

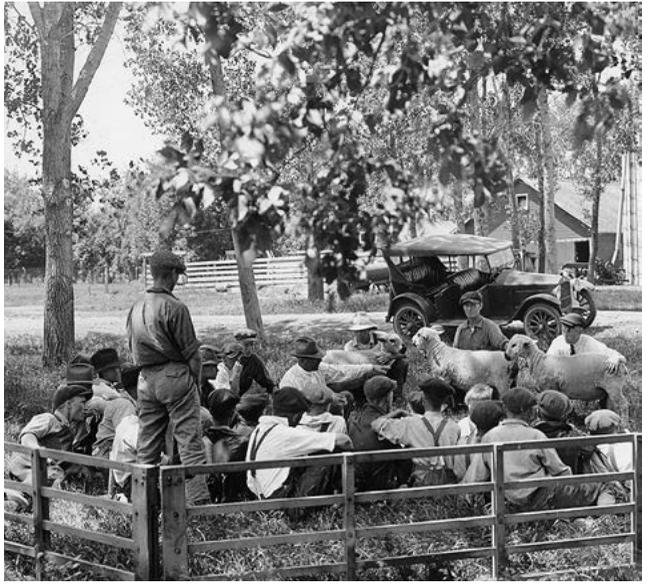


2014 Annual Highlights

North Dakota Agricultural
Experiment Station
NDSU Extension Service

NDSU NORTH DAKOTA
STATE UNIVERSITY





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Ken Grafton



Chris Boerboom

Welcome to NDSU Agriculture and Extension

We are pleased to provide you with this year's edition of our Annual Highlights. While we can't provide examples of all or most of our research and Extension programs that take place throughout the state, we have identified some examples of our activities and accomplishments from the North Dakota Agricultural Experiment Station and the NDSU Extension Service that improve the state's economy and the well-being of its citizens.

North Dakota agricultural activities remain a vital component of the state's economy. Crop and livestock production throughout the state is critically important, and it is our responsibility to be an unbiased provider of the best technology and information to this important industry. Experiment Station scientists and staff, along with Extension Service specialists and county educators, take this responsibility very seriously.

Our research and Extension programs are designed to help North Dakotans be resilient and prosperous. New NDSU crop varieties are bred to excel in our climate and ward off insect and disease pests that reduce yields. Similarly, our livestock scientists are examining methods to enhance profitability in beef cattle production using a team approach involving geneticists, physiologists, nutritionists and meat scientists. Our scientists are exploring ways to improve upon and protect one of our greatest natural resources – the soil – and our agricultural economists strive to provide our farmers and ranchers with the critical information needed to remain profitable despite the vagaries of uncertain commodity prices.

In 2014, the NDSU Extension Service celebrated the centennial of the Smith-Lever Act, which established the Cooperative Extension System. After 100 years, we remain committed to the original ideals of Extension of extending knowledge and changing lives. Extension continues to use our local knowledge, blended with new technology and delivery methods, to address the needs and challenges of today and tomorrow.

Extension is extremely pleased to serve the people of North Dakota with research-based information through our locally connected Extension agents and with the disciplinary expertise of our area and state specialists. While the following pages provide a sample of the valuable impacts of our Extension programs, more program impacts can be found at www.ag.ndsu.edu/impactreports/reports. If you see the opportunity for other agricultural, community, family or youth programs to enhance North Dakota, please visit with one of our Extension staff.

We hope you enjoy reading the 2014 Annual Highlights!

NDSU Evaluating Unmanned Aircraft System Technology

Researchers are closer to determining whether unmanned aircraft systems (UAS) have a place in agricultural production.

“There is currently much interest in using UAS in agriculture,” says NDSU Extension Service agricultural machine systems specialist John Nowatzki, lead investigator on a UAS research project. “However, there is little research to show that UAS can be used effectively or economically for crop or livestock management.”

Researchers spent the 2014 growing season using UAS-mounted thermal infrared sensors and cameras to gather data from crop and livestock research projects at the NDSU Carrington Research Extension Center. They hope that data can help them:

- Identify corn, soybean and sunflower emergence and populations, and nitrogen deficiencies in corn and wheat
- Spot disease and insect damage symptoms, weed infestations and moisture stress on irrigated crops
- Determine tillage and crop rotation impacts on crop emergence, vigor and yield, and soil salinity impacts on crop yields

“The objective is to find out which observations taken from the plane can translate into immediate management actions, or possibly some observations may lead to corrective action for the following season,” says project co-investigator Hans Kandel, NDSU professor and Extension agronomist.

The researchers also monitored beef cattle breeding activity, identified sick or aggressive animals, and monitored animal temperatures and feedlot surface temperatures to mitigate stress from extreme weather conditions.

The next step is for researchers to convert the image data to information that’s useful to producers and crop consultants, and help producers identify how they can make use of UAS.

“The major benefit of UAS is that it offers a very affordable technology that the farmers or consultants can easily adopt,” says project co-investigator Sreekala Bajwa, NDSU Agricultural and Biosystems Engineering Department chair.

NDSU collaborated with the University of North Dakota’s Center for Unmanned Aircraft Systems Research, Education and Training, which flew the UAS.

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NDSU Extension Service

Extending Knowledge, Changing

The North Dakota State University Extension Service celebrated a major milestone in 2014: **100 years of extending knowledge and changing lives.**

The Smith-Lever Act, signed May 8, 1914, created the Cooperative Extension Service, a state-by-state network of educators to deliver information from land-grant universities such as NDSU to the people in the states. NDSU Extension has agents who serve all 53 North Dakota counties, as well as the Fort Berthold Indian Reservation.

NDSU Extension focuses its efforts in four primary areas:

- Agriculture and natural resources (ANR)
- Community vitality
- Family and consumer sciences
- 4-H youth development

Agriculture and Natural Resources

The ANR program helps producers stay on the cutting edge of crop production through technology, such as in-field sensing to determine when and where to apply fertilizer, and new methods for water management, such as tile drainage.

