



# WINTER 2023

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## NDSU AGRICULTURAL AND BIOSYSTEMS ENGINEERING

### MESSAGE FROM THE CHAIR

■ **LEON SCHUMACHER, Ph.D., department chair**

I have been blessed to be able to work with the ABEN team since January 2022. I am certain there have been some ups and downs, but the ABEN team, as always, has proven to be great problem-solvers for both ABEN and all of agriculture.



Upon my arrival, I met with the faculty and learned more about their research and teaching efforts. Much research is taking place by ABEN faculty!

At the same time, I learned the ABEN Department will be relocating into remodeled office space in Ladd Hall. In December, the faculty moved into remodeled offices on the first floor of Ladd Hall. Additional renovations are underway on the second and third floors for teaching and lab space, with expected completion by May.

Discussions continue about how we will better use the lab space in the existing Pilot Plant. Work has begun on the Peltier Complex, where many of the bioengineering/processing activities will be situated. Lab space in the existing Pilot Plant will be repurposed as the Ag and Biosystems Engineering Lab. Of course, we are looking for a new name for the Pilot Plant, and welcome your ideas, as I will be touching base with campus facilities to learn how to accomplish the renaming of the Pilot Plant in the coming months.

The next focus for the ABEN team during the past year has been student recruitment. Unfortunately, student numbers have slipped, due to a number of factors (including COVID-19), so we began organizing ways to recruit students for the three ABEN programs (ag systems management, precision agriculture and agricultural and biosystems engineering). Recruiting activities were held during the state FFA convention (June), the Career and Technical Education Association convention in Bismarck (July), the Career Expo in Minot (November) and the Career Expo in Fargo (December). ABEN faculty and staff shared information about ag tech, precision agriculture, and agricultural and biosystems engineering with high

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### Faculty and staff

#### Faculty

Leon Schumacher  
 Igathinathane Cannayen  
 Clairmont Clementson  
 Sulaymon Eshkabilov  
 Xiaoya (Iris) Feng  
 J. Paulo Flores  
 Ademola Hammed  
 Kenneth Hellevang  
 Xinhua Jia  
 Zhulu Lin  
 Ewumbua Monono  
 Matthew Olhoft  
 Rob Proulx  
 Scott Pryor  
 Thomas Scherer  
 Dean Steele  
 Xin (Rex) Sun

#### Adjunct faculty

Thomas Bon  
 Lowell Disrud  
 Brian Gregor  
 Elton Solseng

#### Postdoctoral research associates

Mohammed Raju Ahmed  
 Nadia Delavarpour  
 Nadeem Fareed  
 Ibukunoluwa Ajayi-Banji

#### Support staff

Ademola Ajayi-Banji  
 Julie Bietz  
 Jana Daeuber  
 Susan Finneseth  
 Tayler Johnston  
 Dongqing Lin  
 Niloy Sarker  
 Sheldon Tuscherer

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■ [www.ndsu.edu/aben](http://www.ndsu.edu/aben)



■ Like NDSU Agricultural and Biosystems Engineering on Facebook

## MESSAGE FROM THE CHAIR

*continued from page 1*

school teachers, students and others.

Technology is changing the face of agriculture, yet high school teachers have not been trained to teach precision agriculture. High school students, however, are expecting teachers to share this information! Xin (Rex) Sun, Paulo Flores and I (along with several of our grad students) organized a workshop in July 2022 to provide training to 10 high school teachers who filled the workshop.

At the same time, Matt Olhoft was helping the teachers organize lesson plans to minimize the time needed for them to prepare precision agriculture lessons for their students. Since this effort was such a success, plans are already underway for the second precision agriculture workshop, which we expect to hold in June.

Some faculty have assumed roles at other universities during the past two years, and we immediately set out to recruit and hire new faculty. One of our newest faculty members is Xiaoyu (Iris) Feng. Her research is related to bioenvironmental and agricultural structures engineering, including developing laboratory equipment, instrumentation and other tools for teaching the practical applications of the theories and principles of agricultural and bioenvironmental engineering.

The second faculty member joining the ABEN team is Clairmont Clementson. His research focus includes ag product development and utilization, sensors and measurements, biomaterials, value-added agriculture, and grain handling and storage for Northern Plains crops.

