

For the Land and Its People

NDSU College of Agriculture, Food Systems, and Natural Resources > North Dakota Agricultural Experiment Station > NDSU Extension

NDSU Extension Agile in Response to Drought

Pulse Crops:
The Food of the Future



NDSU Research
Aims to Help Farmers
Capture Carbon Credits



Living On My Own
Provides Real-life Simulation



4-H Camp Strengthens
North Dakota's Future



3D Printing Class
First of its Kind at NDSU



January–February 2022

The definition of the word “responsive” is reacting quickly and positively. To serve the citizens of the North Dakota, NDSU Agriculture strives to proactively respond to the questions and issues facing our state. This includes research that benefits our agricultural community, recommendations for weathering changing conditions and education to prepare students for careers of the future. We invite you to learn more about how the College of Agriculture, Food Systems, and Natural Resources (CAFSNR); North Dakota Agricultural Experiment Station (NDAES); and NDSU Extension are reacting quickly and positively in this issue of For the Land and Its People.

Enjoy.

Greg Lardy

Vice President for Agricultural Affairs

NDSU NORTH DAKOTA
STATE UNIVERSITY

College of Agriculture, Food Systems, and Natural Resources
North Dakota Agricultural Experiment Station
NDSU Extension



NDSU Extension had well-established relationships and collaborations to respond proactively with drought resources for farmers and ranchers.

NDSU Extension Agile in Response to Drought

NDSU Extension's agility during the drought allowed Extension agents and specialists to provide timely resources and support for farmers and ranchers in North Dakota.

Having hosted bi-weekly disaster response calls with federal and state agencies and stakeholder groups in the state since 2019, NDSU Extension had well-established relationships and collaborations to respond proactively with drought resources for farmers and ranchers.

As a result of NDSU Extension's leadership in disaster response, Miranda Meehan, NDSU Extension livestock environmental stewardship specialist and disaster coordinator, was appointed as co-leader for the drought recovery section of the state's Unified Command.

NDSU Extension's public response began early in winter 2021 with a webinar series to aid ranchers in developing drought plans. This series was followed by a monthly webinar series to help ranchers navigate the ongoing drought in April through October.

As the drought progressed, NDSU Extension observed, assessed and documented local drought impacts, helping to open the door for federal and state assistance programs.

"County-based Extension agents played a crucial role in monitoring drought conditions for the drought monitor map," says Meehan.

The drought monitor map is used to determine the need for drought disaster designation that triggers federal assistance programs. That information is also used by decision makers at the state level to determine needs for additional assistance for farmers and ranchers impacted by drought.

Extension agents also helped ranchers monitor the drought's impact on water quality through NDSU Extension's Livestock Water Quality program.

"If you look at the maps of livestock water projects funded through the state Water Commission, a lot of the projects funded were in areas where Extension agents have been screening water samples," says Meehan.

Additionally, NDSU Extension assessed drought impacts to forage and feed resources, resulting in \$2.5 million from the Emergency Feed Transportation Assistance program through the North Dakota Department of Agriculture.

FOR MORE INFORMATION:

<https://www.ndsu.edu/agriculture/ag-hub/ag-topics/disasters/drought>

<https://www.youtube.com/watch?v=tYI7Mysepd4>

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1,541

water samples
screened



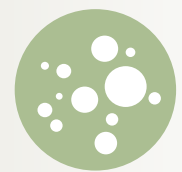
1,152

locations



39

counties



Total Dissolved Solids

142

identified sources that
may contribute to poor
livestock performance

144

identified sources with
potential to negatively
impact livestock health

20

identified sources with
deadly levels



Pulse Crops: The Food of the Future

Pop quiz! Name a group of plants that have been cultivated for more than 10,000 years and are still at the forefront of today's food technology? If you answered pulse crops, you are right!

