

NDSU Extension - Budget No. 630

North Dakota Agricultural Experiment Station

- Main Station - Budget No. 640
- Branch Research Extension Centers - Budget No. 628
- Agronomy Seed Farm - Budget No. 649

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North Dakota Agricultural Experiment Station

NDSU Extension

2019-2021 Biennial Budget Request

House Bill 1020
Senate Appropriations Committee

Senator Ray Holmberg, Chair
March 20, 2019

Agency Overview

NDSU Extension

Agency Statutory Authority

North Dakota Century Code 15-12.1-17

Agency Description

North Dakota State University (NDSU) Extension is part of a nationwide, university-based educational system that provides research-based educational programs to citizens in all 53 counties and four American Indian reservations in North Dakota. Programs focus on selected needs and issues affecting the state's agriculture, youth, families, communities and natural resources. The staff is located at state, area and local/county offices. NDSU Extension combines funding from federal, state, county and grant sources to specifically address local concerns.

Agency Mission Statement

Empower North Dakotans to improve their lives and communities through science-based education.

NDSU Extension believes:

- In lifelong learning through transformational education
- That all people belong and deserve respect
- In stakeholder input to guide program development
- In science-based, locally relevant information
- In the value of partners and collaboration

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Education (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

The mission of NDSU Extension is to empower North Dakotans to improve their lives and communities through science-based education. In response to current and emerging citizen needs, Extension specialists use their expertise in a particular field to develop recommendations, programs, and find solutions to producer and community problems. Extension agents extend these recommendations and programs to all 53 counties and the four American Indian reservations.

Extension's mission, programs, effectiveness and efficiency were comprehensively reviewed by the State Board of Agricultural Research and Education (SBARE) in 2017. The recommendations from the review and the substantial public input to SBARE during their hearings to set agency priorities have established the basis for numerous changes in Extension's organization and programs. The two priority items that were identified were 1) Extension web and digital delivery and 2) Extension operational support. Solidifying these two areas will maintain and enhance Extension's ability to provide transformational education to North Dakotans. (Transformational education is an educational model that combines high quality educational content with trusted, facilitated processes that results in improved economic or environmental conditions or behaviors.)

Extension web and digital delivery

SBARE's review of Extension recommended that Extension optimize the use of technology and target younger age demographics to enhance the effectiveness and efficiency of delivery methods. To accomplish this goal, Extension needs to transition its web strategy to meet future opportunities and ever-changing user needs.

Transitioning Extension's web presence is a significant undertaking because of the complexities of the diversity of materials, the diversity of who generates and manages content, how Extension users access the content (for example, computer, smartphone), and how users interact with the apps and information.

A new strategy will allow Extension to:

- Optimize content for smartphones and tablets, and emerging technologies such as voice-assisted search and augmented reality, especially to reach younger audiences
- Feature more interactive educational modules
- Optimize navigation and search features
- Add more social media use
- Incorporate more apps

Redeveloping Extension's web presence will also be aligned with transformational education, which is the foundation of Extension's mission.

Extension operational support

NDSU Extension is structured to engage with local citizens through the network of county Extension agents and offices. It develops programs that respond to local issues. Extension agents are supported by specialists on campus and at Research Extension Centers. Using their specialized expertise they develop science-based program delivery approaches for agriculture, natural resources, youth, families and communities.

North Dakota receives incredible public value from Extension agents in their local counties as shown by support from several hundred state residents at community hearings and the nearly 150 letters and oral testimony received by SBARE during their hearings. Local educational programs include 4-H, crop and livestock management, health and community leadership, disaster response to droughts or floods, farm business and family finance areas. Complex issues such as soil health, nutrient management, cropping systems, herbicide and insect resistance, drought response and livestock management, and leadership programs were identified as priorities by North Dakota stakeholders for enhanced support.

To sustain local delivery of Extension programs and services, additional funding is needed to support Extension's partnership with counties. To maintain the effectiveness and efficiency of Extension specialists, increased operating support is needed to continue their development and delivery of high-impact programs for North Dakota.

2017-19 Legislation that Included Reporting Requirements to 2019 Appropriation Committees

SB2020 (NDSU Research & Extension, & Agronomy Seed Farm)

SECTION 3. ONE-TIME FUNDING — EFFECT ON BASE BUDGET — REPORT TO SIXTY-SIXTH

LEGISLATIVE ASSEMBLY. The following amounts reflect the one-time funding items approved by the sixty-fourth legislative assembly for ... the 2017-19 biennium one-time funding items included in the appropriation in section 1 of this Act:

One-Time Funding Description

Junior master gardener program — \$15,000

The 2017-19 one-time funding amounts are not a part of the entity's base budget for the 2019-21 biennium. The extension service shall report to the appropriations committees of the sixty-sixth legislative assembly on the use of this one-time funding for the biennium beginning July 1, 2017, and ending June 30, 2019.

Status: received; funds allocated

NDSU Extension Program Initiatives

Final Ranking by SBARE - May 3, 2018

NDSU

EXTENSION

PROGRAM INITIATIVE

Extension Operational Support

JUSTIFICATION: NDSU Extension is structured to respond to locally identified needs with science-based education through Extension agents who have strong relationships in their communities. Extension agents are supported by specialists on campus and at Research Extension Centers. These specialists have specialized expertise to develop science-based recommendations and training programs for agriculture, natural resources, families and communities. The Center for 4-H Youth Development supports youth programs across the state.

COUNTY DELIVERY/EXTENSION AGENTS VALUED

In late 2017 and early 2018, the State Board of Agricultural Research and Education solicited citizen input on priorities for the upcoming legislative session. The board received nearly 150 pieces of written or oral testimony, which emphasized the importance of Extension to the citizens of North Dakota and highlighted the value of the local presence of Extension in communities across the state.

Because NDSU Extension funding was reduced by 13.9 percent for the 2017-2019 biennium, Extension and the North Dakota County Commissioners Association collaborated on a new cost-share agreement to fund Extension agents. Under that agreement, the counties would fund 40 percent of the agent's salary and benefits, and Extension would fund the remaining 60 percent.

This agreement increases the support that counties provide by approximately \$820,000 on a statewide basis for the biennium. While the counties are very supportive of the services of their local Extension agent, they are on record in seeking *"to restore state funding so that a longer-term funding model that reduces the property tax burden can be achieved."*

STATE PROGRAM SUPPORT VITAL

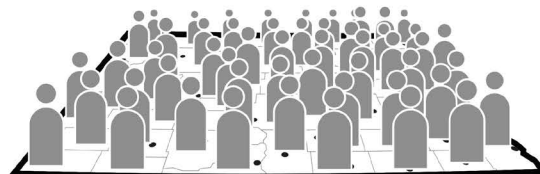
NDSU Extension specialists provide valuable leadership for complex issues such as soil health, nutrient management, cropping systems, herbicide and insect resistance, drought response and livestock management, and leadership programs such as Rural Leadership North Dakota. Specialists rely on operating funds to develop and travel to training workshops and field events, soil health café talks and training events on nitrate testing for drought damaged forages, etc. They train Extension agents, ag professionals and consultants, and agency partners, which is multiplied to help support the \$9 billion agricultural industry in North Dakota.

NEED: North Dakota receives incredible public value from Extension agents in their local counties. To sustain local delivery of Extension programs and services, additional funding is needed so Extension can continue to partner with counties to fund Extension agents. To maintain the effectiveness and efficiency of Extension specialists, they need increased operating support to continue their development and delivery of high-impact programs for North Dakota.

**Operating support - \$870,000
(\$670,000 for county programming and
\$200,000 for state programming)**

Extension Team Serves North Dakota

4-H Youth Development | Crop Management
Family Economics | Farm Business Management
Horticulture and Forestry | Human Development and Family Science
Leadership and Civic Engagement | Livestock Management
Natural Resource Management | Nutrition, Food Safety and Health



Agents serve local needs



Supported by specialists with
in-depth expertise

NDSU EXTENSION

EXTENDING KNOWLEDGE >> CHANGING LIVES

County commissions, North Dakota State University and U.S. Department of Agriculture cooperating. 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.

Agriculture and Natural Resources

Providing the educational programs to help people transform air, water and soil into food, fuel, fiber and a sustainable environment

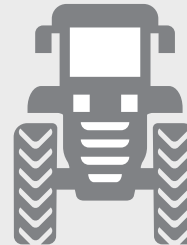
Agriculture is critical to the economy of North Dakota and routinely accounts for approximately 30 percent (\$9.1B in 2015) of all business activity in the state. Extension Agriculture and Natural Resources (ANR) specialists and county-based agents work to ensure that the latest research-based information is available to all who seek it. These same specialists and agents continually probe and listen for agriculture's next "need," and develop innovative educational programs and field studies to meet those needs as fast as possible.



6,932 downloads of the Extension **Pest Management App** since 2014, combining the Extension Plant Disease Management, Insect Control and Weed Control guides into a digital form

The app has the potential to save future printing costs of \$3 per copy

Approximately **15,000** producers attended county Extension **farm bill education meetings** in 2014



90% of respondents used the **Extension-developed farm bill decision aid tool** when making their final decision with FSA; of these respondents, **83% used the decision tool for ALL** of their acres

As of Dec. 2018, an estimated **\$1.3 billion** in farm bill payments were made to North Dakota producers since that training

Soil health networking used **high tech** (twitter and video) and **low tech** (café talks)

ways to share science-based and applied information to individuals with a common interest in soil health

This allowed everyday observations and short bursts of information as well as follow ups with personalized information implemented by producers



Forage testing, along with follow-up consultations and recommendations by Extension agents and specialists, prevented over

16,000 cattle from being exposed to toxic forages during the 2017 drought



Other Extension drought responses:

- developed a platform to streamline **weekly drought condition reporting**
- played a key role in **testing forage and water** for producers
- **answered questions** through one-on-one conversations, articles and videos, and hosting meetings
- **provided information to producers** through meetings, presentations, media interviews, news releases and columns, publications and web-based materials

N.D. producers using precision ag technologies of all kinds realized an **\$88 per acre benefit** compared to producers not using them

Extension has been providing educational programs on precision ag for more than **23 years**



More than **3,800** samples processed and **26,400 tests performed** at the self-funded NDSU **Plant Diagnostic Laboratory** in 2017 resulted in **informed pesticide use decisions and economic savings** for North Dakotans



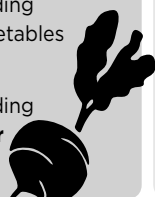
In 2017, **292** North Dakota gardeners **evaluated 106 promising home vegetable and herb varieties**

99% of responding households were **introduced to new varieties**

87% of responding households reported **more productive gardens**

89% of children in responding households who grew vegetables **improved their diets**

89% of children in responding households **improved their level of physical activity**



About **3,000** soybean cyst nematode (SCN) samples have been processed since 2013 because of county Extension office test kit distribution, helping growers identify and manage SCN

The value of planting resistant varieties when SCN is present is approximately a **40% yield increase**



For more information on these and other impacts of NDSU Extension, go to www.ag.ndsu.edu/extension or contact Charlie Stoltenow at 701.231.7171 or charles.stoltenow@ndsu.edu.

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Ag and Natural Resources Educational Programs

■ Cropping Systems

- Soybean cyst nematode
- Increasing salinity and sodicity awareness
- Managing weeds under different production systems
- Managing herbicide-resistant weeds
- Prevention of Palmer amaranth incursion into North Dakota
- Managing Cercospora in sugar beets
- Managing root maggot in sugar beets
- Shop Talks: Sugar beet production
- Managing soil water through drainage and irrigation
- Using farm chemicals safely
- Pesticide application certification program
- Managing soil fertility
- Enhancing soybean yield and profitability
- Management of cereal crop diseases
- Wheat midge soil survey
- Management of stored grains
- Integrated pest management
- Introduction to organic agriculture
- Precision agriculture technology and data management

■ Farm Business Management

- Managing farm margins and financial decisions
- Ag lenders outlook and professional development
- Determining land values, cash rent and net return on land
- Understanding and coping with farmer/rancher stress issues
- Understanding the farm bill: ARC vs. PLC
- Understanding hedging and other risk management tools
- Price risk management for livestock producers
- Design Your Succession Plan
- Annie's Project - increasing knowledge and involvement of farm women
- Bioenergy and bio-byproduct economics

■ Horticulture and Forestry

- Master Gardener program
- Jr. Master Gardener program
- Promoting pollinator conservation
- Trees of Our Town—selecting the right tree species for your community
- Saline soils and shrubs
- Spring Fever Garden Forum
- Garden, horticulture or tree workshops

■ Livestock Management

- Stop the Truck—reviewing livestock health records before shipping
- Livestock mortality composting
- Antimicrobial stewardship
- Improving lamb quality and value
- Sheep education for new flocks
- Corn silage quality program
- Manure management
- Managing livestock during a drought
- Nitrate management in feeds and forage
- Feeding cattle for profit
- Livestock quality assurance
- Bovine emergency response program

■ Natural Resources Management

- Setting stocking rates
- Range and pasture management—grazing readiness
- Cover crops for healthy soil
- Reclamation and remediation of soil impacted by oil extraction
- Healthy soil schools
- Sodic soils: Should I tile the field or add an amendment?
- Café Talks: Soil Health—guiding farmer learning through networks
- Preparing for floods

■ Services Offered

- Crop and Pest Report—weekly
- Market Adviser column—monthly
- Plant Diagnostic Laboratory
- Certified Crop Adviser School
- Scout School
- Nitrate testing
- Feed testing
- Livestock water testing
- Variety trials and demonstrations

■ Youth Programs

- Livestock Camp
- Judging teams
- Kids, Compost, Crops and Consumption

This is a partial listing only. Please check with your local Extension office for more programs.

Extension Family and Community Wellness

Developing healthy people living in healthy, vibrant communities

North Dakota State University Extension family and community wellness agents and specialists enhance the lives of individuals, families and producers through educational experiences, and encourage leadership and service to the community. You will find them at work in your county, at regional Parent and Family Resource Centers and on NDSU's main campus.



2,447

views of Field to Fork webinars, designed to **improve knowledge of growing, transporting, processing and preserving produce**

55% of participants surveyed will change practices

Knowledge of subjects presented increased from **52% to 82%**



More than **300** people from **737** North Dakota organizations

have attended Lead Local since 2016, helping participants **feel more confident to run for and serve on boards, councils and committees**

"I had been thinking of running for City Council for some time, and after taking the Lead Local program, it really gave me that extra confidence to move forward with that decision. The process of running for and winning the City Council seat was a great experience, and I'm using the tools from Lead Local to help me be the best representative I can be."

- Lacey Hinkle, Cavalier, N.D.

Participants in the Diabetes Prevention Program reported an average **5.7% loss of their initial body weight**, along with improved levels of blood glucose, cholesterol and blood pressure



A body weight reduction of just 5 percent decreases an individual's risk of developing type II diabetes by 58 percent

Diabetes costs \$700 million in North Dakota each year



98% of farmers/ranchers in the Design Your Succession Plan program **indicated they were likely to work on their transition plan in the next six months**

"So many farm families start with great intentions and expectations but fail to follow through because the succession planning process seems so daunting. A facilitator can help identify the client's needs and break the process down into steps for them."

- Pam Geiger, lead tax specialist and farm succession planner for Farm Credit Services of Mandan, on the Design Your Succession Plan program

NDSU Extension food and nutrition education programs reached more than

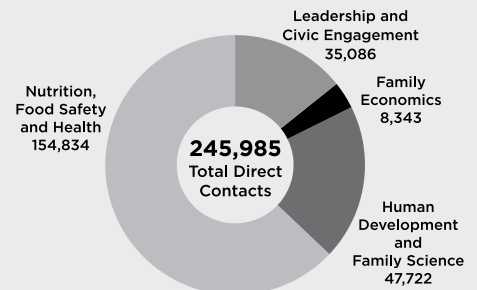
154,000 people in 2017, **helping participants learn to eat healthfully**,

which benefits them as well as all of North Dakota by decreasing the collective health-care costs of poor nutrition and obesity

Obesity results in an estimated \$147 billion in direct medical costs in the U.S.



