

2015 Annual Highlights

North Dakota Agricultural
Experiment Station
NDSU Extension Service

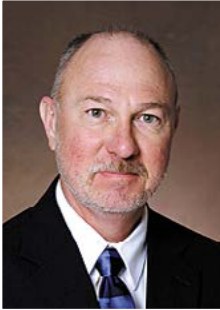
NDSU NORTH DAKOTA
STATE UNIVERSITY





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Ken Grafton



Chris Boerboom

Welcome to NDSU Agriculture and Extension

Our 2015 Annual Highlights is focused, in part, on soils. This focus is natural as the mission of the North Dakota Agricultural Experiment Station (NDAES) is captured in the motto “For the land and its people,” and 2015 is the International Year of Soils. As such, it is fitting that we report on several projects that support our state’s precious resource, the soil and land from which great agricultural productivity and wealth abound. You will see NDAES and NDSU Extension Service contributions in these projects as the NDAES scientists conduct the detailed research and the findings are shared by Extension agents and specialists with farmers, ranchers and landowners.

This publication contains just a sample of highlights from NDAES research projects. The complete efforts of more than 130 research scientists from the Main Station in Fargo and the seven Research Extension Centers cannot be shared in full. However, these NDAES scientists are national and international leaders in their disciplines. For example, they are advancing beef reproduction and genetics, breeding new cultivars and developing new crops, adapting uses of new technologies, and researching policy solutions for national and global markets. They are diligently working on behalf of North Dakota’s agriculture for a prosperous future.

The NDSU Extension Service’s goal is “Extending knowledge. Changing lives.” Extension has a significant focus on agriculture, and our staff frequently collaborate with NDAES scientists. However, Extension also serves families, youth and communities across the state with an array of health and nutrition, 4-H youth development and leadership programs. Extension proudly serves North Dakotans directly through our county-based Extension agents. These agents are supported with area and state specialists who excel in their technical expertise.

As you read this report, we specifically mention the roles of each staff member. One may be a scientist with NDAES, and the next may be an Extension specialist. Some staff have appointments with research and Extension duties. While this may seem complicated, the distinction is important. NDAES and Extension are both part of NDSU, but our missions are unique. The mission of the NDAES truly is to conduct agricultural research, find solutions and discover opportunities that benefit the whole state. Similarly, Extension engages people across the state so they can make informed decisions to improve their lives. We do both of these activities extremely well. After you read these reports, we hope you agree.

We sincerely hope you enjoy reading the 2015 Annual Highlights!

What Do You Know About Soil?

- “Strength From the Soil” is a North Dakota motto. It appears on the state coat of arms and governor’s flag.
- Williams is the state’s official soil.
- The state has more than 2.2 million acres of Williams soil.
- North Dakota soil ranges from thick, black loam in the Red River Valley, some of the richest agricultural land in the world, to more porous, sandy soils in the west.
- Soil quality helps make North Dakota the No. 1 producer of flaxseed, canola, spring and durum wheat, all dry edible beans and peas, lentils, sunflowers, barley and oats.
- Soil has been part of NDSU’s agricultural curriculum since 1890.
- Soil Science became an independent NDSU department in 1959.



2015

International
Year of Soils

The United Nations’ Food and Agriculture Organization (FAO) declared 2015 the International Year of Soils. The FAO’s purpose was to generate awareness about the importance of soils for food security, nutrition and essential ecosystem functions.

Soils are a limited natural resource and nonrenewable on a human time scale. Soils are the foundation for food, animal feed, fuel and natural fiber production, and are essential for the supply of clean water, nutrient cycling and a range of ecosystems.

While the U.N. was promoting the health of soil on an international level, North Dakota Agricultural Experiment Station scientists and Extension Service soil health specialists were doing their part to ensure the vitality of North Dakota soil.





Photo provided by Vern Whitten Photography



Photo provided by Vern Whitten Photography

Scientists Seek Oil Spill Remediation Options for Soil

North Dakota Agricultural Experiment Station scientists are conducting research that could impact the way soils are restored after an oil spill.

“Part of our task is to help the state by providing reclamation options for the region,” says soil science associate professor Tom DeSutter.

With funding from Tesoro Logistics LP, DeSutter, School of Natural Resource Sciences director and soil science professor Frank Casey, assistant professor of soil health Abbey Wick and two graduate students are determining whether the soil impacted by an oil spill near Tioga can be used for agricultural production again once reclamation is complete.

A lightning strike apparently weakened a Tesoro Logistics-managed underground pipeline, causing it to develop a ¼-inch hole that leaked more than 20,600 barrels of Bakken crude in a field. The oil went more than 55 feet deep and covered about eight acres. The impacted area has grown to 60 acres because of reclamation activities.

Remediation involves passing impacted soil through a thermal desorption unit, which heats the soil to drive the oil out. Then the vaporized oil is combusted. The remediated soil eventually will be returned to the field.

Restoring the soil to its prior condition for agricultural productivity is a concern because of the size of the disturbed area and because heating soil affects its characteristics, such as biological and chemical properties, microbial activity and water-holding capacity, Casey says.

“Our task is to determine the most optimal methods for bringing the soil back to agricultural productivity,” DeSutter says.

Planting cover crops or adding manure are some possible options, according to Casey.

The team has collected samples of different mixes of treated and untreated material to see how these will affect plant growth and seed quality. A crop, likely edible peas, will be planted in test plots in the spring of 2016.

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Extension Provides *Reclamation Advice*

Dunn County rancher Daryl Dukart knows firsthand the impact of oil and gas extraction in western North Dakota.

