the Central Grasslands REC hosted the 2012 Select Sires National Beef Tour, which gave about 90 salesmen from throughout the U.S. an opportunity to see cattle raised in North Dakota.

The center also has partnered with Select Sires Inc., a federation of nine farmer-owned and -controlled cooperatives based in Ohio, to help test some new sires in the organization's young sires program.

"This program helps gather performance data on new sires and helps ensure the accuracy of expected progeny differences," says Bryan Neville, center director.

In all, more than 2,100 people attended field days, clinics, crop and horticultural tours, livestock research updates, programs focusing on specific crops (canola, pulses, forage, energy beets), demonstrations (cover crops, collecting blood samples from cattle), beginner sheep schools, wildlife workshops, BBQ Boot Camp, and activities for high school and college students at the RECs in 2012.

"I saw some new faces and revisited with people who had not been at center events for a while," says Kris Ringwall, director of the Dickinson REC.

For more information: Ken Grafton,
(701) 231-7655, k.grafton@ndsu.edu
www.ag.ndsu.edu/research/recenthp.htm





William Henry Hatch, U.S. representative from Missouri

Hatch Act of 1887

Congress funded the agricultural experiment stations and various categories of agricultural and veterinary research under the direction of land-grant universities.

The mission was to “aid in acquiring and diffusing among the people of the United States, useful and practical information on subjects connected with agriculture, and to promote scientific investigations and experiments respecting the principles and applications of agricultural science.”

BIOMASS

Research Shows Promise

Six years into their study, NDSU researchers have a better idea of whether growing perennial grasses for biofuel production is feasible.

Researchers also are answering questions about biomass quality and processing.

“Establishment of perennial grasses is time-consuming,” says Guojie Wang, forage agronomist at the Central Grasslands Research Extension Center near Streeter. “However, whenever they are established, they have the ability to produce steadily and have resilience to environmental variables such as drought.”

NDSU’s Central Grasslands, Carrington, North Central and Williston Research Extension Centers are collaborating with Ducks Unlimited and the U.S. Department of Agriculture’s Agricultural Research Service facility in Mandan on the perennial grasses research.

Production in test plots of warm-season grasses, including switchgrass and big bluestem, was markedly higher in 2012 than in 2011, despite significant drought, Wang says. Researchers also found that weed control is essential for good stands of warm-season grasses.

On the processing side, NDSU established the Biomass Testing Laboratory (BTL) at the USDA-ARS lab facility in Mandan with a \$450,000 grant from the North Dakota Industrial Commission and USDA-ARS. The BTL became fully operational in June 2012.



“Biomass quality results will form baseline data that is important in developing biobased industries, development of efficient biomass processing and handling machines, and to know the quality of biomass produced by the farmers,” says Igathinathane Cannayen, an NDSU assistant professor and Extension bioprocessing engineer housed at the USDA-ARS in Mandan.

Researchers also have evaluated in-field biomass bale collection and transportation strategies, and developed a pneumatic biomass stem-leaf separator that divides chopped switchgrass into streams of stems, which are a good biofuel feedstock, and leaves, which are good livestock fodder. Stems and leaves have more value separately than they do combined, Cannayen says.

The in-field evaluation found that using a self-loading bale picker to collect the nearest bales in sequence and the combination of a loader and a following truck were the best collection strategies.

For more information:

Guojie Wang, (701) 424-3606, guojie.wang@ndsu.edu
Igathinathane Cannayen, (701) 667-3011, igathinathane.cannayen@ndsu.edu



NDAWN's Online Data Becoming Real-time

In 2001, the North Dakota Agricultural Weather Network (NDAWN) set a goal of having voice modems provide near real-time data with a simple phone call at all of the system's stations. By 2003, NDAWN had accomplished that goal, and growers quickly learned the value of that service.

Today, NDAWN is utilizing the latest technology to provide the best service for the ever-growing NDAWN user base.

NDAWN has started a transition with 12 stations (Edgeley, Ekre, Forest River, Inkster, Jamestown, Lisbon, Marion, Michigan, Oakes, Watford City, Plaza and Ross) now offering near real-time data on the NDAWN website (<http://ndawn.ndsu.nodak.edu/ten-minute-data-summary.html>). The information is easily viewed from any Web-browsing device and is especially designed for small screens such as smartphones. Providing updated data on the Web every 10 minutes is possible at these 12 stations because they have an IP (Internet Protocol) address through a wireless modem.