Over **1,700 hours** of **parent education classes** are provided to **7,500** North Dakota parents and other adults each year, **strengthening families and improving the well-being of children** which reduces costs spent on child welfare and lowers crime by adults



For more information on these and other impacts of NDSU Extension, go to www.ag.ndsu.edu/extension or contact Lynette Flage at 701.231.7782 or lynette.flage@ndsu.edu.

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Family and Community Wellness Educational Programs

■ Personal and Family Finance

www.ag.ndsu.edu/money

Design Your Succession Plan — This multisession program assists farm and ranch families in getting started on their succession plan and shaping the future ownership of their business.

Annie's Project — This workshop empowers farm women to be better business partners through a series of educational sessions covering the business of farming and ranching.

■ Food and Nutrition

www.ag.ndsu.edu/food

Health and Nutrition — Multiple health and nutrition programs have been developed for various audiences and include On the Move to Better Health, MyPlate resources, Faith Communities Alive!, Nourishing Boomers and Beyond, and Eat Smart. Play Hard. Together.

Diabetes Prevention Program — This community-based, lifestyle-change program offers diabetes prevention education and support for people with prediabetes and those at high risk for prediabetes.

The Family Table — This is an online resource with activities, handouts, newsletters and more to encourage family meals, which provide numerous benefits to children and parents.

Food Preparation and Preservation — Online materials assist in preparing and preserving healthful and safe food. Food preservation publications include information on canning, drying, freezing, pickling, fermenting, working with wild game, meat and fish, equipment needed and how to store foods properly.

Smarter Lunchrooms — This program that nudges kids to eat more healthfully at school. Our Smarter Lunchrooms technical assistance providers work to improve the environment and practices in schools to positively influence healthful eating.

■ Children, Parents and Families

www.ag.ndsu.edu/cff

Nurturing Parenting Program — It offers family-based parent education programs that help families establish a nurturing way of life and develop healthier, stronger relationships.

Parents Forever — This provides education to aid families in transition (divorce education). It explores the effects of divorce on children, managing stress in family transitions and maintaining respectful, healthy relationships.

Mental and Behavioral Health — Online information on selected resources and programs to increase awareness and assist individuals in seeking out support for needs related to mental, emotional, and behavioral health. Website includes resources for farmers and ranchers in times of stress.

■ Aging and Wellness

www.ag.ndsu.edu/aging

Powerful Tools for Caregivers — This program supports caregivers of spouses, partners, adult children, children with special needs, other family members, neighbors and friends.

Stepping On — The program assists older adults in reducing falls and learning safety strategies in everyday life.

■ Leadership Development and Civic Engagement

www.ag.ndsu.edu/ccv

Rural Leadership North Dakota (RLND) — This 18-month statewide leadership development program includes personal skill development and seminars with experts.

Lead Local — This one-day training helps aspiring, elected and appointed leaders be better prepared to serve on boards, councils and committees.

Building Tomorrow's Leaders and Youth Lead Local — Comprehensive youth leadership programs empower high school youth to build their confidence and skills to lead and get involved civically.

Marketing Hometown America — A community study circle process helps residents better understand community assets and what people are looking for as they relocate to a rural community.



North Dakota 4-H

Inspiring North Dakota youth to reach their full potential

4-H prepares youth for success and the challenges facing North Dakota. It contributes to the development of new leaders, encourages innovation and entrepreneurship, teaches good stewardship, and helps youth acquire important life skills preparing them to be career- and work-ready.

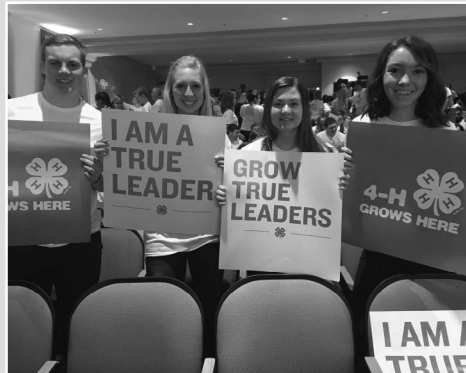
As a non-formal education program, 4-H youth LEARN by choosing an area of interest, get good at something, develop a positive outlook about their learning, direct their own learning and demonstrate it in a number of ways.

4-H youth also LEAD by assuming greater responsibility and accountability, developing good people skills, serving in leadership roles and leading in giving back to their communities.



LEARNING

North Dakota 4-H youth develop life skills of teamwork, decision making, critical thinking and public speaking by engaging in a variety of learning experiences. These skills, coupled with mastering content and integrating knowledge, develop exceptional workforce competencies, making youth ready for post-secondary education, work and life.



LEADING

North Dakota 4-H prepares youth as future leaders through intentional experiences in leading. Beginning at the elementary school age, youth in 4-H become involved as active, engaged citizens and leaders in their local clubs and communities. Youth grow as citizen leaders by finding and using their voice to address local issues and needs, and participate actively in discussions and programs that benefit others.

Youth throughout the U.S., including North Dakota, participated in research to define and measure positive youth development (Source: Lerner and Lerner 2011). **Compared with their peers, youth involved in 4-H programs are:**

2X more likely to participate in STEM activities

75% of youth participants in the Incredible Wearables/ National Youth Science Day Experiment reported it helped them learn how to **use science to solve problems**

2X more likely to make healthier choices

Youth participating in the Impact Teen Driver program reported a **60%** increase in their **ability to make good decisions** as a driver and a passenger

2X more likely to be civically active

1,000+ youth demonstrate **leadership skills** through 4-H club offices, 4-H Ambassadors, or special projects

4X more likely to give back to their communities

777 volunteer service hours contributed to the state by North Dakota 4-H Ambassadors in 2016-17

North Dakota 4-H in 2017-18

6,347 enrolled 4-H members

2,373 volunteers

359 youth volunteers

1,002 youth in 4-H camping programs

Total youth participants by residence:

26% from farms

38% from towns under 10,000 and rural non-farms

36% from towns and cities over 10,000

24,491 total youth participants



19% 4-H enrollment increase in past five years

For more information on these and other impacts of NDSU Extension, go to www.ag.ndsu.edu/extension or contact Brad Cogdill at 701.231.7259 or brad.cogdill@ndsu.edu.

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4-H is North Dakota State University Extension’s youth development program. It is available for youth ages 5 to 18.

4-H accomplishes its work through local Extension staff, with support from Extension specialists, who lead the nonformal educational program through clubs, school enrichment, camping, afterschool and special-topic settings in their communities. 4-H gets its capacity through the work of adults who serve as volunteer leaders. They guide the youth with leadership and organizational support.

4-H Youth Development is an organization and a program.

As an organization, youth join 4-H and the adult volunteers are approved to serve as leaders to create a safe environment for learning through effective youth-adult relationships. As part of a high-quality 4-H experience, youth are expected to:

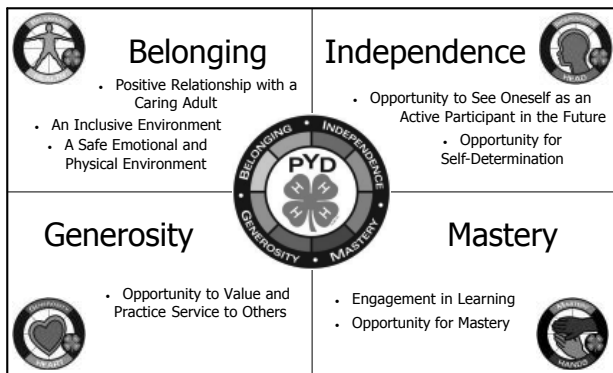
- Select projects for in-depth study
- Record what they learn (record books)
- Attend meetings regularly and be active participants
- Complete community service projects (or become involved in a group community service project)
- Participate in some form of public presentation
- Have projects evaluated (usually part of 4-H achievement days or a fair)

As a program, 4-H offers planned learning experiences at the county, multicounty, state, regional and national levels related to:

- Animal science
- Communication skills
- Clothing, home and consumerism
- Creativity
- Environment, outdoor skills and shooting sports
- Food, nutrition and health
- Plant, soil and range science
- Preventing and reducing youth risk behavior
 - Boundaries and Boundaries Jr.
 - Impact Teen Drivers
 - Living Online: Middle School, High School and Caring Adults
 - Overdone: Practicing Wellness in Busy Families
- Science, engineering and technology
- Service to others
- Youth camping at the North Dakota 4-H Camp
- Youth leadership and civic engagement

4-H is authorized by the U.S. Congress, and at the federal level, is the responsibility of the U.S. Department of Agriculture (USDA), National Institute for Food and Agriculture (NIFA). The authority for the program is assigned to the state’s land-grant university (North Dakota State University) and its Extension program. USDA establishes the use of the 4-H name and emblem, and accountability measures related to fund-raising to support the 4-H program. NDSU Extension’s 4-H Youth Development Program has the responsibility and authority to define what is and is not a 4-H educational program. It also authorizes counties to use the federally protected 4-H name and emblem, and establishes statewide policy and accountability for the 53 county programs where 4-H is conducted.

4-H’s foundation is the Essential Elements of Positive Youth Development



Source: University of Illinois Extension

Agency Overview

Main Research Station

North Dakota Agricultural Experiment Station

Agency Statutory Authority

ND Constitution Article XIX; North Dakota Century Code Chapter 15-12.1

Agency Description

The North Dakota State University Main Research Station is located on the campus of the North Dakota State University of Agriculture and Applied Science. The station is the administrative location of the North Dakota Agricultural Experiment Station. The station conducts research and coordinates all research activities of the Agricultural Experiment Station. The purpose of the research is the development and dissemination of technology important to the production and utilization of food, feed, fiber, and fuel from crop and livestock enterprises. The research provides for an enhancement of economic development, quality of life, sustainability of production, and protection of the environment. The Main Research Station keeps detailed records of all activities and publishes the information that will be of value to the residents of this state.

Agency Mission Statement

The agricultural experiment station shall develop and disseminate technology important to the production and utilization of food, feed, fiber, and fuel from crop and livestock enterprises. The research must provide for an enhancement of the quality of life, sustainability of production, and protection of the environment.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Education (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

SBARE carefully considered stakeholder input and has identified the following Agency Future Critical Issues:

A. Agri biome Initiative

Knowledge of the human microbiome has revolutionized medicine and nutrition and fueled the \$45 billion probiotics industry. A similar revolution is happening in agriculture, where the microbiomes of crops, soils, and livestock (the Agri biome) are being harnessed to increase productivity, efficiency, safety, and quality. Food production must double to meet the global population demand by 2050, despite depleting water resources, shrinking farmland, and rising input costs. The inputs that drove intensive crop production in the 20th century have diminishing returns and may lead to unintended environmental consequences, so the next agricultural revolution must be based on a more sustainable approach that harnesses microbiomes to increase water- and nutrient-use efficiency, stress tolerance, disease resistance, and production of high quality food and agricultural products.

Microbes were an untapped resource until recently, with just a tiny fraction of the microbial world accessible by traditional research methods. Major scientific breakthroughs now allow all microbes to be readily identified, creating a platform for innovation through the discovery of microbes with desirable traits in agriculture (agricultural probiotics). While all sectors of agriculture can benefit from the development of probiotics, the potential gains in crop and livestock production are as exciting as they are highly relevant to North Dakota. The North Dakota Agricultural Experiment Station (NDAES) has several areas of strength that can support an Agri biome initiative focused on crop and livestock production. These include:

- Strong programs in plant breeding, genetics, and genomics; plant nutrition; plant pathology; soil health; and water quality.
- Strong programs in animal nutrition, physiology, husbandry, genetics, and health as well as range sciences and forages.
- Facilities to study microbiomes from lab to field or herd scale.
- Infrastructures to connect researchers with producers across the state to understand problems, identify solutions, and translate discoveries into practical applications.

Research focused on the rhizosphere microbiome (microbes at the soil-root interface) will have large impacts on productivity, efficiency, and quality of both crops and livestock. In addition to a role in discovery, NDAES has the facilities to test the performance of microbial products at the laboratory, greenhouse, field, and herd scale. These activities would be of benefit to the ND producers as well as provide benefit to the private sector, by ensuring the efficacy of products that may be available in the market. A number of crop and livestock production challenges can be addressed by this initiative, including:

- Nitrogen use efficiency. Less than 50% of nitrogen applied as fertilizer is used by the plant. Unused nitrogen can leach into groundwater or runoff into surface water, causing pollution. Engineering the rhizosphere microbiome to increase nitrogen use efficiency will improve water quality and reduce fertilization costs. Additionally, nitrogen use efficiency in livestock is a critical concern in terms of both productivity gains and environmental stewardship.
- Productivity in saline soils. About 13% of the land area in North Dakota is affected by surface salinity. It is estimated that more than \$150 million in revenue is lost annually in the Red River Valley alone due to salinity-related yield reductions in corn, soybean, wheat, and sugarbeet. One approach to this problem is to transplant microbes from salt tolerant plants to salt sensitive crops to increase production yields in saline soils.
- Livestock exist in a uniquely symbiotic relationship with the Agri biome, including the microbiome present with the livestock, the soil, and their feedstuffs. In North Dakota, this is especially important as most of our livestock enterprises include ruminants, which rely on microbes to ferment forages and other feedstuffs. A number of areas of research may yield significant impacts, including:
 - Digestive physiology. Gut microbes are critically important to nutrition, and they impact nutrient fermentation, nutrient use efficiencies, digestion, absorption, and the epigenome. Enhanced understanding of the gut agri biome will improve growth, digestion, and production efficiencies; while at the same time enhancing sustainability and environmental stewardship.
 - Animal Health. The agri biome plays an important role in animal health. Obtaining a better understanding of the role the agri biome has on animal health should lead to advances in vaccine and antimicrobial efficacy, as well as improved disease resistance in livestock.
 - Food Quality and Storage Characteristics. A better understanding of the role of the agri biome on food quality and storage characteristics could lead to enhanced storage methods, higher food quality products, longer shelf life, and reductions in food borne illnesses.
- Drought tolerance. The drought tolerance of crops can be enhanced by incorporating microbes that are adapted to drought conditions into the microbiome of crops and forages grown in dry conditions.
- Food Quality and Health. Engineering the microbiome to increase phytonutrients and create functional foods to counter diet-linked chronic diseases such as diabetes.

B. Precision Agriculture

The future of farming will be 'smart farming' that incorporates computer systems to make real-time decisions based on digital data (artificial intelligence) of the conditions in the field. The smart farm is expected to have increased production efficiency, reduced labor costs, and better net return, while providing more protection to the environment. These technological innovations in Precision Ag are taking place at a fast pace, with new technologies coming to market every year. A 2018 survey by Glacier Farm Media (www.farmmedia.com) indicates that 89-90% of farmers surveyed felt that using sensors, digital data, and autonomous systems can decrease production cost, increase yield, and/or save time. Unmanned Aerial Systems (UAS), for example, used in Precision Ag are expected to contribute up to 80% of the \$80 billion UAS market by 2025.

North Dakota has a large concentration of companies involved in Precision Ag that seek partnerships with NDSU to expand and field validate their technologies. Agricultural producers need research-based information on profitable Precision Ag technologies to adopt, best utilize, or optimize these technologies on individual farms, and learn how to convert the huge amount of data collected in the field to appropriate decisions.

Some of the more recent issues with chemical application (e.g., Dicamba drift), effective management of resistant weeds, nutrient management in crops, assessing weather damage on crops, as well as managing fields for better soil health, etc. are just some of the areas Precision Ag can contribute.

Return on Investment

Precision Ag research at NDSU will benefit the North Dakota agricultural industries by increasing crop yield and efficiency of food production, and reducing inputs. Adopting Precision Ag can result in an economic benefit of as much as \$165/A in North Dakota (Schimmelpfennig, USDA, 2016). Precision Ag can improve both soil health and water quality by minimizing runoff of inputs. It also can improve grain quality through the timely and precise application of inputs to the developing crops, resulting in additional benefits to the producers and environment.

Investing in Precision Ag research will facilitate partnerships with the private sector, both established and startup technology companies. Precision Ag scientists at NDSU can address research needs in the state and collaboration requests from major agriculture and technology companies in the state. North Dakota has a large number of startup companies, and many major Precision Ag technology providers, which makes the state well positioned to be a leader in Precision Ag. Enhancing a strong research program at NDSU is critical to complementing these entrepreneurial efforts.