A subcontractor began digging a typical 150-foot-wide strip on Dukart's land for pipeline installation, but the project easement specified no more than a 4-foot-wide path for ditching or digging, and minimal disturbance to native grass areas. Dukart is one of more than 500 landowners who attended the NDSU Extension Service's land reclamation workshops, so he knew what to do.

"I was able to stop the process, stop the work site disturbance, and got all individuals together or on the phone who needed to settle the matter," he says.

At the workshops, landowners learned about laws and regulations governing the extraction process and information they need when negotiating agreements for the use of their land. For Dukart, the best advice was to include a well-planned reclamation project in land-use agreements.

"You don't need to agree upon who performs the reclamation task, but you should agree on what the land should look like once the project is complete," says Kevin Sedivec, Extension rangeland management specialist and workshop presenter.

David Saxowsky, an associate professor in the Agribusiness and Applied Economics Department, advised landowners to review agreements or contracts carefully before signing anything. Extension community vitality specialist Jodi Bruns educated landowners about the importance of communication.

"I really focused on not standing alone but working with your neighbors and having the conversation about working collaboratively to get what you need and protect your property," she says.

Extension specialists also developed a checklist and template to help landowners and companies develop reclamation plans.

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Multiyear Research Focuses on Relationship Between Soil Salinity and Crop Pests

Soil salinity management has become increasingly important to North Dakota crop producers. Nearly 90 percent are seeing some sort of reduced productivity as a result of soil salinity issues.

An ongoing research project started in 2013 seeks to understand not only how salinity directly affects crop productivity, but also how salinity may influence insect pest infestation. It answers these questions: “What kind of yield drag can we expect at low salinity levels?” “Do salt-stressed crops become hot spots for pest pressures?” “What are the economic losses associated with yield loss and increased pest pressures?”

“Our initial research focuses on corn and soybean response to salinity because both are important crops for North Dakota producers, and we are seeing yields decline at very low levels of salinity,” says Abbey Wick, NDSU assistant professor of soil health.

Funded by the North Dakota Corn Council and North Dakota Soybean Council, the experiment started with greenhouse projects to measure the crop and pest response to salinity in a controlled environment. During the last two years, the project was conducted on six quarters of land in Richland County to collect real-world, in-field data.

“Preliminary results indicate that both leaf size and root mass decrease with increasing salinity,” says Wick. “Smaller leaves mean less surface shading and smaller roots mean less water uptake by the plant. Surface shading to reduce evaporation and water use by roots to lower the water table are both important ways to manage salinity.”

Jason Harmon, North Dakota Agricultural Experiment Station entomologist, says, “While the plants are doing worse as salinity increases, the spider mites we’ve introduced are doing better. There is a lot of variation in how many eggs the spider mites laid in our small cages, but the overall trend is very strong. We have also expanded this project to include soybean aphids, which are proving to be less predictable than the spider mites.”

Wick adds, “Using a whole-systems approach, where we link soils, crops and pest research, is exciting. Getting new information to our North Dakota producers through research and education is our goal.”

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A Cup of Coffee Inspires

Soil Health Conversations

With settings like the local grain elevator, the seed store or the small-town coffee shop, a group of NDSU Extension soil health specialists and local agents are changing the way they disseminate information to North Dakota's farmers.

Started in 2014, the Soil Health Café Talk sessions have become a way for farmers and NDSU Extension agents to share information and learn from each other.

"For some of my producers in Sargent County, a laid-back, informal meeting where they can ask questions about their specific soil concerns has been very popular," says Melissa Seykora, NDSU Extension Service – Sargent County agent. "They love that there is no set agenda for Café Talks, and the direction of the meetings are entirely driven by their questions."

Small-group session time also is included to discuss such issues as soil salinity, sodicity, cropping systems, cover crops and compaction.

"The café talks are a nice, small-group setting where producers feel comfortable asking questions that they normally wouldn't ask at a large meeting," says Terry Wehlander, Sargent County producer. "We can bounce ideas off of each other easily and get our questions answered."

"Café talks create an environment for farmers to talk through management approaches with other farmers and specialists," says Abbey Wick, NDSU Extension soil health specialist. "It also helps NDSU Extension better understand some of the management challenges farmers are facing and the innovative approaches farmers are taking to overcome those challenges. We can then use this information to guide our research efforts and develop meaningful programs."

More Soil Health Café Talks are scheduled for 2016.

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New NDSU Research Institute Focuses on Global Food Security

Inspirational quotes, notes about food safety and sustainable agriculture, and diagrams about the future of the world's food supply are just a few of the things you'll find on a big, whiteboard in Kalidas Shetty's office.

Hired in 2013, Shetty's mission was to establish an agricultural institute that researches a significant global challenge: food security.

In April 2014, the State Board of Higher Education granted approval for the Global Institute of Food Security and International Agriculture (GIFSIA).

"Traditionally, food security means having enough food to eat," he says. "One of our main goals at GIFSIA is a 'crops for health' concept, which focuses not only on the abundance of food supply, but also on the nutritional quality. With North Dakota's crop diversity, NDSU is the perfect place to study how food can be used to fight chronic disease like diabetes or obesity-related illness."