Several faculty were awarded grants during the past year. The grant work associated with the USDA Agricultural Research Service precision agriculture efforts necessitated a trip to Starkville, Miss., by Paulo Flores, Rex Sun, Frank Casey, Aaron Reinholz and I. This grant will be renewed for another five years. Paulo and Rex have organized new objectives for their precision agriculture research associated with this project.

I have teamed with Guillermo Scaglia, the new chair in animal science, to plan how we might develop a livestock precision agriculture emphasis at NDSU. Meetings were held with the team from 701x, a Fargo company developing tracking systems for livestock. A plan has been submitted to the College of Agriculture, Food Systems and Natural Resources, and work is ongoing to seek funding for this initiative.

I attended the spring and fall commencement ceremonies and was pleased to learn one of our ag engineering graduates, Justin Lester, was selected to be the student speaker at the College of Engineering fall commencement. Justin worked for Xinhua Jia as an undergraduate student and developed a strong interest in natural and environmental engineering.

We are focusing on the 100-year celebration of Agricultural and Biosystems Engineering at NDSU in 2024. Historical beginnings, images, accomplishments and fellowship will be planned. ■

## Faculty and staff announcements

### Departures:

- **Cengiz Koparan** – Accepted an assistant professor position at University of Arkansas.
- **John Stenger** – Accepted a developer/programmer position with N.D. Agricultural Weather Network (NDAWN).
- **Kenton Jensen** – Retired.
- **Yu (Heather) Zhang** – Accepted a position in private industry.
- **Chelsie Bormann** – Accepted a position with Fargo Moorhead West Fargo Chamber of Commerce.

### New faculty and staff:

- **Clairmont Clementson** – Assistant professor, started in June 2022. Teaching responsibilities include: ASM 323 Post-Harvest Technology; ASM 354 Electricity and Electronic Applications; ABEN 456/656 Biobased Energy; and ABEN 358 Electric Energy Application in Agriculture. Research responsibility will address bioprocessing engineering, including ag product development and utilization, sensors and measurements, biomaterials, value-added agriculture, and grain handling and storage for Northern Plains crops.
- **Xiaoyu (Iris) Feng** – Assistant professor, started in July 2022. Teaching courses related to bioenvironmental and agricultural structures engineering, including ABEN 452/652 Structures and Bioenvironmental Systems Design; ABEN 391 Seminar; ABEN 790 Graduate Seminar; ASM 368 Structures and Environmental Systems; and ASM 475/675 Management of Agricultural Systems. Research will address bioenvironmental and ag structures engineering.
- **Rob Proulx** – Extension ag technology systems specialist, started in January. Programming will focus primarily on technologies and processes associated with precision agriculture, variable rate and spraying technology and machinery. ■



## Alumni!

Help us share information about our great department!

Alumni who receive the Department of Agricultural and Biosystems Engineering's newsletter are asked to share it with any high school students you might know.

**ABEN**



# ABEN offers course for drone pilots

A course focusing on flying drones commercially was offered for the first time last fall through the Department of Agricultural and Biosystems Engineering at North Dakota State University (NDSU).

The course, Precision Agriculture 291 “Drone Pilots for Agricultural Operations,” was new in the fall semester as a trial course in the precision ag curriculum. The course was taught by Dr. Nadia Delavarpour, a post-doctoral research associate, under the supervision of Dr. Paulo Flores, an assistant professor.

As pilots send unmanned aircraft systems (UAS) skyward for commercial use, Federal Aviation Administration (FAA) requirements must be met.

That UAS flight requires more than just the pilot wearing those cool sunglasses.

So, the course’s objective is to give an in-depth, hands-on opportunity for students to prepare themselves to take and pass the FAA Part 107 commercial drone pilot’s license test.

That includes how to get detailed information regarding air spaces, air space classifications, applicable regulations for each classification, preparing certain FAA reports, operating requirements, flight restrictions, weather and other topics.

“We go through all the aeronautical knowledge topics created by the FAA,” Delavarpour said.

The class also includes two field experiences for students to fly drones. One includes a session during which the students fly the drones manually without apps or software, while the second session allows students to fly the drones autonomously using apps without human interference.