Currently, we have gaps in expertise in the following areas:

- Big data management and machine learning in Precision Ag: Vast amounts of data are collected by sensors, unmanned aerial systems, and agriculture machinery. Research is needed to develop crop management decisions by applying machine learning methods to these data and to develop data management strategies necessary for smart farms of the 21st century.
- Site-specific chemical application: Examples of issues that need to be addressed include monitoring herbicide injury (e.g., glyphosate injury in crops or Dicamba in non-tolerant crops), establishing conditions contributing to herbicide drift, temperature inversion effects, site-specific weed management, and herbicide resistance management in weeds. Research is also needed on precision management of insect pests and diseases.
- Robotics and autonomous systems: Machinery manufacturers are requesting partnerships to develop sensors and intelligent systems that make their machines more autonomous (where a computer makes decisions rather than an operator). Major industries are approaching NDSU for research collaboration, as autonomous and robotic systems can improve operational efficiency, and reduce labor requirements.
- Nutrient management: Site-specific management of nutrients in crops can improve soil health. Precision Ag technologies can help in monitoring soil problems and manage crop by square inch to improve soil health.

- Economic viability of Precision Ag technologies: new Precision Ag technologies are coming at a fast pace without adequate independent study on their economic viability. Therefore, it is important to evaluate technologies for their economic viability. Also, the crop budgets handled by most farm management software need to be modified to include site-specific input application regimes.

C. Enhancing Research Capacity - Increased Support for Operations

Agricultural research is a labor-intensive effort spanning a number of disciplines to improve the profitability of farming, ranching, and agribusiness enterprises. A strong focus of the research effort at the NDAES is to work on providing solutions to problems that affect crop and livestock production, improve production efficiency, product quality, and environmental sustainability.

Operating costs for research activities continue to increase. Scientists at the Research Extension Centers (RECs) and the Main Station receive high levels of grant funding from a variety of agencies. However, inflationary pressures on operating costs, such as state motor pool leasing, equipment repairs, and supplies, reduce our ability to respond to current and future production-related issues affecting crop and livestock producers. In addition, it is critically important that our scientists remain relevant by incorporating new technologies into our research programs, which allows the NDAES to emulate the rapidly changing technology environment that exists in 21st Century Agricultural systems.

An increase in operating funds for RECs (\$30,000/REC/biennium) was last received in the 2015-17 session. Funds for the 2019-21 biennium would be used to offset increasing costs of fuel, supplies, minor equipment, and timeslip (student) labor needed for our existing research projects.

The Oakes Irrigation Site has been funded through the Garrison Conservancy District. This funding will no longer be available in the near future. The facility has been supervised through the Carrington REC, but is entirely grant supported. Stakeholders in the region have made commitments to provide support for the Oakes site, including a gift of 40 acres to increase the research land area. The facility carries out research on high-value irrigated crops for the SE region of ND.

2017-19 Legislation that Included Reporting Requirements to 2019 Appropriation Committees

SB2020 (NDSU Research & Extension, & Agronomy Seed Farm)

SECTION 3. ONE-TIME FUNDING — EFFECT ON BASE BUDGET — REPORT TO SIXTY-SIXTH

LEGISLATIVE ASSEMBLY. The following amounts reflect the one-time funding items approved by the sixty-fourth legislative assembly for ... the 2017-19 biennium one-time funding items included in the appropriation in section 1 of this Act:

One-Time Funding Description

Seed cleaning plant; Other Fund authorization - \$1,500,000

The 2017-19 one-time funding amounts are not a part of the entity's base budget for the 2019-21 biennium. The main research center shall report to the appropriations committees of the sixty- sixth legislative assembly on the use of this one-time funding for the biennium beginning July 1, 2017, and ending June 30, 2019.

- Seed Cleaning

Status: Fundraising campaign for seed cleaning project underway at Williston REC

SECTION 7. DICKINSON RESEARCH EXTENSION CENTER — MINERAL RIGHTS INCOME.

The Dickinson research extension center may spend up to \$755,000 of revenues received during the 2017-19 biennium from mineral royalties, leases, or easements for ongoing operational expenses. Any revenues received in excess of \$755,000 may be spent only for one-time expenditures for the biennium beginning July 1, 2017, and ending June 30, 2019.

Status: Oil Revenue received July 1, 2017 to November 30, 2018 - \$114,592

SECTION 8. WILLISTON RESEARCH EXTENSION CENTER — MINERAL RIGHTS INCOME.

The Williston research extension center shall report to the appropriations committees of the sixty-sixth legislative assembly on amounts received and spent from mineral royalties, leases, or easements in the biennium beginning July 1, 2015, and ending June 30, 2017, and the biennium beginning July 1, 2017, and ending June 30, 2019.

Status: July 1, 2013 to June 30, 2015 - Amounts received \$491,230; Amounts spent \$0

July 1, 2015 to June 30, 2017 - Amounts received \$141,034; Amounts spent \$581,570

July 1, 2017 to November 30, 2018 - Amounts received \$22,640; Amounts spent \$23,883

SECTION 12. EXEMPTION.

The amounts appropriated for the veterinary diagnostic laboratory and the seed cleaning plants contained in subdivision 4 of section 1 of chapter 20 of the 2015 Session Laws, are not subject to the provisions of section 54-44.1-11, and any unexpended funds from these appropriations or related revenues are available and may be expended during the biennium beginning July 1, 2017, and ending June 30, 2019.

Carryover Status	GF	OF	Amount Spent	Status
	Carryover	Carryover	12/31/2018	
Seed Cleaning plant NCREC	575,693	1,545,888	565,551	Remaining GF to be spent by 6/30/2019
Seed Cleaning plant CREC	-	1,393,110	602,984	Project to be complete 6/30/2019
Veterinary Diagnostic lab	-	3,675,781	3,461,515	Remainder returned to SIIF (\$214,266)

SBARE Priorities for the North Dakota Agricultural Experiment Station

May 3, 2018

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Agribiome Initiative

Knowledge of the human microbiome has revolutionized medicine and nutrition and fueled the \$45 billion probiotics industry. A similar revolution is happening in agriculture, where the microbiomes of crops, soils, and livestock (the Agribiome) are being harnessed to increase productivity, efficiency, safety, and quality. Food production must double to meet the global population demand by 2050, despite depleting water resources, shrinking farmland, and rising input costs. The inputs that drove intensive crop production in the 20th century have diminishing returns and may lead to unintended environmental consequences, so the next agricultural revolution must be based on a more sustainable approach that harnesses microbiomes to increase water- and nutrient-use efficiency, stress tolerance, disease resistance, and production of high quality food and agricultural products.

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- Strong programs in plant breeding, genetics, and genomics; plant nutrition; plant pathology; soil health; and water quality.
- Strong programs in animal nutrition, physiology, husbandry, genetics, and health as well as range sciences and forages.
- Facilities to study microbiomes from lab to field or herd scale.
- Infrastructures to connect researchers with producers across the state to understand problems, identify solutions, and translate discoveries into practical applications.

REQUEST: 2.0 FTE scientist and technician (\$355,000 salary and fringe— focusing on microbe-livestock interactions) and 2.0 FTE scientist and technician (\$355,000 salary and fringe—focusing on organismal-plant interactions); \$450,000 operating.

Total— \$1,160,000

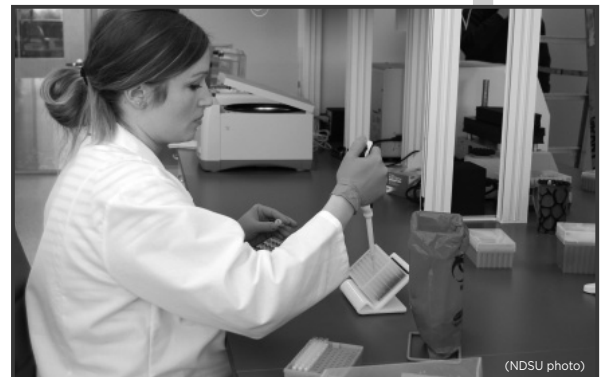
Addressing important areas of the Agribiome related to crop and livestock production will require a multi-faceted approach. While several scientists are already engaged in researching some aspects of the Agribiome, additional scientists will reduce gaps in our existing expertise and move North Dakota to the forefront in this critical area.



(NDSU photo)



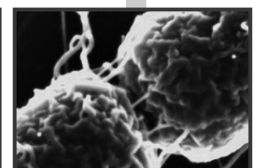
(NDSU photo)



(NDSU photo)



E. Coli (NDSU photo)



E. Coli biofilm (NDSU photo)

SBARE Priorities for the North Dakota Agricultural Experiment Station

May 3, 2018

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Precision Agriculture

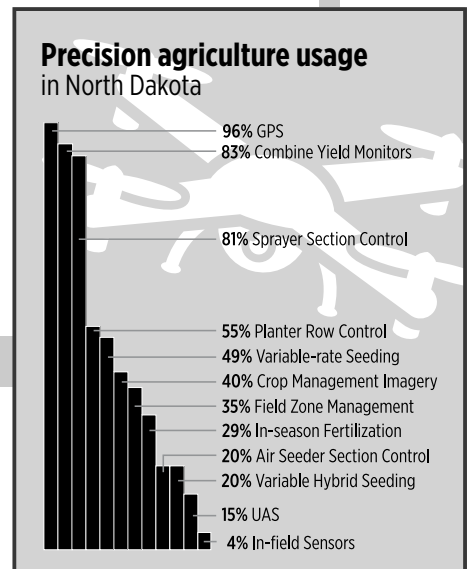
The future of farming will be 'smart farming' that incorporates computer systems to make real-time decisions based on digital data (artificial intelligence) of the conditions in the field. The smart farm is expected to have increased production efficiency, reduced labor costs, and better net return, while providing more protection to the environment. These technological innovations in Precision Ag are taking place at a fast pace, with new technologies coming to market every year. A 2018 survey by Glacier Farm Media (www.farmmedia.com) indicates that 89-90% of farmers surveyed felt that using sensors, digital data, and autonomous systems can decrease production cost, increase yield, and/or save time. Unmanned Aerial Systems (UAS), for example, used in Precision Ag are expected to contribute up to 80% of the \$80 billion UAS market by 2025.

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Precision Ag can improve both soil health and water quality by minimizing runoff of inputs. It also can improve grain quality through the timely and precise application of inputs to the developing crops, resulting in additional benefits to the producers and environment.

REQUEST: The 2015-17 Legislative session provided \$600,000/biennium in operating funds for Precision Ag research. These funds are distributed through an internal competitive grants process. In each biennium, funds requested greatly exceeded the amount that was distributed. An increase in **Operating (\$800,000)** is requested to establish a smart crop farm at Casselton and a smart livestock farm at Fargo that utilizes sensors, autonomous systems, and data to make crop management decisions, and to evaluate these decisions in partnership with industries.



An example of a greenhouse using LED lighting technology that can help boost food production. (photo Shutterstock.com)

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SBARE Priorities for the North Dakota Agricultural Experiment Station

May 3, 2018

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Enhancing Research Capacity

Support for Operations to Offset Inflationary Costs

Agricultural research is a labor-intensive effort spanning a number of disciplines to improve the profitability of farming, ranching, and agribusiness enterprises. A strong focus of the research effort at the NDAES is to work on providing solutions to problems that affect crop and livestock production, improve production efficiency, product quality, and environmental sustainability.

Operating costs for research activities continue to increase. Scientists at the RECs and the Main Station receive high levels of grant funding from a variety of agencies. However, inflationary pressures on operating costs, such as state

motor pool leasing, equipment repairs, and supplies, reduce our ability to respond to current and future production-related issues affecting crop and livestock producers. In addition, it is critically important that our scientists remain relevant by incorporating new technologies into our research programs, which allows the NDAES to emulate the rapidly changing technology environment that exists in 21st Century Agricultural systems.

REQUEST: Operating support for REC's—\$280,000; Operating support for Main Station—\$210,000; Operating support for Oakes site—\$200,000. **Total — \$690,000**



(NDSU photo)

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North Dakota Agricultural Experiment Station

Main Research Station

2017-2019 IMPACTS

- A novel radio frequency sensor is being developed to reduce grain loss during harvesting; this work is in collaboration with industry and other NDAES units. A grain loss of 10 percent during harvesting is not unusual and is higher than the industry standard of 1 to 3 percent. In North Dakota, a grain loss of 5 percent above the standard will result in a loss of approximately 22.5 million bushels of corn, and 12.5 million bushels each of wheat and soybean. The development of a sensor that detects grain loss in real time and allows farmers to make quick combine adjustments will save approximately \$85 million for corn, \$73 million for soybean and \$71 million for wheat in the state.
- The impact of storage environments on green and semigreen soybeans is being studied by NDAES researchers in collaboration with NDSU Extension. High discounts are applied at the elevator when a large presence of green soybeans occurs, and this proportion of green soybeans usually varies from season to season. This study will provide best management strategies to North Dakota farmers during drying and storage, especially in seasons when a high proportion of green soybeans is harvested.
- The Red River Valley of North Dakota and Minnesota accounts for about 50 percent of the sugar beet production in the U.S. Sugar beet growers and sugar industries require tools for in-season diagnosis of crop development and forecasting of crop yields at harvest. Spatial variation of crop growth and yield can be explained by the diversity of environmental factors and cropping systems. NDAES researchers are developing a computer model and decision support system to improve diagnosis of crop growth and yield prediction of sugar beet grown in the Red River Valley.
- NDAES agricultural engineers are revising a publication on irrigation scheduling by the “checkbook” method to include more recently developed online and spreadsheet tools for irrigation scheduling in North Dakota. The checkbook publication presents principles and procedures for effective irrigation water management to help growers optimize crop yields, avoid excessive pumping costs, manage water resources and withdrawals, and minimize leaching of nutrients to groundwater. The irrigation scheduling publication and tools have been used as educational aids for growers, agencies and students.
- NDAES researchers have conducted studies in alfalfa harvest management and fertility. Research has demonstrated that optimization of management and fertility practices can increase forage yield by at least 0.3 ton/acre/year. In 2017, North Dakota had 449,046 acres of pure alfalfa and 962,015 acres of alfalfa-grass mixtures. Thus, an increase in forage yield of 0.3 ton/acre/year x 1,411,061 acres (alfalfa and alfalfa-grass mixtures) at \$100/ton of hay equals an economic impact of \$42,331,830/year.

NDAES agricultural engineers are revising a publication on irrigation scheduling by the “checkbook” method to include more recently developed online and spreadsheet tools for irrigation scheduling in North Dakota.



■ 2017-2019 IMPACTS: ND Agricultural Experiment Station - Main Station

- Control of herbicide-resistant weeds is estimated to cost \$10 to \$40 more per acre than standard weed control. In comparison, proactive resistance management strategies are estimated to provide long-term annual economic returns of \$20 to \$50 per acre. The weed genetics project is developing tools to facilitate proactive resistance management through genetic diagnostics and to mitigate resistance using emerging genetic technologies.
- Based on the last three years' average, North Dakota produced 55 percent (43.2 million bushels) of the durum in the U.S., with a \$268 million direct economic value to producers in North Dakota annually. More than 90 percent of the North Dakota durum acreage is sown with varieties developed at the NDAES. In 2018, Divide and the two new varieties, Carpio and Joppa, collectively were grown on 54 percent of the acreage in North Dakota. Two low-cadmium varieties, ND Grano and ND Riveland, with high yield potential, were released in 2017. If the new varieties replace 50 percent of the acreage and provide a 2 percent increase in yield, they will add approximately \$2.7 million annually to North Dakota producers.
- During 2016, the U.S. had 14,217 certified organic farms that produced \$7.6 billion in certified organic products. North Dakota had 114 certified organic farms that produced \$22.7 million in certified organic products. NDAES research is aimed at addressing one of the major problems faced by organic farmers and small- to medium-scale vegetable producers, which is weed management. Researchers are investigating novel approaches for suppressing weeds in these production systems. Results have been communicated to producers at several field days, and producers have indicated via surveys that they will utilize the new techniques.
- In 2018, 25 percent of North Dakota's spring wheat acreage was sown to varieties developed at the NDAES. The cash value of the 2017 spring wheat crop, according to National Agricultural Statistics Service estimates, was more than \$1.3 billion. According to NDAES ag economist William Wilson, a variety released from the NDAES spring wheat breeding program has an estimated direct economic impact to the state ranging from \$69 million to \$284 million beyond other competitive varieties for the period it remains in the marketplace. The spring wheat program also facilitates and participates in statewide variety trial testing for agronomic factors, as well as plant diseases. This unbiased source of data is invaluable to farmers as they make variety planting decisions.
- Soybean growers in the northern tier of North Dakota counties can save \$30 an acre in seeding costs by planting the glyphosate-resistant soybean variety ND17009GT, which was developed by the NDAES. As much as 500,000 acres of ND17009GT could be grown in 2019, which would save growers \$15 million in input costs by reducing their cost of seed.
 - Early detection and characterization of resistance traits in weeds such as wild oat, redroot pigweed and kochia have allowed changes in weed control programs and cultural practices to reduce the seed rain of resistant plants and restrict the geographic spread of the resistant biotypes. This can reduce the long-term herbicide input costs by 30 percent for the local geography.