GIFSIA's other goals and objectives include:

- Linking North Dakota agricultural products to international markets to help meet global challenges of food security, health and ecological sustainability

- Building opportunities for global engagement, partnership and education for NDSU faculty
- Making NDSU a global leader in solving critical and integrated global food security challenges, including chronic-disease pandemics and ecological breakdowns, through a systems-based science and educational platform
- Organizing and hosting conferences, short courses, forums, certificate courses and degree programs focused on the vision of GIFSIA
- Increasing the number of international students and visiting scholar enrollments and improving NDSU's international reputation and standing
- Providing opportunities for NDSU students and faculty to have international engagement and work experience of the highest quality, and to provide the education that NDSU students need to be competitive when seeking national and international job opportunities

Shetty's vision for GIFSIA already is coming to life in a multitude of ways.

In the fall of 2014 and 2015, GIFSIA hosted a group of exchange students from Kagoshima University in Japan to study world food systems, and the inaugural NDSU Conference on Food for Health welcomed conference participants from across the world in 2015

Shetty says, "GIFSIA will help North Dakota advance economically and scientifically by allowing NDSU to collaborate and build partnerships around the world, raising our global profile and the quality metrics of NDSU as a world-renowned university. This is my life's passion."

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NDAES Greenhouse Complex Vital for Research

North Dakota Gov. Jack Dalrymple considers the North Dakota Agricultural Experiment Station (NDAES) Research Greenhouse Complex a valuable research asset not only for NDSU but the entire state.

“This high-tech facility will expand the state’s research capabilities and student learning opportunities, and ensure that North Dakota remains on the forefront of agricultural innovation and technology, especially in the areas of economic development, land and water use, crop and livestock production, value-added activities, and food quality and safety,” he told university leaders, faculty and staff, legislators, commodity organization representatives and others gathered to dedicate the greenhouse in November 2015.

The 156,300-square-foot complex contains North Dakota’s only plant-based Biosecurity Level 3 facility. This highly secure area allows scientists to work on infectious agents that could cause a serious or potentially lethal plant disease.

The greenhouse also houses growth and humidity chambers, laboratories, long-term seed storage, seed cleaning equipment, spray booths for simulating field pesticide applications, and facilities for subjecting seeds or seedlings to low temperatures to hasten plant development and flowering.

The complex provides facilities for research in several areas, including entomology, food safety, horticulture, pathology, plant breeding and genetics, and soil and weed science.

“This is a global impact because you are talking about crop research that prevents disease and increases yield,” U.S. Sen. John Hoeven of North Dakota said at the dedication. “And remember, we are the No. 1 producer of about 14 major crops. We produce a ton of different crops and ship not only all over the country but export them all over the world. We produce the highest-quality, lowest-cost food supply in the world and this ag research facility is a very important part of helping our farmers and ranchers do it.” Hoeven served as North Dakota governor during the 60th and 61st legislative assemblies, which provided funding for the greenhouse complex.

The facility was constructed with a combination of \$28.5 million in state funding and \$5 million in donations.

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Campers Enjoy Renovated N.D. 4-H Camp

Major renovations at the North Dakota 4-H Camp near Washburn are getting a thumbs-up from campers.

“The new shower house was way bigger,” says 11-year-old Cassidy Strommen of Fort Rice. “Last year, there were only two showers and this year, with five showers, everyone had time to shower.”

New showers were part of a \$2.35 million project including upgrades to the three cabins and dining hall and expanding outdoor camping opportunities. Another major component was constructing a multipurpose facility, named the Johnsrud 4-H Education Center in honor of Myron Johnsrud, NDSU Extension Service director from 1974 to 1986.

“I thought the new bunks were a big improvement,” says Cassidy’s 10-year-old brother, Cooper. “I also liked the new jumbo water slides and the mud pit.”

Foster County 4-H’er Adam Gorseth agrees.

“The cabins were good,” he says. “The new showers were great, with plenty of space. The remodeled dining center was nice.”

The cabin and dining hall renovations were completed in time for the 2015 camping season. The Johnsrud 4-H Education Center opened in August.

Donors provided \$1.4 million for the project through the North Dakota 4-H Foundation’s Shape a New Destiny campaign. The state Legislature provided the other \$950,000.

The foundation has launched another campaign to raise \$400,000 for furnishings in the cabins, dining hall and new center; small-group seating; and program amenities such as a crafts shack, multidiscipline shooting range, fishing pond, high-ropes course, and walking and riding trails.

“All of these improvements help enhance our learning environment, increase our capacity to accommodate larger youth groups, provide access to people of all abilities and ensure a safe camping facility,” says Center for 4-H Youth Development Chair Brad Cogdill.

Established in 1967 as one of two regional 4-H camps, the 84-acre entity has become the state’s sole 4-H camp.

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Langdon Research Extension Center Tests Industrial Hemp

More than 30 nations grow industrial hemp as an agricultural commodity, but until last year, it was not allowed in the U.S. As a result of the 2014 farm bill, universities and state agriculture departments can begin cultivating industrial hemp for limited purposes.

North Dakota is one of 15 states to establish a commercial industrial hemp program. The NDSU Langdon Research Extension Center (REC) started variety trials of industrial hemp in the summer of 2015 and harvested the crop in the fall.

Center scientists planted five Canadian varieties, five French varieties, and one each from Australia and Finland. The goal is to gain practical insights that help North Dakota producers raise this little-known crop efficiently and profitably.

“We started by testing different varieties, but much more research in crop production practices is needed, such as seeding dates and rates—the sort of basic information that industrial hemp growers could need in the future,” Langdon REC agronomist Bryan Hanson says.

“After harvesting the crop this fall, we are seeing varietal differences in seed and fiber yields,” says NDSU Plant Sciences Department professor Burton Johnson, who is involved with this study. “Because information is limited about the production of industrial hemp, our research will continue in the 2016 growing season.”

