

# 2013 Annual Highlights

North Dakota Agricultural Experiment Station  
NDSU Extension Service





Ken Grafton



Chris Boerboom

## **Welcome to NDSU Agriculture and Extension**

The motto “For the land and its people” is central to the mission of the North Dakota Agricultural Experiment Station. The NDSU Extension Service’s motto is “Extending knowledge. Changing lives.” Within these research and outreach missions, it is our honor to share and highlight a sample of the many accomplishments from the North Dakota Agricultural Experiment Station and the NDSU Extension Service.

In serving the needs of North Dakota, our research and Extension activities mirror the challenges of the state. Consider the 2013 growing season. Western regions started dry but received record rainfall in late spring. Northern areas experienced significant prevented planting acres again. Eastern regions faced a cold, late spring only to be followed by drought. Despite the vagaries of the weather, crop yields were reasonable and even record-setting for spring wheat.

Our research and Extension programs are designed to help North Dakotans be resilient and prosperous under these uncertain conditions. New NDSU crop varieties are bred to excel in our climate. Agribusiness researchers seek risk management solutions to the volatility of falling crop prices or to capture strong cattle prices. Other research is focused on optimizing inputs and stewarding our land resources. Extension expands the scope of this service to youth through 4-H, and to families and communities. The following pages illustrate many of our accomplishments in these areas.

The strength of our research and Extension programs is the close tie that we maintain with the people and issues in North Dakota. To serve the land and its people, please let us know about research needs or concerns that you may have. As Extension celebrates the centennial of the Smith Lever Act in 2014, we want you to share your ideas with us so we can continue to extend knowledge and change lives. We especially hope to see you at one of the many celebration events this year.

We sincerely hope you enjoy these 2013 Annual Highlights.



## Greenhouse Complex Nearing Completion

North Dakota soon will have its only plant-based Biosafety Level 3 facility.

This highly secure area is the final phase of the NDSU Greenhouse Complex. Construction is scheduled to be completed in 2014.

The area allows researchers to work on infectious agents that could cause a serious or potentially lethal plant disease. Researchers should be able to start projects there in the fall of 2014, greenhouse manager Julie Hochhalter estimates.

The first two portions of the state-of-the-art, 156,300-square-foot greenhouse already are in use; the 88 rooms are at full capacity. Researchers who want space in the complex are on a waiting list.

“It would not be possible to do my research at NDSU without the new greenhouse facility,” says Jared LeBoldus, an assistant professor in the Plant Pathology Department.

One project he and his graduate students are working on is integrated pest management of Septoria canker on hybrid poplar farms in the north-central U.S. The researchers are developing a better understanding of how trees defend themselves from fungal infection. Hybrid poplar represent a bioenergy crop for the U.S. and Europe, LeBoldus says.

The greenhouse has growth and humidity chambers, inoculation rooms, labs, chambers for subjecting seeds or seedlings to low temperatures to hasten plant development and flowering, and spray booths that simulate field pesticide applications. These expand NDSU researchers’ abilities to help producers and businesses increase their productivity and sales.

The complex is designed for research in entomology, food safety, food science, horticulture, pathology, plant breeding and genetics, plant nutrition, and soil and weed science.

The greenhouse was constructed with a combination of state funding and private donations totaling \$33.5 million.

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Length of main  
greenhouse  
hallway: nearly

900  
feet



# NDSU Tests Effectiveness of Latest Ag Technology

NDSU is helping producers stay on the cutting edge of crop production through precision agriculture.

One of the latest efforts involves testing and demonstrating the effectiveness of in-field sensing for determining when and where to apply fertilizer. A crop sensor mounted on a fertilizer applicator shines red, green and near infrared light at plants to see how much light reflects back.

“The more vegetation, the more light reflects back, and the greener the vegetation, the more light reflects back,” says John Nowatzki, NDSU Extension Service agricultural machine systems specialist.

That data goes into a computer in the tractor, which lets producers adjust their fertilizer spray applications. This allows producers to apply the right amount of fertilizer exactly where the crop needs it, saving them money and reducing the potential for chemical runoff.

Part of this research is comparing the effectiveness of in-field sensing vs. remote sensing from satellites.

NDSU also is collaborating with the University of North Dakota on a one-year project in 2014 to use unmanned aircraft to monitor crop conditions in research plots at NDSU Research Extension Centers. Researchers plan to compare that information with the data they collect at ground level to see whether the unmanned aircraft sensors can provide accurate crop assessments.

“If it doesn’t work, then we learn something, too,” Nowatzki says.

Also, Extension specialists are demonstrating in corn fields how technology can help producers control seeding rates to avoid double seeding.

“With double seeding, not only do you waste the seed, you get reduced yield,” Nowatzki says.

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North Dakota is the top U.S. producer of **10** commodities



## Researchers Work to Make Food Safer

A researcher in NDSU's Veterinary and Microbiological Sciences Department is hoping to find ways to make lettuce and some other popular foods safer to eat.