"The advantages of a wireless network already are well tested in various marketplaces, especially in the ATM industry," says Adnan Akyüz, NDAWN director and state climatologist. "For NDAWN, some of the advantages are cost efficiency, reliability, security, speed, mobility, backward compatibility with the current system and forward compatibility with future systems."

The use of IP data downloads, as well as wireless communication, is a must in today's world. Whether it is through a wireless system or a fiber optic landline, NDAWN's near real-time data eventually will be available for all stations across the state.

"When the appropriate funding becomes available to transition the entire network into the latest technology and with appropriate staffing, NDAWN will continue to provide the best service to assist growers on the farm, at home or just about anywhere else for the economic benefit of the state," Akyüz says.

The network provides weather data, which is instrumental in developing various agricultural models such as late blight, degree-day and growth stage for barley, corn, canola, potatoes, sugar beets, sunflowers, wheat and other small grains. NDAWN users also can monitor irrigation scheduling, crop water use, and the conditions for sugar beet root maggot and other insect development.

For more information: Adnan Akyüz,
(701) 231-6577, adnan.akyuz@ndsu.edu



Researchers Study GRAIN DUST IMPACT ON HEALTH

NDSU researchers are getting a clearer picture of what happens when agricultural workers are exposed regularly to grain dust and grain mold.

“Moldy grain bins are particularly nasty because of the high concentration of spores in the air,” NDSU research immunologist Jane Schuh says.

Schuh and her research team study the long-term health effects of repeated exposure to inhaled mold spores. Using a fungal asthma model her lab developed with mice as test subjects, her group has found that exposure to common molds irritates the lining of the lungs, inflames the lung tissue and causes damage to the epithelium that lines the lungs, even just a few days after being exposed.

Now she and her research team are using this knowledge to study how inhaling corn and soybean dust can impact the function of normal and allergic lungs. Little research is available on the combination of complex agricultural exposures such as these or on the long-lasting effects for the agricultural worker.

Pulmonary fibrosis is a particular concern with mold exposure and asthma. It is the formation of excess fibrous connective tissue in the lungs, which makes breathing difficult.

“This is one of those conditions that we don’t see getting better with time,” she says. “And we don’t know what effect breathing organic dust may have on it.”

This research is part of a pilot project on occupational inhalation exposures in agriculture. It’s being funded through the Central States Center for Agricultural Safety and Health in Omaha, Neb.

Schuh says research in this area, as well as safety training, rural health care education and agriculture-related disability services, is critical because agricultural workers are exposed regularly to a complex mix of chemical, biological and particulate matter, any of which may cause or aggravate chronic lung problems.

“Agriculture is a major economic driver for the state,” she adds. “To keep the industry vigorous, we need to safeguard the health of our producers.”

For more information: Jane Schuh,
(701) 231-7841, jane.schuh@ndsu.edu





Program Readies Children for KINDERGARTEN

National research on school readiness finds that about 32 percent of children experience some problems entering kindergarten, and starting kindergarten is difficult for another 16 percent.

To help North Dakota children make that important home-to-school transition, NDSU Extension developed a program called Gearing Up for Kindergarten. It's a multisession program that teaches parents how they can help their children increase their social and academic abilities and avoid the readiness gap that troubles so many children when they enter kindergarten.

"Parents are a child's first and best teachers, but many parents need and want support in their role of preparing their children for success in school," says Extension family science specialist Sean Brotherson.

Topics the program covers include parenting styles, children's brain development, encouraging children to read, discipline, developing responsibility and independence in children, importance of sleep, children's learning styles, temperament, early math skills, children's social and emotional development, and safety.

NDSU Extension teamed up with the North Dakota Department of Public Instruction to implement the program. The 2011 state Legislature provided \$500,000 for implementing the program in schools and \$125,000 for administration. The program coordinator works with Extension's eight Parent Resource Centers to promote the program and train the instructors.