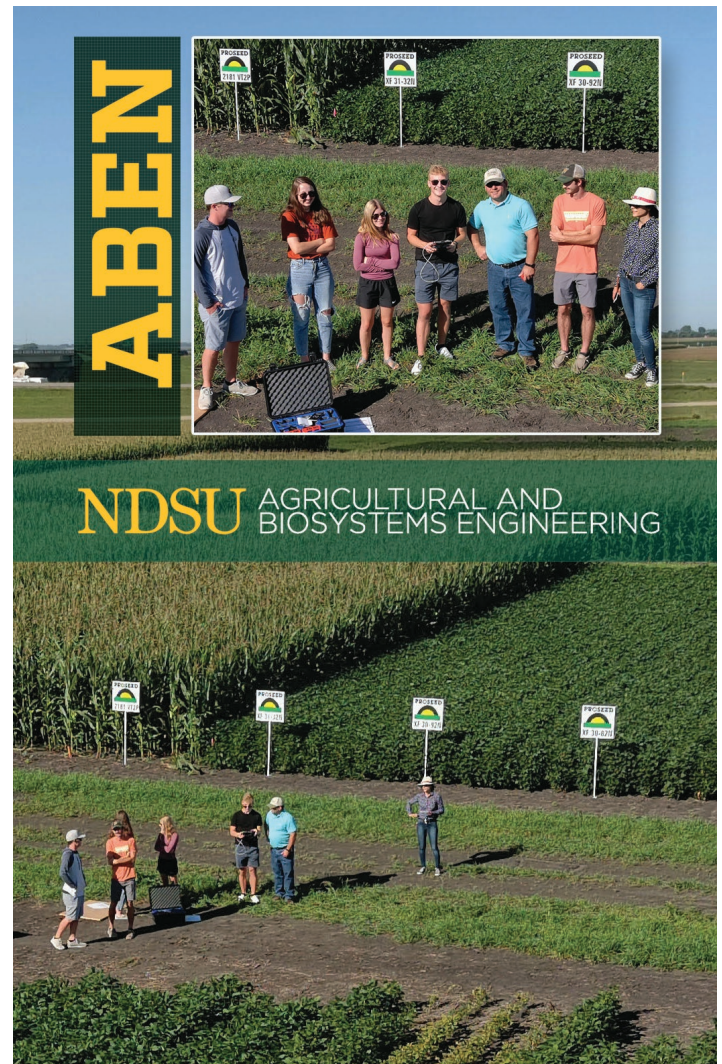
Students in the precision ag degree program take classes related to data mapping, remote data analysis and site-specific agriculture using aerial data collection, such as drone imagery, but that data must first be collected through UAS applications.

“With the use of drones, it is possible to get an overview of fields and collect data much faster and more efficiently than traditional methods. The basic need is to be able to gather the data for this purpose,” she said.

Besides the agricultural domain, drones are being used in many different applications, including wildlife and historical conservation, construction, surveillance and in the military, which has brought students from many different backgrounds and departments, Delavarpour said.

Students in the class were currently enrolled from computer science, agricultural and biosystems engineering, ag systems management, precision ag and general agriculture.

Pilots flying drones heavier than 55 pounds or flying commercially must have a license. Farmers using drones for spraying must also obtain certain waivers and permissions.



Students in the new course through the Department of Agricultural and Biosystems Engineering at North Dakota State University participate in the course geared toward obtaining a commercial drone pilot license.

“Some people think just purchasing the drone and getting the license will be enough to do any kind of operation, but it’s not like that,” she said.

“This course is to make sure nobody is violating any rules and regulations and to ensure the remote pilot in command understands the regulations, operating requirements and procedures for safely flying drones for the drone itself and for people who are in the area of operation,” Delavarpour said.

According to the Association for Unmanned Vehicle Systems International, the drone industry is expected to create more than 100,000 jobs and provide more than \$82 billion in economic impact by 2025 in the United States. ■



*Sean Hertz recently returned to the family farm north of Mott after graduating from North Dakota State University.*

## Sean Hertz follows in family footsteps

**S**ean Hertz knows about adversity. He's watched family members suffer the consequences of drought and tanked commodity prices. But the 23-year-old is returning as the fifth generation of family farmers with confidence, after obtaining a degree in agricultural systems management (ASM) through North Dakota State University's (NDSU) Department of Agricultural and Biosystems Engineering.

Sean now farms alongside his parents, Shane and Stacey Hertz, as one of several young farmers and ranchers who have returned to their roots in Hettinger County.

Sean graduated from Mott-Regent High School in 2017, then graduated in December 2020 from NDSU with a degree in agricultural systems management and minors in crop and weed science and agribusiness. Everyone needs to make the decision about attending college themselves, he says, but he gained value from his college experience.