Researcher and assistant professor Teresa Bergholz, research technician Julie Sherwood and graduate student Deepti Tyagi are trying to understand how foodborne pathogens, specifically salmonella and E. coli O157:H7, survive on lettuce after it is harvested, washed and packaged, and reaches consumers. They're also studying how these pathogens adapt to conditions that aren't optimal for growth.

Salmonella and E. coli have been linked to illness outbreaks in lettuce, spinach and other fresh produce.

"We hope to use the information to develop different decontamination treatments, and make recommendations to producers and processors," Bergholz says.

They expect to have results in early 2014. The national Center for Produce Safety is funding this research.

The researchers are doing their work at NDSU's new Greenhouse Complex, which allows them to simulate growing conditions under different temperatures, humidity levels and ultraviolet light conditions.

"Being able to use the greenhouse has been fantastic," Bergholz says. "It's an awesome facility."

In a separate study, Bergholz and three undergraduate students are evaluating some antimicrobial agents as potential methods for inhibiting the growth of another pathogen, listeria monocytogenes, in refrigerated ready-to-eat foods such as deli meats and hot dogs.

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# Commodity Trading Room **Reduces Risk**

The NDSU Agribusiness and Applied Economics Department has developed a commodity trading room (CTR) and financial laboratory.

The reason?

Today, agriculture is three to four times more risky than it was in the 1980s, and risk affects all aspects of agriculture and agribusiness. That risk is expected to persist in future years.

“The CTR will enhance educational opportunities by providing a state-of-the-art teaching platform and escalating the sophistication of training for students,” says Bill Wilson, university distinguished professor. “There is substantial interest by employers in expanded training in these areas.”

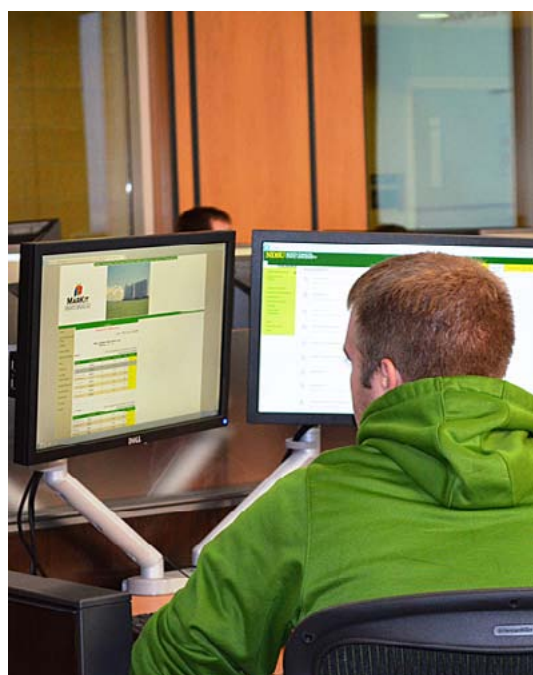
The CTR is a high-technology room with live information feeds from financial and commodity markets. It gives students the ability to analyze portfolios, trading strategies and risks. All of these are important to North Dakota and the region. The room has 32 work stations (20 DTN and 12 Bloomberg) for adopting information/trading technology. Students also have the tools to analyze regional cash markets.

“Substantial demand also exists for outreach in risk analysis using the CTR,” Wilson says. “For example, the Northern Crops Institute uses the trading room to teach one-week courses on commodity risk. There also has been interest by a number of agribusinesses to teach courses for midcareer managers.”

The department has five faculty members – Frayne Olson, Saleem Shaik, Ryan Larsen, William Nganje and Wilson – whose teaching, research and Extension focus on the varying aspects of risk.

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## Shooting Sports Hitting the Bull's-eye

Shooting sports is one of the NDSU Extension Service's fastest-growing youth programs.

Five years ago, it had 80 to 90 youth in four shooting sports-focused clubs. In 2013, it had 528 youth in 21 clubs. Shooting sports activities are offered in 41 of North Dakota's 53 counties.

"The program is successful because it is not a one-time experience," says Adrian Biewer, the 4-H youth development specialist who oversees it. "The program provides access to trained coaches and adult mentors who are willing to devote time to allow our youth to pursue their interest through multiple years and in a variety of ways."

About 600 trained volunteer 4-H shooting sports instructors devote more than 2,000 hours to the program each year.

Shooting sports is part of the 4-H Environmental Project, which educates youth about natural resources and wildlife, archery, black powder weaponry, pistol, rifle, shotgun and hunting. Youth can participate in local, state and national competitions.

"The shooting sports program brings in new youth and families to 4-H and opens their eyes to all the possibilities that 4-H offers," says Samantha Roth, an Extension agent for Stark and Billings counties.

Mason Hanson, 14, of Webster, likes what shooting sports teaches him.

"We have a lot of really good coaches that teach us the skills we need, but learning how to handle the mental part of competition is a challenge," he says. "Shooting sports has helped me to learn how to focus under stressful situations, which is a skill that I can use in other areas of life."