Other ANR efforts include:

- An “oil patch” livestock water quality study
- Consumer outreach such as BBQ Boot Camp
- Master Gardener and Junior Master Gardener programs
- Assistance for livestock producers to expand their operations

David Herzig turned to NDSU Extension when he wanted to add a cattle feeding component to his mixed-grain and cow-calf operation northwest of Burlington.

“We did ultimately expand our backgrounding operation, which has proven to be an integral part of my belief in multiple areas of diversification of the operation,” he says.

Community Vitality

The community vitality program provides initiatives such as Rural Leadership North Dakota (RLND). It’s a leadership development program in which participants make use of the skills they learn by developing and implementing projects to improve their organization, community or region. For example, Watford City gained a playground, New England has a new swimming pool and a dairy near Mandan is giving visitors a chance to learn about agriculture.



Lives for 100 Years

"I feel the program brought out a new level of confidence in me that will push me to be a positive voice for North Dakota agriculture and the issues that are important to my industry and my state," says 2011-13 RLND program participant Stacy Artz, a grain farm owner from Antler.

The community vitality program also provides small-business and manufacturing development assistance, and aids communities through revitalization programs such as Marketing Hometown America.

Family and Consumer Sciences

Family and consumer sciences provides information on:

- Eating healthfully and being physically active
- Preventing diseases such as macular degeneration and diabetes
- Managing money and reaching financial goals
- Improving 4-year-olds' school readiness and increasing parents' involvement in their children's educational development
- Avoiding credit card or identity theft
- Helping low-income families eat nutritious meals and stretch their food dollars
- Showing middle school youth the consequences of risky behaviors such as drinking and driving

"Thank you for providing this excellent learning activity for our students," Devils Lake Central Middle School health instructor Rick Grinsteiner says of the risky behaviors program.

4-H Youth Development

4-H is the largest and only research-based youth organization in North Dakota. More than 5,500 youth were 4-H members in 2013-14, and more than 23,000 youth participated in Extension youth development activities through one-time programs, in-school or after-school programs, and camps.

4-H provides youth with opportunities to make friends, have fun and develop lifelong skills in areas such as working with livestock, crop production, clothing and textiles, health, aerospace science, computers, geospatial technology, forestry, child development, leadership, communication, robotics, outdoor skills, wind energy and small engines.

"My years in 4-H taught me how to problem solve, but also to seek advice from others so I can make an informed decision," says Jim Peterson, Starion Financial market president in Dunseith, Rolla and Bottineau.

These are just some of the examples of what Extension offers. In 2013, Extension faculty and staff provided 817,427 face-to-face or other direct contacts with North Dakotans.

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Program Helps Communities Market Themselves

Just because some rural communities are declining doesn't mean they all are or will eventually. That's the concept behind Marketing Hometown America, the community revitalization program a team of Extension specialists and agents from NDSU, South Dakota State University and the University of Nebraska-Lincoln developed.

A key element is a guidebook for community members to have structured conversations that will help them create a community marketing plan. The conversations, led by a trained community facilitator, help residents:

- Reveal their thoughts about community living
- Discover community assets
- Learn what people are looking for when they relocate to another community
- Understand the importance of

community referrals from local families and friends, and the positive image a community can project through its website and social media

- Identify new ways to market their community to potential residents

"This one-of-a-kind method to building a community marketing plan actually invites participation from many segments of the community," says team member Jodi Bruns, an NDSU Extension area community vitality specialist. "It stresses that individual opinions are valued and gives individuals an opportunity to create the marketing plan they envision after studying their community, reaching out to others and conversing with their small group to key in on the most important assets of the community that must be publicized or rejuvenated."

Ellendale has taken advantage of the program.

"Overall, this effort was a learning experience and has made new connections possible, as well as new community partnerships," former mayor Don Flaherty says.

The program also helped Adams, Brockton, Edmore, Nokoma, Hampden, Lawton and Fairdale join forces to market their region.

"I learned during this process that, working as a community, we can make things better," says Diane Martinson, business manager for the Edmore Public School District.

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This one-of-a-kind method to building a community marketing plan actually invites participation from many segments of the community.

Experts Explain

Temperature Inversions

Ironically, some of the seemingly best weather conditions for pesticide application often are the worst.

“That is because those conditions are caused by air temperature inversions,” says Vern Hofman, professor emeritus in NDSU’s Agricultural and Biosystems Engineering Department.

Hofman, NDSU Extension Service Pesticide Program specialist Andrew Thostenson and NDSU Soil Science Department professor emeritus John Enz are helping pesticide applicators understand temperature inversions and how they can cause chemical droplets to drift away from their targets and damage other crops or vegetation.

Basically, a temperature inversion is a condition in which the atmosphere’s temperature increases with height above the soil surface. Pesticide applicators need to understand inversions to follow state and federal regulations that prohibit pesticide application during inversions, yet very few people are aware of them, Thostenson says.

After Thostenson received an inquiry from an applicator who had a spray drift accident and wanted to know why it happened, he contacted Enz, a retired agricultural climatologist, and Hofman, a retired agricultural engineer, and they collaborated on a publication, “Air Temperature Inversions.” It explains in detail what they are, why they develop, how land conditions impact them, how to measure them and how to minimize their impact on pesticide applications.

While measuring the air temperature is a good way to confirm whether an inversion is present, inversions also provide some clues.

“A telltale sign that an inversion already has formed is road or field dust rising slowly or hanging in the air near the surface,” Enz says. “The dust tends to drift along with the wind but dissipates very slowly. Similarly, a strong odor you normally don’t smell or distant sounds you normally don’t hear also indicate the presence of an inversion.”

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**Pesticide
applicators need
to understand
inversions to follow
state and federal
regulations.**



Langdon Research Extension Center



Hettinger Research Extension Center



Carrington Research Extension Center

RECs Gaining **New Agronomy Labs**

Work is under way on much-needed agronomy labs at NDSU's Carrington, Hettinger and Langdon Research Extension Centers.

The 2013 North Dakota Legislature provided a total of \$5.5 million for the three labs.

The new labs will replace an early 1960s-era potato warehouse being used as the agronomy lab at the Carrington REC and a granary converted to a lab at Hettinger. Langdon has not had a dedicated lab facility.