"I went into it with the mindset that I wanted to get something

out of it," he says. And with the ASM major, he had the flexibility to obtain two minors.

"I got a really broad range of classes, from taking a bunch of marketing classes to help with marketing our grain or taking welding classes to improve my welding skills or going to a crop scouting seminar and getting my private applicator's license," he says.

Sean first learned about the degree from an NDSU upperclassman from Mott.

"It really just kind of sparked my interest and sounded like something that would fit me really well," he said. "I was drawn to ag systems management, mostly because of how versatile (the ASM program) was."

Sean points to the senior capstone class, in which his project focused on farming succession, as another valuable class at NDSU.

To transition into the family farm, Sean is currently farming his own land to establish himself, then plans to eventually be melded into the whole operation, and he will rely on information from his

senior capstone class project to guide him during that transition. “When it’s my turn to take over the operation, I think (the ASM senior capstone) will come in handy,” he says. “I’m slowly starting to branch off onto my own, taking a few acres here and there.” Sean also branched out beyond his department to take versatile, hands-on courses, including a welding course, to gain more experience with state-of-the-art equipment.

“There are countless other classes you can mix in with your course load,” he says.

Connecting with other young farmers in college was another advantage, he says.

“Being around a lot of like-minded young farmers and seeing their perspectives was kind of eye-opening. Being in Fargo and being around some Red River Valley farmers, who had totally different views on farming than we do, overall was a really good experience just to broaden my knowledge base,” Sean says.

During college, Sean served as president of the Agricultural Systems Management Club, which was another valuable networking tool for him, even though it wasn’t part of the course load.

“I had a really good time with that and I met a lot of lifelong friends through the club,” he says. “There are aspects of that club that I use to this day as well.”

Sean’s father, Shane, also sees Sean’s college education as a valuable asset to the family farm.

“I think you have to constantly be learning,” Sean says. “My

classes at NDSU and in ag systems management really made me look through a different angle on what I’m doing when I’m farming. ... You start focusing on returns on investments and you look at tractors based on when you should be buying and selling based off of when their value is the greatest and when you’re going to start losing your return on them. I think I started looking at things a little differently than before I went to NDSU.”

As Sean harvests corn on the family farm, which dates back to 1905, he encourages others to pursue an NDSU degree through the Department of Agricultural and Biosystems Engineering.

“Give it a shot. At least take a tour, talk with some of the professors. There are some really good professors that I had at my time there. There are a lot of them I would consider a friend now, and someone I could call if I had a question and I know they would help me out,” he says. “Go see what it’s all about and then you can make that decision for yourself.”

Sean points to his grandfathers and parents as role models, with memories of tinkering in the farm shop with his maternal grandfather, Ray Zent.

“I had a lot of fun doing that with him and I remember riding with my Grandpa Milt in the combine and my parents when they were seeding. A lot of things that I do I trace back to specific situations watching them and now trying to do, hopefully, as good as they did it,” he says. ■

# DUAL CREDIT

**ABEN**

**Earn high school and college credit at the same time or take early-entry courses. Both options give you a head start on your degree.**

[www.ndsu.edu/otl/programs/dual\\_credit](http://www.ndsu.edu/otl/programs/dual_credit)

**VIEW ALL CLASSES AT:** <https://bit.ly/3wr98mn>

## NEW DUAL CREDIT CLASSES

**Course Title: ASM 115 - Fundamentals of Agricultural Systems Management**

**Credits:** 3

**Course Mode:** Online

**Offered:** Fall 2023

**Instructor Name:** Matthew Olhoft

**Course Description:**

An overview of agricultural systems management; engines, machinery, structures, electricity, processing and conservation. (Prerequisite: Math 103)



**Course Title: PAG 115 - Introduction to Precision Agriculture**

**Credits:** 2

**Course Mode:** Online

**Offered:** Fall 2023

**Instructor:** Dr. Xin (Rex) Sun

**Course Description:** Introduces you to principles of precision agriculture, crop and livestock production in precision agriculture, GIS, GPS, sensors, drones, data acquisition and management, remote sensing. The course is offered in two one-hour lectures per week. (Prerequisite: Math 103)

# Van Berkom, Drovdal win Ag Tech Expo

**H**osted by the North Dakota State University (NDSU) Agricultural and Biosystems Engineering Department, the 75th annual Agricultural Technology Exposition named Ben Van Berkom and Scott Drovdal as the grand champions this year.