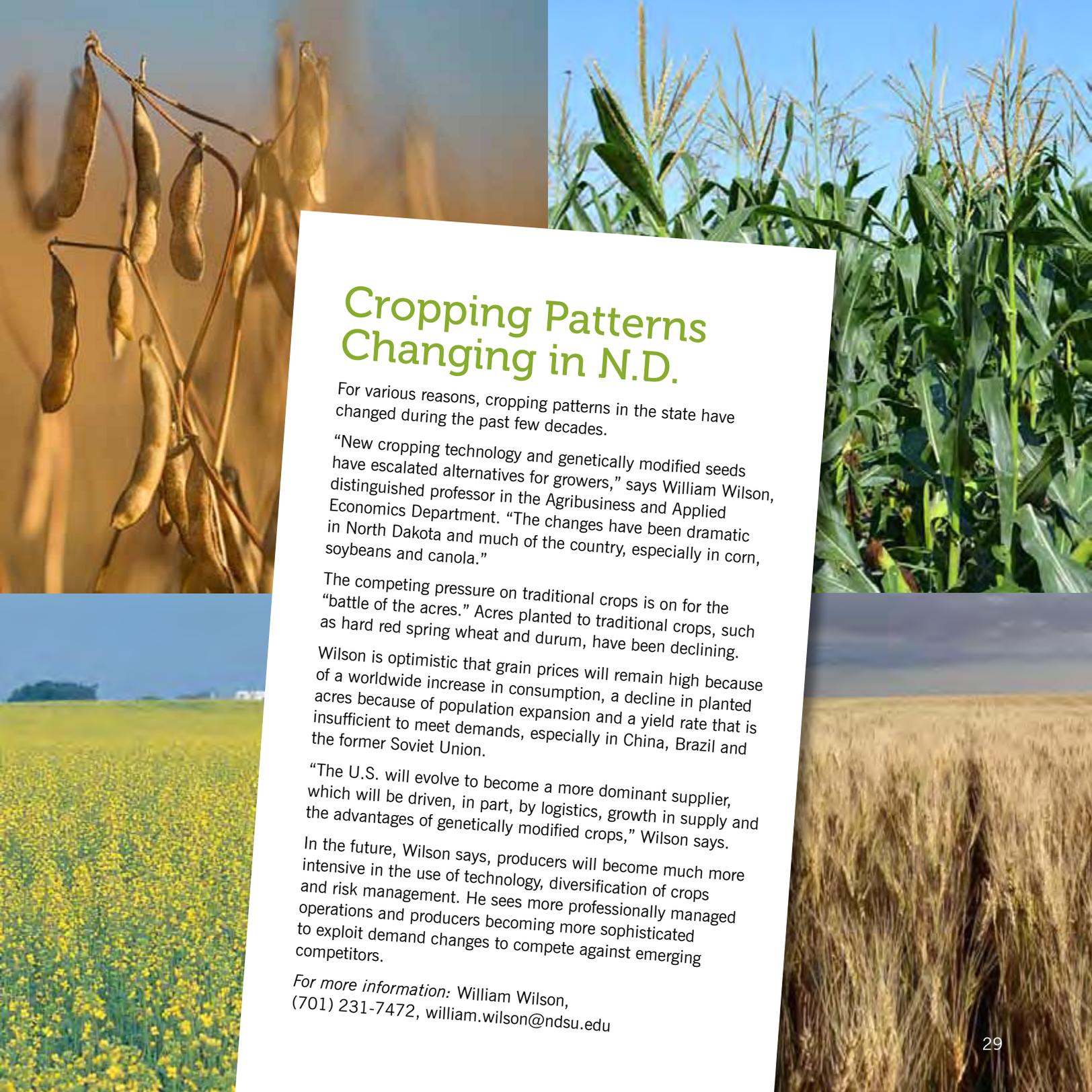
During the 2011-12 school year, 34 school districts and about 750 children and families participated in the program.

"This program is successful because it is based on North Dakota research, which allows the program to be tailored to this state and take advantage of the best research results in early education," says Deb Gebeke, Extension's assistant director for family and consumer sciences.

Parents who have completed the program say it is very useful and it increased their knowledge of healthy parenting and confidence in being a good parent, and positively influenced their relationship with their pre-kindergarten child.

About 50 school districts and nearly 1,500 students and families will participate in the program during the 2012-13 school year.

For more information: Sean Brotherson, (701) 231-6143, sean.brotherson@ndsu.edu, www.gearingupnd.org



Cropping Patterns Changing in N.D.

For various reasons, cropping patterns in the state have changed during the past few decades.