"The Langdon Research Extension Center has an active agronomy research program that includes all aspects of crop production, including soil health, plant pathology, entomology, crop fertility, weed control and variety development," says Director Randy Mehlhoff. "A new agronomy lab will allow LREC scientists to conduct this work and, in the long run, will save resources that are expended on shipping research materials away for processing and testing."

Hettinger's current lab doesn't have adequate drying ovens, sample storage space, equipment storage, Internet service or modern office space.

"A modern agronomy and range lab will provide technicians and graduate students with office space, technical facilities in line with modern research (Internet access, dust-free environments to work on computers, and lab areas for handling radio telemetry collars for wildlife and domestic livestock), new drying ovens and sampling processing areas, and storage for research samples and equipment," Director Christopher Schauer says.

Carrington's new lab will provide space for experiment preparation and processing, sample cleaning, soil and plant analysis, dryers and field sample storage, as well as dust and air exchange capabilities, isolated chemical-handling space, a controlled environment for seed storage, and room for plant pathology experiments.

"This new lab will enhance and expand the center's agronomists', soil scientists' and plant pathologist's ability to conduct innovative and proactive research," says center Director Blaine Schatz.

The labs are scheduled to be completed by late spring of 2015.

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Health, Nutrition Program Targets Older Adults

The number of adults 65 and older will double to more than 70 million by 2030, according to the latest estimates. Chronic diseases are affecting a larger proportion of older adults, decreasing their quality of life and increasing health-care costs.

To improve the health literacy of older (50-plus) adults, a campus-based Extension team specializing in food and nutrition, gerontology, technology and communication obtained a U.S. Department of Agriculture rural health grant and developed the Nourishing Boomers and Beyond program.

The program includes a website with a monthly theme, links to credible websites with interactive activities for participants, a Facebook page with daily scheduled posts, a Pinterest page and a monthly online newsletter. Another major part of Nourishing Boomers and Beyond is a lesson package for Extension agents to use in delivering the free program to audiences face to face each month. The lessons include a teaching script, PowerPoint presentations, activities and recipes.

“We have reached hundreds of people face to face and thousands through social media,” says NDSU Extension food and nutrition specialist Julie Garden-

Robinson, one of the program’s developers. “In our first year, we are averaging about 300 face-to-face participants in our classes per month. Our goal is to have ‘repeat customers’ because research has shown that health behavior change requires repeated exposure and practice, along with environmental supports.”

Jane Strommen, NDSU Extension gerontology specialist, is co-program leader with Garden-Robinson.

The Web page has had more than 18,600 views and 1,400 ongoing users. The e-newsletter has 630 subscribers from 48 counties. The Facebook site has had more than 5,600 engaged users and a total reach of more than 59,000. The program also has moved beyond North Dakota to include users in Minnesota, Indiana, Nebraska, South Dakota and Florida.

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**We have reached hundreds of people face to face
and thousands through social media.**



Some research projects focus on utilization of hard red spring wheat in new food products.

Research Improves Wheat Varieties

On average, North Dakota farmers grow nearly half of the nation's hard red spring wheat and two-thirds of the durum, so research on improving wheat varieties is very important.

For example, Senay Simsek, assistant professor and cereal scientist, is in charge of the hard red spring wheat quality laboratories at NDSU. As part of her work, she analyzes thousands of hard red spring wheat lines each year for their flour and baking quality profiles.

She performs basic and applied research on hard red spring wheat chemistry and functionality in relation to end-product quality. She interacts with wheat producers, end users (domestic and international), breeders, wheat pathologists and geneticists. Her wheat quality-related projects are designed to support the marketing needs of hard red spring wheat producers and quality demands of U.S. spring wheat customers.

"In her short time at NDSU, Simsek has built a strong research program that is recognized inter-nationally," says Rich Horsley, professor and Plant Sciences Department head. "She has been very successful in obtaining grants to outfit a laboratory that had minimal analytical equipment when she arrived on campus to one that is fully equipped to address research problems associated with carbohydrate chemistry and wheat quality."

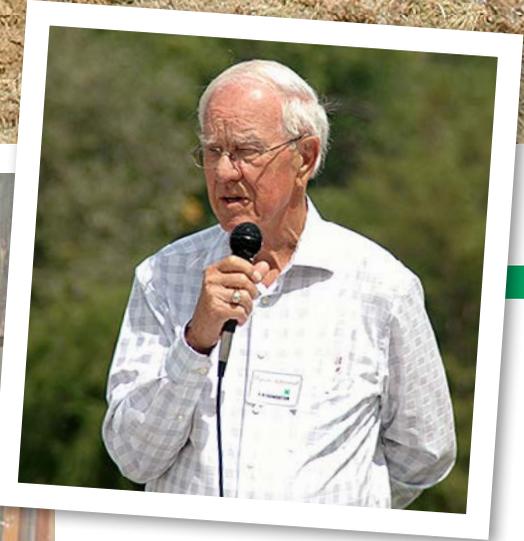
Part of her job is to highlight the unique quality aspects of the state's hard red spring wheat. Also, some of her research projects focus on utilization of hard red spring wheat in new food products. Therefore, market development activities will help farmers in this region sell their wheat to overseas customers.

In another example, Xiwen Cai, NDSU associate professor and wheat geneticist, in collaboration with Shiaoman Chao, Agricultural Research Service research geneticist, does research on plant breeding and production to improve U.S. agricultural production, sustainability and competitiveness.

The research will address the problem of limited genetic variability in wheat germplasm while augmenting the gene pool needed for progressive wheat breeding. They will introduce genes for characteristics such as disease resistance and salt/waterlogging tolerance from wild species into wheat and perform physical mapping of the wheat genome.

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Myron Johnsrud





N.D. 4-H Camp Undergoing Major Renovations

Work has started on a much-needed upgrade at the North Dakota 4-H Camp near Washburn.

The upgrades, which include remodeling the three cabins, dining hall improvements and expanding outdoor camp opportunities, are part of a \$2.3 million project to renovate the 47-year-old camp.