Pulse crops, including dry peas, lentils and chickpeas, are playing a major role in addressing global food security and environmental challenges, as well as contributing to healthful diets. Pulses are linked to:

- Food security because they are a critical and inexpensive source of plant-based protein, vitamins and minerals
- Human health because their consumption can prevent and help manage obesity, diabetes and coronary conditions
- Sustainable agriculture because they are able to biologically fix nitrogen and free soil-bound phosphorus

"The growing demand for pulse crops is due to the incorporation of more plant-based protein in the American diet," says Hannah Worrall, a pulse crop research specialist at the North Central Research Extension Center (NCREC) in Minot. "Pea protein is a main ingredient in many alternative meat products."

For these reasons and because of their suitability for the soil and climate of western North Dakota, the pulse crop breeding program is a key research focus at the NCREC.

Originally started in 2008 and now led by Nonoy Bandillo, NDSU Department of Plant Sciences assistant professor and pulse crop breeder, the pulse crop breeding program on NDSU's campus partners with the NCREC and multiple Research Extension Centers across the state to advance pulse production in North Dakota. The program focuses on developing and releasing

high-yielding varieties with increased resistance to pests and diseases and expanding opportunities for marketing pulse crops.

Though the release of new varieties ND Dawn yellow field pea and ND Crown chickpea were major milestones for the pulse breeding program in 2020, the program is not slowing down. Some of the cutting-edge technologies currently being studied or developed are:

- High-protein varieties
- Climate-resilient varieties
- Specialty-type varieties, such as zero-tannin lentil
- Precision-breeding using molecular markers for disease resistance
- Genomic selection
- High-throughput phenotyping using unmanned aerial systems and robotics

In addition to these projects, Bandillo's pulse breeding program was recently awarded a \$1.2 million grant to build genomic resources, breeding models and tools for improving total protein content in peas.

"Everybody talks about a projected world population of nine billion people by 2050," says Bandillo. "What they do not tell you is that as part of this growth there will also be a rising demand for pulse crops, as the front runner for protein-rich ingredients. We hope to help North Dakota pulse farmers capitalize on this growth."

FOR MORE INFORMATION:

https://www.ndsu.edu/research/news/ndsu_pulse_crops_breeder_nonoy_bandillo_receives_12_million_grant_to_study_pea_protein/
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NDSU Research Aims to Help Farmers Capture Carbon Credits

You've probably heard that soils have the capacity to capture carbon from the atmosphere and store it for a long time, and conservation-based farming practices can help this process.

This concept is part of emerging carbon market programs incentivizing farmers to increase the carbon content of their soils. These programs pay farmers to store carbon by planting cover crops and not tilling their soil. These stored carbon "credits" are then sold to other companies who want to offset their greenhouse gas emissions.

"We know that increasing soil carbon provides many soil health benefits, yet capturing carbon is not a simple or fast process, as the soil carbon cycle is complicated," says Caley Gasch, NDSU soil science assistant professor in the School of Natural Resource Sciences.

So how can farmers take advantage of carbon credits by guaranteeing the carbon content of their soils, if carbon is constantly cycling through the soil system?

Gasch, along with postgraduate student José Pablo Castro Chacon, NDSU research specialist Joel Bell, and Department of Agricultural and Biosystems Engineering assistant professor Paulo Flores, are working to answer that question.

Though traditional soil laboratory methods can precisely measure carbon in one sample of soil, the research team's goal is to make recommendations to farmers about where and how much to sample in order to guarantee an accurate measure of carbon in the field.

Their current project involves sampling fields throughout the Red River Valley in order to understand more about where carbon is being stored in fields and how to get an accurate measurement as soil conditions can vary widely in one field alone. The team then combines other data sources like drone and satellite imagery and crop yield data to create maps that pinpoint the best places to sample a field for carbon.

In addition, the research team is also testing some of the new commercial sampling tools available on the market that estimate soil carbon without having to remove a soil sample.

"I'm excited about the work we are doing and hope that it will answer questions for North Dakota farmers about whether utilizing carbon markets are right for them," says Gasch.

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The research team's goal is to make recommendations to farmers about where and how much to sample in order to guarantee an accurate measure of carbon in the field.