Some facts about industrial hemp:

- Marijuana and hemp come from the same plant species but from different varieties or cultivars. They have a similar leaf shape, so the two often are confused; however, hemp is genetically different and has extremely low levels, 0.3 percent, of THC, the chemical responsible for most of marijuana’s psychological effects.
- Hemp use includes food, cosmetics, nutritional supplements, fabric, paper, construction and insulation materials. The global hemp market is estimated at more than 25,000 products.
- Hemp grows in a wide variety of climates and soil types. The biggest advantage for farmers could be that it grows rapidly and chokes out competing weeds.

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Producers, Landowners Receive

Farm Bill Assistance

The Agricultural Act of 2014 was the first farm bill passed since 2008, and agricultural producers such as Bruce Voegele had major decisions to make.

Voegele, who raises corn and winter wheat near Beulah, was among more than 11,500 producers who have attended educational workshops that NDSU Extension specialists and agents and Farm Service Agency (FSA) personnel conducted to help farm operators and farmland owners enroll in the program that best addresses their needs.

"It definitely helped that they had the meetings," Voegele says. "With that bill, anything was helpful."

Workshop presenters showed producers how to update their base acres and yields and explore payment options. Presenters also explained the bill's compliance and other provisions. Extension agents also provided considerable individual assistance.

"I ended up helping 69 guys one-on-one in my office and about 30 others on the phone," says Craig Askim, the agriculture and natural resources agent for Mercer County.

To help agents and FSA county directors become knowledgeable about the new farm

bill, Extension farm and family resource management specialist Andrew Swenson and farm management specialist Dwight Aakre held train-the-trainer programs for them across the state.

"The relationships FSA county directors have with county Extension agents is very unique and an envy of many of my colleagues across the U.S.," says Aaron Krauter, the FSA's state executive director.

The Extension specialists also developed a Web page (www.ag.ndsu.edu/farmmanagement/farm-bill) with information on the farm bill. The page includes news releases for state and regional news media, a PowerPoint presentation and the 2014 Farm Bill Decision Aid Excel spreadsheet, which Swenson developed.

Askim says the spreadsheet was very helpful because it provides examples of different farming operations so producers could better understand the bill's program options.

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Research Shedding Light on Cow Pregnancy

North Dakota Agricultural Experiment Station scientists and others are a step closer to solving the mystery of why 90-plus percent of beef cows become pregnant after insemination, but only 50 to 60 percent still have a viable embryo 30 days later.

The scientists have developed a procedure that allows them to evaluate factors affecting embryo development in the early part of pregnancy, from days 16 to 50.

“Up until about day seven after fertilization, it’s easy to look at what’s going on,” researcher and Extension beef cattle specialist Carl Dahlen says. “But for the rest of the loss period, it’s like a big black box.”

Scientist Joel Caton says learning why so many embryos are lost is important because beef production needs to be as efficient as possible if the U.S. is going to help meet the challenge of feeding 9.2 billion people by 2050.

Nine scientists from campus and the NDSU Central Grasslands Research Extension Center are working on the problem using center cattle. New Mexico State University researchers also are involved, and scientists from other universities are interested.

“There’s no one else in the world who is doing this,” Dahlen says. “This puts NDSU squarely in the forefront of this research.”

Preliminary indications are that the issue is nutrient transfer to the embryo and when it occurs. The scientists found that the transfer changes dramatically during the first 50 days of pregnancy.

“We’ve opened the door on that black box to take a look,” Caton says.

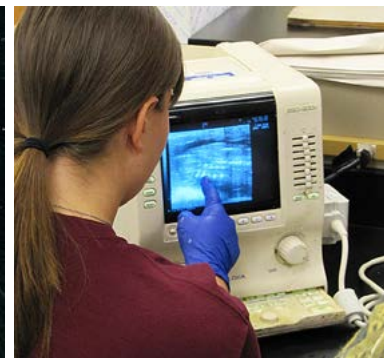
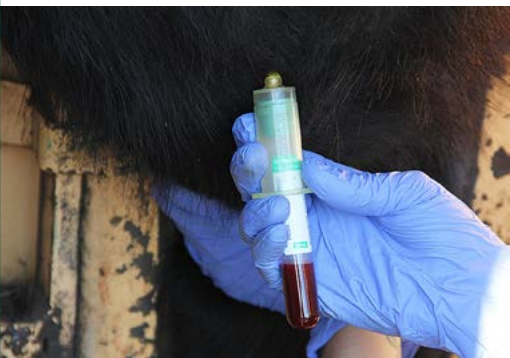
Scientists say this research eventually will translate into ways producers can improve production efficiency and lead to a new reference book on the subject. Current publications are decades old.

“This is a state-of-the-art reference that probably would stand for an extended period of time, and I’d like North Dakota to be part of that,” Caton says.

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Research Shows UAS Can Benefit Agriculture

Once crops start growing, producers would like an accurate stand count so they can decide whether fertilizing low-yielding areas is worth the cost.

That assessment isn't easy to do on the ground, so North Dakota Agricultural Experiment Station (NDAES) scientists and Extension specialists are evaluating whether unmanned aircraft systems (UAS) fitted with infrared sensors and cameras can provide the data.

In tests at NDSU's Carrington Research Extension Center, UAS-mounted sensors and cameras could predict yield fairly accurately and pinpoint nitrogen deficiency in corn, says Blaine Schatz, center director.