Research on soybean varieties, weed control and crop injury has resulted in more profits for growers.



Application of the same strategy for the recently introduced weed Palmer amaranth could be even more important because the cost of control programs in other states has more than doubled once this weed is established.

- Research repeatedly has demonstrated the susceptibility of group 1- and group 2-resistant wild oat in North Dakota to triallate. Where tillage can be used for incorporation, inclusion of triallate for wild oat control in wheat has resulted in a \$35 per acre return, compared with wild oat control with a postemergence herbicide alone. Adoption of this program and successful wild oat control have been identified in areas with incidence of resistance to both groups of postemergence wild oat herbicides.
- Research has shown that off-target dicamba movement to susceptible soybean easily causes visible symptoms and can cause mild to moderate yield loss across large areas. Substantial visible injury of up to 60 percent vegetation loss has resulted in as much as 50 percent less seed yield. However, dicamba was not found at excessive levels in the seed, oil and protein content were not adversely affected, seed size was not altered appreciably, and germination and seedling growth were not inhibited. Soybean seed production might be reduced, but seed use, whether for the commodity or seed industry, should not suffer from off-target dicamba movement.
- Winter camelina and field pennycress production in second-year relayed soybean production added \$268 to \$493 per acre grain value to soybean yields in a wheat/soybean/soybean cropping sequence. Field pennycress caused soybean yield reduction in a wheat/corn/soybean cropping sequence. Potential is indicated for winter camelina and field pennycress to add grain value in wheat/soybean/soybean cropping systems.
- Based on the annual grower survey, 92 percent of the total acreage planted with black beans is of the Eclipse cultivar released by NDAES. At least 60 percent of the pinto bean acreage in the state will be grown with slow-darkening pintos, and approximately half of that area is grown with ND-Palomino, the first public slow darkening pinto released for the state and one of the first in the country.
- Assuming an average price of \$0.35 per pound across the different market classes, NDAES cultivars help contribute approximately \$110 million to the state's economy every year. The value of production for dry beans in the state is approximately \$300 million annually.
- In 2018, more than 18.9 percent of acres planted in the seven major states producing fall potatoes (Idaho, Washington, North Dakota, Wisconsin, Oregon, Maine and Minnesota) were planted to cultivars (or selections thereof) developed by the NDAES potato breeding program. The NDAES variety Dakota Trailblazer utilizes one-third less nitrogen than Russet Burbank; additionally, it is highly resistant to *Verticillium* wilt, thus, saving approximately \$200/acre fumigation costs for standard commercial processing cultivars.
- The NDAES woody plant improvement project has introduced 57 superior ornamental woody plants for production and sale; these plants have increased disease tolerance and winter hardiness for landscapes throughout the northern Great Plains. NDAES woody plant introductions have a nursery wholesale sale value of more than \$2.1 million and a \$6.1 million value in retail sales for 2017 alone. Introductions are being propagated for sale by commercial wholesale firms in four countries: Australia, Canada, England and the U.S. (14 states, including 35 nurseries).
- Artificial insemination (AI) offers beef producers the potential to make genetic progress in their herd at a fraction of the cost of purchasing herd bulls of equivalent genetic value. Research conducted by NDAES scientists indicates that the value of replacement heifers can be increased by more than \$500 per head through the use of AI. If an additional 10 percent of the 375,000 replacement heifers maintained in North Dakota were generated from AI breeding, the net increase in their value would be more than \$18 million annually.



NDAES scientists are evaluating the frame size of beef cows and its effect on efficiency. Matching the size of cows to resources and increasing longevity could save beef producers in North Dakota \$20 million annually.

- Cow size affects the economics of calf production. NDAES scientists are evaluating the frame size of beef cows and its effect on efficiency. During the past four years, cows have been bred for different frame sizes and feed intake, and production has been measured in offspring. While the research is ongoing, so far, larger cattle are more efficient at using feed for growth, while smaller cattle wean more calf for their weight. This means larger and smaller cows will fit different operations, depending upon their goals and objectives. How long a cow stays in the herd, which is another objective of the research, will affect economic efficiency as well. A conservative estimate of savings by matching the size of cows to resources and increasing longevity would be \$20 million annually for North Dakota beef producers.
- Research related to the interactions between reproduction and nutrition, and research concerning regulation of ovarian, uterine and placental functions in nonpregnant and pregnant domestic animals, has identified selected mechanisms critical for reproductive efficiency that ultimately may improve fertility and embryo survival. A 1 percent increase in the pregnancy rate in North Dakota livestock potentially would result in more than \$10 million in increased revenue for North Dakota ranchers annually.
- Saline and nonsaline areas within a field function as different ecosystems. As such, saline patches should be delineated and managed separately. Saline soils tend to hold more water and more fertility throughout the growing season. Soil structure generally is better in nonsaline parts of the field, allowing better drainage and rooting conditions. As a result of these water and nutrient conditions in saline soils, microbial biomass is higher in the saline soils. This project ultimately will guide management of saline patches with the goal of improving field-level crop productivity and revenue across North Dakota.
- Deployment of the Mobile Cow Command Center (MCCC) units were successful and serve as portable units that use solar power to run individual components and upload data to cloud-based data acquisition platforms. SmartFeed units were able to control intake of individual animals assigned to different treatments in a group pasture scenario. The CowManager system was able to detect divergence in highly active behavior among treatment groups. The feed controlling portion of the MCCC can be used for precision feeding of individuals in expansive group-managed scenarios.

Agency Overview

Carrington Research Extension Center

North Dakota Agricultural Experiment Station

Agency Statutor Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Carrington Research Extension Center (CREC) was established in 1960. CREC operates on a land base of around 1,700 acres and has infrastructure to irrigate about 260 acres with center-pivot systems and 120 acres by surface methods. The balance of the acreage is managed as traditional dryland and is utilized primarily for dryland field crop research activities.

The research effort at CREC focuses on these general program areas: traditional crop variety evaluation, crop production and management, plant disease management, alternative crop development, cropping systems, irrigation, integration of crop and livestock production, intensive cow/calf production, beef cattle feeding, feedlot management, livestock waste and nutrient management, foundation seedstocks production, and development of new agricultural enterprises. Through these efforts, the CREC research program has gained a national reputation for its involvement in agriculturally-based economic development and study of a wide range of crops and cropping systems.

CREC maintains a strong Extension program as five extension specialists base their educational programming from the center. The Extension program emphasis areas addressed by these specialists include: agronomy, plant pathology, irrigation, livestock, and livestock waste – nutrient management.

Agency Mission Statement

The Carrington Research Extension Center conducts research that will lead to the enhancement of agriculture and improve the quality of life across the central region of North Dakota. Specifically, the Carrington Center conducts research on both dryland and irrigated crop production methods and systems, improved crop cultivars, feeding of beef cattle, cow/calf nutrition, sustainable agricultural production, and produces foundation seedstocks. The objective is to discover the balance between farm enterprise profitability and conservation of the natural resource base. The results of these studies are disseminated to the entire state through an on-going extension educational program.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- A secure (owned or long-term leases) land base is critical to sustain the current and future research mission of the Carrington Center. The diverse and broad based programs of the CREC operate on a relatively small land base. The Carrington REC operates on a land base of around 1,940 acres with the state owning around 840 acres. The 1,100 acres not secured by state ownership must be sourced by annual rental agreements with multiple landlords. This heavy reliance upon a willing group of land owners to annually rent a significant portion of the minimum amount of acres the CREC requires is risky at best. If any one parcel of rented land was not made available in a given year, the CREC would be forced to greatly reduce or eliminate program contributions that are depended upon by North Dakota producers and are basic to our department mission.
- The beef research unit needs a multi-use 'feedlot research support facility'. This facility would expand the scope of research capabilities, assist in sustaining Institutional Animal Care and Use Committee (IAUAC) compliance, address worker protection challenges, and reduce maintenance costs for equipment. An associated need for this program is an additional set of feedlot pens that would include a subset placed within a hoop structure. Current pens are fully utilized and feedlot research projects are often backlogged. An additional set of pens would allow the CREC to conduct at least one additional experiment per feedout period. Alternatively, these pens would allow more treatments or replications within other studies, thereby expanding research capacity and quality. Any feedlot pen expansion must include associated waste containment facilities to remain compliant with regulations.
- It is important that grant fund opportunities continue to be widely available in future years. Funds that support crop and livestock production or agricultural related issues in general are needed to leverage public funding. The CREC research programs must continue to have a diversity of opportunities to compete for grant funds that, when successful, allow us to most effectively empower current research programs.
- The programs of the CREC are supported by a diversity of facilities that include not only the primary buildings like headquarters and laboratories but also feedlot pens, feed and seed storage, animal shelters, water supply features, storage buildings, parking lots, roadways and waste containment. Current support for maintenance of these facilities is fully inadequate to address the current deferred maintenance costs.
- Equipment storage capacity at the CREC is critically limited resulting in a number of high value pieces of equipment needing to be stored outside year round exposed to the elements. This exposure has resulted in repair costs that would not have been experienced if the equipment was stored indoors, and faster depreciation especially on the higher-value equipment.

2017-2019 IMPACTS

- Expanded research on using winter rye as a cover crop for subsequent planting of soybean and dry bean to reduce erosion, suppress weeds and mitigate salinity effects while maintaining crop performance
- Established a precision agriculture research concept of testing crop input combinations across a landscape with variable soil characteristics to improve crop quality and yield across a whole field while increasing efficiency of input utilization
- Produced, conditioned and delivered foundation grade seed from an average of 33 varieties and 11 different crops the past two seasons through the CREC foundation seedstocks program. The seed increases represent contributions toward the introduction of new genetics and maintenance of pure seed for varieties in demand.
- Improved control of the disease Sclerotinia in soybeans significantly by optimizing fungicide deposition to the lower canopy through appropriate nozzle selection with boom-mounted nozzles and the use of a newly designed drop nozzle
- Completed a study to evaluate the safety of spring wheat herbicides on subsequent cover crop plantings. Many popular cover crop species are sensitive to herbicides frequently used in wheat. The research led to the development of a cover crop injury risk table included in the “2018 North Dakota Weed Control Guide.”
- Developed a new winter rye variety, ND Dylan, which was released by the NDSU Agriculture Experiment Station. The variety has higher seed than winter rye varieties commonly grown in the region.
- Demonstrated through initial field studies that the planting date, but not residue cover, may be a significant determinant of the severity of Fusarium and Aphanomyces root rots of field pea. An early planting date was critical for strong field pea performance in fields with root rot pressure.



The CREC foundation seedstocks program contributes toward the introduction of new genetics and maintenance of pure seed for varieties in demand.

Agency Overview

Central Grasslands Research Extension Center – Streeter

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Central Grasslands Research Extension Center (CGREC) conducts research for the Coteau region of North Dakota, an area bounded by the Missouri River on the west and the James River on the east and extends from Divide and Burke counties in northwestern North Dakota in a southeasterly direction through Dickey County.

Research objectives must increase the range-carrying capacity of native range emphasizing conservation and preservation, stabilize grass production to compensate for the vagaries of the weather and precipitation as it influences forage production in the dryland agriculture, identify the impact of different management systems upon beef production in the central region and explore the increased use of crop residues and byproducts for the maintenance of the cow herd. CGREC's primary focus is management of grassland acreage which occupies about one-third of the agricultural land in the state and aims to improve production and increase returns to cattle producers.

Agency Mission Statement

The legislated mission of the CGREC is as follows: The CGREC shall conduct research designed to fulfill needs within an area bounded by the Missouri River on the west and the James River on the east with research objectives as follows:

1. To increase the range-carrying capacity of native range with emphasis on conservation.
2. Stabilization of grass production to determine how to best compensate for the variability of the weather as it influences forage production.
3. Identification of different management systems on beef production in the central region of the state.
4. Exploration of increased use of crop residues and by-products for the maintenance of the cow herd.
5. To disseminate research results and information for the benefit of the state of North Dakota.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- Livestock facilities continue to be deficient and impede potential research. Improvements to livestock handling and feeding facilities including replicated dry-lot pens, feed storage, and a new working barn are needed to allow for growth of the animal science research program with animals that come off the range and forage research projects.
- Significant improvements or replacement of the director's residence is needed as the current residence has water, possible mold, and foundational issues in the basement.
- Deferred maintenance and other repairs that affect both safety and use of facilities continue to be a critical issue.

2017-2019 IMPACTS

- Initiated a large landscape-level research project addressing invasive cool-season grass species and improving plant diversity using two different prescribed patch-burn grazing (spring only and spring plus summer) strategies and a modified twice-over/rest-rotation grazing strategy
- Expanded winter grazing research to include grazing of corn residues, cover crops and bale grazing projects
- Studied through a precision agriculture project the impacts of supplementing enhanced mineral feeds to grazing developing heifers on pasture using radio frequency identification technology
- Continued to expand on collaborative research efforts evaluating the impacts of management on reproductive performance of beef cows and bulls
- Expanded and initiated alfalfa trials to assess varieties and explore enhancing a multi-harvested haying system to improve forage production and retain grass in the mixture
- Assessed different cover crop mixtures for forage production and quality while improving soil health
- Created on-farm demonstrations with NDSU Extension agents and specialists, finalized the bale grazing demonstration project and started a project with ranchers in the Coteau region
- Developed regional Extension programs for farmers and ranchers, and in-service training for Extension agents and specialists, and the U.S. Department of Agriculture-Natural Resources Conservation Service

Research at Central Grasslands included using patch-burn grazing strategies to improve plant diversity and address invasive cool-season grass species.



Agency Overview

Dickinson Research Extension Center

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Dickinson Research Extension Center (DREC) has an established record of service to the people in the 13-county region south and west of the Missouri River. The DREC operates 6,506 acres of owned land within the region as well as annual land leases needed to accommodate ongoing projects. The land base provides opportunities for a broad perspective in evaluating various agricultural systems that can serve as engines for economic development. This is a continuation of what has taken place for over 100 years. Currently, the DREC assists agricultural producers in solving production problems with agronomy, animal science and range science, while integrating new developments. Five major areas are served: agronomy, beef management, bio-security, range management, and sustainable agricultural practices. Faculty and staff are committed to engaging people of the region and to the identification of current economic opportunities, while sustaining natural resources for future generations as directed by the mission statement and Advisory Board. Research data and producer ideas are continually considered so the DREC can leverage the latest knowledge to best benefit the people of North Dakota.