Construction of a multipurpose 4-H center is the other major part of the project. The center is being named in honor of Myron D. Johnsrud, a Watford City area native who served as NDSU Extension Service director from 1974 to 1986. The Johnsrud family was one of the project's major contributors.

The state Legislature provided \$950,000 of the funding in the NDSU Extension Service's 2013-15 budget. Individuals, organizations and corporations donated the rest through the North Dakota 4-H Foundation's Shape a New Destiny campaign.

"The generosity and overwhelming support that we have received for the construction and renovations at the North Dakota 4-H Camp have been amazing," North

Dakota 4-H Foundation Chairwoman Leann Schafer says. "Without the leadership and statewide support of 4-H, this project would not be possible. We are excited for the future opportunities our youth will have available to them through a multiseason facility."

The foundation has launched a second campaign to raise funds for furnishings for the camp buildings.

"We are so excited to see the plans for the North Dakota 4-H Camp come to life," NDSU Center for 4-H Youth Development Chair Brad Cogdill says. "This project will transform the facility by making it a better learning environment, improving our capacity to accommodate the participants, providing access to people of all abilities and ensuring a safe camping facility."

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**We are excited
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App Offers

Pest Management Information

Three NDSU Extension Service publications now are available as one app for smartphone and tablet users.

The free app combines information available in the “North Dakota Weed Control Guide,” “Field Crop Plant Disease Management Guide” and “Field Crop Insect Management Guide” into one user-friendly electronic medium.

The app gives users the ability to search by crop or pest to find solutions to problems or recommended treatments. Growers also are able to save or mark their favorite areas. Photos of pests, weeds and diseased plants are included to make in-field comparisons.

Crops included in the app are corn, soybeans, dry beans, sunflowers, sugar beets, potatoes and small grains. Additional crops may be added in the future. Because the app is a dynamic tool, it can be updated at any time with the latest information, unlike the printed versions of each guide.

Lead authors of the printed publications are Andrew Friskop, Extension plant pathologist and assistant professor; Richard Zollinger, Extension weed specialist and professor; and Janet Knodel, Extension entomologist and associate professor. Friskop is the lead contact for the pest management app.

The commodity groups supporting the planning, implementation and ongoing maintenance of the app are the North Dakota Corn Council, North Dakota Soybean Council, Sugarbeet Research and Education Board, North Dakota Wheat Commission, Northharvest Bean Growers Association, Northern Plains Potato Growers Association and National Sunflower Association.

Technical work was done by Myriad Mobile, a company founded by NDSU Electrical and Computer Engineering faculty and students.

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Research Leads to **Better Bean-breeding Strategies**

Two NDSU scientists are members of a national research team that successfully completed the sequence of the common bean genome. North Dakota is the leading producer of dry beans in the U.S.

The NDSU team members are Phil McClean, plant genomicist, and Juan Osorno, dry edible bean breeder. Both scientists are faculty members of the NDSU Plant Sciences Department.

McClean guided the data analysis that determined that the domestication of the common bean in Mexico and the Andean region of South America involved almost completely different sets of genes.

Osorno organized a national field trial that identified regions of the genome associated with seed size and other traits of economic importance.

“The genome sequence has important implications for North Dakota agriculture because the state produces 30 percent of this billion-dollar crop,” Osorno says. “The sequence will help breeders release varieties that are competitive with other crops a producer can grow. This includes breeding a more climate-resilient bean.”

The sequence revealed that disease-resistance genes are highly clustered in the genome. This knowledge will lead to better breeding strategies to combat the many diseases that challenge the bean crop.

McClean and Osorno are cooperating locally, nationally and internationally with other bean breeders and geneticists to develop the next generation of molecular markers that will be another important tool to aid bean breeding worldwide.

McClean and Osorno worked in collaboration with project leader Scott Jackson from the University of Georgia, and Dan Rokhsar and Jeremy Schmutz of the U.S. Department of Energy Joint Genome Institute. Schmutz also is with the HudsonAlpha Institute for Biotechnology.

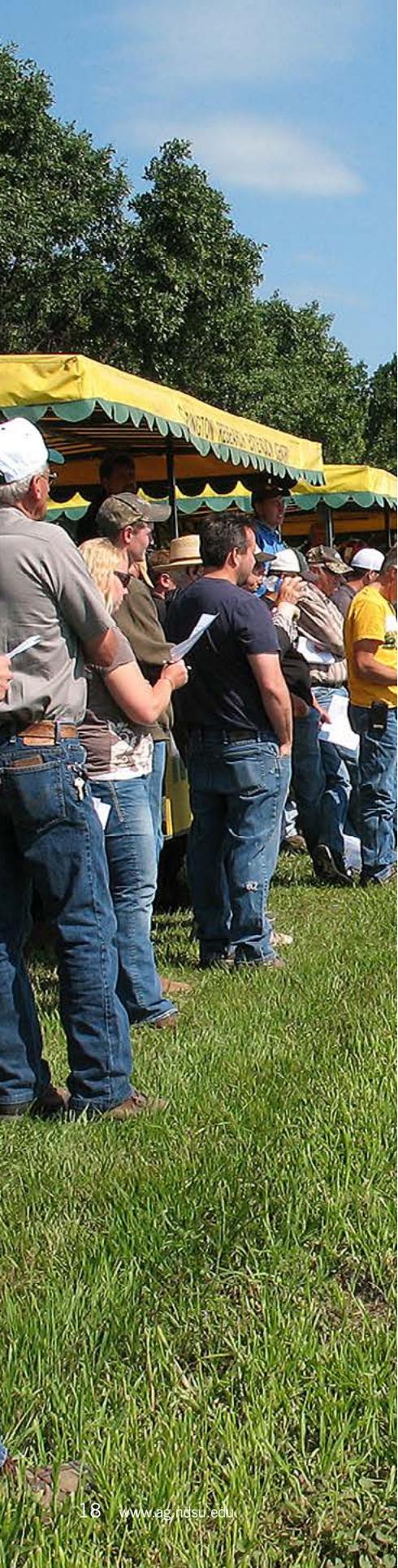
Other NDSU personnel on the project are postdoctoral scientist Sujam Mamidi and graduate student Samira Mafi Moghaddam. Both are members of McClean’s research group.

