

For the Land and Its People

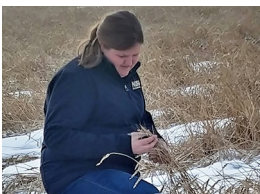
North Dakota Agricultural Experiment Station and NDSU Extension Newsletter

Precision agriculture technology adoption and usage

NDSU
scientists study
pain responses
of sheep



NDSU Extension
focuses on 2019's
ag challenges



Leadership
training benefits
North Dakota



4-H volunteers
impact North
Dakota positively



January-February 2020

Welcome to the new North Dakota Agricultural Experiment Station (NDAES) and NDSU Extension newsletter.

The North Dakota Agricultural Experiment Station and NDSU Extension contribute greatly to the economic success of North Dakota agriculture and improve the lives of North Dakota citizens on a daily basis.

The goal for this bimonthly publication is to highlight the work we are doing and the impact made by the NDAES and NDSU Extension. I am pleased to share some of our accomplishments in this issue.

Enjoy.

Greg Lardy

Vice President for Agricultural Affairs
NDSU Extension Director
North Dakota Agricultural Experiment Station Director

NDSU NORTH DAKOTA
STATE UNIVERSITY

North Dakota Agricultural Experiment Station
NDSU Extension



Our goal for the future will be to continue to use these technologies and the resulting data to help us create a strategic, highly efficient, whole-systems approach to farming.

NDSU Research Examines Precision Agriculture Technology Adoption and Usage

The ancient Greek philosopher Plato said that necessity is the mother of all invention, meaning that a specific need or problem encourages the creative efforts to solve that problem.

The introduction of precision agriculture technologies has helped modern farmers solve many problems. Satellite imagery, unmanned aerial vehicles (UAVs), auto-steer, sensors and data analytics are all part of the technology that some farmers use to help them deal with the growing complexities of farming.

But the cost of these technologies can be prohibitive for some operations, and the training and knowledge needed to operate them can make some producers shy away from using them.

For precision agriculture technology manufacturers, the need to understand who is using these technologies and how they are being used is vital to remaining in business. For policymakers, understanding how the technology is being adopted can help direct funding for future precision agriculture research and education. For farmers, knowing what technology their peers are adopting can help them make more informed decisions about the future of their operations.

To better understand these needs, Max Cossette, an NDSU graduate student in agricultural economics, set out to study precision agriculture technology adoption and usage in North Dakota.

"We surveyed 237 farmers who are landowners and involved in decision making on their farms," Cossette says. "Our goal was to identify data patterns in the adoption and intensity of usage for seven different precision ag technologies: global positioning system (GPS) guidance, autosteer, automatic section control (ASC), satellite imagery, unmanned aerial vehicles (UAVs), variable-rate nitrogen application (VRNA), and variable-rate seeding (VRS)."

Working with Erik Hanson and David Roberts, NDSU Department of Agricultural and Applied Economics assistant and associate professors, respectively, and Paulo Flores, NDSU Agricultural Biosystems and Engineering assistant professor, Cossette identified several key findings:

- ▶ The most commonly used precision agriculture technologies on North Dakota farms are GPS guidance and autosteer, with a 58.2% adoption rate.
- ▶ ASC sprayers are being used by 48.1% of survey respondents, and VRNA technology is being used by 30.4% of respondents.
- ▶ The age of respondents had negative effects on the adoption of many precision agriculture technologies, indicating the older producers are, the less likely they are to adopt these technologies.
- ▶ The more acres of no-till producers farm, the more likely they are to adopt ASC sprayers and VRS planters. Researchers agree that a possible explanation for this is that equipment operators have a hard time judging shut-off points for sprayers and planters because of stubble on no-till land. Therefore, these technologies may provide increased efficiency and savings on no-till ground.
- ▶ Conversely, no-till land acreage had a negative effect on the adoption of satellite imagery, signifying that satellite imagery is used less on no-till ground. A likely reason for this is crop stubble can interfere with normalized difference vegetation index (NDVI) measures that satellite imagery uses in early season crop monitoring.
- ▶ More acres in cultivation had positive effects on the adoption of VRS, VRNA, satellite imagery for nitrogen management, GPS guidance, auto-steer and ASC sprayer technology. Researchers expected this finding because these technologies provide greater economic benefit when used on more land.
- ▶ The more acres of wheat producers planted, the less likely they were to adopt VRS and VRNA technology. Researchers speculate that wheat's small seed size contributes to the negative impact on VRS technology usage. Wheat acreage's negative impact on VRNA technology adoption is likely due to nitrogen being applied at a low rate on wheat, with in-season application often not required.