The two NDSU seniors presented their project, “High Capacity Batteries in Agriculture,” during the Feb. 11 event. Van Berkom is a precision agriculture major, while Drovdal is majoring in agribusiness at NDSU. Both are graduates of Des Lacs-Burlington High School.

During the Agricultural Technology Exposition, students present on a topic related to technology within the agricultural industry.

Van Berkom and Drovdal explored the technology being advanced by companies such as Bobcat and John Deere in battery-powered equipment. The project explored the advantages and disadvantages of the batteries and specifications on how they operate.

“The biggest learn from it, content-wise, was the fact that there are so many variables that go into electric or battery-powered machinery,” Van Berkom said. “One thing I really enjoyed about this project is the learning I was actually able to do as I presented it. I learned more presenting it than I did while I was preparing it. I thought that was fun. I love learning.”

The Agricultural Technology Exposition is also a great environment to hone presentation skills, he said, and to have balanced conversations.

“It is a hotly debated topic. I thought it was fun to practice presenting information and having open conversations about a topic that can sometimes be a more of a heated topic,” he said.

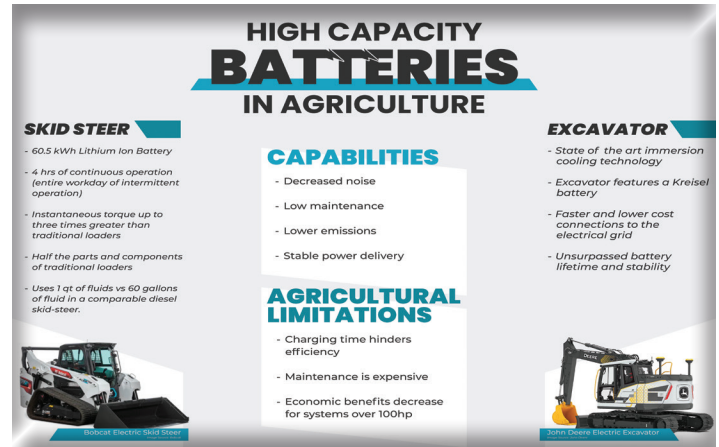
After serving as the North Dakota state FFA president in 2019-20, Van Berkom initially started a major in agriculture education at NDSU.

“That was a huge part of my high school career and really opened up a lot of doors for me. I thought I might as well just invest back into the thing that made a difference in my life,” he said. But after taking precision ag classes to fill his electives, he discovered a new interest.

“I’ve loved the precision agriculture program,” he said. “I think there are incredible job opportunities in the Fargo area with a precision agriculture degree.”

The Agricultural Technology Expo began in 1948 and is sponsored by the student branch of the American Society of Agricultural and Biological Engineers and the Agricultural Systems Management Club. It is the largest student activity in the Department of Agricultural and Biosystems Engineering.

More than \$1,500 in scholarships are typically awarded during the event. Scholarships are awarded to the grand champion project, division winners and best freshman project. ■



Ben Van Berkom and Scott Drovdal explored the topic of “High Capacity Batteries in Agriculture” in their project for the Agricultural Technology Exposition in February.



Ben Van Berkom, right, and Scott Drovdal presented the grand champion project during the Agricultural Technology Exposition.



## 2023 Agricultural Technology Exposition results

### Grand Champion:

Scott Drovdal and Benjamin Van Berkom  
*Project:* "High Capacity Batteries in Agriculture"

### Reserve Champion:

Eric Koch, Kyle Senger and Ian Swenson  
*Project:* "Sensors in Agriculture"

### Freshman Champion:

Eric Koch, Kyle Senger and Ian Swenson  
*Project:* "Sensors in Agriculture"

### Senior Design:

**First place**  
Kenny Meyer, Kate Wrolson and Jarad Mattis  
*Project:* "Quadtrac Rear Frame Implement Harness Routing"

### Second place

Shad Mack, Mason Falk and Wilson Howard  
*Project:* "Amity Crop Chaser"

### Machinery:

**First place**  
Alex Nelson  
*Project:* "The Weed Zapper"

### Second place

Ben Bloom and Jonah Friedrichs  
*Project:* "Case Autonomous Tractor"