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**North Dakota is the leading
producer of dry beans in the U.S.**



Research Extension Centers

Share Knowledge

Soil salinity and sodicity are two major issues facing North Dakota producers. In summer 2014, about 225 people watched drain tile being installed for the NDSU Langdon Research Extension Center's groundwater management project.

The drain tile project is part of the center's effort to find ways for producers to manage and alleviate soil salinity and sodicity. The drain tile site was one of the tour stops on the center's annual field day program.

"The Langdon REC has a saline-sodic site that is perfectly suited to the research of these issues, as well as other salinity and water management-related questions," center Director Randy Mehlhoff says. "The layout includes a dedicated area for research, as well as for Extension demonstrations."

Also in 2014, the Hettinger REC once again hosted the Shearing and Wool Classing School.

"This event has become known throughout the sheep industry as the largest shearing and wool school in the country," center Director Christopher Schauer says.

Instructors came from North and South Dakota, Colorado, Montana and Iowa. The school attracted about 120 participants, some from as far away as Alaska, California and New Hampshire.

A tour and demonstration of how unmanned aircraft systems can benefit agriculture drew the largest crowd – 110 people – at the Carrington REC's 2014 field day.

The Williston REC's two-day MonDak Ag Showcase attracted one of the largest crowds of the RECs' summer educational events. Some 300 to 400 visitors, including producers, landowners, business leaders and consumers, attended the event, which included horticultural, dryland and irrigated crop tours.

More than 40 youth and their agricultural education instructors turned out for the Dickinson REC's high school student field day. The center's living lab got the students engaged in field-based teaching.

In all, more than 2,200 people attended field days, workshops, clinics, tours, research updates and demonstrations at the RECs in 2014.

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**Youth
involved in
4-H programs
are two times
more likely to
be civically
active.**





4-H Shows

Power of Positive Youth Development

North Dakota adolescents have helped shape new thinking and approaches to youth development around the world.

The North Dakota youth were part of the national 4-H Study of Positive Youth Development that began in 2002 and was repeated annually for eight years.

The study, which surveyed more than 7,000 adolescents from diverse backgrounds in 42 states, began with fifth-graders during the 2002-03 school year and ended with 12th-graders in 2010. Since then, the researchers – youth development scholars Richard Lerner and Jacqueline Lerner and a team at the Institute for Applied Research in Youth Development at Tufts University, Medford, Mass. – conducted rigorous analyses of the data collected. The researchers' final report, issued in December 2013, shows that youth involved in 4-H programs are:

- Four times more likely to make contributions to their communities
- Two times more likely to be civically active
- Two times more likely to make healthier choices
- Two times more likely to participate in science, engineering and computer technology programs during out-of-school time

The study also found that 10th-grade girls in 4-H are two times more likely and 12th-grade girls in 4-H are nearly three times more likely to take part in science programs, compared with girls in other out-of-school time activities.

“The results of this study provide a compelling reason why youth need to be part of 4-H,” says Brad Cogdill, director of the NDSU Extension Service’s Center for 4-H Youth Development. “It also provides a compelling reason for parents and adult volunteers to be engaged in the program.”

These findings are helping families, schools, communities and youth programs develop strategies to support children and adolescents.

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The results of this study provide a compelling reason why youth need to be part of 4-H.

Producers Learn About Farm Bill

The 2014 farm bill gives agricultural producers a chance to make decisions that could affect them for years to come.

To help them make the right decision for their operation, NDSU Extension farm management specialists and agricultural agents are educating producers about the legislation's provisions.

For example, the bill gives producers an opportunity to update program yields, which are a factor in the size of payments under the Price Loss Coverage program. The new farm bill also allows producers to reallocate their base acres, or change the mix of crop bases.

"That's a major decision for them," farm management specialist Dwight Aakre says. "They're going to struggle with that."

Extension efforts to help producers include Aakre and farm management specialist Andy Swenson:

- Providing producer education at about 50 meetings arranged by Extension agents, bankers and insurance agents

- Providing information at the NDSU Research Extension Centers' field days
- Teaming up with the Farm Service Agency of North Dakota to hold six educational programs statewide for Extension agents and county FSA directors who, as a result, are able to help producers who need advice
- Developing a Web page with information on the farm bill and an online decision aid

"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. "North Dakota producers are fortunate to have such a great Extension Service."

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Wheat, Barley Mold Research Could Help **Set U.S. Policies**

NDSU researchers are providing data on wheat and barley mold that could help set U.S. policy.

This research is part of a five-

year USDA-Agriculture and Food Research Initiative-funded study that includes researchers from four universities, the Food and Drug Administration and the USDA's Agricultural Research Service.

The researchers are studying ochratoxin A (OTA), one of several mycotoxins commonly produced by molds that can grow on grain. It's also a possible cancer-causing agent in humans. The researchers are looking for OTA in freshly harvested and stored grains, as well as higher-risk consumer products such as wine, cereal and coffee.

Little research has been conducted on OTA in the U.S. Most of it has occurred in Europe, which regulates OTA levels.

Charlene Wolf-Hall, head of NDSU's Veterinary and Microbiological Sciences Department, and graduate student Julie Kuruc found that OTA is not very common in freshly harvested grain in the upper Great Plains.

"That is what was expected and is consistent with what other countries have found," Wolf-Hall says. "It increases during storage, which is also consistent with what other countries have seen in their commodities."

The research is based on two years of crop data analyzed at NDSU.

This information provides a better understanding of U.S. crops, compared with crops grown elsewhere, Wolf-Hall says. It also points out the need for proper grain-storage practices, according to Kuruc. Those practices include good sanitation in grain storage facilities and good storage management, such as keeping the grain dry.

The next steps in this study are to complete the sampling, and compile and analyze the data. The data will be used to create risk analysis prediction models, which can help the U.S. set policy on acceptable OTA levels in grain, as the country has for other mycotoxins.