Future precision agriculture technology adoption

"One of the main goals of this study was to see what technologies North Dakota farmers are currently using and to help them gain an understanding of where the industry is headed in the future," Cossette says.

The research indicates that farmers plan to increase their use of precision agriculture technology. Survey respondents indicated that during the next five years:

- ▶ 28.7% plan to increase their use of VRNA technology
- ▶ 27.4% plan to increase their use of VRS technology
- ▶ 27% plan to increase their use of satellite imagery
- ▶ 19% plan to increase their use of UAVs

"Our family has been using much of this technology on our diversified grain operation for more than 15 years," says Thomas Richman of Tower Farms Seed in Tower City, N.D. "Most recently, we've seen the real-time benefits of UAVs for scouting disease, checking field drainage and general crop progress.

"Our goal for the future will be to continue to use these technologies and the resulting data to help us create a strategic, highly efficient, whole-systems approach to farming," Richman adds.

FOR MORE INFORMATION:

Erik Hanson, 701-231-5747,
erik.drevlow.hanson@ndsu.edu

Scientists at the Hettinger Research Extension Center (HREC) and North Dakota Agricultural Experiment Station on campus hypothesized that lamb performance may be affected by stress and pain associated with common castration and tail-docking procedures.

The researchers theorized that Flunixin Meglumine (FM) would decrease the lambs' stress behavior and affect their cortisol levels and average daily gain. FM is a nonsteroidal anti-inflammatory drug (NSAID) used to treat pain and reduce fever or inflammation in animals.

Christopher Schauer, HREC director, says that to test the theory, 182 male Rambouillet lambs were divided into four treatments:

- A saline injection 15 to 30 minutes prior to rubber ring castration and tail docking
- An FM injection 15 to 30 minutes prior to rubber ring castration and tail docking
- A saline injection 15 to 30 minutes prior to surgical castration and emasculator docking
- An FM injection 15 to 30 minutes prior to surgical castration and emasculator docking

As the lambs were restrained manually, researchers used a visual scale to assess stress based on the lambs' lying or standing with various positions of the limbs and head. These physical evaluations were taken immediately after castration and tail docking by both methods plus at 30-minute periods for three hours afterward. In addition, the lambs were scored for swelling and wound appearance.

For the first 60 minutes, the rubber ring lambs had higher levels of pain, compared with surgical castration and docking, with no differences because of FM administration. However, at 180 minutes after castration and docking, behavioral stress was lower for rubber ring lambs that received FM and highest for surgical lambs that did not receive FM. This part of the trial indicates that FM may be beneficial for reducing behavioral-related stress in surgically castrated and docked lambs.

"Cortisol is the stress hormone that functions as nature's built-in alarm system," Schauer says. "A high level in the blood signifies stress. Blood was drawn at 30 minutes before the procedure and 30, 90 and 140 minutes after for cortisol analysis. In all four treatments, cortisol concentration peaked in the lambs 30 minutes after the procedure, indicating that's when the lambs were most stressed. Over the time frame we measured cortisol, it became evident that FM administration decreased overall cortisol concentrations, especially in lambs that were surgically castrated and docked."

The lambs were weighed every two weeks until weaning at six to eight weeks, and average daily gain was not affected by treatment.

"Lamb docking and castration are ethically acceptable practices; the benefits outweigh welfare risks," Schauer says. "FM administered during castration and docking decreases stress when measured by both cortisol in blood and animal behaviors, depending on the castration and docking method. The use of pain relievers to decrease stress in baby lambs has not been a widely studied topic, but this trial points to some interesting findings that warrant additional research."