“New cropping technology and genetically modified seeds have escalated alternatives for growers,” says William Wilson, distinguished professor in the Agribusiness and Applied Economics Department. “The changes have been dramatic in North Dakota and much of the country, especially in corn, soybeans and canola.”

The competing pressure on traditional crops is on for the “battle of the acres.” Acres planted to traditional crops, such as hard red spring wheat and durum, have been declining.

Wilson is optimistic that grain prices will remain high because of a worldwide increase in consumption, a decline in planted acres because of population expansion and a yield rate that is insufficient to meet demands, especially in China, Brazil and the former Soviet Union.

“The U.S. will evolve to become a more dominant supplier, which will be driven, in part, by logistics, growth in supply and the advantages of genetically modified crops,” Wilson says.

In the future, Wilson says, producers will become much more intensive in the use of technology, diversification of crops and risk management. He sees more professionally managed operations and producers becoming more sophisticated to exploit demand changes to compete against emerging competitors.

For more information: William Wilson,
(701) 231-7472, william.wilson@ndsu.edu



Researchers Study Oil Region HOUSING TRENDS

Nancy Hodur and Dean Bangsund from the NDSU Department of Agribusiness and Applied Economics were hired by Dickinson to study housing trends in the city due to the oil boom.

Significant growth in the petroleum sector likely will continue for the next five to 10 years, according to the study. Regardless of the rate or extent of oil field development, there will be higher levels of employment in the region than there are today.

Their model illustrates that there will be substantial demand for housing in the near future, but it will level off in the next 10 to 25 years, depending on future oil field development.

“However, workforce characteristics are an important consideration,” Hodur says. “For now, employment will be driven more by short-term or temporary jobs, such as those associated with construction, drilling and fracking. Long-term employment will be more closely associated with maintenance and oil field services. However, both will require housing and access to services.”

The model also illustrates the potential ramifications of building to meet the demand for permanent and temporary workers.

“Workforce characteristics have substantial implications for housing demands,” Hodur says. “Some short-term jobs have a high turnover rate or are transient, such as most of the jobs in pipeline construction, drilling or fracking operations. Building permanent housing for a temporary workforce has negative consequences. However, in the short term, they have needs. We looked at future employment in the region and found the housing issue is more than just supplying more units. The city needs to avoid chasing peak demand and must have a plan to provide for temporary workers.”

The researchers also pointed out that there are implications for not responding to the demand for housing.

“The workforce is very mobile and will go where housing is available,” says Bangsund. “They will live at one place and work at another. Workers who live elsewhere have different demands for goods and services, which translates into less demand for secondary goods and services and secondary employment. A lack of housing also may affect growth in other sectors of the economy. Other local businesses or industries may relocate or at least not expand if they cannot find workers because of a lack of housing.”

For more information:

Nancy Hodur, (701) 231-7357, nancy.hodur@ndsu.edu

Dean Bangsund, (701) 231-7471, d.bangsund@ndsu.edu

Forums Help Meet Oil Patch CHALLENGES

The rapidly growing oil and gas industry in western North Dakota is having significant impacts on people and communities. To meet the challenges, the NDSU Extension Service Center for Community Vitality has conducted several Taking Charge of Your Community's Future forums.

The forums assisted individuals and community leaders in the fringe communities to plan for the dynamic change, take advantage of the opportunities and help mitigate problems such as rapid growth and deal with issues such as mineral rights.

Participants were asked to list actions they will take. The results included:

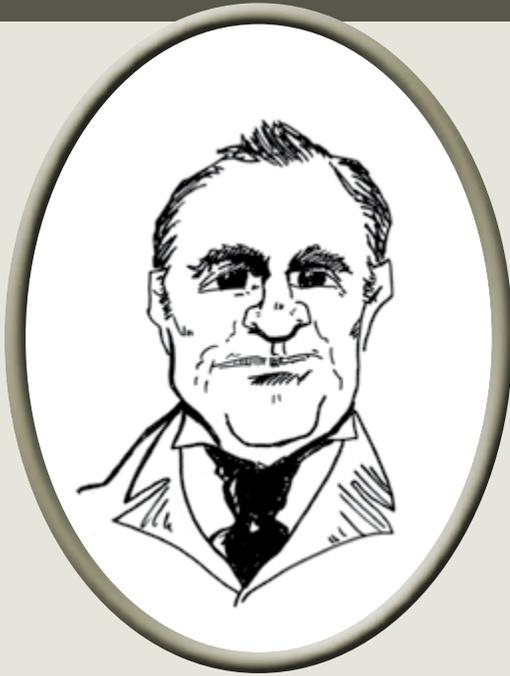
- Study and develop planning and zoning ordinances
- Research and learn more about the mineral rights on owned property
- Prepare their communities in advance of oil industry impacts and become informed of mineral and surface rights and leasing
- Be involved in preparing local governments for change

The sessions were held in Hettinger, Lansford, Glen Ullin and Underwood.