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Program Works to **Prevent Diabetes**

More than 29 million Americans have diabetes, and another 86 million adults have prediabetes, which means their blood sugar levels are higher than normal but not high enough to be diabetes.

To help keep prediabetes from turning into diabetes, the NDSU Extension Service is piloting the Centers for Disease Control and Prevention's National Diabetes Prevention Program in North Dakota.

It's a free community-based lifestyle change program for prediabetics. A class meets weekly for 16 weeks, then once a month for six months. The goal is to help participants have a 7 percent weight loss and do 150 minutes of physical activity per week.

"Statistics show that these can delay or even prevent the onset of diabetes," says Rita Ussatis, an Extension agent for Cass County and a certified lifestyle coach for the program. She is partnering with Essentia Health-Fargo on the class.

Without weight loss and moderate physical activity, 15 to 30 percent of people with prediabetes will develop type 2 diabetes within five years, the CDC estimates. Delaying the onset of diabetes five years can result in a \$40,505 savings in health-care costs, the North Dakota Health Department reports.

Topics Ussatis covers in class include holiday eating, eating while stressed, eating healthfully at restaurants, portion control, picking the right walking shoes, how to stay active and staying motivated.

"We're getting some great results," she says.

In the first four weeks of the class that started in September, 19 participants lost a total of 82 pounds.

A participant says she has tried numerous diets through the years, and this is the first time she is learning about nutrition.

Another woman says she has read lots of books about diabetes prevention, but being in a class is much better.

"Pretty soon I'm going to shop for smaller clothes," a third participant says.

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NDSU Leads

Cattle Breeding Research

NDSU is leading a research and Extension effort to evaluate the sustainability of two breeding systems on beef operations throughout North Dakota.

While artificial insemination (AI) is not new, the synchronization technology has evolved to the point where all cows in a herd can be AI bred on a single day and achieve pregnancy rates acceptable to many producers, says Carl Dahlen, Extension beef cattle specialist in the NDSU Animal Sciences Department.

Benefits of using AI and estrus synchronization can include shifting calving distribution, increasing weaning weight of calves and incorporating superior genetics of AI bulls. However, cattle still need to be gathered and handled a minimum of three times to accomplish timed AI protocols.

To evaluate the production, performance and profit of each breeding system, producers, Extension agents and campus faculty work side by side to implement the breeding systems research and interpret results. Conducting research on commercial operations also offers students and Extension personnel opportunities to see science in action, understand and address a variety of other concerns facing producers and use this experience to help others with similar questions.

Personnel from the NDSU Animal Sciences, Agribusiness and Applied Economics, and Sociology and Anthropology departments; NDSU Extension Service; North Dakota Beef Cattle Improvement Association; and North Dakota Farm Business Management are involved in the effort.

“Results of this project provide sound data to help decipher whether it is worth the opportunity and cost to dedicate three additional days to the cow herd to accomplish AI during a season when time and labor resources are very precious commodities,” Dahlen says.

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Courtesy of Tracy Frank/The Forum of Fargo-Moorhead

Pigs are the ideal model to study how food affects health and well-being.

Animal Steroids' Don't Affect Human Puberty

Ever wonder if the meat from cattle that received growth-promoting steroidal implants influences the onset of puberty in young girls?

Research that NDSU Animal Sciences Department professor Eric Berg conducted suggests it does not. Berg used pre-pubertal female swine as a biomedical model for human girls.

Pigs are simple-stomached omnivores like humans. Pigs digest food similar to us, and the consumed food influences hormone release in pigs as it does in humans.

"They are the ideal model to study how food affects health and well-being," says Berg, who selected pigs at weaning that all were born on the same day and had the same sire genetics.

Pigs were housed in the same facility but separate pens and received a similar grain-based diet low in estrogenic properties. The pigs were divided into four feed groups. Group one ate the base diet, group two was fed a quarter-pound of cooked "natural" hamburger and group three received a quarter-pound hamburger from steers that had received growth-promoting steroidal implants twice while in the feedlot. Group four received a quarter-pound cooked tofu (meat alternative) burger.

The beef burger treatments then were compared with the meat-alternative tofu burger that also was fed every day. The burgers were fed until each gilt reached puberty. The estrogenic content of the burgers was lowest in the "natural" beef, while it was three times higher in the "implanted" beef. Mating out at the top was the tofu; its estrogen content was 572 times higher than in the natural burger.

"Despite the large difference in estrogenicity, none of the treatments significantly influenced the onset of puberty," Berg says. "If you accept pigs as a model for humans, then eating a burger a day from the time you are weaned won't promote early puberty in girls."

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Research Improves Cover Crop Knowledge

Researchers at NDSU's Central Grasslands Research Extension Center are filling in the knowledge gaps about cover crops.

Cover crops, which establish and grow quickly, can provide soil cover to control wind and water erosion, says Guojie Wang, forage agronomist at the center. Cover crops also improve soil fertility by increasing the humus input into the soil and increase the land's biodiversity, which can benefit pollinators and wildlife habitat.

The researchers' work includes screening and evaluating four groups of annual forage species: brassicas (turnips, radishes, rape, kale, swede and cabbage), small grains (wheat, barley, oat, triticale and rye), legumes (clovers, peas, beans, vetches and lentils) and warm-season grasses (millets, proso, sorghum, sudangrass and sorghum-sudangrass hybrids).

Wang and his colleagues also are studying whether:

- Full-season cover crops can be used in cropping rotation systems as a breaking crop or as forages for livestock production.
- Late-season cover crops can be used as alternatives in prevented-planting areas.
- Growing double crops, or two crops in the same season, is worth considering because of North Dakota's short growing season and limited soil water. For example, the first crop could be harvested as forage earlier than as grain, giving the following crop a longer growing period.

The researchers also are studying winter cereal grains, which they say have unique niches in North Dakota as forage and cover crops. The winter cereal grains can be seeded in early September to avoid spring seeding problems, and they mature early, especially for forage purposes. After winter cereal grains are harvested for hay or grain, cover crops can be seeded into the stubble.

"Hopefully, through these projects, we can shed some sunlight about this important topic and understand better about cover crops issues," Wang says.