Living on My Own Provides Real-life Simulation

NDSU Extension's Living On My Own (LOMO) program is a hands-on, real-life simulation providing young people the opportunity to practice life skills and experience their future in a fun way.

"The curriculum was adapted from the University of Florida IFAS Extension," says Carrie Johnson NDSU Extension interim assistant director and family and community wellness program leader. "Students learn how to explore career options, the difference between gross and net income, how to make a deposit and

balance a bank account, the advantages and disadvantages of credit, the components of a credit report and credit score, the different parts of a budget and more."

"During LOMO, students are encouraged to make wise consumer choices, based on lifestyle choices similar to the decisions that adults face daily," says Caroline Homan, NDSU Extension agent in LaMoure County. "The program allows students to learn, do, reflect and apply important life skills."

A simulation is held yearly with seniors from Kulm and Edgeley Public Schools. Thirteen community volunteers manage stations and assume roles such as realtors, bankers, car salesperson, grocers and more.

"Students comment that they had no idea how expensive childcare is, and they are motivated to wait to have children until they have the financial resources to adequately provide for a child," says Homan. "Other students have shared that they didn't realize how stressful it can be to make financial decisions, and they have more empathy for their parents."

"Our community loves this program and being involved because they enjoy working with the students and feel the lessons learned about budgeting are so valuable," says Brandy Klusmann, Kulm Public School counselor.

"When I visit with college students, they often wish they had worked harder at time management and budgeting," says Klusmann. "Living On My Own definitely helps students to learn budgeting and address life skills."

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Kulm and Edgeley Public Schools seniors participated in Living On My Own.





4-H Camp Strengthens North Dakota's Future

North Dakota 4-H Camps provide youth ages 8 to 18 with an opportunity to learn new skills while having fun. The modern camp is on 80 acres nestled in the Cottonwoods along the Missouri River near Washburn, N.D.

"4-H Camp has been committed to providing a safe environment where youth master new skills, and gain independence and confidence for more than 50 years," says Karla Meikle, NDSU Extension's 4-H youth development agent in Morton County. 4-H is an NDSU Extension program.

"All four of my kids attended 4-H Camp which provided numerous opportunities to use communication tools and practice leadership," says Becky Peterson, a N.D. 4-H Foundation Board member from Mandan.

The Peterson kids attribute their 4-H experiences and 4-H Camp to their personal growth, education and career direction.

Thomas is an agricultural engineer for John Deere in Waterloo, Iowa. Daniel is a salesman for Tom James in Boston. Hannah will graduate in Extension education this spring from NDSU, and Samuel is a sophomore in finance and math at NDSU.

"4-H and 4-H Camp showed me my future degree and career path while providing amazing experiences," says Hannah. "Because of 4-H, I have an interest in becoming a 4-H Youth Development agent in North Dakota."

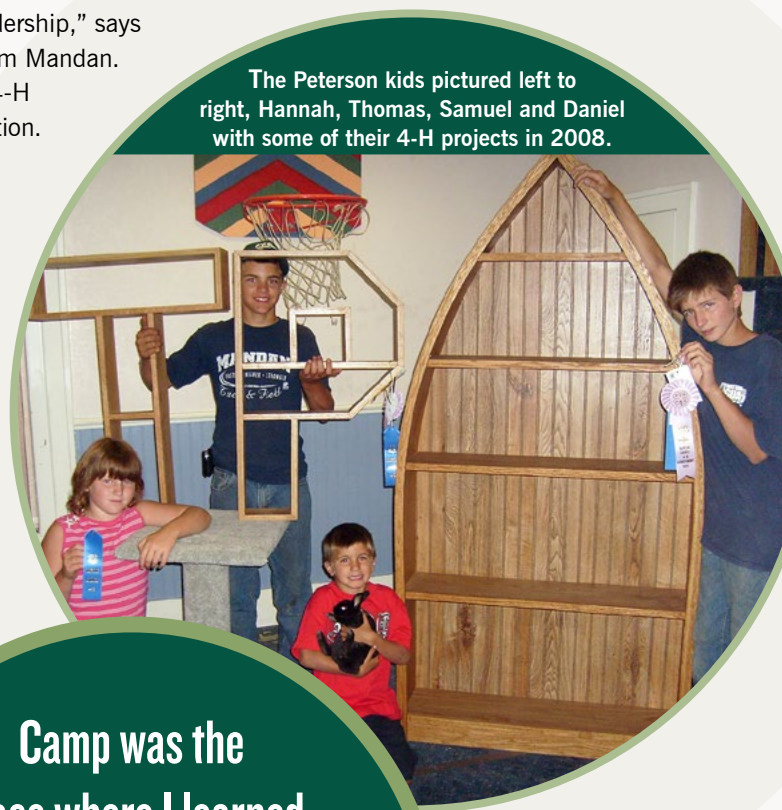
"My camp experiences provided opportunities to learn things I was passionate about and have success in later events due to what I learned at camp," says Samuel.