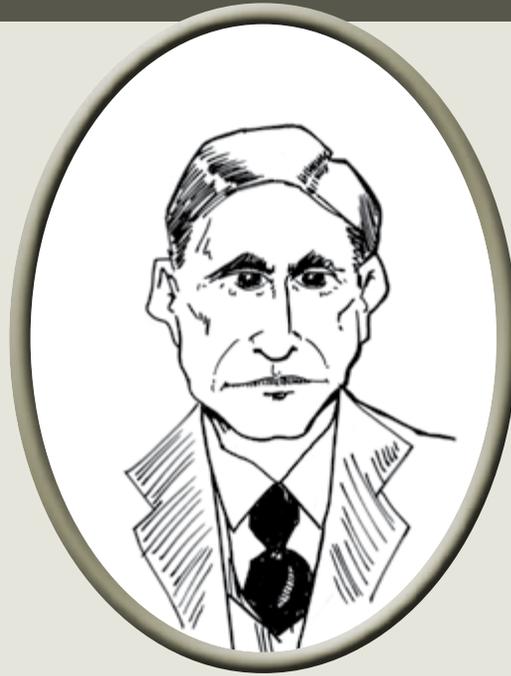
The center has set up a website at www.ag.ndsu.edu/ccv/oil-and-gas-resources to provide resources to answer energy-related questions about mineral leasing and oil production.

For more information:
Kathleen Tweeten, (701) 328-9718,
kathleen.tweeten@ndsu.edu,
www.ag.ndsu.edu/ccv





Michael Hoke Smith,
U.S. senator from Georgia



Asbury Francis Lever,
U.S. representative from South Carolina

Smith-Lever Act of 1914

In May 1914, the Smith-Lever Act created the Cooperative Extension Service. When the act passed in 1914, Secretary of Agriculture David Houston called it “one of the most striking educational measures ever adopted by any government.”

The purpose of the Smith-Lever Act was to “aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics and to encourage the application of the same.” Extension’s task was to inform people about current developments in agriculture, home economics and related subjects, and to “give instruction and practical demonstrations in agriculture, home economics to persons not attending or residents in said colleges ... and imparting to such persons information on said subjects through field demonstrations, publications and otherwise.”



Photos courtesy Huck Krueger



FINANCIAL LOSSES

from Devils Lake Flooding Continue

While North Dakota and surrounding areas experienced several months of below-average precipitation, Devils Lake has been slow to recede.

In 2012, an estimated 151,000 acres of cropland were not available for planting. However, this is down about 12,000 acres from 2011.

“The total impact on business activity in the region from direct and indirect losses this year is estimated at \$180 million,” says Dwight Aakre, Extension farm management specialist. “These losses include reduced personal income of \$47 million and reduced retail trade activity of \$39 million. The loss of business activity ultimately is reflected in lost jobs in the region. Employment losses are estimated at 264 jobs for the region.”

Tax revenues will decline primarily due to a reduction in sales tax revenue. Personal and corporate income taxes also will be reduced.

The data used for the study included the average acreage of each crop grown in the area, five-year average yields for each crop and estimated marketing year average price for each crop.

“This analysis quantifies the extent of the lost agricultural production in the Devils Lake Basin due to the continued high water levels in Devils Lake, Stump Lake and the surrounding area,” says Bill Hodous, the Extension Service’s Ramsey County agent. “It does not include any nonagricultural costs associated with roads and other infrastructure.”

Hodous, Aakre and Randal Coon, NDSU research specialist, have been studying Devils Lake losses for several years.