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Cover crops also improve soil fertility by increasing the humus input into the soil, and increase the land's biodiversity, which can benefit pollinators and wildlife habitat.

Woody Plants Greening the Plains

“It’s the jewel of North Dakota,” says Todd West, associate professor and woody plant specialist. West is referring to the NDSU Dale E. Herman Research Arboretum near Absaraka. It’s the main research station for evaluating woody plants for release to the public.

The Absaraka arboretum was named after Herman, who was a research horticulturist and professor at NDSU for more than 35 years. Through his research, more than 50 woody plant varieties were released.

“The research arboretum has the largest collection of woody plants in North Dakota,” West says. “I wish everyone could enjoy this plant paradise as much as I do.”

Other woody plant research areas are near Minot, Dickinson, Carrington, Langdon, Grand Forks, Bismarck and Fargo.

Two variety releases were made in 2014. The Cinnamon Curls Dwarf Korean birch is a distinctive dwarf selection of Korean birch, which grows in a diminutive, compact, single-stemmed form.

The Northern Empress Japanese elm is a very hardy small to medium-sized growing elm with a rounded crown, open branching and attractive summer and fall foliage.

Future potential releases include:

- Upright Ohio buckeye – specimen tree no wider than 12 feet
- Early coloring sugar maple – begins fall color around Sept. 15
- Upright Japanese tree lilac – superior boulevard tree
- Upright thornless honeylocust – superior boulevard tree
- Upright burr oak – superior boulevard tree
- Dwarf Japanese tree lilac – smaller specimen tree

“It can take years to develop a new woody plant variety, so it takes patience,” West says. “There is a deficiency of adapted, winter-hardy, pest-resistant woody plants for landscape uses in the northern Great Plains. However, the NDSU Woody Plant Improvement Program enhances, diversifies and increases the inventory of usable landscape plants for this region.”

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It’s the jewel
of North Dakota.





Courtesy of Forum News Service/Agwee/Mikkel Patas

Experiment Station Releases New Crop Varieties

The North Dakota Agricultural Experiment Station continues to enhance producer productivity through the release of new crop varieties. Various NDSU departments, Research Extension Centers and the Main Research Station in Fargo work collaboratively in the development of new varieties.

Two red kidney bean cultivars and one potato cultivar were released in 2014.

Talon is a high-yielding, dark red kidney bean with high levels of tolerance to the root rot fungal complex commonly present in Minnesota. It has shown a superior seed yield of 200 pounds more per acre, compared with other cultivars commonly grown in the region. Talon is resistant to bean common mosaic virus and has shown resistance to the new race of bean rust present in North Dakota. Greenhouse screenings for anthracnose showed that it is resistant to race 7 but susceptible to race 73.

Rosie is a high-yielding, full-season, light red kidney bean with high levels of tolerance to the root rot complex in Minnesota. It has shown a superior seed yield, compared with other regional cultivars. Averaged across all environments, Rosie produced 890 pounds per acre more than CELRK, 440 pounds more than Foxfire and 180 pounds more than Pink Panther. Rosie is resistant to the bean common mosaic virus but is susceptible to the new race of bean rust present in

North Dakota. Greenhouse screenings for anthracnose showed that it is resistant to race 7 but susceptible to race 73.

Rosie was one of the top 10 performers out of 300 in Michigan's U.S. Department of Agriculture low-nitrogen tests. This could be a very important trait for a kidney bean grown in Minnesota, where a lot of nitrogen is used. Rosie has potential to be grown in other areas such as Nebraska and Puerto Rico.

Dakota Ruby is an attractive, bright red-skinned potato cultivar for the fresh market. The vine is vigorous and erect to semierect, and has a determinate growth habit and medium maturity. The strengths of Dakota Ruby include uniform tubers with a bright red color that is retained in storage and smooth skin. In yield trials from 2006 to 2012, Dakota Ruby yielded more than Dakota Jewel and Red LaSoda but less than Red Norland. An advantage of Dakota Ruby over other red-skinned varieties is the greater number of tubers in the 0- to 4-ounce and 4- to 6-ounce range. Smaller tuber size profiles often demand higher prices in the market.

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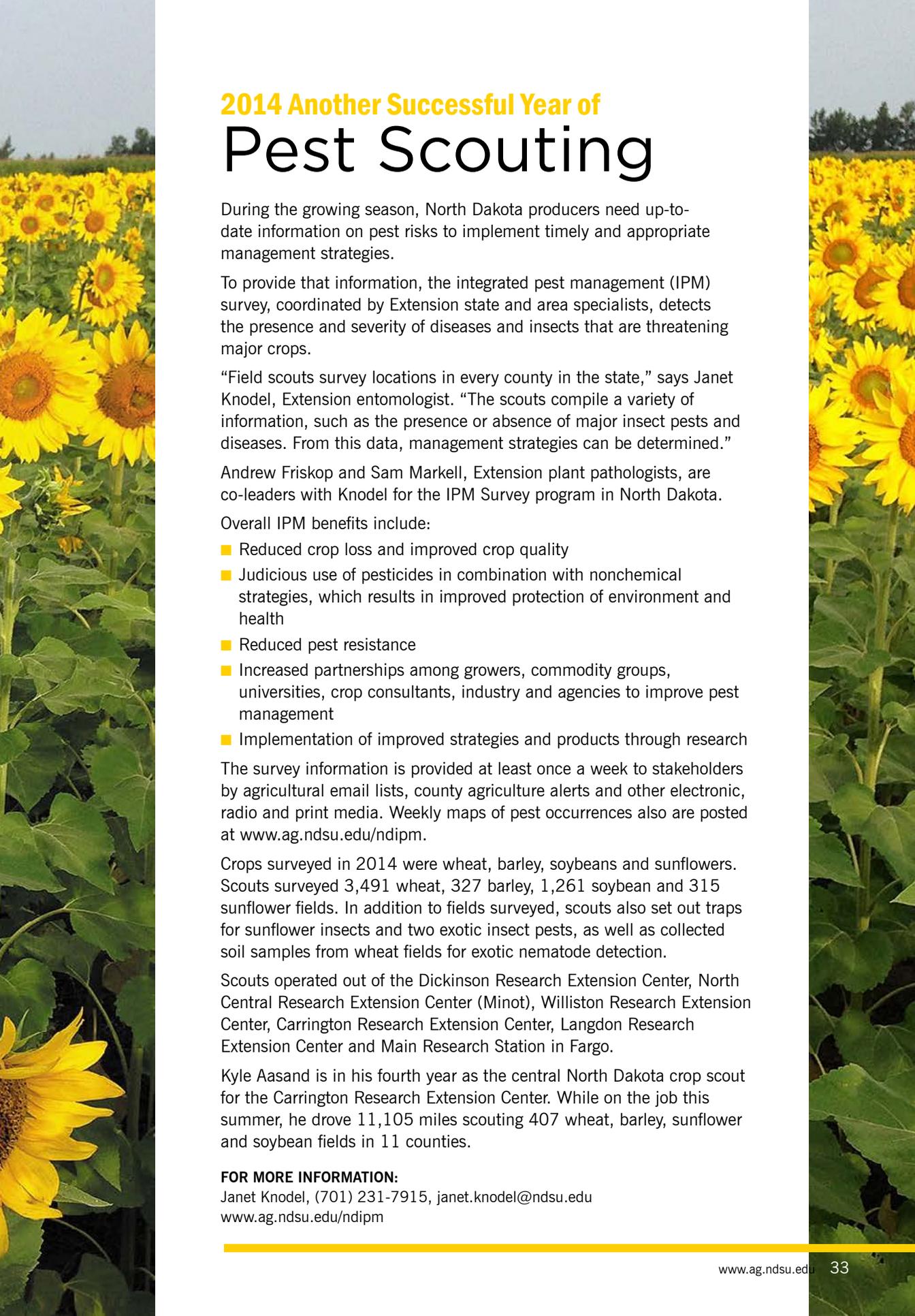
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From this data, management strategies can be determined.