### Precision Ag:

**First place**  
Ty Longtin  
*Project:* "Biometric Sensing Ear Tag"

### Second place

Mathew Nepsund, Jacob Vogt and Mathew Heley  
*Project:* "Autonomous Robot for Specialty Crops"

### Soil, Water & Environment:

**First place**  
Eric Koch, Kyle Senger and Ian Swenson  
*Project:* "Sensors in Agriculture"

### Second place

Tate Reichmann, Nicholas Popp and Jack Thompson  
*Project:* "The Future of Irrigation"

### Structures, Electrical Power & Processing:

**First place**  
Hayden Quittenschreiber  
*Project:* "Ag Optimus System"

### Power:

**First place**  
Trevor and Daniel Hinkle  
*Project:* "Self Propelled Beet Lifter"

# Soybean storage research conducted

**T**HE IMPACT OF ENVIRONMENTAL AND STORAGE CONDITIONS ON THE QUALITY OF IMMATURE SOYBEANS AND ESTIMATED ALLOWABLE STORAGE TIME OF MATURE SOYBEANS BASED ON TEMPERATURE AND MOISTURE CONTENT

Research by Ibukunoluwa Ajayi-Banji, Kenneth Hellevang and Ewumbua Monono

Immature (green and semi-green) soybeans occur due to an early frost and pose quality and financial challenges to farmers in North Dakota. Research and producer comments reported the color of the seed coat may or may not change in storage. In addition, there was no published work that examined optimal storage conditions that may facilitate the fading away of the green color. There was also a lack of current storage recommendations for mature soybeans.

Soybeans were harvested at two maturity stages (R6 and R7), dried and conditioned to two moisture contents (12% and 17%). The green color faded some during drying. The immature soybeans were stored for six months at 40 degrees and 75 degrees under the presence/absence of light and/or aeration.

ANOVA analysis showed light had the greatest contribution (~81%), when compared to other storage factors. The green color faded some during storage for all maturity stages. By eight weeks of storage, the color “A” value of R6 green seed was close to that of the mature control, but still had a green tone. Higher free fatty acid levels were recorded in the high moisture beans at the end of the storage period.

Since it is not feasible to commercially store soybeans exposed to light, exposure to light while field drying was studied. Desiccated soybeans at R6 and R7 and R8 (frozen) were planted on two separate plots at two different dates and left in the field to dry down. Weather conditions in Plot 1 had higher growing degree days and potential evapotranspiration values that aided seed harvest maturity and drying, unlike Plot 2 which experienced frost, snow and wet conditions. R6 seeds from Plot 1 had color “A and B” value of +0.1 and +18.1, like that of the mature commercial control. R6, R7 and R8 seeds from Plot 2 still had a slight external green seed coat with lower B values of +15.3, +16.1 and +15.7 after field drying. Color “A” value increased minimally in storage with seed lightening, since the color had changed in the field.

Chlorophyll levels were initially low for desiccated and control seeds and maintained in storage. As expected in the storage study, high-moisture seeds (17%) showed quicker deterioration in storage – as early as week 4. Generally low peroxide and free fatty acid values were recorded, indicating oil quality was maintained.

Up-to-date information on allowable storage time of mature newer soybean varieties is crucial to maximizing seed quality, minimizing quantity losses during storage, and maximizing profit for farmers. This study evaluated the effect of typical storage temperatures of

## Oil color of field-dried soybeans before storage



a.

b.

c.

(a) R6 desiccated  
(b) R7 desiccated  
(c) R8 frozen

4, 40 and 70 degrees, and moisture contents (MC) of 11, 13, 15 and 17% w.b. of two soybean varieties (ND17009GT and EL80-23) on quality parameters of germination, fungal development and oil quality for a duration of 12 months. Soybeans stored at 4 and 40 degrees recorded more than 98% germination, irrespective of the moisture content throughout storage. However, the 15% MC samples at 70 degrees by the end of the fifth month had less than 10% germination percentage for both varieties.

Despite more than 95% germination recorded for both varieties at 17% MC at the end of the first month, secondary fungi infection was observed on the germinated seedlings.

Mold counts remained relatively stable for seeds stored at 11% and 13% for both varieties at lower storage temperatures of 4 and 40 degrees. Mold counts of 17% MC seeds stored at 70 degrees doubled the initial log counts by the end of the first month, while it was observed in 15% MC seeds at week eight.