For more information:

Bill Hodous, (701) 662-7027, bill.hodous@ndsu.edu

Dwight Aakre, (701) 231-7387, dwight.aakre@ndsu.edu



SBARE Helps Set Ag, Extension PRIORITIES

NDSU's North Dakota Agricultural Experiment Station (NDAES) and Extension Service continually strive to develop information, technology and products that help North Dakotans improve their lives by strengthening agriculture and developing the potential of youth, adults and communities.

The State Board of Agricultural Research and Education (SBARE) assists NDSU in that effort by helping the NDAES and Extension Service identify needs and set funding priorities.

SBARE gathers input on agricultural research and Extension needs from producers, commodity and other interest groups, NDSU's Research Extension Centers, the Extension Service and departments in NDSU's College of Agriculture, Food Systems, and Natural Resources. The board then organizes the needs into initiatives and ranks them for consideration for state funding each biennium.

"It's helped the Legislature immensely because they have a priority process," says Jerry Doan, SBARE's first chairman.

"The relationships developed among agricultural producers, commodity organizations and SBARE are very significant," says Rodney Howe, SBARE's current chairman. "SBARE has helped create a greater awareness of the value and the needs of North Dakota agriculture, the state's No. 1 industry."

The state Legislature established the board in 1997 as the State Board

of Agricultural Research and made it responsible for budgeting and policymaking for the NDAES. Two years later, the Legislature added the Extension Service to the board's responsibilities and the board became known as SBARE.

The board consists of five people appointed by the North Dakota Ag Coalition (a nonpartisan federation of more than 35 organizations representing commodities and associations with a direct interest in agriculture), five appointed from the geographic areas Extension's multicounty program units represent, two legislators and the NDSU president or the president's designee. NDSU's vice president for Agricultural Affairs, the Extension director and the North Dakota agriculture commissioner also serve on the board as ex-officio, nonvoting members.

For more information: www.ag.ndsu.edu/sbare/



NDSU Taking LEAD Against Bullying, Underage Drinking

Bullying and underage drinking are major concerns nationwide. To help combat those issues, NDSU Extension is involved in two programs: Parents LEAD and Take a Stand.

Parents LEAD (Listen, Educate, Ask, Discuss) is a North Dakota-specific underage drinking prevention program that provides parents with tips on handling children's questions and starting the often-difficult conversation about underage drinking. The program also suggests prevention measures for children at each developmental stage from toddler to young adult.

Parents' opinions and expectations do matter to their kids, so parents need to start talking about important issues such as underage drinking now, says NDSU Extension 4-H youth development specialist Sharon Query.

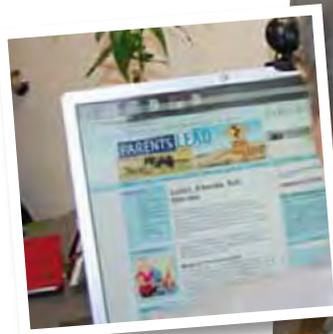
She communicates with parents through a blog on the Parents LEAD website, www.parentslead.org, and writes monthly emails with information for parents based on their child's age and/or grade. She also writes emails on specific situations, such as financial stress and the messages that TV, movies and other media are sending children. Parents can sign up for the emails on the website. Parents LEAD also has a Facebook page.

Parents LEAD is a partnership of the North Dakota Department of Transportation, North Dakota University System's Consortium for Substance Abuse Prevention, North Dakota Department of Human Services and NDSU Extension Service.

Take a Stand, created by the Texas A&M AgriLife Extension Service, is a bullying prevention curriculum that focuses on equipping youth with some basic life skills to help them deal with bullying and conflict. NDSU Extension staff are trained in the curriculum, which helps meet the North Dakota Legislature's mandate that bullying prevention education become part of school districts' programming throughout the state.

"Bullying at school is a growing problem among children of all ages," Query says.

For more information: Sharon Query,
(701) 231- 5923, sharon.query@ndsu.edu
www.parentslead.org





Seedstocks Program Providing **ECONOMIC BENEFIT** to N.D.



North Dakota, through the Foundation Seedstocks Program (FSP) and North Dakota State Seed Department (NDSSD), releases more certified seed than any other state.

“Of course, one of the reasons is the great varieties that are released through NDSU,” says Ken Bertsch, NDSSD commissioner. “The goal of both agencies is to provide genetically pure seed to the agriculture industry. We should not undervalue using high-quality seed when planting the high-revenue crops of today’s market.”