2014 Another Successful Year of Pest Scouting

During the growing season, North Dakota producers need up-to-date information on pest risks to implement timely and appropriate management strategies.

To provide that information, the integrated pest management (IPM) survey, coordinated by Extension state and area specialists, detects the presence and severity of diseases and insects that are threatening major crops.

“Field scouts survey locations in every county in the state,” says Janet Knodel, Extension entomologist. “The scouts compile a variety of information, such as the presence or absence of major insect pests and diseases. From this data, management strategies can be determined.”

Andrew Friskop and Sam Markell, Extension plant pathologists, are co-leaders with Knodel for the IPM Survey program in North Dakota.

Overall IPM benefits include:

- Reduced crop loss and improved crop quality
- Judicious use of pesticides in combination with nonchemical strategies, which results in improved protection of environment and health
- Reduced pest resistance
- Increased partnerships among growers, commodity groups, universities, crop consultants, industry and agencies to improve pest management
- Implementation of improved strategies and products through research

The survey information is provided at least once a week to stakeholders by agricultural email lists, county agriculture alerts and other electronic, radio and print media. Weekly maps of pest occurrences also are posted at www.ag.ndsu.edu/ndipm.

Crops surveyed in 2014 were wheat, barley, soybeans and sunflowers. Scouts surveyed 3,491 wheat, 327 barley, 1,261 soybean and 315 sunflower fields. In addition to fields surveyed, scouts also set out traps for sunflower insects and two exotic insect pests, as well as collected soil samples from wheat fields for exotic nematode detection.

Scouts operated out of the Dickinson Research Extension Center, North Central Research Extension Center (Minot), Williston Research Extension Center, Carrington Research Extension Center, Langdon Research Extension Center and Main Research Station in Fargo.

Kyle Aasand is in his fourth year as the central North Dakota crop scout for the Carrington Research Extension Center. While on the job this summer, he drove 11,105 miles scouting 407 wheat, barley, sunflower and soybean fields in 11 counties.

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NDAWN

Provides Economic and Environmental Benefits

The North Dakota Agricultural Weather Network (NDAWN) continues to provide economic benefits through the collection of weather data.

“The network provides local industry and decision makers with valuable assistance in the timing and proper quantity of needed crop applications that result in a direct economic and environmental advantage,” says Adnan Akyuz, North Dakota’s state climatologist and NDSU associate professor of climatological practices. “These data have become a part of the North Dakota climatological archive and will become more valuable as the period of record grows and new models are implemented.”

During the years and locations when the risk of Fusarium head blight infection was high, as indicated by the NDAWN disease forecasting models, producers responded by effectively managing fungicide applications that saved North Dakota producers about \$26 million per year. In years when the disease risk was low, producers saved millions of dollars in input costs.

One of the benefits of utilizing NDAWN data is to reduce the amount of pesticides that the sugar beet growers use. If growers can eliminate one fungicide application from their cercospora program, they have the potential to save \$20 per acre. On about 450,000 acres of sugar beets, the savings amount to \$9 million annually.

The American Crystal Sugar Co. (ACSC) has designed a Pest Text Alert System that utilizes NDAWN data to alert growers about:

- Soil temperatures for timing rhizoctonia fungicide applications
- Growing degree days for the second application of insecticide granules for root maggots
- Growing degree days for peak fly emergence and post emergence insecticide applications
- Daily infection value alerts for favorable cercospora development

The ACSC has identified \$78 million in net benefit to growers by increasing the control of root maggot flies, cercospora and rhizoctonia. Ten percent of the savings are due to the utilization of NDAWN data.

If North Dakota potato growers can avoid one to two applications of fungicide by using NDAWN data, then farmers can realize a net profit of \$1 million to \$2 million per year.

Based on the documented economic benefit facts and the cost of the weather stations that need to be maintained annually, the most conservative numbers indicate that the state’s agricultural sector saves \$150 for every dollar spent for NDAWN.

“These numbers will likely multiply as NDAWN becomes 100 percent near-real time,” Akyuz says. “Today, the NDAWN network is utilizing the latest technology to provide the best service for the ever-growing NDAWN user base. As technology advances, we cannot afford not to take advantage.”

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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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