The 17% MC seeds for both varieties showed higher free fatty acid values that exceeded the acceptable limit (greater than 0.75%) by month four. Increasing temperature and MC contributed to deterioration of seed quality in storage. A 13% moisture soybean rotated in the sequence of 40, 4, 40 and 70 degrees, representing a North Dakota weather cycle-maintained germination above 80% and fungal (mold and yeast counts) less than 4.00CFU/g until 36 weeks of storage. ■



## ABEN grad gives keynote address

Justin Lester, a senior in the Department of Agricultural and Biosystems Engineering (ABEN), was the student speaker during North Dakota State University's winter commencement ceremony Dec. 16 at the Sanford Health Athletic Complex.

Lester, a native of Buffalo, Minn., graduated with a degree in agricultural and biosystems engineering, with a focus on natural resources.

"I think it is a very special honor," Lester says about being selected to give the commencement address, in which he focused on the quote, "Believe in yourself and you will do great things."

While in high school, Lester took advantage of the post-secondary enrollment option in Minnesota, which allowed him to graduate early from NDSU.

When Lester visited the NDSU campus for the first time, it simply felt like the right fit.

"When I visited, it felt like the right one. It is a little bit smaller, so it was more personal, but big enough that I had a lot of opportunities with student organizations. I just like the feel of the campus. I always tell students as an engineering ambassador it just felt like the right place and that's the most important thing," he says.

And the ABEN Department drew Lester's attention due to its degree offerings.

"I can focus on engineering and problem-solving, but also have a natural resources focus, so I can do something to hopefully improve the environment," he says. "Graduating with an engineering degree proves you are a good problem-solver."

As a freshman, Lester was part of the Engineering Living Learning Community, sharing a dorm with other engineering students.

"I was able to really take advantage of that to get off on the right foot with different connections as well as meeting a lot of people for studying," he says.

He also became a College of Engineering ambassador, focusing on the ABEN Department, introducing other students to the campus. And he was a Grand Challenge Scholar, an organization which helps undergraduate students gain the ability and knowledge to address future challenges. Lester is also a member of Alpha Epsilon, the ABEN honor society.

Lester gained experience by assisting Dr. Xinhua Jia's drip irrigation trial, which studied automatic drip irrigation with remote access for commercial production of melons and squash.

Working with graduate students during the research trial helped him understand their role, he says.

"And from a professional standpoint, I think it really helped in my technical writing skills and my presentation skills," he says.

"With the ABEN Department specifically, I have really enjoyed how personal the learning experience is, and developing a really good relationship with both the students and the faculty makes for a more enjoyable college experience," he says.



*Justin Lester*

Lester recommends the ABEN Department to other students due to its open-door policy and family-like atmosphere.

"It's very broad in what you can do," he adds about the department. "They do a good job introducing you to all the options and it's very flexible."

He also appreciated the hands-on aspects, taking classroom work directly to the lab.

"I think that was really valuable to have a lot of those more theoretical-based classes have a hands-on component to understand it better," he says.

Reflecting on his college career, Lester sees how much he's grown as a person throughout college.

During his freshman year's learning community leadership seminar, the students were asked to line up according to how they saw themselves as a leader.

"I remember going somewhere probably two-thirds on the side of not being a very good leader," Lester recalls. "Now, I feel like through the different organizations and class projects, I have really developed myself and gotten a lot more confident with speaking. So, I think that would probably be the proudest moment is my development throughout the entire time."

"I would line up much differently now," he adds.

Lester interned at Kimley-Horn in St. Paul, Minn., and joined the consulting firm full time after graduation on the development services team, a team that helps with the planning and design of residential, commercial and industrial projects.

"I think the internship experience is great," he says. On-campus career fairs help connect students with companies, making the process seamless.

"An internship is a two-way interview process," he says, as students experience the company's culture firsthand and the company becomes familiar with the student as a potential employee.