Agency Mission Statement

The Dickinson Research Center must be located at or near Dickinson in Stark County. The Center shall conduct research on increasing the carrying capacity of native rangeland, with emphasis on conservation and preservation for future generations. The Center shall conduct research on grass production to determine how to best compensate for the vagaries of the weather as it influences forage production in the dry land agriculture of western North Dakota. The Center shall conduct research at the ranch location in Dunn County with beef cattle breeding, feeding, management and disease control for the benefit of livestock producers of western North Dakota and the entire state. The Center shall conduct research designed to increase productivity of all agricultural products of the soil by maintaining or improving the soil resource base in the dry land agricultural region of southwestern North Dakota by the identification of adapted crop species and superior crop cultivars; propagation and distribution of selected seed stock; and development of profitable cropping systems that achieve the necessary balance between profitability and conservation of all natural resources. The Center shall disseminate research results and information for the benefit of this state.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- Continue soil-plant-livestock-air continuum research emphasizing soil health, agronomy, range management and livestock production. The current research focus and long research history provide a firm foundation to continue cutting edge research to match goals and objectives for work related to the agricultural biome. The integration of sustainable plant and beef systems requires more evaluation. In the future, more avenues for additional compensation need to be explored, to enhance the economic viability for beef producers and the rural areas associated with beef production. This compensation may come from not only beef but synergistic crop production.
- The Dickinson Research Extension Center, as part of North Dakota State University, takes serious the need for sustainable beef, beef and grass systems. Currently, the Center is striving to develop sustainable and integrated production strategies that match conditions of western North Dakota and surrounding regions. The inclusion of forages into traditional cropping systems can provide the resources necessary for the development of integrated production strategies that increase sustainability and profitability.
- There is a need to develop agro-ecosystems that optimize the balance between forage-based and grain-based crop/livestock systems reflective of the many individual ecosystems. These integrated systems must be synergistic to, or enhance the native and agronomic plant communities, thus providing the base for future beef production. In addition, enhanced value for commodities produced from forage-based systems is key.
- Deferred Maintenance Increase – The DREC has maintenance issues with the main public use and cattle working facility at the ranch. The facility needs major roof repair and 1,800 square feet of additional cattle working space. arena at the DREC ranch headquarters southwest of Manning to improve our cattle working facility and create a more effective and safe handling facility for cattle and labor. This arena is our multi-purpose building, used as an educational area for conferences and public meetings. As previously requested, a new building for large equipment storage, chemical and hazardous material storage, and repairs.
- Programmatic Needs - Maintain adequate operating funds. Fund a research specialist to allow us to continue our efforts in the integration of livestock, range science, cover crops and cropping systems. Fund a research specialist with a master's level education to facilitate research and data collection. The Center needs annual support for a multitude of research projects, which require a broad understanding of various research techniques and data analysis related to the agricultural biome.

2017-2019 IMPACTS

- The DREC faculty and staff are active in finding answers that will identify positive economic advantages for producers and successfully preserve our natural resources. Major areas of research involvement are: soil health research and education to show how soil health is improved by the microbial action of microorganisms, which can reduce input costs and increase productivity, and the continued exploration of symbiotic relationships among livestock, range science, cover crops and cropping systems to advance revenue streams and the quality of place for North Dakotans. For all of our impacts, see our website: www.ag.ndsu.edu/DickinsonREC.
- Soil is a biological system that depends on the recycling of nutrients to sustain microbial action beneath the surface and provide nutrients for above-ground production. The balance between the ground surface and below-ground interaction is essential for soil to function properly, allowing water infiltration, nutrient cycling and erosion reduction. Research and educational efforts explore new forage and cattle resources and inputs that shift from a grain-based beef production model to a grass-based beef production model based on the principals of soil biology.
- Grass cultivars, soil mineral nitrogen, prairie ecosystems, grassland restoration and integrated grazing systems were evaluated. The diverse rotational cropping systems showed improved and increased per-acre return on seeded annual crops. Beef gain per acre grazing annual crops exceeded 2 pounds per day, and results on the 34-year old twice-over rangeland study show improved forage production per acre and greater plant nitrogen availability. These directly translate into improved revenue and decreased costs.
- Reduced soil disturbance, increased plant diversity, added animal diversity, maintained living roots to feed soil organisms and successfully covered soil with plants and plant residues all resulted in improvement in the sustainability of agronomic systems, cropping systems, pest control and the integration of beef cattle.

Research at the Dickinson REC explores new forage and cattle resources and inputs that shift from a grain-based beef production model to a grass-based beef production model based on the principles of soil biology.



Agency Overview

Hettinger Research Extension Center

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Hettinger Research Extension Center (HREC) is a semi-arid site located in southwest North Dakota, providing the most southerly NDSU location in the non-glaciated portion of North Dakota as a site for its agronomy research program. The HREC also is located at the center of the North Dakota sheep industry, the focus of one of its animal research programs, and in an area of rapidly growing livestock feeding ventures, another focus of animal research at the HREC. Additionally, the HREC is located in a region where much of the land base is in the Conservation Reserve Program, which has resulted in additional research evaluating potential changes in the CRP program and how these changes may affect upland native and game bird populations. A new research program evaluating low-cost rangeland monitoring strategies on U.S. Forest Service lands and wildlife/livestock interactions has resulted in a significant increase in the quantity of rangeland research conducted at the HREC throughout the western Dakotas. Research at HREC involves the disciplines of animal science, range science, wildlife science, agronomy, and agri-business and applied economics. Collaboration is with Main Station scientists, Branch Station scientists, U.S. Forest Service, grazing associations, university scientists from WY, SD, and MT, and USDA research entities in these research disciplines to improve productivity of livestock, grazing, and cropping systems, and to improve economic development of the region.

Agency Mission Statement

The Hettinger Research Extension Center, an outreach of North Dakota State University, provides applied research and education in agriculture and environmental sciences that will enrich the lives of North Dakotans and support economic development.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- Technical support for the livestock research program is needed to provide all research programs with a full time technician. This position is needed to meet the research needs of producers in SW North Dakota.
- A modern livestock processing and research support facility is needed to conduct the research by our sheep and cattle research programs. The current facility is a 16' x 32' lean-to, with no ability to utilize today's modern technology, such as web access, in our research program.
- A Sheep Feed Efficiency Research Facility for the evaluation of feed efficiency is needed for the sheep producers of ND to remain competitive. The ND Lamb and Wool Producers Association continues to support such a facility at the Hettinger REC.
- Housing of the graduate students and technicians needed for a nationally competitive program continues to be a struggle in western ND. Permanent housing, in a bunkhouse format, is needed to ensure the HREC program can continue to recruit these valuable members of our team on an annual basis.
- Deferred maintenance and safety issues are over \$1,000,000. Specifically, due to a past wet cycles and heavier than normal traffic, the road to the office is unstable and needs to be replaced. The most recent inspection by the Fire Marshall indicated that the 1970's era bunkhouse needs to be renovated to maintain its use as a housing facility, due to fire and safety concerns. Additional needs include mechanical system renovation of the 1992 office, and parking lot re-paving.

2017-2019 IMPACTS

- Evaluated new varieties (16) and technologies to grow drought-tolerant crops and new and emerging biofuels
- Conducted weed science research evaluating new herbicides for weed control and crop safety for crops grown in southwestern North Dakota
- Evaluated the effects of patch burning in post-Conservation Reserve Program lands on livestock, vegetation, pollinators and wildlife in western North Dakota
- Developed a multidisciplinary research project evaluating an integrated crop-livestock system using annual forages, winter wheat and sheep
- Conducted a nationally recognized sheep research program evaluating alternative technologies for increasing reproductive efficiency in males and females and feedlot nutrition
- Developed a nationwide training program for the National Sheep Industry Improvement program that trained and certified carcass ultrasound technicians for the U.S. sheep industry
- Certified 44 Extension agents in the Nitrate QuikTest Certification Program for annual forages so they could assist in the statewide drought response for NDSU Extension
- Trained five M.S. and Ph.D. students in the fields of Natural Resource Management and Animal Science



The Hettinger REC developed a nationwide training program for the National Sheep Industry Improvement program that trained and certified carcass ultrasound technicians for the U.S. sheep industry.

Agency Overview

Langdon Research Extension Center

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Langdon Research Extension Center (LREC) is located one mile east of Langdon on US highway five. The agricultural land base at the station consists of 549 owned acres and an additional 206 acres under lease agreement. The LREC serves a nine-county region located in northeast North Dakota and has North Dakota's highest precipitation rates, coolest temperatures, and richest productive soils. The climate supports diverse crop production and recurring disease problems.

The LREC has a strong tradition of assisting the region's producers to meet agricultural production challenges throughout the course of its existence since 1909. In 1993, the LREC redirected much of its research programming to focus on the significant increase of disease and insect pressure associated with its climate. This redirected applied research programming has provided producers with information regarding disease minimizing cultural farming practices and trusted information regarding chemical applications and other inputs that minimize disease and insect pressures that give growers the best return on investment.

Recently, the LREC has significantly enhanced its overall agricultural research programming with an increase in the foundation seed stocks program, the addition of a crop protection scientist, farm business management instructor, Extension specialist in agronomy and an Extension specialist in soil health. New infrastructure additions in the past 12 years include a full service agricultural based learning center/headquarters building constructed in 2004, agronomy/pathology laboratory in 2015 and a 25 acre field tiling project completed in 2014. The NDSU LREC with its recent personnel and infrastructure additions and improvements will insure that growers can depend on research data that will improve their bottom line for the next 100 years.

Agency Mission Statement

The Langdon Research Extension Center will conduct applied agricultural research that enhances the quality of life for the regions citizens with a responsive, flexible and accessible overall agricultural based research program. This programming will combine the concepts of agricultural research, information technology and community/economic development while conserving the regions natural resources.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- The number one issue currently for the NDSU Langdon Research Extension Center is to maintain a level budget through the 2019-21 biennium based on the 2017-19 budget. This is essential to support the research and extension programming at its current level. Further budget cuts would require eliminating FTE(s) which would scale back research and extension efforts demanded by the public.
- All research and extension programming are supported by all facilities at the Langdon REC. Most are becoming outdated and unsafe. Acquiring additional funds for extraordinary repairs will help to shore up these facilities to support the level of research and extension programming currently supported at Langdon.
- With appropriated funds becoming less and less, the LREC has become more dependent on research grant opportunities. Supporting an atmosphere that readily accepts private funding to leverage public funding will be essential to continue employing problem solving applied research for growers.

Langdon Research Extension Center

2017-2019 IMPACTS

- Continued to build strong research partnerships with agricultural input companies, commodity groups, regional crop improvement associations, growers and others
- Produced and distributed the highest quality foundation grade seed of the major crops grown in our region
- Provided dependable support for Main Station crop breeding programs and other cropping system research programs
- Continued to foster and strengthen two new Extension specialists' outreach programs in agronomy and soil health
- Applied research at Langdon in agronomy, pathology and soil health to provide growers with answers they need to become more profitable



Applied research at Langdon in soil health provides growers with answers they need to become more profitable.

Agency Overview

North Central Research Extension Center - Minot

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The North Central Research Extension Center (NCREC) was established in 1945 and is located one mile south of Minot on Highway 83. The 1,200-acre center specializes in crop research and extension education activities and foundation seed production. Approximately 1,500 owned, rented, and contracted acres are planted for foundation seed production each year. The NCREC evaluates conventional and new crops for production in the region and explores weed management and cropping systems to improve the economic potential of crop production in the north central region. The NCREC is a leader in North Dakota on production and disease research of canola, pea, lentil, and chickpea crops, in addition to the conventional crops of hard red spring and durum wheat, barley, flax, sunflower, and oats. The NCREC works closely with business and economic development leaders in the region to improve the economic vitality of north central North Dakota.

Agency Mission Statement

The North Central Research Extension Center conducts research to increase agricultural productivity in north central North Dakota. The center serves agricultural producers in a 12-county region surrounding Minot through crop research, foundation seed production and dissemination, and extension education programs in crop and livestock production. Studies at the center focus on crop variety and new germplasm evaluation, weed control, cropping systems, crop pest management, reduced tillage, and soil fertility. Research is conducted on cereal grains, oilseeds, legumes, forages, and new specialty crops.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- Increased base funding to support research and extension efforts
- Additional technical support
- Increased operating funds
- Equipment replacement
- Drain tile NCREC yard
- Encroachment from city of Minot
- Sale and purchase of additional land for seed production

2017-2019 IMPACTS

- Produced, conditioned and distributed foundation seed of nine crops grown in the region (24 unique varieties)
- Assisted in developing new varieties of economically important crops and evaluated production strategies for alternative crops
- Researched crop production products to improve efficiencies and maximize economic return for minor and major acreage crops grown in North Dakota
- Provided transformational Extension education in the areas of livestock, soil health, crop protection and cropping systems
- Conducted residue trials that led to registration of new pesticides



The North Central REC assisted in developing new varieties of economically important crops and evaluated production strategies for alternative crops.

Agency Overview

Williston Research Extension Center

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Williston Research Extension Center (WREC), established in 1907 and relocated to the present site in 1954, is an 800-acre rain-fed farm located in northwest North Dakota near the city of Williston. In 2001, an additional 160 acres were purchased in the Nesson Valley and an irrigated research and development project was established. WREC research studies are conducted on crop variety evaluation, herbicide performance and other cultural management research, cropping systems and soil and water conservation practices. The main dryland crops are spring wheat and durum. Barley, oats, safflower, pea, lentil, chickpea, canola, flax, alfalfa and other alternative crops are also grown as cash crops or for livestock feed.

WREC research is intended to increase the producer's net profit, support crop diversification and encourage more intensive cropping and irrigation development. Research on soil and crop management systems for sprinkler irrigation, on alternative irrigated high value and value-added crops and on western malting barley programs are conducted. WREC also conducts variety development research on safflower, winter wheat, and durum and variety evaluations in cooperation with NDSU Main Station scientists. WREC produces and supplies foundation seed to area farmers of new and old varieties adapted to the region.

Agency Mission Statement

The Williston Research Extension Center conducts research to increase agricultural productivity in the semi-arid region for northwestern North Dakota while achieving a necessary balance between profitability and conservation of natural resources. Research on soil and crop management systems for sprinkler irrigation and alternative irrigated high-value/value-added crop production at the Nesson Valley site are conducted in cooperation with the Montana State University Eastern Agricultural Research Center at the USDA-ARS Northern Plains Agricultural Research Laboratory in Sidney, Montana and other cooperating NDSU and University of Minnesota scientists.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

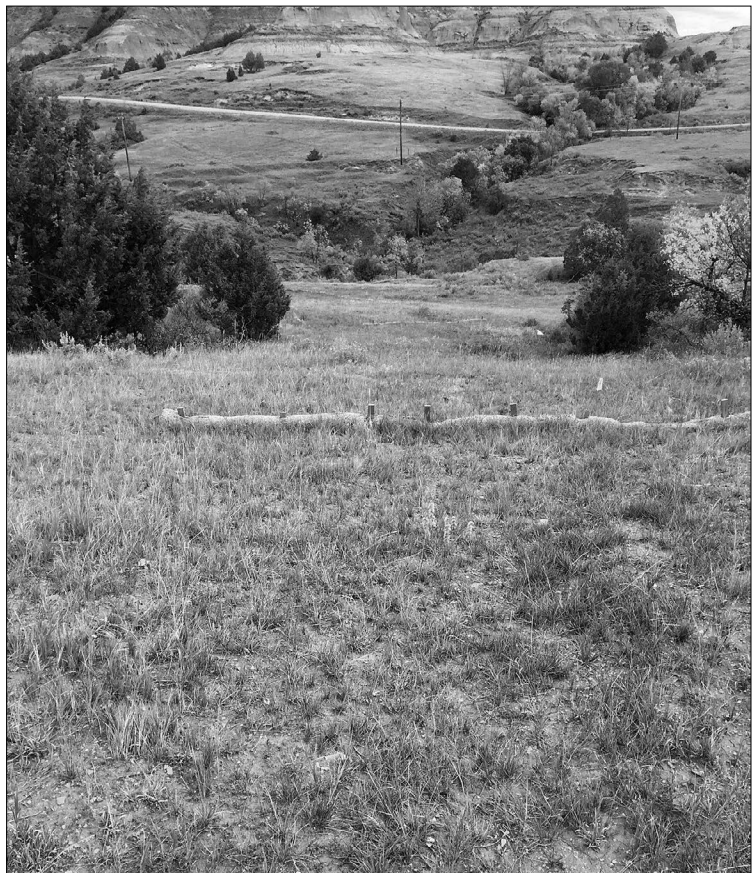
Agency Future Critical Issues

- Increasing operating costs and higher labor costs for research activities continue to impact WREC abilities to carry out our research programs vital to the improvement of the economic and environmental performance of our agricultural lands. A high priority need is the request to restore the WREC budget to the 100% funding level. Deferred maintenance funding continues to be an important need for WREC to maintain its facilities.
- The switch from a strict small grain-fallow rotation to a more intensive no-till diversified cropping system has resulted in northwest North Dakota farmers growing more than 20 different crops on over an additional million acres of previously fallowed land increasing the demand for pure seed of varieties of pulse crops and other fragile specialty seeds. The WREC seed conditioning plant built in 1954 is antiquated and was designed to only handle cereal crops and does not have the capability of cleaning peas, lentils, chickpeas, and other fragile seeds that are in high demand by our farmers. The outdated seed conditioning plant also poses considerable safety issues. A horizontal seed conditioning plant with optical color sorter and higher bushel per hour capacity is needed to allow WREC to condition Foundation seed of a wide array of new crop varieties to provide pure seed to growers.
- An additional equipment storage building is needed for WREC farm and plot research equipment to allow all WREC high cost farm and research equipment to be stored indoors from the elements.
- A greenhouse is needed for the new WREC Plant Pathology Program and the Horticulture Program to allow these programs to conduct plant disease and horticulture research during the winter months.
- Increased state operating costs due to state fleet rate/policy change.