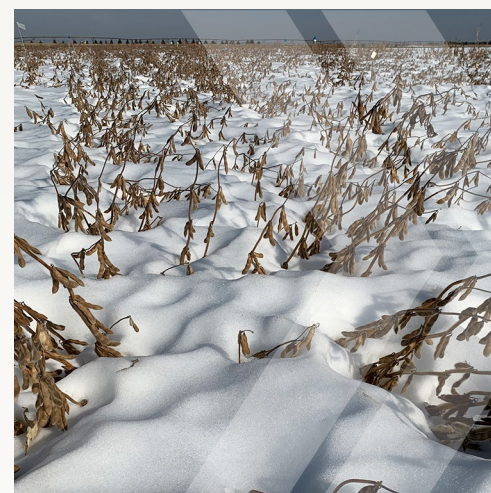
FOR MORE INFORMATION:

Christopher Schauer, 701-567-4323, christopher.schauer@ndsu.edu

NDSU Scientists Study Pain Responses of Sheep



Paige Anderson, a master's student in Animal Sciences from Jackson, Minn., weighs a lamb as part of this research project.



NDSU Extension Focuses on 2019's Ag Challenges

A wet spring that led to late planting. Low commodity prices and trade wars. Fall rain and snow that hampered harvest. Feed shortages for the winter.

In 2019, North Dakota farmers were hit by multiple whammies, and NDSU Extension staff are doing what they can to help.

Miranda Meehan, livestock environmental stewardship specialist, leads biweekly calls for state agencies and organizations. These include the USDA Farm Service Agency (FSA), state departments of Agriculture and Emergency Services, commodity groups and congressional offices.

"These calls enable agencies and organizations across the state to coordinate efforts and respond more effectively to the needs of farmers and ranchers," Meehan says. "Discussions during these calls have led to NDSU Extension conducting surveys to assess storm impacts, forage availability and corn status. The information gleaned from these surveys was used in both the secretarial and presidential disaster requests and led to the development of state forage assistance programs."

Meehan says a key has been county Extension agents, who are boots on the ground to review and assess damage, listen to farmers and ranchers, and share information.

In Ward County, Extension agent Paige Brummond says, "Much of our wheat crop was left unharvested and will be destroyed come spring as it has no value since it would cost more to harvest it than it is worth, plus it would be nearly impossible to harvest after the winter weather conditions."

Angie Johnson, Extension agent in Steele County, says, "We are looking at 75% standing corn left out in the fields to be harvested. We are seeing some mold issues develop on the ears. This is a big concern for our livestock producers, as those molds produce mycotoxins that can cause issues if fed to livestock."

"Another quality concern is the low test weights," she adds. "The standard test weight of corn is 56 pounds per bushel, and I have heard test weights as low as 39 pounds per bushel. At our local elevator, that is a 68-cent-per-bushel discount on a corn market that is already on the low side."

As many Extension agents did, Johnson worked with her county FSA director and emergency manager to estimate losses from the Oct. 10 snowstorm. They developed a spreadsheet that helped calculate the damage, an estimated \$16 million in crop and livestock loss in Steele County. The spreadsheet was used across the state to help assess damage, which led to county and state emergency declarations.

Extension sponsored a public webinar featuring FSA representatives sharing information about government programs available. The recording and additional Extension resources are at www.ag.ndsu.edu/agdisaster.

The challenges are especially stressful when they're out of producers' control. Family science specialist Sean Brotherson works with Extension agents and specialists to provide education through the www.ag.ndsu.edu/farmranchstress website, publications, podcasts, programs, news releases and social media.

"Your health is your most important asset as a farmer or rancher," Brotherson says. "Just like it's important to maintain your farm equipment so that it doesn't break down at a critical time, the same is true of your health — pay attention to any early warning signs."

With continuing moisture, unknown markets and more challenges, NDSU Extension staff will continue to educate and support North Dakota's farmers and ranchers.

FOR MORE INFORMATION:

Miranda Meehan, 701-231-7683, miranda.meehan@ndsu.edu
Paige Brummond, 701-857-6444, paige.f.brummond@ndsu.edu
Angie Johnson, 701- 524-2253, angela.b.johnson@ndsu.edu
Sean Brotherson, 701-231-6143, sean.brotherson@ndsu.edu



Leadership Training Benefits North Dakota

Finding enough people willing to serve on the boards of governmental units and nonprofit organizations can be a challenge.