Research shows the new technology also can identify herbicide-resistant weeds after herbicide is applied to fields, giving producers another tool to combat herbicide resistance, a big problem with the potential to hurt growers' bottom lines significantly, according to John Nowatzki, Extension agricultural machine systems specialist.

Don Larson, who farms southwest of Larimore and has flown a UAS as a hobbyist for the past two years, is glad NDSU is studying whether UAS can benefit agriculture.

"The time and resources needed to research and develop such implementations are likely far beyond what's available to the farmer-hobbyist," he says. "The wealth of agricultural scientific expertise and resources available at North Dakota State University make it a natural to lead in the implementation of these new UAS technologies."

Starting in April 2016, NDAES scientists and Extension specialists will be involved in a project in which an Israeli-based electronics company will fly a UAS in North Dakota to gather agricultural and other data. This UAS has a 35-foot wingspan and can gather data from 25,000 acres an hour, compared with the 500 acres the much smaller, more common UAS can cover.

NDAES scientists and Extension specialists also have worked with a Florida-based company that has flown a UAS to help the Barnes County Weed Board spot noxious weeds.

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Farmers, Ranchers Learn

Value of Succession Planning

Like many farmers and ranchers, Mary and Glenn Walz of New Rockford are nearing retirement, and they need to make some decisions on what will happen to their farm, especially because their children have nonfarm careers.

They found help from NDSU Extension's Design Your Succession Plan program, which was held at several locations throughout the state in 2015. It shows farm and ranch families how to:

- Get started in developing a plan
- Talk with family members about this subject
- Choose and work with professionals such as attorneys, financial planners, trust officers, accountants, agricultural lenders, insurance agents and tax experts

"It gives you a great tool to start the discussion with your family," Mary Walz says. "It gives you great advice about what questions to be asking."



Having a succession plan is vital because the farm or ranch often is more than a business; it is a legacy that has been in the family for generations, according to Extension family economics specialist Lori Scharmer, who helped develop the program.

Participants receive a resource binder and

workbook to help them get started on a succession plan during the program and continue to work on it afterward. The program also includes case studies of farm families who could benefit from a succession plan. These generate discussion on what can happen if families don't have a plan.

The program was a revelation for a Harvey-area farm couple. Paul Anderson, who is 45, said he realized he and his wife, Vanessa, were the youngest people in the room.

"We said we were starting early," he recalls telling the facilitator. The facilitator responded with, "You're the only ones starting at the right time. You've got to start early."

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4-H Competitions, Judging Events Help

Build Valuable Skills



Young people often are nervous about giving presentations or have trouble setting goals and sticking to them.

But not Walsh County 4-H'er Hayley Fingarson. She is one of more than 1,000 North Dakota youth who participate in 4-H judging contests and other competitions such as shooting sports.

"Attending national and local 4-H judging contests has helped me become a more confident and well-rounded person," she says. "From judging land to making consumer decisions, I have learned many valuable life skills that will stick with me forever."

Those skills include public speaking, setting goals and priorities, listening, communicating effectively, making decisions and teaching others.

"Judging events help develop youth in ways that can't be taught in a classroom," says Rick Schmidt, an Extension agent and coach for the Oliver County judging teams. "The teams I have traveled with really mature from these opportunities."

To become proficient at shooting sports, youth need to be dedicated to practicing, planning, setting goals and maintaining self-discipline, all skills they will need to be successful in life, says Adrian Biewer, Extension youth development specialist and 4-H shooting sports program leader.

Traveling to other states for competitions is another long-term benefit, according to Extension 4-H youth development specialist Dean Aakre. Walsh County 4-H'er Andrew Brummond agrees.

"It allows you to meet people from all over the state and then all over the nation," he says. "You can meet new people and make new friends while learning about things that can help you on your future career path."

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New Crop Varieties Offer Unique Properties

The North Dakota Agricultural Experiment Station has released two new crop varieties: ND Genesis and ND Henson.

ND Genesis

Improved foliar disease resistance and yield potential give this two-rowed barley variety an advantage over Pinnacle, an NDSU two-rowed variety released in 2007. ND Genesis was added to the American Malting Barley Association's 2016 list of malting barleys.

ND Genesis seems adapted to all parts of North Dakota and adjacent areas of Minnesota, Montana and South Dakota. Its large kernel and low grain protein may be helpful when growing malting barley in environments where moisture stress develops after heading.

Other unique properties of ND Genesis are:

- High grain yields
- Large, plump kernels and some drought tolerance
- Better resistance to the net and spot forms of net blotch than Pinnacle
- Less accumulation of DON than Pinnacle
- Low grain protein
- Good malt extract values
- Lower beta-glucan values than Pinnacle

ND Genesis testing began in 2005 under the supervision of Jerry Franckowiak, now a professor emeritus in the Plant Sciences Department.

ND Henson

This conventional soybean variety is intended to replace the NDSU-developed cultivar Cavalier.

In yield trials that NDSU soybean breeder Ted Helms conducted, ND Henson matured two days later than Cavalier and yielded 6 bushels per acre more. ND Henson is resistant to lodging and races 3 and 4 of phytophthora root rot, and is tolerant to iron-deficiency chlorosis.

ND Henson performed very well in multistate uniform regional tests conducted in 2013 and 2014. Averaged across all multistate locations, it matured two day later and yielded 8.1 bushels per acre more than Cavalier. In North Dakota, the tests were conducted in Langdon, Park River and Minot. Other tests were conducted in Shelly, Moorhead and Crookston, Minn., and Canada.