Williston Research Extension Center

2017-2019 IMPACTS

- Produced more than 45,000 bushels of foundation seed of 23 varieties of small grains and broadleaf crops
- Developed and utilized a 160-acre irrigated site to identify improved irrigated cropping and tillage systems, water use efficiency and soil health
- Established and continued a pipeline reclamation research project
- Established and continued a high-tunnel research project with vegetable crops and cut flowers
- Established and continued a saline seep reclamation research and demonstration project in collaboration with the Montana Salinity Control Association
- Established and continued a multidisciplinary long-term dryland cropping systems project to develop diversified cropping systems recommendations
- Established and continued a plant pathology research program to investigate disease on peas, lentils, durum, barley and sugar beets; oversee crop scouts; and collaborate with other agencies to identify and treat diseases in crops
- Received funding from NDAES Precision Agriculture to establish the Drone-based High-throughput Phenotyping in Support of Cereal Grain project



Research continues on pipeline soil reclamation at Williston.

Agency Overview

Agronomy Seed Farm

North Dakota Agricultural Experiment Station

Agency Statutory Authority

North Dakota Century Code Chapter 15-12.1

Agency Description

The Agronomy Seed Farm (ASF) is a 590 acre farm located near Casselton, which has been a part of the North Dakota Agriculture Experiment Station (NDAES) since it was gifted to the state in 1950. It was the result of a fund drive conducted by the North Dakota Crop Improvement Association, which solicited farmers, seed companies and many others throughout the state to help establish a farm whose main purpose is to increase seed of new varieties as they are developed by the plant breeding and supporting departments of the NDAES. The ASF also propagates seed of older but still desirable varieties for the seedsmen of the area.

Agency Mission Statement

To produce an adequate supply of foundation-grade seed for the seedsmen of the state and area at a reasonable price and to support the varietal development research of the NDAES.

Agency Performance Measures

Per North Dakota Century Code 15-12.1-17 the State Board of Agricultural Research and Extension (SBARE) presents a status report to the budget section of the legislative council. SBARE's most recent presentation to the budget section was on July 11, 2018. The report they gave and provided in written form included the status of the North Dakota Agricultural Experiment Station and NDSU Extension. A copy of the information is on file in the legislative council office.

Agency Future Critical Issues

- The critical issues facing the ASF are a continued demand for foundation-grade seed, favorable weather for growing seed and a good supply of varieties that are in demand by the seed industry. If these three conditions are present and good commodity prices accompany them, the future of the ASF is secure.

Agronomy Seed Farm

2017-2019 IMPACTS

- Produced 35,000 to 50,000 bushels of seed for availability to the seed industry annually
- Conditioned 35,000 to 50,000 bushels of seed for availability to the seed industry annually



The Agronomy Seed Farm's main purpose is to increase seed of new varieties as they are developed by the plant breeding and supporting departments of the NDAES.

NDSU Extension Program Initiatives

Final Ranking by SBARE - May 3, 2018

NDSU

EXTENSION

ONE-TIME FUNDING REQUEST

Extension Web and Digital Delivery

JUSTIFICATION: SBARE's review of Extension recommended that Extension optimize the use of technology and target younger age demographics to enhance the effectiveness and efficiency of delivery methods. To accomplish this goal, Extension needs a new web strategy and reimagining of content options to meet future opportunities and ever-changing user needs.

Reimagining the Extension web presence is a significant undertaking because of the complexities of the diversity of materials, the diversity of who generates and manages content, how Extension users access the content (for example, computer, smartphone), and how users interact with the apps and information.

NDSU Extension's current web presence has evolved into a decentralized system that allows specialists, and Research Extension Center (REC) and county staff to post directly to their websites with a focus on localized content. This approach has relied on staff expertise because Extension lacked sufficient web specialists to manage all of the content contained on 123 topic, 13 REC and 52 county sites. Web delivery is a critical component of Extension's educational delivery system; NDSU Extension websites had 953,897 users and 3,546,916 page views in 2017.

NDSU Extension's web presence serves as an important platform to support a diverse array of electronic media. Extension has about 645 publications available online, of which about 300 are available only on the web. Online publication access is popular; 59,482 users made 307,912 page views in 2017. Nearly all publications are available in html format for easy smartphone and tablet use, along with a PDF option for high-quality printing.

Extension has 722 YouTube videos on 11 channels, and the videos had 261,759 views in 2017. Extension also posts podcasts covering crop and livestock issues. These podcasts are available as feeds via iTunes, Google, Yahoo or NDSU, and are used by radio stations and directly by producers.

Reimagining:

Transforming complex sources and content to simple access and media

Extension uses multiple platforms for online meetings, webinars and trainings, such as the interactive video network, Blackboard Collaborate, Moodle and Skype for the public and staff. Blackboard Collaborate is used more for training the public, and counties often provide local viewing sites with additional in-person training.

Several traditional newsletters have transitioned to electronic distribution and posting. For example, the Crop and Pest Report is emailed as a PDF to a listserv (4,865 subscribers) and articles are cross-posted on the web (215,133 page views in 2017). Other newsletters are distributed by Mailchimp as an e-newsletter.

Finally, Extension has a strong social media effort, with 81 NDSU Extension-related Facebook pages and numerous NDSU Extension Twitter accounts.

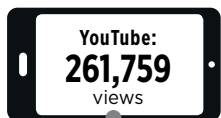
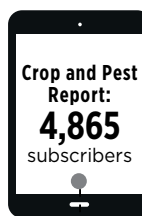
A new web strategy and reimagining of content will allow Extension to:

- Optimize content for smartphones and tablets, and emerging technologies such as voice-assisted search and augmented reality, especially to reach younger audiences
- Optimize navigation and search features
- Add more social media use
- Incorporate more apps
- Feature more interactive educational modules

Extension needs this enhanced web presence to augment transformational education, which is the foundation of Extension's mission.

NEED: This one-time funding request will add temporary support to overhaul and reimagine NDSU Extension's online presence.

One-time operating support - \$345,000



SBARE Priorities for the North Dakota Agricultural Experiment Station

May 3, 2018

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Capital Improvement Requests

Agronomic, Pathology, and Soils Field Lab Facility

(Waldron Hall replacement) — Waldron Hall was built in the mid-1950's to house the field laboratories for the wheat breeding programs in the Department of Agronomy. An addition was built in the mid-1960's to house approximately another 16 scientists from the Departments of Agronomy and Plant Pathology. The building now houses field labs and wet labs for nearly 60 scientists, each with numerous projects, at the Main Station involving a number of disciplines. Many of these labs are shared and the seed drying, cleaning, and storage facilities needed by our scientists are now grossly insufficient and a health hazard to anyone working in the facility. A new facility is needed to provide our scientists a safe environment to conduct their research, as well as processing, cleaning, and storing seed.

REQUEST: \$65,000,000 (approximately)

Seed Cleaning Facility WREC

Seed cleaning facilities at WREC need to be replaced. Current facilities are antiquated, lack reliable capability to ensure high quality seed, are slow, and inefficient. Current facilities were designed to handle cereal crops and have limited/no capability of cleaning pulse crops and other fragile seed that are in high demand. These facilities pose considerable worker safety issues. A fundraising effort is underway.

REQUEST: \$750,000

Equipment Storage Sheds

Purchasing and/or leasing expensive field equipment is an investment that the AES needs to protect. Storing expensive research plot equipment outdoors, such as tractors, seeders, and combines, reduces the life of the machines and can compromise the sophisticated electronics typically used on equipment.

REQUEST: 8 (\$300,000/shed)

Precision Ag/ABEN Facility

A field lab with large indoor space and accessibility to perform research, demonstration and field testing of ag equipment and technology. Additional infrastructure would include a 100-ft long soil bin to test soil-tool interaction of tillage equipment and a high speed wind tunnel to test nozzles for spray drift and droplet size distribution of active ingredients under various weather conditions. The facility would be critical in conducting research and training on agricultural technologies such as unmanned aerial surveillance, variable rate application systems, precision planting, and other technology used in crop and livestock systems.

REQUEST: \$6,000,000



(NDSU photo)



(NDSU photo)

REQUEST:

One-time deferred maintenance \$1,440,465

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19.0208.01000

Sixty-sixth
Legislative Assembly
of North Dakota

HOUSE BILL NO. 1020

Introduced by

Appropriations Committee

1 A BILL for an Act to provide an appropriation for defraying the expenses of the North Dakota
2 state university extension service, northern crops institute, upper great plains transportation
3 institute, main research center, branch research centers, and agronomy seed farm.

4 **BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:**

5 **SECTION 1. APPROPRIATION.** The funds provided in this section, or so much of the funds
6 as may be necessary, are appropriated out of any moneys in the general fund in the state
7 treasury, not otherwise appropriated, and from special funds derived from federal funds and
8 other income, to the North Dakota state university extension service, the northern crops
9 institute, the upper great plains transportation institute, the main research center, branch
10 research centers, and agronomy seed farm, for the purpose of defraying the expenses of the
11 North Dakota state university extension service, the northern crops institute, the upper great
12 plains transportation institute, the main research center, branch research centers, and
13 agronomy seed farm, for the biennium beginning July 1, 2019, and ending June 30, 2021, as
14 follows:

15 Subdivision 1.

16 NORTH DAKOTA STATE UNIVERSITY EXTENSION SERVICE

		Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>	
18				
19	Extension service	\$51,188,489	\$53,124,252	\$51,188,489
20	Soil conservation committee	<u>1,091,520</u>	<u>1,091,520</u>	<u>1,091,520</u>
21	Total all funds	\$52,280,009	\$54,215,772	\$52,280,009
22	Less estimated income	<u>26,646,689</u>	<u>27,886,984</u>	<u>26,646,689</u>
23	Total general fund	\$25,633,320	\$26,328,788	\$25,633,320
24	Full-time equivalent positions	252.98	242.51	252.98

Sixty-sixth
Legislative Assembly

1 Subdivision 2.

2 NORTHERN CROPS INSTITUTE

	Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>
4 Northern crops institute	<u>\$3,642,721</u>	<u>\$3,803,620</u>	<u>\$3,642,721</u>
6 Total all funds	\$3,642,721	\$3,803,620	\$3,642,721
7 Less estimated income	<u>1,755,830</u>	<u>1,897,853</u>	<u>1,755,830</u>
8 Total general fund	\$1,886,891	\$1,905,767	\$1,886,891
9 Full-time equivalent positions	11.80	12.80	11.80

10 Subdivision 3.

11 UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

	Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>
13 Upper great plains transportation	<u>\$22,060,242</u>	<u>\$22,421,422</u>	<u>\$22,060,242</u>
14 institute			
16 Total all funds	\$22,060,242	\$22,421,422	\$22,060,242
17 Less estimated income	<u>18,617,068</u>	<u>18,957,222</u>	<u>18,617,068</u>
18 Total general fund	\$3,443,174	\$3,464,200	\$3,443,174
19 Full-time equivalent positions	43.88	43.88	43.88

20 Subdivision 4.

21 MAIN RESEARCH CENTER

	Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>
23 Main research center	<u>\$108,642,243</u>	<u>\$107,032,049</u>	<u>\$108,642,243</u>
24 Total all funds	\$108,642,243	\$107,032,049	\$108,642,243
26 Less estimated income	<u>59,084,828</u>	<u>58,053,640</u>	<u>59,084,828</u>
27 Total general fund	\$49,557,415	\$48,978,409	\$49,557,415
28 Full-time equivalent positions	336.12	340.05	336.12

29 Subdivision 5.

30 BRANCH RESEARCH CENTERS

Sixty-sixth
Legislative Assembly

		Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>	
1				
2				
3	Dickinson research center	\$6,825,551	\$6,707,017	\$6,825,551
4	Central grasslands research center	3,423,624	3,389,685	3,423,624
5	Hettinger research center	4,975,133	4,984,698	4,975,133
6	Langdon research center	2,964,607	2,968,417	2,964,607
7	North central research center	4,953,652	4,989,503	4,953,652
8	Williston research center	5,118,890	5,117,619	5,118,890
9	Carrington research center	<u>9,175,491</u>	<u>9,445,861</u>	<u>9,175,491</u>
10	Total all funds	\$37,436,948	\$37,602,800	\$37,436,948
11	Less estimated income	<u>20,281,691</u>	<u>20,807,242</u>	<u>20,281,691</u>
12	Total general fund	\$17,155,257	\$16,795,558	\$17,155,257
13	Full-time equivalent positions	110.29	109.81	110.29

14 Subdivision 6.

15 AGRONOMY SEED FARM

		Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>	
16				
17				
18	Agronomy seed farm	<u>\$1,536,129</u>	<u>\$1,571,648</u>	<u>\$1,536,129</u>
19	Total special funds	\$1,536,129	\$1,571,648	\$1,536,129
20	Full-time equivalent positions	3.00	3.00	3.00

21 Subdivision 7.

22 BILL TOTAL

		Governor's		
	<u>Base Level</u>	<u>Recommendation</u>	<u>Appropriation</u>	
23				
24				
25	Grand total general fund	\$97,676,057	\$97,472,722	\$97,676,057
26	Grand total other funds	<u>127,922,235</u>	<u>129,174,589</u>	<u>127,922,235</u>
27	Grand total all funds	\$225,598,292	\$226,647,311	\$225,598,292

29 **SECTION 2. ONE-TIME FUNDING.** The following amounts reflect the one-time funding
30 items approved by the sixty-fifth legislative assembly as adjusted for the 2017-19 biennium.

1	<u>One-Time Funding Description</u>	<u>2017-19</u>	<u>2019-21</u>
2	Seed cleaning plants	\$1,500,000	\$0
3	Junior master gardener program	15,000	0
4	Road and bridge asset management system	<u>300,000</u>	<u>0</u>
5	Total all funds	\$1,815,000	\$0
6	Total other funds	<u>1,700,000</u>	<u>0</u>
7	Total general fund	\$115,000	\$0

8 **SECTION 3. ADDITIONAL INCOME - APPROPRIATION.** In addition to the amount
9 included in the grand total other funds appropriation line item in section 1 of this Act, any other
10 income, including funds from federal acts, private grants, gifts, and donations, or from other
11 sources received by the North Dakota state university extension service, the northern crops
12 institute, the upper great plains transportation institute, the main research center, branch
13 research centers, and agronomy seed farm, except as otherwise provided by law, is
14 appropriated for the purpose designated in the act, grant, gift, or donation, for the biennium
15 beginning July 1, 2019, and ending June 30, 2021.

16 **SECTION 4. DICKINSON RESEARCH EXTENSION CENTER - MINERAL RIGHTS**
17 **INCOME.** The Dickinson research extension center may spend up to \$755,000 of revenues
18 received during the 2019-21 biennium from mineral royalties, leases, or easements for ongoing
19 operational expenses. Any revenues received in excess of \$755,000 may be spent only for
20 one-time expenditures for the biennium beginning July 1, 2019, and ending June 30, 2021.

21 **SECTION 5. WILLISTON RESEARCH EXTENSION CENTER - MINERAL RIGHTS**
22 **INCOME - REPORT.** The Williston research extension center shall report to the sixty-seventh
23 legislative assembly on amounts received and spent from mineral royalties, leases, or
24 easements in the biennium beginning July 1, 2017, and ending June 30, 2019, and the
25 biennium beginning July 1, 2019, and ending June 30, 2021.

26 **SECTION 6. TRANSFER AUTHORITY.** Upon approval of the state board of agricultural
27 research and education and appropriate branch research center directors, the director of the
28 office of management and budget shall transfer appropriation authority within subdivisions 1, 2,
29 4, and 5 of section 1 of this Act.