North Dakota has 2,665 governmental bodies and 5,815 nonprofit organizations, public charities and private foundations that need leaders. This means that one of every 23 residents over age 18 would need to serve in a leadership role.

To help aspiring, elected and appointed leaders develop the skills and confidence to serve on a board, council or committee, NDSU Extension developed Lead Local. It's a one-day program that teaches participants about the components of an effective meeting, ethics, parliamentary procedure, understanding different personality styles and how they can work together, and conflict resolution.

Stacey Lilja decided to sign up for Lead Local after being elected to the Tower City (N.D.) City Council in 2018.

"I thought it would benefit me since I am in my first term as an elected official and have served on other boards and committees," she says.

"The most important things I learned were how to run an efficient meeting and the personality assessment," she adds. "The understanding of how to communicate with different personalities will help me collaborate with others more effectively."

One of her goals is to help Tower City's City Council meetings run more efficiently, and she has shared some ideas she gained through Lead Local with the mayor.

"He is supportive and wants to help make some changes to how the council meetings are conducted," Lilja says.

She is one of nearly 400 people who have participated in Lead Local sessions at 24 locations throughout North Dakota. Agriculture-related groups sponsored three of the sessions, which were attended by 62 people.

"I strongly recommend Lead Local because living in North Dakota, there is a good chance you will be asked to serve on a board or committee," she says. "The course gives you the tools to be confident in saying yes and serving successfully."

FOR MORE INFORMATION:

Lynette Flage, 701-231-7782, lynette.flage@ndsu.edu

www.ag.ndsu.edu/lead/leadership-development-program/lead-local



The course gives you the tools to be confident in saying yes and serving successfully.



4-H Volunteers Impact North Dakota Positively

What is the value of an adult 4-H volunteer?

Is it the number of hours they spend at a 4-H club meeting each month? Is it the way they mentor a 4-H member in a specific project area? Is it how many 4-H members they recruit in a given year? Maybe the value of a 4-H volunteer is so much more.

The North Central Region 4-H Volunteer Study, recently conducted across a 12-state region, aimed to understand and document the specific value and impact that 4-H volunteers have on the 4-H youth development program and in communities.

Specifically, the goals of the study were to:

- Document what individuals believe they gain from their experiences as a 4-H volunteer
- Investigate the organizational benefits the 4-H program gains from volunteers
- Assess volunteers' beliefs about the public value of volunteering with the 4-H program

The electronic survey was sent to 1,000 randomly selected volunteers in each state, and 2,978 volunteers, including 225 from North Dakota, completed the survey.

"We have always known the value of 4-H volunteers, but through this study, we learned their impact goes beyond the scope of the program and leads to changes in communities," says Rachelle Vetter, NDSU Extension associate professor, and leadership and volunteer development specialist.

"Extension volunteers are at work in nearly every community in North Dakota, and their communities need them," says Brad Cogdill, NDSU Extension Center for 4-H Youth Development chair. "This study reaffirms that the private growth of an individual volunteer transforms into public benefit and stronger communities."

Stutsman County 4-H volunteer Ben Weber says, "The 4-H program has created new friendships that have grown into opportunities for me and my children."

Brenda Weber, also a 4-H volunteer, adds, "On a personal level, I have learned valuable leadership skills that extend beyond 4-H, but seeing the kids learn a new skill or take on a leadership role is my favorite part of being a 4-H volunteer."

FOR MORE INFORMATION:

www.ndsu.edu/4h/volunteers_leaders/4_h_volunteer_impact_study
Rachelle Vetter, 701-231-7541, rachelle.vetter@ndsu.edu



The survey research demonstrated three key findings:

4-H volunteers gain personal skills

Volunteers come into the 4-H program hoping to support youth and make a difference, but they also gain skills in teaching, leadership and communication. These skills transfer to other environments in which volunteers work and live.

Survey respondents indicated:

- 95%** built new relationships with youth
- 87%** gained skills that were useful in other settings
- 82%** increased their confidence as a leader

NDSU Extension benefits significantly from 4-H volunteers

Volunteers give their time, talents and energy to the 4-H youth development program. On average, North Dakota's 4-H volunteers give seven hours per month to the 4-H program in their communities. Annually, that time is worth \$2,165 per volunteer.