"With the growing problem of glyphosate-resistant weeds, there is a potential for conventional soybeans, such as ND Henson, to be a good fit with marginal land situations and save on seed costs," Helms says.

ND Henson was named in honor of the late Bob Henson, who was an associate agronomist at the NDSU Carrington Research Extension Center.

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Family and Consumer Education *Improves Lives*

Extension Service family and consumer science (FCS) programming addresses some of the most pressing social challenges for North Dakota communities and families, including obesity, chronic health conditions and poverty.

“Since research-based prevention education programs are the cornerstone of our philosophies and methodologies, FCS Extension educators are uniquely positioned to address these 21st century economic and health challenges,” NDSU Extension Service Director Chris Boerboom says.

A recent study conducted by nonprofit research organization Battelle to evaluate the impact of FCS programs in the U.S.’s north-central region found Extension FCS programs offer several economic benefits. For example, every \$1 spent on the Expanded Food and Nutrition Education Program results in a \$2.48 savings on food expenditures because participants are savvy shoppers and better at meal planning and using low-cost recipes, and make more home-cooked meals.

Here are other examples of how FCS programming impacts North Dakotans.

Parenting

Programs such as Love and Logic Early Childhood Parenting Made Fun and Parenting the Love and Logic Way teach parents, grandparents, foster and adoptive parents, and others working with children and youth to use positive tools for raising happy and well-balanced children. Parents learn strategies to balance love, mutual respect, limits and accountability to help youth become happy, self-controlled adults.

“By helping parents find positive strategies that will work for them, we can really make a difference for families,” says Debra Theurer, NDSU Extension parent educator at the West Dakota Parent and Family Resource Center in Dickinson. Parent Resource Centers offer the programs across the state.

Nearly 90 percent of those attending these programs say they’ve improved their parenting skills.

Sessions are provided free to families because of grants from the North Dakota Department of Human Services’ Children and Family Services division and through collaborative partnerships with NDSU Extension county offices, area schools and community agencies serving families.



Youth Nutrition



Three programs—On the Move to Better Health, Go Wild With Fruits and Veggies! and Banking on Strong Bones—are key components of NDSU Extension’s effort to improve children’s health. Extension teams up with school districts across the state to deliver the programs.

On the Move encourages fifth-graders to eat more fruits, vegetables and calcium-rich foods, and improve their fitness habits. It made a huge impression on Hunter Schwab of Englevale.

“He was telling his siblings what they should and shouldn’t eat,” says his mom, Joan Schwab.

Banking on Strong Bones teaches fourth-graders about nutrition and provides educational materials for school libraries, supplemental activities and taste testing. Families receive newsletters on nutrition and why being physically active every day is important.

Brenda Jarski-Weber of Jamestown saw a big change in her son’s eating habits.

“My son now takes out the measuring cups to measure out his food to get the right serving size, and he makes sure I offer at least two vegetables with dinner,” she says.

Go Wild With Fruits and Veggies! targets third-graders with wild animal characters that emphasize the importance of eating fruits and vegetables and participating in physical activity. The students taste produce and participate in movement activities.

Empowering Older Adults

One of three people 65 and older fall each year. Nearly half of all seniors who fall do not resume independent living.

Stepping On is a national, evidence-based falls prevention program that NDSU Extension, in partnership with the North Dakota Department of Health, offers across the state. Participants learn about improving their balance and strength, home modifications, community safety, vision issues, safe footwear and sleep.

Surveys three months later show only 24 percent of the participants had fallen since the workshop.

Access to Local Foods

To make local foods more accessible, Extension staff partnered with the Go! Bismarck Mandan Healthy Community Coalition to hold three Saturday morning farmers markets. These events featured agricultural vendors, local artists and crafters, health promotion booths and music.

Based on participant reaction, Extension staff then helped establish BisMarket, a permanent farmers market. Extension staff also developed a process for using Supplemental Nutrition Assistance Program (SNAP) benefits at the market so lower-income families could improve their nutrition by buying and consuming local foods.

The market, held twice a week, regularly attracts more than a dozen vendors, and more people participate in physical activities each year. Vendors report their sales jumped from about \$25,000 the first year to more than \$110,000 in 2015. SNAP benefit use more than doubled in 2015.

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Producers Learn How to Combat Soybean Cyst Nematode

Soybean cyst nematode (SCN), a microscopic plant-parasitic worm, is emerging as a major threat to soybean production in North Dakota.

SCN was identified in the U.S. in 1954 and quickly spread through all major soybean production areas. It first was detected in North Dakota's Richland County in 2003, and within a decade, SCN was confirmed in a dozen counties.

The state Legislature recognized a need for a dedicated nematology position in NDSU's Department of Plant Pathology, and in 2014, Guiping Yan was hired to research soybean nematode diseases and nematode issues in other crops.

Sam Markell, NDSU Extension plant pathologist, also is working to help farmers identify and proactively manage the disease.

"Once a farmer sees above-ground symptoms, a soybean yield loss of up to 30 percent likely has already occurred," says Markell. "Early detection and aggressive management before a significant yield loss occurs will not only protect farmers' yields, it will also keep egg levels low so yield reductions are limited in the future."

Markell and Yan, along with a team of NDSU Extension agents, soybean pathologist Berlin Nelson and others in the Plant Pathology Department, have developed a multipronged approach to prepare farmers for SCN.

With support from the North Dakota Soybean Council, Extension distributed SCN sample bags to soybean growers through county Extension offices and at Research Extension Center field days throughout the state. Growers could sample for SCN, mail the bag to the NDSU Plant Pathology Lab and receive their data in the mail.