30 **SECTION 7. FULL-TIME EQUIVALENT POSITION ADJUSTMENTS.** The state board of
31 higher education may adjust or increase full-time equivalent positions as needed for the entities

1 in section 1 of this Act, subject to availability of funds. All full-time or part-time positions must be
2 separate from North Dakota state university. Annually, the board shall report to the office of
3 management and budget and to the budget section any adjustments made pursuant to this
4 section.

5 **SECTION 8. UNEXPENDED GENERAL FUND - EXCESS INCOME.** Any unexpended
6 general fund appropriation authority to and any excess income received by entities listed in
7 section 1 of this Act are not subject to the provisions of section 54-44.1-11, and any
8 unexpended funds from these appropriations or revenues are available and may be expended
9 by those entities, during the biennium beginning July 1, 2021, and ending June 30, 2023.

**HOUSE BILL NO. 1020
(Governor's Recommendation)**

Introduced by

Appropriations Committee

(At the request of the Governor)

A bill for an act to provide an appropriation for defraying the expenses of the extension service, northern crops institute, upper great plains transportation institute, main research center, branch research centers, and agronomy seed farm; to provide for a transfer; and to provide an exemption.

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:

SECTION 1. APPROPRIATION. The funds provided in this section, or so much of the funds as may be necessary, are appropriated out of any moneys in the general fund in the state treasury, not otherwise appropriated, and from special funds derived from federal funds and other income, to the North Dakota state university extension service, the northern crops institute, the upper great plains transportation institute, the main research center, branch research centers, and agronomy seed farm for the purpose of defraying the expenses of the North Dakota state university extension service, the northern crops institute, the upper great plains transportation institute, the main research center, branch research centers, and agronomy seed farm, for the biennium beginning July 1, 2019, and ending June 30, 2021, as follows:

Subdivision 1.

NORTH DAKOTA STATE UNIVERSITY EXTENSION SERVICE

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Extension Service	\$51,188,489	\$1,935,763	\$53,124,252
Soil conservation committee	<u>1,091,520</u>	<u>0</u>	<u>1,091,520</u>
Total all funds	\$52,280,009	\$1,935,763	\$54,215,772
Less estimated income	<u>26,646,689</u>	<u>1,240,295</u>	<u>27,886,984</u>
Total general fund	\$25,633,320	\$695,468	\$26,328,788
Full-time equivalent positions	242.51	0.00	242.51

Subdivision 2.

NORTHERN CROPS INSTITUTE

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Northern Crops Institute	\$3,642,721	\$160,899	\$3,803,620
Total all funds	\$3,642,721	\$160,899	\$3,803,620
Less estimated income	<u>1,755,830</u>	<u>142,023</u>	<u>1,897,853</u>
Total general fund	\$1,886,891	\$18,876	\$1,905,767
Full-time equivalent positions	12.80	0.00	12.80

Subdivision 3.

UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Upper great plains transportation institute	\$22,618,201	(\$196,779)	\$22,421,422
Total all funds	\$22,618,201	(\$196,779)	\$22,421,422

Less estimated income	<u>18,717,068</u>	<u>240,154</u>	<u>18,957,222</u>
Total general fund	\$3,901,133	(\$436,933)	\$3,464,200
Full-time equivalent positions	43.88	0.00	43.88

Subdivision 4.

MAIN RESEARCH CENTER

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Main Research Center	\$109,217,936	(\$2,185,887)	\$107,032,049
Total all funds	\$109,217,936	(\$2,185,887)	\$107,032,049
Less estimated income	<u>59,084,828</u>	<u>(1,031,188)</u>	<u>58,053,640</u>
Total general fund	\$50,133,108	(\$1,154,699)	\$48,978,409
Full-time equivalent positions	340.05	0.00	340.05

Subdivision 5.

RESEARCH CENTERS

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Dickinson Research Center	\$6,825,551	(\$118,534)	\$6,707,017
Central grasslands research center	3,423,624	(33,939)	3,389,685
Hettinger research center	4,975,133	9,565	4,984,698
Langdon research center	2,964,607	3,810	2,968,417
North central research center	4,953,652	35,851	4,989,503
Williston research center	5,118,890	(1,271)	5,117,619
Carrington research center	<u>9,175,491</u>	<u>270,370</u>	<u>9,445,861</u>
Total all funds	\$37,436,948	\$165,852	\$37,602,800
Less estimated income	<u>20,281,691</u>	<u>525,551</u>	<u>20,807,242</u>
Total general fund	\$17,155,257	(\$359,699)	\$16,795,558
Full-time equivalent positions	109.81	0.00	109.81

Subdivision 6.

AGRONOMY SEED FARM

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Agronomy Seed Farm	\$1,536,129	\$35,519	\$1,571,648
Total special funds	\$1,536,129	\$35,519	\$1,571,648
Full-time equivalent positions	3.00	0.00	3.00

Subdivision 7.

BILL TOTAL

	<u>Base Level</u>	<u>Adjustments or Enhancements</u>	<u>Appropriation</u>
Grand total general fund	\$98,709,709	(\$1,236,987)	\$97,472,722
Grand total other funds	<u>128,022,235</u>	<u>1,152,354</u>	<u>129,174,589</u>
Grand total all funds	\$226,731,944	(\$84,633)	\$226,647,311

SECTION 2. ONE-TIME FUNDING - EFFECT ON BASE BUDGET - REPORT TO SIXTY- SEVENTH LEGISLATIVE ASSEMBLY. The following amounts reflect the one-time funding items approved by the sixty-fifth legislative assembly for the 2017-19 biennium and the 2019-21 one-time funding items included in the appropriation in section 1 of this Act:

<u>One-Time Funding Description</u>	<u>2017-19</u>	<u>2019-21</u>
Seed Cleaning Plants	\$1,500,000	\$0
Road and bridge asset management system	300,000	0
Junior master gardener program	15,000	0
Ext srvc web strategy & content re-imaging	0	345,000
Extraordinary repairs	<u>0</u>	<u>1,440,465</u>
Total all funds	\$1,815,000	\$1,785,465
Total other funds	<u>1,700,000</u>	<u>1,440,465</u>
Total general fund	\$115,000	\$345,000

The 2019-21 one-time funding amounts are not a part of the entity's base budget for the 2019-21 biennium. The extension service and main research center shall report to the appropriations committees of the sixty-seventh legislative assembly on the use of this one-time funding for the biennium beginning July 1, 2019 and ending June 30, 2021.

SECTION 3. ADDITIONAL INCOME - APPROPRIATION. In addition to the amount included in the grand total special funds appropriation line item in section 1 of this Act, any other income, including funds from federal acts, private grants, gifts, and donations, or from other sources received by the North Dakota state university extension service, the northern crops institute, the upper great plains transportation institute, the main research center, branch research centers, and agronomy seed farm, except as otherwise provided by law, is appropriated for the purpose designated in the act, grant, gift, or donation, for the biennium beginning July 1, 2019, and ending June 30, 2021.

SECTION 4. DICKINSON RESEARCH EXTENSION CENTER - MINERAL RIGHTS INCOME. The Dickinson research extension center may spend up to \$755,000 of revenues received during the 2019-21 biennium from mineral royalties, leases, or easements for ongoing operational expenses. Any revenues received in excess of \$755,000 may be spent only for one-time expenditures for the biennium beginning July 1, 2019, and ending June 30, 2021.

SECTION 5. WILLISTON RESEARCH EXTENSION CENTER - MINERAL RIGHTS INCOME. The Williston research extension center shall report to the sixty-seventh legislative assembly on amounts received and spent from mineral royalties, leases, or easements in the biennium beginning July 1, 2017, and ending June 30, 2019 and the biennium beginning July 1, 2019, and ending June 30, 2021.

SECTION 6. TRANSFER AUTHORITY. Upon approval of the state board of agricultural research and education and appropriate branch research center directors, the director of the main research center may transfer appropriation authority within subdivisions 1, 2, 4, and 5 of section 1 of this Act. Any amounts transferred must be reported to the director of the office of management and budget.

SECTION 7. FULL-TIME EQUIVALENT POSITION ADJUSTMENTS. The board of higher education may adjust or increase full-time equivalent positions as needed for the entities in section 1 of this Act, subject to availability of funds. The board shall report any adjustments to the office of management and budget pursuant to this section.

SECTION 8. UNEXPENDED GENERAL FUND - EXCESS INCOME. Any unexpended general fund appropriation authority to and any excess income received by entities listed in section 1 of this Act are not subject to the provisions of section 54-44.1-11, and any unexpended funds from these appropriations or revenues are available and may be expended by those entities, during the biennium beginning July 1, 2019, and ending June 30, 2021.

SECTION 9. EXEMPTION. The amounts appropriated for the veterinary diagnostic laboratory and the seed cleaning plants contained in subdivision 4 of section 1 of chapter 20 of the 2017 Sessions Laws, are not subject to the provisions of section 54-44.1-11, and any unexpended funds from these appropriations or related revenues are available and may be expended during the biennium beginning July 1, 2019, and ending June 30, 2021.

Introduced by

Appropriations Committee

1 A BILL for an Act to provide an appropriation for defraying the expenses of the North Dakota
2 state university extension service, northern crops institute, upper great plains transportation
3 institute, main research center, branch research centers, and agronomy seed farm.

4 **BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:**

5 **SECTION 1. APPROPRIATION.** The funds provided in this section, or so much of the funds
6 as may be necessary, are appropriated out of any moneys in the general fund in the state
7 treasury, not otherwise appropriated, and from special funds derived from federal funds and
8 other income, to the North Dakota state university extension service, the northern crops
9 institute, the upper great plains transportation institute, the main research center, branch
10 research centers, and agronomy seed farm, for the purpose of defraying the expenses of the
11 North Dakota state university extension service, the northern crops institute, the upper great
12 plains transportation institute, the main research center, branch research centers, and
13 agronomy seed farm, for the biennium beginning July 1, 2019, and ending June 30, 2021, as
14 follows:

15 Subdivision 1.

16 NORTH DAKOTA STATE UNIVERSITY EXTENSION SERVICE

		Adjustments or	
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>
18 Extension service	\$51,188,489	\$2,167,185	\$53,355,674
20 Soil conservation committee	<u>1,091,520</u>	<u>0</u>	<u>1,091,520</u>
21 Total all funds	\$52,280,009	\$2,167,185	\$54,447,194
22 Less estimated income	<u>26,646,689</u>	<u>982,267</u>	<u>27,628,956</u>
23 Total general fund	\$25,633,320	\$1,184,918	\$26,818,238
24 Full-time equivalent positions	252.98	(10.47)	242.51

Sixty-sixth
Legislative Assembly

1 Subdivision 2.

2 NORTHERN CROPS INSTITUTE

		Adjustments or	
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>
5 Northern crops institute	<u>\$3,642,721</u>	<u>\$186,426</u>	<u>\$3,829,147</u>
6 Total all funds	\$3,642,721	\$186,426	\$3,829,147
7 Less estimated income	<u>1,755,830</u>	<u>137,010</u>	<u>1,892,840</u>
8 Total general fund	\$1,886,891	\$49,416	\$1,936,307
9 Full-time equivalent positions	11.80	1.00	12.80

10 Subdivision 3.

11 UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

		Adjustments or	
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>
14 Upper great plains transportation 15 institute	<u>\$22,060,242</u>	<u>\$777,487</u>	<u>\$22,837,729</u>
16 Total all funds	\$22,060,242	\$777,487	\$22,837,729
17 Less estimated income	<u>18,617,068</u>	<u>257,255</u>	<u>18,874,323</u>
18 Total general fund	\$3,443,174	\$520,232	\$3,963,406
19 Full-time equivalent positions	43.88	0.00	43.88

20 Subdivision 4.

21 MAIN RESEARCH CENTER

		Adjustments or	
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>
24 Main research center	<u>\$108,642,243</u>	<u>(\$775,377)</u>	<u>\$107,866,866</u>
25 Total all funds	\$108,642,243	(\$775,377)	\$107,866,866
26 Less estimated income	<u>59,084,828</u>	<u>157,539</u>	<u>59,242,367</u>
27 Total general fund	\$49,557,415	(\$932,916)	\$48,624,499
28 Full-time equivalent positions	336.12	3.93	340.05

29 Subdivision 5.

30 BRANCH RESEARCH CENTERS

Sixty-sixth
Legislative Assembly

		Adjustments or		
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>	
1				
2				
3	Dickinson research center	\$6,825,551	(\$152,469)	\$6,673,082
4	Central grasslands research center	3,423,624	(56,881)	3,366,743
5	Hettinger research center	4,975,133	(22,900)	4,952,233
6	Langdon research center	2,964,607	(16,696)	2,947,911
7	North central research center	4,953,652	314	4,953,966
8	Williston research center	5,118,890	(50,125)	5,068,765
9	Carrington research center	<u>9,175,491</u>	<u>198,300</u>	<u>9,373,791</u>
10	Total all funds	\$37,436,948	(\$100,457)	\$37,336,491
11	Less estimated income	<u>20,281,691</u>	<u>459,338</u>	<u>20,741,029</u>
12	Total general fund	\$17,155,257	(\$559,795)	\$16,595,462
13	Full-time equivalent positions	110.29	(0.48)	109.81

14 Subdivision 6.

15 AGRONOMY SEED FARM

		Adjustments or		
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>	
16				
17				
18	Agronomy seed farm	<u>\$1,536,129</u>	<u>\$26,205</u>	<u>\$1,562,334</u>
19	Total special funds	\$1,536,129	\$26,205	\$1,562,334
20	Full-time equivalent positions	3.00	0.00	3.00

21 Subdivision 7.

22 BILL TOTAL

		Adjustments or		
	<u>Base Level</u>	<u>Enhancements</u>	<u>Appropriation</u>	
23				
24				
25	Grand total general fund	\$97,676,057	\$261,855	\$97,937,912
26	Grand total other funds	<u>127,922,235</u>	<u>2,019,614</u>	<u>129,941,849</u>
27	Grand total all funds	\$225,598,292	\$2,281,469	\$227,879,761

28 **SECTION 2. ONE-TIME FUNDING.** The following amounts reflect the one-time funding
 29 items approved by the sixty-fifth legislative assembly for the 2017-19 biennium and the one-time
 30 funding items included in the appropriation in section 1 of this Act:

1	<u>One-Time Funding Description</u>	<u>2017-19</u>	<u>2019-21</u>
2	Seed cleaning plants	\$1,500,000	\$750,000
3	Extraordinary repairs	0	1,440,465
4	Junior master gardener program	15,000	0
5	Road and bridge asset management system	<u>300,000</u>	<u>0</u>
6	Total all funds	\$1,815,000	\$2,190,465
7	Total other funds	<u>1,700,000</u>	<u>1,940,465</u>
8	Total general fund	\$115,000	\$250,000

9 The 2019-21 biennium one-time funding amounts are not a part of the entity's base budget
10 for the 2021-23 biennium. The main and branch research centers shall report to the
11 appropriations committees of the sixty-seventh legislative assembly on the use of this one-time
12 funding for the biennium beginning July 1, 2019, and ending June 30, 2021.

13 **SECTION 3. ADDITIONAL INCOME - APPROPRIATION.** In addition to the amount
14 included in the grand total other funds appropriation line item in section 1 of this Act, any other
15 income, including funds from federal acts, private grants, gifts, and donations, or from other
16 sources received by the North Dakota state university extension service, the northern crops
17 institute, the upper great plains transportation institute, the main research center, branch
18 research centers, and agronomy seed farm, except as otherwise provided by law, is
19 appropriated for the purpose designated in the act, grant, gift, or donation, for the biennium
20 beginning July 1, 2019, and ending June 30, 2021.

21 **SECTION 4. ESTIMATED INCOME - STRATEGIC INVESTMENT AND IMPROVEMENTS**
22 **FUND.** The estimated income line item in subdivision 4 of section 1 of this Act includes
23 \$1,440,465 of one-time funding from the strategic investment and improvements fund for
24 extraordinary repairs.

25 **SECTION 5. DICKINSON RESEARCH EXTENSION CENTER - MINERAL RIGHTS**
26 **INCOME.** The Dickinson research extension center may spend up to \$755,000 of revenues
27 received during the 2019-21 biennium from mineral royalties, leases, or easements for ongoing
28 operational expenses. Any revenues received in excess of \$755,000 may be spent only for
29 one-time expenditures for the biennium beginning July 1, 2019, and ending June 30, 2021.