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# Extension Focuses on Seniors' Well-being

North Dakota had nearly 98,600 residents 65 and older in 2011 (latest information available). That number is expected to jump to 148,060 by 2025.

"Falls are a big concern for seniors," NDSU Extension Service gerontology specialist Jane Strommen says. "It can mean the end of independent living for some. If we can change behaviors that can prevent falls, it's a win/win."

Extension has partnered with the North Dakota Health Department on Stepping On, a program used internationally. It provides seniors with strength and balance exercises and information on home hazards, safe footwear, vision and how it relates to falls, and coping after a fall.

Strommen and Dena Kemmet, an Extension agent from Mercer County, are certified master trainers who educate Extension agents and others to become Stepping On class leaders. The agents team up with other community class leaders to present the program to seniors.

About 180 seniors have completed the program. Research shows participants experience a 31 percent reduction in falls.

To allow seniors to remain in their home and community as long as possible while getting the care they need, Extension developed the Livable Homes program. It helps older adults identify and correct home safety hazards and make home modifications to meet their physical needs.

Caregiving is another major senior-related issue in North Dakota. The state has 80,000 family caregivers; 28,000 of them care for a loved one with dementia.

Extension trains class leaders for the national Powerful Tools for Caregivers program. It gives caregivers tools, strategies and resources to care for a family member, friend or neighbor.

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Participants experience a

# 31

percent reduction in falls





## AIM Lab Offers State-of-the-art Technology

A small lab on the second floor of NDSU's Hultz Hall has a huge impact on research campuswide and beyond.

The Advanced Imaging and Microscopy (AIM) Core Laboratory, which is about half the size of a classroom, houses four top-end microscopes and a cryostat (a device used to prepare samples at freezing temperatures).

NDSU researchers have access to state-of-the-art technology they wouldn't be able to obtain on their own, says Pawel Borowicz, lab director and research assistant professor in the Animal Sciences Department. Just one microscope cost \$500,000.

Faculty in the Animal Sciences and Veterinary and Microbiological Sciences departments initiated the lab. It continued to develop through the grass-roots efforts of other faculty across campus who saw the need to enhance NDSU's research infrastructure.

The lab opened in 2010 with one microscope. It added two more in 2011 and the fourth in 2012. A majority of the funding for this equipment came from federal and private grants.

Borowicz manages the lab; trains researchers and students on how to run the equipment; and provides technical support in microscopy techniques, preparing samples, analyzing data and images, generating high-quality images for manuscripts and writing grant proposals.

Users have included research groups from seven NDSU departments, along with their collaborators from outside the university.

"The facility has provided invaluable training and teaching opportunities for faculty, students, staff and post-doctoral researchers in diverse areas of basic and applied science, including infectious diseases of plants and animals, plant breeding, reproductive physiology, animal nutrition, meat science and muscle biology, cell biology, microbiology, pharmacology, cereal and food science, material sciences, and polymers and coatings," Borowicz says.

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## Sioux County Growing Veggies, Youth Skills



Sioux County residents are enjoying fresh vegetables and high school students are learning valuable job skills, thanks to NDSU Extension Service assistance.

With a federal specialty crops grant that county Extension agent Sue Isbell obtained, volunteers helped start a community garden in Fort Yates two years ago. Since then, Isbell and volunteers have built box gardens and four high-tunnel gardens, which resemble greenhouses. Community members help plant, tend the gardens and harvest the produce.

They've grown tomatoes, carrots, beans, peas and squash, and some not-so-common veggies such as okra, cabbage and Jerusalem artichoke. Some of the produce is sold at a weekly farmers market or donated to the school lunch and senior citizen nutrition programs, soup kitchen and food pantry.

In 2013, youth began developing a bush-type squash that takes less space to grow than the vining-type Hubbard and produces smaller squash.

Youth skills are growing well beyond high-tunnel gardens. Grants from the National 4-H Youth Council and Office of Juvenile Justice and Delinquency Prevention helped Solen High School students develop Sioux Image, an embroidery and silk screening business that opened in January 2013.

The students also make pens with a wood lathe, and heat press photos and other images onto water bottles, cutting boards, coffee mugs and other items. With assistance from the high school art teacher and other mentors, some students are creating pen and charcoal drawings, beadwork, and artwork with pastels and oil paint. Another mentor is helping digitize the embroidery work.

"The students are learning a lot of high-level skills that will make them employable beyond high school," Isbell says.

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## NDSU Corn Breeding Program Continues to Grow

NDSU's 85-year-old corn breeding program is the most northern public program of its kind in North America.

"We manage controlled winter nursery conditions with no rain and extreme cold when wanted and needed during North Dakota winters to annually screen thousands of corn lines for drought and cold tolerance," corn breeder Marcelo Carena says. "New corn genotypes are developed very fast (four years vs. 15) to move corn north to cooler seasons and west to dry areas."