"Camp was the place where I learned a lot about myself, my leadership style, and how I work with coworkers and customers," says Thomas. "There were ample opportunities to help, go above and beyond, take responsibility, trust your coworkers, adapt, communicate, plan, teach, fail, learn and work with all types of people. Many of those experiences have shaped how I do my job every day."

FOR MORE INFORMATION:

<https://www.ndsu.edu/agriculture/extension/extension-topics/4-h-youth-development/camps>
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The Peterson kids pictured left to right, Hannah, Thomas, Samuel and Daniel with some of their 4-H projects in 2008.



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www.ndsu.edu/vpag

NDSU's Land-Grant Mission

The College of Agriculture, Food Systems, and Natural Resources has a tradition of excellence in educating students for real-world careers. Our students learn from and work with world-class scientists in state-of-the-art facilities. These interactions, along with a relatively low student-faculty ratio, provide opportunities for students to develop their critical thinking skills, to work in a team setting, and to capitalize on hands-on learning experiences that will allow them to be competitive in a global economy.

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.

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3D Printing Class First of its Kind at NDSU

A course focusing on three-dimensional (3D) printing was offered for the first time in the fall of 2021 through the NDSU Department of Agricultural and Biosystems Engineering (ABEN). Agricultural Systems Management 291 – Additive Manufacturing/3D Printing was offered as a trial course in the ABEN curriculum.

Seventeen of the available 20 seats were filled for the first class, which was taught by Matthew Olhoft, a senior lecturer in the ABEN department. Olhoft has been involved with 3D printers for several years and recently attended a major conference on additive manufacturing.

"There is a need for our young engineers coming out of NDSU to be more aware of what they can do with additive manufacturing," says Olhoft. "More and more companies are switching over to additive manufacturing, which is the process of joining materials to make 3D objects from 3D model data. There's just a lot more flexibility and the cost factors tend to be a lot cheaper, especially for producing prototype parts."

The class starts with a brief history of 3D printing, then moves into the different types of 3D printing and the different materials that can be used. It then explores the process of printing, from designing a project to printing the product.

The class toured the manufacturing facilities of LulzBot in Fargo and Fargo 3D-Fuel, which manufactures filament. The president of LulzBot is a graduate of the NDSU Agricultural and Biosystems Engineering Department. Laser-etching, cutting and 3D scanning also were covered during the course.

"In the not-too-distant future, a lot of the parts that you need for machines will probably come to you via the internet," predicts Olhoft. "You'll purchase a 3D file and then you'll actually print the part at your location or a local business."

A farmer, for example, could go to a local supplier who will receive the file and print the part for pick-up the same day, Olhoft pointed out.

"We believe it is essential for our ABEN students to be at the forefront of today's technology," says David Buchanan, NDSU College of Agriculture, Food Systems, and Natural Resources associate dean. "This class provides hands-on learning opportunities for students wanting to be leaders in 3D printing technology."

FOR MORE INFORMATION:

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