At the field days, growers were taught how to identify potentially infested areas, dig and clean roots for sampling and differentiate cysts from soil particles. Producers also learned about management topics including SCN-resistant soybean varieties, crop rotation and seed treatment products.

"It is our hope that every farmer who first identified SCN as a result of our awareness programs will be able to manage this pest that would have caused potentially devastating levels of yield loss," says Markell.

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NDSU Pulse Research Update

Disease Management

Pathologists at NDSU are committed to working with growers and others in the pulse industry in North Dakota for the management of diseases that affect pulse crops.

“Our growers face many crop production challenges; one of the most important is diseases,” says Julie Pasche, NDSU Plant Pathology assistant professor. “We are working to protect the yield of pulse crops by developing economical management tools for growers.”

Pasche adds, “NDSU plant pathologists diligently perform research to advance management tools for diseases that have plagued the industry for years, like white mold, root rot and leaf blights, but also newly emerging diseases that could be economically important in the future.”

Quality and Utilization

Quality evaluations are done annually by the Pulse Quality and Utilization Laboratory and focus on nutritional components such as protein and mineral content and end-use factors such as pulse cooking firmness and starch-pasting properties.

Research in the end use of pulses includes determining milling characteristics of pulse flours and the use of pulse flours in nontraditional applications. Examples are the inclusion of milled pulse flour to enhance nutritional and functional properties of wheat flour, using pulse flours in gluten-free applications and using pulse flour as an egg replacer.

Methods to deodorize pea flour and the application of these flours in food systems also have been investigated. Turning bean flours into snack products is an ongoing research project.

Breeding

Pulse breeding at NDSU is focused on four crops: dry peas, lentils, chickpeas and dry beans. Each of these crops has more than one market class that serve diverse markets internationally. Greater than 80 percent of the pulse crops produced in the U.S. are exported to countries where they serve as staple food sources for local populations.

“A goal of our breeding programs is to increase the nutritional quality of new varieties,” says NDSU Plant Sciences professor Kevin McPhee. “These programs have the potential to improve the health and nutrition status of a sector of the world population. Our efforts in the breeding programs aim to combine and increase resistance to many important pathogens, as well as reduce sensitivity to adverse weather conditions.”

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Photo provided by Carrington Area Chamber of Commerce



Photo provided by Carrington Area Chamber of Commerce



Outside Impressions

Can Lead to Community Improvements

If you've lived in your community awhile, you probably don't need a sign to direct you to the hospital, and you no longer pay attention to that empty lot filled with tall weeds and trash.

But if you're a stranger in town, those may be the first things you notice.

That's the premise behind NDSU Extension's Community Impressions, a new program to help communities learn about their strengths and weaknesses through the eyes of first-time visitors. A group of volunteers from two similar communities make unannounced visits to each other's town, then report their findings to residents and leaders.

This is valuable information communities can use in planning efforts to improve themselves, says Extension industrial and manufacturing engineer David Lehman, who helped create Community Impressions. It's based on the University of Wisconsin's First Impressions program.

Bowman and Carrington piloted the North Dakota program. The volunteers drove through the community to gather their first impressions, then ate at restaurants, chatted with residents, and checked out businesses, housing, and tourism and recreational opportunities.

"It was very eye-opening in a lot of ways," says Andrea Bowman of Bowman. The visit showed that Bowman needs to educate its frontline workers about the community so they can be more helpful to visitors. Many of those workers are new to the area.

"You'll never look at a small community the same way again," adds Bowman, a member of the group who visited Carrington.

One of the things Carrington residents learned is the community lacked signage for the hospital, tourist attractions and some businesses.

"It was really good to hear about things from someone else," says Joel Lemer, Foster County Extension agent and leader of the group who visited Bowman.

Both groups found community pride was among the communities' major strengths.

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Extension Works to *Control Waterhemp*

One weed—waterhemp, a member of the pigweed family—is adding to North Dakota producers' list of concerns.

A number of factors—reduced tillage systems, herbicide resistance and simplified weed management systems—have contributed to the spread of waterhemp across eastern North Dakota.

How is waterhemp moving so rapidly? Scientists know its seed moves readily in water. They also believe that geese and ducks feeding on waterhemp distribute seed along flyways. Finally, humans unintentionally move seed, especially with harvesting equipment.

Plus, waterhemp biotypes are especially resistant to herbicides, including glyphosate, and have the ability to produce massive quantities of seed that potentially germinate and emerge after a farmer has completed postemergent herbicide applications.

“The first step in waterhemp control is awareness and identification,” says Tom Peters, an NDSU Extension weed control specialist who is working with farmers to develop strategies to slow the advance of waterhemp in North Dakota. “Our county Extension agents, farmers, crop consultants and industry retailers need to learn and understand the difference between pigweed and waterhemp in order to begin the process of controlling it.”

In the fall of 2014, Peters and a team of NDSU Extension specialists in the Plant Sciences Department developed a program to help Extension agents educate producers about managing weeds, including waterhemp.

That education paid off in Walsh County. One day, a producer walked into the county Extension office with a 6-foot-tall weed. After attending Extension agent Brad Brummond's training, the producer suspected the weed was waterhemp or Palmer amaranth. Brummond confirmed it was waterhemp, and about a half-dozen plants were pulled and destroyed before they could go to seed.