NDSU is a genetic provider to the corn processing industry, foundation seed companies, retail seed companies, and breeders nationally and internationally.

"With the support of the corn industry and the Minnesota and North Dakota corn grower organizations, the program annually screens more than 1 million genotypes in breeding nurseries and hybrid experiments across more than 50 NDSU and industry locations," Carena says.

NDSU has developed and distributed 54 elite and diverse corn products to the industry in the past

five years. These products have generated fees and royalties for NDSU. The program's large network of cooperators reduces NDSU's investment in costly research labs or other resources.

Research on fast dry-down has led to a new breeding methodology that saves millions of dollars in farmers' artificial drying and industry screening costs.

NDSU's EarlyGEM program increases the genetic diversity of northern U.S. hybrids by adapting tropical corn to shorter growing seasons.

"Corn breeding for short-season environments has been essential to move corn from a minor to a major crop with the highest profitability in the region," Carena says. "NDSU is the only genetic provider with 70 and 75 RM (relative maturity) hybrids."

Industry data show NDSU's corn lines are excellent sources of genes for lodging resistance, test weight, green snap tolerance and staying green.

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# Beef Research Complex Finding Answers



NDSU's Beef Cattle Research Complex is raising awareness of North Dakota beef cattle research and education to a national and international level.

"We conduct a broad range of research that encompasses what happens in the beef industry in North Dakota," says Kendall Swanson, an associate professor in the Animal Sciences Department who, along with associate professor Marc Bauer, oversees the complex.

In the two years since the complex opened, researchers have conducted 11 experiments there, including three on growing cattle, three on pregnant cows and two on finishing cattle. They've studied alternative feed ingredients, feeding management, feeding behavior, carcass quality, reproduction, fetal development, hormones and environmental impacts.

The complex accommodates up to 192 cattle. It consists of a computerized feeding system, cattle handling facilities, calving pens, a lab, and a feed mixing and storage facility.

"Feed intake is one of the most variable and laborious measures to take when doing animal research," Bauer says. "So we do what is easy: measure intake of a pen of cattle, divide by the number of cattle in the pen and arrive at an average intake for the whole pen. This is good, but it doesn't tell us anything about individual animals. With our new system, we not only know how much they ate but also when they ate."

Researchers also will be able to study other issues affecting North Dakota producers, such as how cold temperatures affect feed intake.

The complex, unlike any other facility at a U.S. university, was constructed with more than \$3 million in state and federal funding.

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## Families Making Healthful Choices

Research shows that poverty is a key factor in food insecurity, or limited/uncertain access to nutritious, safe foods.

Inadequate resources can lead to families buying high-calorie, low-nutrient, low-cost foods instead of more healthful options. Poor diets can increase people's risk of obesity and related health issues, such as diabetes and heart disease, says Megan Ness, coordinator of the NDSU Extension Service's Expanded Food and Nutrition Education Program (EFNEP) and Family Nutrition Program (FNP).

EFNEP offers a series of free lessons for limited-resource adults with children in the household. The lessons help them improve their nutrition knowledge, physical activity and food safety practices, and stretch their food dollars. EFNEP also provides programming that encourages youth to increase their consumption of fruit, vegetables and low-fat dairy products, and become more physically active.

FNP is for individuals and families who participate in the Supplemental Nutrition Assistance Program (SNAP). Participants learn about nutrition; food selection, handling and preparation; and shopping wisely.

In 2013, FNP provided direct education to 2,760 adults and 10,892 youth, and reached more than 55,000 people indirectly through educational articles and community events. Specific impacts include:

- More than 60 percent of adults adopted at least one habit for spending their food dollars more wisely, such as shopping with a grocery list
- 68 percent of youth eat more varieties of vegetables
- 72 percent of youth choose milk instead of soda pop
- 89 percent of youth are more physically active

Of the 243 adult and 1,381 youth EFNEP participants in 2013:

- 54 percent improved at least one food safety practice
- 76 percent improved at least one food resource management practice
- 82 percent improved at least one nutritional practice

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# 82

percent  
of participants  
improved at least  
one nutritional  
practice



## Research Extension Centers Providing

The NDSU Research Extension Centers' agricultural research and producer education efforts attracted visitors from around the globe in 2013.

For example, 15 beef producers from Brazil, Uruguay and Argentina visited the Central Grasslands Research Extension Center near Streeter to view cattle generated from artificial insemination.

"The visitors spent the afternoon visiting with scientists, graduate students and research techs about our livestock and production practices, and looking at cattle," center director Bryan Neville says.

Almost half of the attendees at the Williston Research Extension Center's annual irrigation field day were from Montana. Attendance grows every year; it attracted about 75 producers in 2013.

"The research and information brought forth by the irrigation project is very important to the Mondak region because each year, the sprinkler-irrigated acres continue to grow, either by new



# Answers

irrigation or converting flood irrigation to sprinkler-irrigated acres,” says Chet Hill, Extension agricultural diversification area specialist at the center. “Also, we are seeing a change in the diversity of crops grown under irrigation.”