NDSSD provides testing, inspections and regulatory services for all crops. Much of the work is done at its 32,000-square-foot facility on the NDSU campus. A facility in Grafton provides services for the potato certification program.

FSP aims to increase, maintain and distribute genetically pure foundation class seed, coordinate with other agencies locally and globally, and implement improved systems for foundation seed increases and distribution.

Production, conditioning and seed distribution locations are the Agronomy Seed Farm at Casselton and Research Extension Centers at Carrington, Langdon, Minot and Williston.



“As an example of our work, 74 percent of the North Dakota wheat crop planted during the year has a seed history traceable back to FSP, which has a value of approximately \$2 billion and an overall economic impact of approximately \$6 billion,” says Dale Williams, FSP director.

For more information:

Dale Williams, (701) 231-8140, dale.williams@ndsu.edu
Ken Bertsch, (701) 231-5400, kbertsch@ndseed.ndsu.edu



North Dakota State University

“The object of this institution is not the making of farmers, but rather the making of men and women, and then so to equip them that, if their inclinations draw them toward the farm, their efforts there may be reasonably expected to be attended by success. It is not the intention, however, to limit or restrict the capabilities of students, and while the curriculum is made sufficiently rigid to enforce the principles on which the work of the institution is founded, abundant scope is given by means of electives for the display of individual preferences and the development of personal abilities.”

– North Dakota Agricultural College,
First Annual Catalogue, May 1892

Extension Offers Producers DROUGHT ADVICE

Drought made 2012 a tough year for some North Dakota farmers and ranchers.

The lack of rain stunted some crop growth, reduced forage production and quality, and led to some insect problems in crops.

To give producers options for dealing with these situations and others, Extension specialists and agents:

- Held regular conference calls to assess the drought conditions and learn of specific issues
- Updated NDSU's drought Web page (www.ag.ndsu.edu/drought) with up-to-date information and advice
- Promoted NDSU's FeedList, a free online service (www.ag.ndsu.edu/feedlist) where farmers and ranchers can list livestock feed they have for sale or pasture they have for rent and what they want to buy or rent
- Prepared news releases with information on topics such as improving low-quality forages, water quality and quantity, overcoming harvesting challenges, storing drought-stressed or immature crops, weaning calves to reduce feed needs, testing forages to determine their nutritional value before feeding them to livestock, scouting for and controlling insects in vulnerable crops, haying and grazing Conservation Reserve Program land, and using potatoes, canola and cool-season cereal grains as possible alternative livestock feed sources
- Worked one-on-one with producers to find solutions to their drought dilemmas
- Wrote newspaper columns, participated in radio programs and spoke with news media about the drought, its effect on farmers and ranchers, and what producers could do to lessen its impact

For more information: Chris Boerboom,
(701) 231-8944, chris.boerboom@ndsu.edu



NDSU Aiding Standing Rock in RANGE RENOVATION

NDSU is spearheading a multiyear project to improve the land and lives of people on the Standing Rock Sioux Reservation.

The 2.2 million acre reservation straddles the North Dakota-South Dakota border and is home to about 9,000 people. Inadequate land management led to degraded rangeland conditions, including poor forage production, large prairie dog towns and considerable erosion potential.

An NDSU team led by Rob Maddock, Animal Sciences Department associate professor and Extension meats specialist; Chris Schauer, Hettinger Research Extension Center director; Kevin Sedivec, Extension rangeland management specialist; and Robert Littlefield, Communication Department professor, is partnering with other colleagues at NDSU, South Dakota State University, the U.S. Department of Agriculture and Sitting Bull College in an effort to renew the land and increase beef production on the reservation.

“One of the main goals of this project is to develop a natural beef production system,” says Gary Halvorson, Sitting Bull College Agribusiness Division chair and a project co-director. “This will provide a source of meat that is healthy and nutritious for the Standing Rock people.”

He hopes the project also adds ranching, beef processing and marketing jobs; exposes students to a high-quality research program and some of the best researchers in the world; and gives students opportunities to work on the research and conduct their own research.

“Successful completion of this work will result in a model system that can be adopted by other food-insecure, dispersed peoples, both in the United States and worldwide,” Maddock says.