"It's important to find something that you're passionate about," he says. ■

# Scholarship winners

Scholarship	Major	Recipient
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## *College of Engineering*

Ernie French	ABEN	Kate Wrolson
Lawrance & Elizabeth Shaw	ABEN	Li Ian Koh
Lawrance & Elizabeth Shaw	ABEN	Lochlan Baird
Lawrance & Elizabeth Shaw	ABEN	Sean Gierke
Thoreson Engineering	ABEN	Mason Falk
Thoreson Engineering	ABEN	Shad Mack
Brian & Debra Houkom	ABEN	Wilson Howard

## *College of Agriculture, Food Systems and Natural Resources*

Vernon Lee	ASM	Tanner Haugen
Elton Solseng	ASM	Kordell Myers

## *ABEN/ASM or PAG*

A.R. Bon Memorial	ABEN	Ryan Doe
E.L. Bon Memorial	ASM	Broden Frolek
E.L. Bon Memorial	ABEN	Alex Radermacher
F.A. Bon Memorial	PAG	Matt Nepsund
M. Bon Memorial	ASM	Hunter Frederick
M. Bon Memorial	ABEN	Justin Lester
Clarence & Irene Becker	PAG	Justin Roswick
Scott and Mary Handy	ABEN	Alexander Nelson
Walter and Pearl Nyquist	ASM	Carson Hovelson
Bill & Ann Promersberger	ABEN	Jarad Mattis
Dr. George & Patti (Jones) Pratt	ABEN	Alexander Nelson
Marvin and Doris Jensen	PAG	Jonah Steffl
Lundstrom Family	PAG	Tristen Uglen
Earl & Dotty Stegman	ABEN	Maison Zimmer
ABEN Dept. Scholarship	PAG	Keenan Kalhagen
ABEN Dept. Scholarship	ABEN	Ian Swenson
ABEN Dept. Scholarship	ABEN	Ashton Esco
ABEN Dept. Scholarship	ASM	Karson Matejcek
ABEN Dept. Scholarship	ASM	Jack Thompson
ABEN Dept. Scholarship	ASM	Connor Ruschen
ABEN Dept. Scholarship	ABEN	Connor Alto
ABEN Dept. Scholarship	ABEN	Andrew Caughey
ABEN Dept. Scholarship	ABEN	Garrett Haakenson
ABEN Dept. Scholarship	PAG	Eric Meredith
ABEN Dept. Scholarship	ASM	Joseph Ellison
ABEN Dept. Scholarship	PAG	Melanie Hansen

## *ABEN Graduate Student*

Frank Bain Agricultural Scholarship	GRAD	Emily Nelson
Frank Bain Agricultural Scholarship	GRAD	Arjun Upadhyay
Frank Bain Agricultural Scholarship	GRAD	Tosin Oywole

## Student clubs and officers

### *Agricultural Systems Management*

<i>Office</i>	<i>Name</i>
President	Connor Blessum
Vice president	David Scheresky
Secretary	Cole Rasmusson
Treasurer	Roman Steffan
CSO representative	Garrett Anderson
Advisors	Matt Olhoft, Tayler Johnston



### *ABEN Robotics*

<i>Office</i>	<i>Name</i>
President	Billy Ram
Advisor	Rex Sun

### *Bison Pullers/Quarter Scale Tractor*

<i>Office</i>	<i>Name</i>
President	Lawson Kraft
Vice president	Emma Arstein
Secretary	Brandon Kasper
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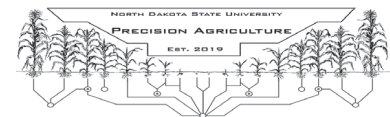
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Secretary	Shad Mack
Treasurer	Maison Zimmer
Advisor	Xinhua Jia



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### *ABEN Graduate Students Association*

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Vice president	Anup Kumar Das
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## Welcome

Welcome to the annual newsletter of the Department of Agricultural and Biosystems Engineering.

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For a program to stay current and relevant, our labs need to be continually updated to current technology. ABEN has been proactively updating our teaching labs, and your support is critical. Your contributions are also used to sponsor scholarships for Ag Tech Expo, recruiting, and other teaching and student activities. Lots of exciting things are happening at ABEN, and your contributions play a vital part in supporting ABEN activities. Thank you for your support of our great department!

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Enclosed is my tax-deductible check, payable to: **NDSU Foundation & Alumni Association, with a memo indicating ABEN**, in the amount of

\_\_\_\_\_ \$25 \_\_\_\_\_ \$50 \_\_\_\_\_ \$100

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Or, you may wish to help NDSU students majoring in Agricultural and Biosystems Engineering, Agricultural Systems Management and Precision Ag with a contribution of \$\_\_\_\_\_ to go toward the scholarship fund indicated below. Please be sure to check to see if your employer has a program to match your contribution

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- \_\_\_\_\_ ABEN Scholarship Fund
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