Visitors from other states and Canada were among the 150 people who attended the 69th annual field day at the North Central Research Extension Center near Minot.

For Eric Eriksmoen, research agronomist at the center, annual events such as field tours are a good way to give producers information they can use in their operations. In 2013, the center highlighted research on precision fertilizer applications.

In all, more than 3,600 people attended field days, crop and horticultural tours, workshops, clinics, demonstrations and other events at the seven Research Extension Centers throughout the state and Agronomy Seed Farm near Casselton in 2013.

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## NDSU Updating Nitrogen Recommendations for Corn

NDSU Extension crop and soil specialists are updating 40-year-old nitrogen application recommendations for corn.

With funding from the North Dakota Corn Council, International Plant Nutrition Institute and Pioneer Hi-Bred International, NDSU researchers spent the last four years gathering nitrogen (N) data from 80 trials statewide. One of their discoveries: Nitrogen's behavior in soils varies across the state.

For example, N loss was very high in the Red River Valley's high-clay soils after heavy rains in May and June.

"Not only do we need different recommendations for high-clay soils, but also different application timing," Extension soil science specialist Dave Franzen says. "Historically, producers apply nitrogen in the fall or early spring, which sets them up for May and early June losses."

New N recommendations include:

- In high-clay soils, apply half the N at or before planting time, or even in the fall, and the rest at the six- to eight-leaf stage
- Apply a nitrification inhibitor with preplant N to slow N loss
- Apply the N with a liquid nitrogen injection coulter in high-clay soils

Several producers already are following these suggestions with good results, Franzen says.

Specialists also encourage long-term no-till or one-pass seeding. Research shows corn doesn't need as much N with those practices.

In addition, researchers are demonstrating how active optical sensors on tractors can aid in applying N. If producers create a small N-rich strip in their field during the first half of their application, they can drive their tractor across that strip before making the second application to provide a reference for how much N to apply in the rest of the field.

### FOR MORE INFORMATION:

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North Dakotans who work in agriculture or related jobs: nearly

24  
percent





# NDSU Working to Keep Zebra Chip Out

The zebra chip pathogen costs U.S. potato growers millions of dollars each year. The pathogen is spread by potato psyllid insects and causes potato plants to die four to six weeks after becoming infected.

The disease has not been found in North Dakota; however, the psyllid vector has been found in the state in three of the past five years. At least nine other states have zebra chip problems and the fear is that it will spread to other potato-growing states.

“Potato plants have no natural resistance to the zebra chip pathogen, so it has gone from a minor to a major disease,” says Neil Gudmestad, NDSU plant pathologist and university distinguished professor.

Gudmestad and Gary Secor, NDSU plant pathology professor, have been doing research on the zebra chip pathogen since 2005. Gudmestad also is collaborating with more than 30 researchers from seven other universities, the U.S. Department of Agriculture and a research team in New Zealand.

As part of his research, Gudmestad is leading a team that is studying the biology, variability and detection of the bacterium that causes zebra chip. Gudmestad’s research team is investigating the zebra chip bacterium at the molecular genetics level.

“The research team has determined that there are two types of zebra chip bacterium in the U.S. and Mexico, but only one in New Zealand,” Gudmestad says. “More recently, one type (type A) is displacing the other, and our research is directed at determining why this is occurring. Genome sequencing has revealed significant differences genetically between the two types, but the researchers are still trying to understand how these differences biologically impact the strains of the zebra chip bacterium.”

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# New Crop Varieties Build Profits

Working collaboratively, the North Dakota Agricultural Experiment Station, Research Extension Centers across the state, main experiment station in Fargo and various NDSU departments continue to develop new crop varieties.

In 2013, more than 50 percent of the spring wheat varieties and more than 90 percent of the durum varieties planted in North Dakota were developed by NDSU.

2014 will be the first year that Elgin-ND, a hard red spring wheat variety from NDSU, will be available for general distribution to commodity growers. Elgin-ND's attributes are yield, quality and disease protection.

According to North Dakota variety trial results, Elgin-ND's yield beat five of the top six most popular varieties for 2013 in eastern North Dakota. In addition to yield, protein levels of Elgin-ND are

very good. Glenn is known for its quality and high protein, but test results show that Elgin-ND's protein rivals it.

Elgin-ND has a good disease-resistance package, including resistance to prevalent leaf and stem rusts. It has protection against the new leaf rust race Lr21, although it still shows some susceptibility.

"Three of the most important characteristics wheat growers are looking for are yield, quality and disease protection, which Elgin-ND possesses," says Dale Williams, North Dakota Foundation Seedstocks director.

Elgin-ND is named after the city of Elgin in southwestern North Dakota.