Survey respondents reported:

- 89%** made connections in the community on behalf of 4-H
- 85%** spoke about the value of the 4-H program
- 83%** recruited new youth to 4-H
- 70%** recruited and helped train new 4-H volunteers

Communities are stronger because of 4-H volunteers

Volunteers impact the communities where they live and work. 4-H volunteers network with other volunteers, helping communities and organizations stay better connected. Volunteers donate their time and service to community gardens, retirement homes, cleanup projects, fairs and other civic engagement endeavors.

- 93%** say volunteering with 4-H makes communities stronger
- 91%** say volunteering with 4-H contributes to better connected communities
- 87%** say volunteering with 4-H improves the health of communities
- 87%** say volunteering with 4-H increases civic engagement

NDSU

Agricultural Affairs

North Dakota State University
Dept 7520, PO Box 6050
Fargo, ND 58108-6050

Would you like For the Land and its People newsletter emailed to you on a bimonthly basis?
Visit www.ndsu.edu/vpag/newsletter to subscribe today. We will never share, trade or sell your email address.

www.ag.ndsu.edu

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, the Agronomy Seed Farm in Casselton 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.

NDSU Extension empowers North Dakotans to improve their lives and communities through science-based education. We serve all people of the state through our 52 county and Fort Berthold offices, seven Research Extension Centers and the main campus in Fargo.

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 me.

Greg Lardy

Vice President for Agricultural Affairs
NDSU Extension Director
North Dakota Agricultural Experiment Station Director
NDSU Dept. 7520, 314 Morrill Hall, Box 6050
Fargo, ND 58108-6050
701-231-7655
gregory.lardy@ndsu.edu

NDSU NORTH DAKOTA STATE UNIVERSITY

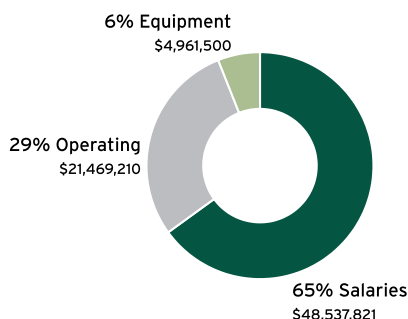
NDSU does not discriminate in its programs and activities on the basis of age, color, gender expression/identity, genetic information, marital status, national origin, participation in lawful off-campus activity, physical or mental disability, pregnancy, public assistance status, race, religion, sex, sexual orientation, spousal relationship to current employee, or veteran status, as applicable. Direct inquiries to Vice Provost for Title IX/ADA Coordinator, Old Main 201, NDSU Main Campus, 701-231-7708, ndsu.eoaa@ndsu.edu. This publication will be made available in alternative formats for people with disabilities upon request, 701-231-7881.

Year 1 Summary of 2019-2021 Biennium

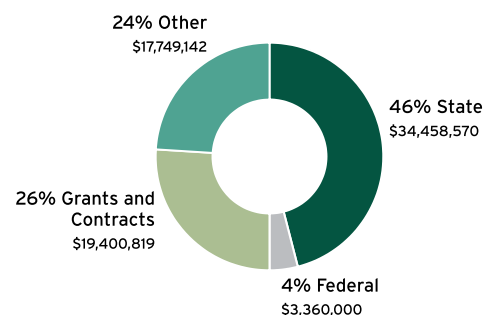
2019-2021 Annual Budget Book – Authorization (Excludes Capital)

North Dakota Agricultural Experiment Station

Budgeted Expenses

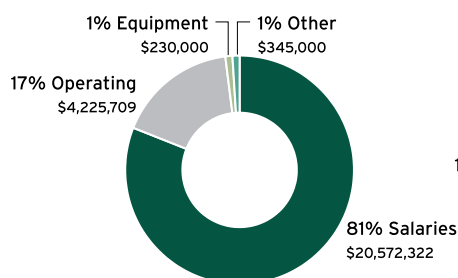


Funding Source



NDSU Extension

Budgeted Expenses



Funding Source