Project partners have leased a 4,000-acre parcel of rangeland near McLaughlin, S.D., as a demonstration site. Their accomplishments include:

- Evaluating the interaction of the Sioux people’s cultural traditions and this project
- Completing initial evaluations of forage, and soils and wildlife surveys
- Initiating opportunities for students and Native American ranchers to learn modern and sustainable beef production strategies

They’re also evaluating the productivity and ecological integrity of the rangeland. This year, they began grazing yearling cattle on rangelands with varying levels of prairie dogs to determine methods to improve the degraded land.

Funding for the project came from a five-year, \$5 million grant from the USDA’s Agriculture and Food Research Initiative.

For more information: Rob Maddock,
(701) 231-8975, robert.maddock@ndsu.edu







NDSU Research Team Improving Wheat Germplasm

In North Dakota, wheat still is the No. 1 crop. However, germplasm research is ongoing to develop improved wheat cultivars that perform better under changing environmental conditions.

The Wheat Germplasm Enhancement (WGE) project at NDSU is directed toward identifying and transferring genes that improve disease resistance, grain quality and overall productivity.

“It gets a little complicated, but the WGE project uses genomics, genetics and cytogenetics (study of chromosomes) to more efficiently and effectively transfer important genes, or those that can improve human health benefits, into cultivated varieties that are adapted to North Dakota,” says Shahryar Kianian, professor in the Plant Sciences Department. Kianian also heads the WGE Research Group at NDSU.

The research group doing the work ranges from other professors to Ph.D. students.

The team uses some of wheat’s wild relatives, as well as elite cultivars, to incorporate new traits and improve

existing traits in the germplasm. The team also uses radiation-induced breaks in chromosomes to map and clone genes.

“Another area of research we are involved in is the analysis of wheat alloplasmic lines (that carry cytoplasm from wheat relatives),” Kianian says.

Cytoplasmic components such as mitochondria help almost all living organisms grow. For example, mitochondrial dysfunction in humans leads to debilitating diseases such as infertility, Parkinson’s, Alzheimer’s and neuropathies.

“We are one of the very few groups in the world who have a large collection of wheat alloplasmic lines,” Kianian says. “That is due to the pioneering work of NDSU geneticist S.S. Mann. We look at alien cytoplasm for plant sterility, disease resistance, plant vigor and development, plus several other traits, all at the genomic and proteomic (entire set of proteins expressed by a plant) level.”

For more information: Shahryar Kianian, (701) 231-7574, s.kianian@ndsu.edu

New Crop Varieties Released

Throughout its history, the North Dakota Agricultural Experiment Station, in collaboration with Research Extension Centers across the state, the Main Station in Fargo and various NDSU departments, has developed and released improved crop cultivars that have high quality characteristics, high yield potential, and drought and pest resistance.

This year is no exception, and several new varieties were introduced. They include:

- Carpio, a durum wheat with very good yield stability across multiple environments, good protein, and the highest gluten index and firmness scores among NDSU's varieties
- Elgin, a hard red spring wheat cultivar with yields similar to Faller and protein content similar to Glenn that is widely adapted to the North Dakota and Minnesota spring wheat growing region

- Jury, which is only the second oat cultivar available with resistance to prevalent races of crown and stem rust, produces large kernels and high grain yield, and has high milling qualities
- Rio Rojo, a small red bean cultivar that has superior seed yield and disease resistance compared with other small red bean commercial cultivars

“As plant breeders, we have to be thinking 10 or more years into the future,” says Richard Horsley, NDSU Plant Sciences head. “For example, we know that a wheat stem rust from Africa eventually will come to the U.S. When it does get here, we have to make sure we have developed resistant wheat varieties. Our overall goal is to improve yields, overcome various weather conditions and fight diseases to benefit producers.”

For more information: Richard Horsley,
(701) 231-8142, richard.horsley@ndsu.edu



NDSU NORTH DAKOTA
STATE UNIVERSITY

Agriculture and 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.



www.ag.ndsu.edu

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.

Ken Grafton

Vice President for Agricultural Affairs
Director, North Dakota Agricultural Experiment Station
Dean, College of Agriculture, Food Systems, and Natural Resources

Chris Boerboom

Director, NDSU Extension Service

NDSU Dept. 7520
314 Morrill Hall, Box 6050
Fargo, ND 58108-6050

(701) 231-7655 Fax (701) 231-7566
k.grafton@ndsu.edu