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One bushel of  
wheat makes

42

1.5-pound loaves  
of bread

Average North Dakota  
farm size:

1,253

acres

One bushel of  
durum makes

336

servings  
of pasta



## Program Grows Junior Master Gardeners

Each year, hundreds of youth discover gardening through the NDSU Extension Service's Junior Master Gardener program.

Youth develop an interest in gardening, as well as leadership skills and responsibility, and community involvement. Master Gardener volunteers, classroom teachers and Extension agents team up to teach the youth. Here are a few projects from 2013:

- Twenty-eight youth and 12 adults landscaped in front of a new child-care center in Bowman. The youth also planted square-foot gardens behind the center.

"The square-foot gardens have given youth a chance to learn about planning and planting a garden," says Andrea Bowman, Bowman County Extension agent. The youth also were able to enjoy some of their produce.

- A Junior Master Gardener grant supported the construction of four raised garden beds at Mount Pleasant School in Rolla. The beds provided elementary students with a "living" classroom, where they planted vegetables and learned about gardening and nutrition. The lettuce, zucchini, summer squash, tomatoes, beets and carrots the students grew were incorporated into the school's hot lunch program. Students in the family consumer science program froze beans from the garden as part of a food preservation lesson, and they used tomatoes and peppers in a salsa-making lesson.

"I really appreciate all the time and effort you and your (Extension) office were able to lend to this undertaking," Principal Kristin Mitchel says.

- Ward County youth planted trees in Minot's Oak Park, which was destroyed during the 2011 Souris River flood.

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# NDSU Improving Environment Through Nutrient Management

NDSU has stepped up its efforts to improve the environment by educating the state's livestock producers on nutrient management.

"Improving the environment of confined animals by stabilizing soil with fly ash, controlling runoff, irrigating with livestock runoff, composting plant and animal biomass, and utilizing livestock manure as a fertilizer are areas of current and future focus," says Mary Berg, Extension livestock environmental management area specialist at the Carrington Research Extension Center.

Ongoing initiatives include:

- Helping producers start and maintain manure composting piles
- Providing insight on marketing opportunities and business plans for producers who want to start a composting operation
- Connecting producers from across the state to encourage them to learn nutrient management techniques from each other

Shafiqur Rahman, Extension waste management engineer, teamed up in 2013 with Tom Scherer, an Extension agricultural engineer specializing in water quality and irrigation, and Jeremiah

Lang, an environmental engineer with the North Dakota Health Department's water quality division, to create a publication on the importance of controlling runoff from feedlots to prevent pollution in surface and ground water.

In the Discovery Farms program, working farms and ranches collaborate with local, state and federal natural resource managers to demonstrate practices for reducing environmental impacts while maintaining farm profitability.

Other efforts include:

- Demonstration compost piles at the Carrington Research Extension Center
- Carcass disposal compost piles at the Carrington and Central Grasslands Research Extension Centers for educational tours
- On-farm manure sampling to show producers the fertilizer value of their livestock manure
- Development of a database of nutrients in North Dakota manure
- Manure spreader calibration to make sure producers are spreading manure on their fields at the correct agronomic rates

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1.79  
million  
head of cattle  
in North Dakota



## NDSU Tests Livestock Water Quality

Western North Dakota livestock producers have a better idea of the quality of their animals' drinking water.

From May to Aug. 15, 2013, Extension agents in Bowman, Dunn, Golden Valley, McKenzie, Mountrail and Oliver counties collected 28 samples per county from wells, ponds, rivers and creeks. NDSU Veterinary Diagnostic Laboratory (VDL) staff conducted a basic analysis of the samples. They tested for pH (indicates alkalinity or acidity), total dissolved solids (a measure of salinity), nitrates, sulfates and, if requested, blue-green algae, which can be fatal to livestock.

VDL research specialist Michelle Mostrom, NDSU Extension beef cattle specialist Carl Dahlen and Charlie Stoltenow, Extension's assistant director for agriculture and natural resources, created this study because of an increase in water samples sent to the lab during the 2012 drought and some producers' concerns about oil field development impacts on their water quality. This project was funded through a \$5,790 grant from the State Board of Agricultural Research and Education's Animal Agriculture Committee.

The quality of the water tested ranged from very good – “It was as good as tap water from Fargo,” Mostrom says – to water so toxic that she warned producers to stop letting their livestock drink it.

“I think a lot of it is natural salts and sulfates that are the result of the geological formation of North Dakota,” she says of the poorer-quality water. “But when the pH is over 11, you have some industrial contamination.” The analysis wasn't detailed enough to determine whether the contamination was from oil development or other area industries.

Dahlen says that in addition to providing valuable information to help producers make management decisions, this project fostered more interaction between Extension agents and producers.

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## Programs Promote Youth Nutrition and Fitness

Obesity and lack of calcium are two major health issues facing today's youth.

Childhood obesity, which has more than tripled in the past 30 years, puts youth at higher risk for cardiovascular disease, diabetes, strokes and cancer. A calcium shortage during childhood increases the risk of developing osteoporosis, a disease that leads to weak bones during adulthood.