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North Dakota State University
Agricultural Experiment Station
VETERINARY DIAGNOSTIC LABORATORY

THE STATE ARCHITECTURE CANNON DESIGN

NDAES Gaining New Veterinary Diagnostic Lab

Unloading large animals at the North Dakota Agricultural Experiment Station's Veterinary Diagnostic Laboratory (VDL) can be difficult, especially in the winter when the loading dock, which is on the building's north side, is icy.

South-facing, heated docks and an overhead monorail system for unloading large animals are among the features of the new lab that will be built along 19th Avenue North west of Interstate 29.

Construction on the one-story, \$18 million building is scheduled to start in the spring of 2016 and be completed late the following summer. An appropriation from the 2015 Legislature is funding the facility.

With approximately 27,000 square feet of space, the new lab will be about double the size of the current facility. It also will include a biosecurity level 3 suite, which will allow staff to work safely with diseases that can be passed between humans and animals.

The additional space, and better lighting and design, will improve the staff's efficiency and ability to handle a growing caseload, lab director Neil Dyer says. The new location also will eliminate the need to bring dead animals on campus.

Lab staff conduct tests on more than 9,000 dead animals and 2,000 feed samples a year to diagnose plant and animal diseases. As a member of the National Animal Health Laboratory Network, the lab also is involved in the surveillance of diseases such as bovine spongiform encephalopathy, West Nile virus, avian influenza and chronic wasting disease.

The type and scope of testing activities at veterinary diagnostic labs has changed significantly in the past few decades, according to Brett Webb, veterinary pathologist in the lab.

"I look forward to working in a facility whose design is more aligned with our testing activities and has sufficient flexibility to address future changes in the scope and volume of testing performed by the VDL," he says.

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Commodity Trading Room Expands Outreach

Since its inception in 2013, the NDSU Agribusiness and Applied Economics Department's Commodity Trading Room (CTR) has educated more than 160 students per year in the areas of commodity marketing and risk.

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. The room has 32 work stations (20 DTN, formerly known as Data Transmission Network, and 12 Bloomberg) for adopting information/trading technology. Students also have the tools to analyze regional cash markets.

Beyond the traditional undergraduate and graduate classroom setting, the opportunity to use the CTR for expanded outreach and international education has become apparent in the years since it began.

"We recognized early on that the CTR could become an environment for farmers, grain traders, commodity managers, international buyers and ag finance experts to expand their knowledge," says Bill Wilson, university distinguished professor and professor in the Agribusiness and Applied Economics Department. "But we never could have predicted how valuable these groups have found the room to be."

The Northern Crops Institute regularly uses the CTR to host groups of foreign grain and oilseed buyers to learn about the mechanics and strategy of buying commodities.

"With the use of the CTR, we regularly have them using trading technology and live market information," Wilson says. "We give them an assignment on day one, and in the following five days, they have to create strategies and execute the annual volumes of grains representative of a typical importer."

He adds, "Substantial demand also exists for outreach in risk analysis using the CTR. There also has been interest by a number of agribusinesses to teach courses for midcareer managers."

He believes that no matter what group is utilizing the technology tools, the CTR will continue to expand its education and outreach to audiences across the globe.

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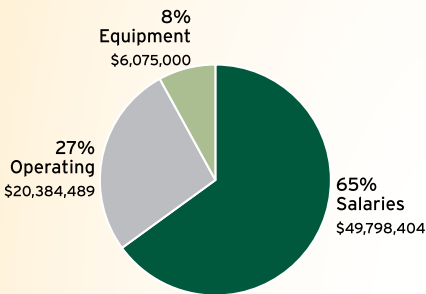
Year 1 Summary of 2015-2017 Biennium

2015-2016 Annual Budget Book – Authorization

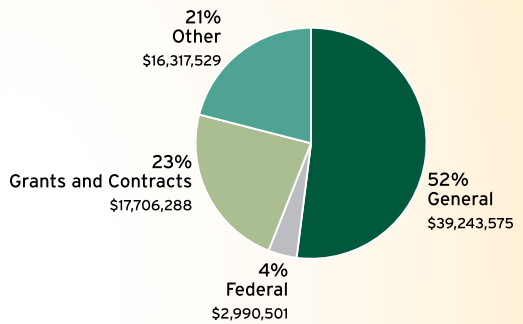
Excludes Capital

North Dakota Agricultural Experiment Station

Budgeted Expenses

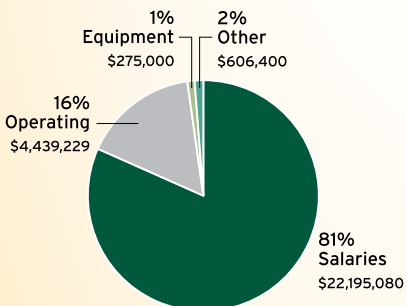


Funding Source

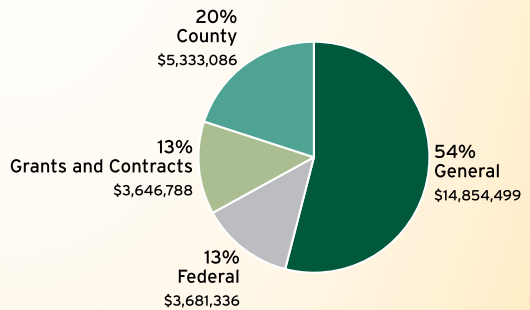


NDSU Extension Service

Budgeted Expenses



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◀ The Johnsrud 4-H Education Center at the North Dakota 4-H Camp near Washburn opened in August 2015.

▼ The North Dakota Agricultural Experiment Station Research Greenhouse Complex on the NDSU campus was dedicated in November 2015.



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.

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