NDSU Extension partners with schools statewide to reduce that risk through three main programs:

- **On the Move to Better Health**, a five-week curriculum for fifth-graders – Based on MyPlate, the U.S. food guidance program, it aims to increase fruits, vegetables and calcium-rich foods in children's diets and improve their fitness habits. Nearly 10,500 children and their families have participated since 2007.
- **Banking on Strong Bones**, a five-week program for fourth-graders – This program, also based on MyPlate, includes classroom nutrition lessons with participation incentives, educational materials in libraries, supplementary activities and taste testing. About 8,770 children and their families have participated since 2005.
- **Go Wild With Fruits and Veggies!** a seven-week program targeting third-graders – Six wild animal characters are role models that reinforce the importance of eating fruits and vegetables and participating in physical activity every day. A little more than 500 children completed it in 2013, the first year the program went statewide.

Here is a snapshot of the programs' effectiveness:

- **On the Move to Better Health** – 61 percent of the fifth-graders increased their daily physical activity and 54 percent ate more fruits and vegetables
- **Banking on Strong Bones** – fourth-graders' daily milk consumption increased from 75 to about 81 percent while soda pop consumption dropped from 16 to 12 percent
- **Go Wild With Fruits and Veggies** – 89 percent of the third-graders were more physically active, 90 percent ate more fruit and 72 percent ate more vegetables

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# Agronomy Seed Farm Plays Vital Role

NDSU's Agronomy Seed Farm (ASF) is a springboard for nearly all crop production in North Dakota that relies on public breeding programs.

The ASF, near Casselton, produces foundation seed for North Dakota's certified seed industry and cooperates in North Dakota Agricultural Experiment Station (NDAES) research efforts at the Main Station in Fargo. The research focuses on evaluating and developing new crop varieties and providing data on varieties grown in eastern North Dakota growing conditions.

The demand for seed grows as the NDAES releases protected crop varieties. The ability to produce adequate foundation seed is an important step in providing producers with improved varieties from NDSU plant breeding programs. Foundation seed is used to produce registered seed, which is sown to produce certified seed, and that is used to grow commodity crops.

Alsen, the first scab-resistant hard red spring wheat variety, is a good example. The ASF produced,

conditioned and distributed more than 13,000 bushels of foundation class Alsen seed to the agricultural industry.

"Since the ASF is located close to the Main Station, we are often the station of choice for increasing small lots of breeder seed," says ASF director Tom Teigen. "This proximity gives the breeder, seedstocks director, State Seed Department inspectors and ASF personnel the opportunity to all be in the field at the same time to evaluate the characteristics of the new variety to see if it needs more purification work before it is released."

In 2013, the ASF evaluated five advanced barley and two spring wheat lines that are potential new varieties. NDSU's Plant Sciences Foundation Seedstocks Project coordinated these efforts.

The ASF, in operation since 1950, is financed entirely by the sale of the seed it produces.

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North Dakota land  
in farms and ranches:  
almost

90  
percent





## NDSU Develops Farm Fuel Budget App

Farmers can use the new Farm Fuel Budget cellphone app to plan their farm fuel budget.

John Nowatzki, NDSU Extension Service agricultural machine systems specialist, developed the Android cellphone app for crop producers to compare projected fuel costs and use based on alternate crop acreages, tillage systems and crop rotations.

Users select the number of acres they intend to plant each year and acreage for each crop, then select the field operations they will use for each crop. The app estimates the fuel cost by year.

The amount of fuel budgeted for each field operation is based on machinery cost estimates. These fuel consumption estimates are based on the assumption that 0.044 gallon of diesel fuel is used per power takeoff horsepower-hour, on average, for each implement type.

Users can select the number of acres allocated to each crop to compare total farm fuel use based on the same number of acres.

“This feature is intended to help crop producers quickly see the difference in fuel consumption on their farm by changing the number of acres allocated to each crop,” Nowatzki says. “Because field operations vary significantly for each type of crop, changing the number of acres of each crop grown impacts the total fuel cost for the farm.”

By choosing the field operations on each crop, users can use the app to evaluate the effects of various tillage systems on fuel use. Because each field operation requires a different amount of fuel per acre, users quickly can see the impact on fuel costs by eliminating or adding specific field operations for each crop.

The last user input for the app is the projected fuel cost per gallon. Crop producers can use this feature to see the effect of projected fuel prices on their total fuel budget.

The app is available on the Google Play website at <https://play.google.com>. Search for Farm Fuel Budget.

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## Corn Stover, Distillers Grain Viable Beef Feed Options

Carrington Research Extension Center researchers have found one way beef cattle producers may be able to reduce their feed costs and make use of the growing supply of corn stover and distillers grain, an ethanol production byproduct.

In comparing lactating beef cows fed a diet of corn stover and distillers grain with cows fed corn silage, wheat middlings, barley hulls and straw, the researchers found:

- Calves of cows on the stover-distillers grain diet gained 2.73 pounds per day during the 92-day study while calves of cows fed the other diet gained 2.57 pounds per day.
- The decrease in cows' condition score during the summer feeding period was nearly identical (1.1 for cattle on the stover-distillers grain diet vs. 1 for cows on the other diet).
- The daily ration cost for the stover-distillers grain diet was \$1.71, compared with \$2.22 for the other diet.

“Our past research indicates beef cows are capable of using a wide variety of feeds, including crop residues (corn, wheat, pea, barley, straw, regrowth or cover crops) when properly supplemented,” says Carrington REC animal scientist Vern Anderson, who led this research. “This study indicates diets formulated with corn stover and nutrient-dense supplements, such as distillers grain, can be very successful in supporting excellent growth and performance in the cow and her calf.”

Acreage planted to corn is increasing, which means more corn stover will be available. Thus, research such as this has huge implications throughout the Corn Belt, Anderson notes.

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# NDSU Addressing Oil Boom's Impact

Energy development and the associated impacts have influenced western North Dakota residents and businesses far beyond expectations. What had been business as usual has become the infrastructure of change in housing, employment, education, transportation and associated services.

As a result, NDSU's Dickinson Research Extension Center, along with other NDSU researchers and faculty, is formulating a response, called "A Commitment to Continue," to meet the challenges.

"The Commitment to Continue goal is to cooperatively produce significant scientific research and education on ways to assist the agricultural and energy industries," says Kris Ringwall, DREC director. "This consensus-building attitude recognizes the interdependence between agricultural producers and energy developers."

Significant land area is required to build roads, control dust, grow field crops, graze livestock, build oil extraction pads, engage in mining activities, dispose of drilling and mining wastes, and construct pipelines, and all of these activities have impacts,

he notes. These land-based interactions create a need to develop a science-based understanding that will allow agriculture and energy to co-exist in a way that's productive for North Dakota's economy, as well as conserves and preserves the land for future generations.

"The NDSU Dickinson REC is integrating the needs of the energy industry into a legislatively directed mission by expanding our relationship with the energy industry and working with agricultural producers to protect and preserve North Dakota's air, water and soil," Ringwall says. "This stakeholder cooperation is paramount to grow North Dakota's economy, strengthen our quality of life and enhance collaboration to address the needs of the people, developers and resources."

The DREC has identified four general areas in which to expand research and Extension efforts: energy co-dependence, food production, teaching and Extension, and technology.

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## Alliance Promotes Tourism

A south-central North Dakota tourism effort grew from a 2009 Germans from Russia bus tour in Emmons, Logan and McIntosh counties. The trip was a success; another followed in 2011.

“To build on that success, a meeting was held in Wishek to form the Tri-County Tourism Alliance to promote even more tourism in the three-county area,” says Carmen Rath-Wald, an NDSU Extension Service agent from Logan County. The alliance’s goal also is to preserve the area’s German-Russian culture and heritage.

“We have many projects in the works, such as gathering oral histories, to preserve German-Russian history,” says Acacia Stuckle, an Extension agent for Kidder and Emmons counties. “In North Dakota, Emmons, Logan and McIntosh counties are at the center of German-Russian country.”

The alliance promotes events such as Wishek’s Sauerkraut Days, Napoleon’s Oktoberfest and Braddock’s Threshing Bee, and tourist destinations such as Lawrence Welk’s boyhood farm near Strasburg, the Catholic Church in Hague, iron cross cemeteries, and restaurants focusing on German-Russian cuisine.

“A very large project for us is the food culture/recipe book, ‘Ewiger Saatz — Everlasting Yeast,’” Rath-Wald says. “This is much more than a recipe book. It is a book full of stories and pictures about German-Russians.”

Social media is one way the alliance is promoting the region.

“We have a Facebook page and website, are on flickr, Twitter, Pinterest, and have content on other websites such as Trip Advisor and Google Earth,” Stuckle says. “We also have a blog centered around our German-Russian food ways called Das Gute Essen (Good Eating).”

The alliance partners with the State Historical Society, North Dakota Department of Commerce’s Tourism Division, NDSU Extension’s Center for Community Vitality, NDSU Libraries’ Germans From Russia Heritage Collection and NDSU Center for Heritage Renewal.

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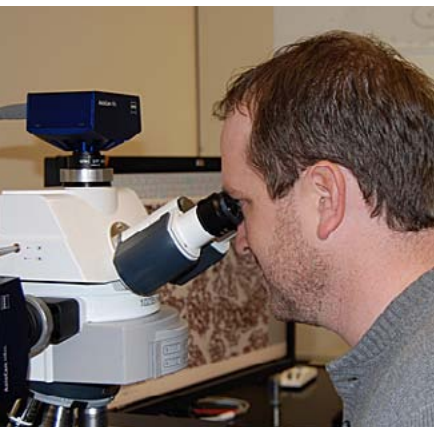
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## Agriculture and Extension at North Dakota State University

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.



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