30 **SECTION 6. WILLISTON RESEARCH EXTENSION CENTER - MINERAL RIGHTS**
31 **INCOME - REPORT.** The Williston research extension center shall report to the sixty-seventh

1 legislative assembly on amounts received and spent from mineral royalties, leases, or
2 easements in the biennium beginning July 1, 2017, and ending June 30, 2019, and the
3 biennium beginning July 1, 2019, and ending June 30, 2021.

4 **SECTION 7. TRANSFER AUTHORITY.** Upon approval of the state board of agricultural
5 research and education and appropriate branch research center directors, the director of the
6 office of management and budget shall transfer appropriation authority within subdivisions 1, 2,
7 4, and 5 of section 1 of this Act.

8 **SECTION 8. FULL-TIME EQUIVALENT POSITION ADJUSTMENTS.** The state board of
9 higher education may adjust or increase full-time equivalent positions as needed for the entities
10 in section 1 of this Act, subject to availability of funds. All full-time or part-time positions must be
11 separate from North Dakota state university. Annually, the board shall report to the office of
12 management and budget and to the budget section any adjustments made pursuant to this
13 section.

14 **SECTION 9. UNEXPENDED GENERAL FUND - EXCESS INCOME.** Any unexpended
15 general fund appropriation authority to and any excess income received by entities listed in
16 section 1 of this Act are not subject to the provisions of section 54-44.1-11, and any
17 unexpended funds from these appropriations or revenues are available and may be expended
18 by those entities, during the biennium beginning July 1, 2021, and ending June 30, 2023.

19 **SECTION 10. EXEMPTION - WILLISTON SEED CLEANING PLANT.** The \$1,500,000 of
20 special funds appropriation authority for the Williston research extension center included in
21 subdivision 5 of section 1 of chapter 45 of the 2017 Session Laws for a seed cleaning plant is
22 not subject to the provisions of section 54-44.1-11 and may be continued and expended by the
23 Williston research extension center for the seed cleaning plant during the biennium beginning
24 July 1, 2019, and ending June 30, 2021.

Internal Control

In our audit for the biennium ended June 30, 2017, we identified the following areas of North Dakota State University's internal control as being the highest risk:

Internal Controls Subjected to Testing:

- Controls surrounding the processing of revenues.
- Controls surrounding the processing of expenses.
- Controls effecting the safeguarding of assets.
- Controls relating to compliance with legislative intent.
- Controls surrounding the ConnectND (PeopleSoft) system.
- Controls relating to compliance with the MAT bus contract provisions.
- Controls surrounding the Agricultural Experiment Station, Extension Service and Northern Crops Institute.

The criteria used to evaluate internal control is published in the publication *Internal Control - Integrated framework* from the Committee of Sponsoring Organizations (COSO) of the Treadway Commission.

We gained an understanding of internal control surrounding these areas and concluded as to the adequacy of their design. We also tested the operating effectiveness of those controls we considered necessary based on our assessment of audit risk. We concluded that internal control was not adequate noting certain matters involving internal control and its operation that we consider to be significant deficiencies.

Auditors are required to report deficiencies in internal control that are significant within the context of the objectives of the audit. A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect (1) misstatements in financial or performance information; (2) violations of laws and regulations; or (3) impairments of effectiveness or efficiency of operations, on a timely basis. Considering both qualitative and quantitative factors, we identified the following significant deficiency in internal control. We also noted other matters involving internal control that we have reported to management of North Dakota State University in a management letter dated July 13, 2018.

Inadequate Journal Entry Approval for the Agricultural Experiment Station and Extension Service (Finding 17-1)

Condition:

Journal entries were not properly approved at the NDSU Agricultural Experiment Station and Extension Service. Of the 32 items tested, 10 were not properly approved (31%).

Criteria:

The Committee of Sponsoring Organizations (COSO) of the Treadway Commission's *Internal Control - Integrated Framework* states that control activities are the actions established through policies and procedures that help ensure that management's directives to mitigate risks to the achievement of objectives are carried out. They may be preventive or detective in nature and may encompass a range of manual and automated activities such as authorizations and approvals.

The NDUS accounting manual states in part the basic principles of internal control include a review of journal entries and should be documented with the initials or signature of the reviewer and the date reviewed. Additionally, the accounting manual lists acceptable formats for approval, and further states that typing an approver's name in a fillable form is not an acceptable approval.

Cause:

There is a misinterpretation of what constitutes approval.

Effect or Potential Effect:

Improper or erroneous entries could be made to the general ledger.

Recommendation:

We recommend that all journal entries are properly approved and that the approval is documented.

North Dakota State University Response:

NDSU agrees with the recommendation. However, there were no improper or erroneous entries. With support of CTS (Core Technology Services), NDSU plans to implement journal entry workflow in PeopleSoft by December 2018, which we anticipate will clearly demonstrate proper approval and will satisfy this audit recommendation.

Compliance with Legislative Intent

In our audit for the biennium ended June 30, 2017, we identified and tested North Dakota State University's compliance with legislative intent for the following areas we determined to be significant and of higher risk of noncompliance:

- NDUS reported to the appropriations committees of the sixty-fifth legislative assembly on the use of one-time funding for the biennium ended June 30, 2017 (2015 HB 1003, chapter 3, section 2).
- The deferred maintenance funding pool was used for eligible projects that were identified in the campus master plan and space utilization studies (2015 HB 1003, chapter 3, section 25).
- Two dollars of matching funds were provided from operations or other sources for each one dollar of extraordinary repairs that were included in the capital asset line item (2015 HB 1003, chapter 3, section 38).
- The Main Research Center reported to the appropriations committee of the sixty-fifth legislative assembly on the use of one-time funding for the biennium ended June 30, 2017 (2015 HB 1020, chapter 20, section 2).
- Dickinson Research Center spent up to \$755,000 on operating expenses and any revenues in excess of \$755,000 were spent only on one-time expenses (2015 HB 1020, chapter 20, section 11).
- Williston Research Center reported to the sixty-fifth legislative assembly on amounts received and spent from mineral royalties, leases or easements for the bienniums ended June 30, 2015 and June 30, 2017 (2015 HB 1020, chapter 20, section 12).
- The Main Research Center and the Extension Service reported to the appropriation committees of the sixty-fifth legislative assembly on full-time equivalent positions for the biennium ended June 30, 2017 (2015 HB 2010, chapter 20, section 13).
- The Main Research Center reported to the budget section regarding the status of the flooded land study and spending related to the study for the biennium ended June 30, 2017 (2015 HB 1020, chapter 20, section 16).
- Proper use/approval of clearing account and petty cash/till funds (NDCC 54-06-08.1, Attorney General's letter dated September 11, 1987 and Article X, Section 12, part 1 of ND Constitution).
- BND used as credit card processing depository (NDCC 54-06-08.2).
- Scholarship expenses were proper (Article IX, Section 1 of the ND Constitution, NDCC 1-08-02, 15-10-12, 59-21).
- Fixed asset requirements were followed including surplus property, record keeping and lease analysis requirements (NDCC 54-44-04.6, 44-04-07, 54-27-21, 54-44.1-06, 54-27-21.1).
- Expenses including proper voucher approvals (NDCC 44-08-05.1, Article X, Section 12, subpart 2 of ND Constitution) and being within budgeted amounts (NDCC 54-44.1-09, Attorney General Opinion dated January 6, 1977).
- Travel-related expenses are made in accordance with state statute (NDCC 44-08-04, 44-08-04.1, 04.2, 04.3, 04.4, 04.5, 54-06-09).
- Purchasing including bidding and following sole source requirements (NDCC 54-44.4-01, 02, 05, 06, 54-44.7-02, 48-01.2, 44-08-01).
- Conflict of Interest (NDCC 12.1-13-03, 48-01.2-08).
- Carryover of unexpended appropriations (NDCC 54-44.1-11).
- Adequate blanket bond coverage (NDCC 26.1-21-08).

- Capital construction (NDCC 48-01.2-02, 04, 07, 09, 10, 54-44.7).
- Unclaimed property laws (NDCC 47-30.1-02.1, 47-30.1-03.1).
- Nepotism (NDCC 44-04-09).
- Bond revenues and reserves (NDCC 15-55-03, 15-55-06).
- Misapplication of entrusted property (NDCC 12.1-23-07).

The criteria used to evaluate legislative intent are the laws as published in the *North Dakota Century Code* and the *North Dakota Session Laws*.

Government Auditing Standards requires auditors to report all instances of fraud and illegal acts unless they are inconsequential within the context of the audit objectives. Further, auditors are required to report significant violations of provisions of contracts or grant agreements, and significant abuse that has occurred or is likely to have occurred.

The results of our tests disclosed two instances of noncompliance that are required to be reported under *Government Auditing Standards*. These findings are described below. Other than these findings, we concluded there was compliance with the legislative intent identified above. We also noted certain inconsequential instances of noncompliance that we have reported to management of North Dakota State University in a management letter dated July 13, 2018.

Noncompliance With Procurement Rules (Finding 17-2)

Condition:

NDSU had the following issues surrounding procurement:

- Eight sole source purchases for commodities and services (totaling \$680,203) did not adequately justify or exempt the purchase from the normal procurement process; and
- The Elan One credit card services program for study abroad was not properly procured. Total usage of the program card was \$1,042,132.

Criteria:

NDCC section 12.1-13-03, states in part, every public servant authorized to sell or lease any NDCC section 15-10-17 part 5, states in part, that the SBHE may determine policy for purchasing by the University System in coordination with OMB as provided by NDCC chapter 54-44.4 and NDCC section 44-08-01 part 3.

NDUS Procedure 803.1 parts 1 and 4, states in part that sole source purchases are unique and the vendor is the only vendor able to furnish the commodity or service. Sole source requests based on personal preference, cost or price, perceived quality, vendor performance, delivery time, trade-in allowance or no cost options or accessories or other special packages or deals are not permitted; rather, these items may be considered in evaluating bids or proposals.

Cause:

NDSU's purchasing policy does not include prudent information surrounding sole source purchases. The Elan One card program was not bid out because of the difficulties NDSU encountered in locating vendors that met their specific needs.

Effect or Potential Effect:

Without properly procuring commodities and services, there was noncompliance with NDUS procedures, and ultimately, noncompliance with NDCC chapter 54-44.4 and NDCC section 44-08-01 part 3.

Recommendation:

We recommend that NDSU properly procure commodities and services in compliance with NDCC and NDUS requirements.

North Dakota State University Response:

NDSU agrees with the recommendation but disagrees with the condition. Elan was the only vendor identified through an extensive search who could handle a faculty lead study abroad. OMB permitted NDSU the exemption from the state's procurement card. Card fees paid to Elan are below the threshold required for a competitive purchase. In the eight sole source purchases, NDSU achieved the best possible value. In some cases, the lowest price was selected from multiple quotes. In other cases a bid process was not appropriate. NDSU plans to propose a rewrite to the NDUS procedure to clarify these alternate procurement methods.

Inadequate Controls Over Disclosed Conflicts of Interest (Finding 17-3)

Condition:

NDSU had conflicts of interest that were disclosed and a summary list was maintained by the Purchasing Department; however, the summary list was not communicated with other departments and purchases were made with disclosed conflicts of interest without any additional scrutiny.

Criteria:

NDCC section 12.1-13-03, states in part, every public servant authorized to sell or lease any property, or to make any contract in his official capacity, alone or in conjunction with other public servants, who voluntarily becomes interested individually in the sale, lease, or contract, directly or indirectly, is guilty of a class A misdemeanor.

Committee of Sponsoring Organization of the Treadway Commission (COSO), states in part, control activities specifically relate to those policies and procedures that contribute to the mitigation of risks to the achievement of objectives to acceptable levels. Supervisory controls assess whether other transaction control activities are being performed completely, accurately, and according to policy and procedures. Control activities can be preventive or detective, preventive controls are designed to avoid an unintended event or result at the time of initial occurrence.

Cause:

There was a lack of communication between departments surrounding conflicts of interest.

Effect or Potential Effect:

There is noncompliance with NDCC section 12.1-13-03 and inadequate controls exist for purchases with disclosed conflicts of interest.

Recommendation:

We recommend NDSU develop and implement controls to ensure that no conflict of interest exists with any transaction with a disclosed conflict of interest.

North Dakota State University Response:

NDSU agrees with the recommendation. Department heads already approve conflict disclosures. However, as an extra step, NDSU Purchasing will summarize the reported conflict disclosures and provide a list to the department heads for further monitoring. In addition, we will inactivate the applicable supplier IDs in PeopleSoft to better flag future transactions to ensure department head approval on the transaction.

North Dakota University System
 Extension Service, Main & Branch Research Centers, and Agronomy Seed Farm
 Major Components of current base level

	630	640	641	642	643	644	645	646	647	649
	Extension	Main Station	Dickinson	Central Grasslands	Hettinger	Langdon	North Central	Williston	Carrington	Agronomy Seed Farm
Salaries	\$ 41,920,195	\$ 67,308,153	\$ 2,560,617	\$ 1,775,191	\$ 2,457,753	\$ 1,562,704	\$ 2,529,959	\$ 3,465,061	\$ 5,212,338	\$ 565,381
Operating	9,949,814	36,641,090	3,149,934	1,373,433	2,192,380	1,146,903	1,998,693	928,829	2,738,153	670,748
Equipment	410,000	4,693,000	1,115,000	275,000	325,000	255,000	425,000	725,000	1,225,000	300,000
Capital Projects	-	-	-	-	-	-	-	-	-	-
Total Budget	\$ 52,280,009	\$ 108,642,243	\$ 6,825,551	\$ 3,423,624	\$ 4,975,133	\$ 2,964,607	\$ 4,953,652	\$ 5,118,890	\$ 9,175,491	\$ 1,536,129
Funding:										
Federal Fund	\$ 7,740,790	\$ 8,419,260	-	-	-	-	-	-	-	-
General Fund	25,633,320	49,557,415	3,383,862	1,991,605	2,167,501	1,559,510	1,875,900	2,737,313	3,439,566	-
Special Fund	18,905,899	50,665,568	3,441,689	1,432,019	2,807,632	1,405,097	3,077,752	2,381,577	5,735,925	1,536,129
Total Funding	\$ 52,280,009	\$ 108,642,243	\$ 6,825,551	\$ 3,423,624	\$ 4,975,133	\$ 2,964,607	\$ 4,953,652	\$ 5,118,890	\$ 9,175,491	\$ 1,536,129

Source: IBARS 2019-21, Agency Submitted

**Appropriation Status
Reports**

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 25,648,320	\$ 16,167,224	\$ 9,481,096	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	* \$50,133,108	\$30,245,433	\$19,887,675	--Balance will be drawn down for expenditures by end of biennium. * Includes carryover of \$575,693

Source: November 2018 Appropriation Status Report

Note: uncertain changes expected to Federal funding levels.

NDSU Dickinson Research Center- 641

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 3,383,862	\$ 2,329,501	\$ 1,054,361	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU Central Grasslands Research Center- 642

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 1,991,605	\$ 1,429,975	\$ 561,630	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU Hettinger Research Center- 643

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 2,167,501	\$ 1,505,832	\$ 661,669	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU Langdon Research Center- 644

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 1,559,510	\$ 1,089,165	\$ 470,345	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU North Central Research Center- 645

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 1,875,900	\$ 1,014,979	\$ 860,921	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU Williston Research Center- 646

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 2,737,313	\$ 1,751,758	\$ 985,555	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

NDSU Carrington Research Center- 647

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total General Fund Appropriation	\$ 3,439,566	\$ 2,093,432	\$ 1,346,134	--Balance will be drawn down for expenditures by end of biennium.

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

Comparison of 2017-19 Appropriation and Estimated Spending

	2017-19 Appropriation	Actual Expenditures Through 11/30/18	Remaining Balance	Comments
Total Appropriation	\$ 1,536,129	\$ 1,000,441	\$ 535,688	

Source: November 2018 Appropriation Status Report

Note: No significant changes anticipated in federal formula funds or federal grants

North Dakota University System
NDSU Extension, Main & Branch Research Centers
Reconciliation of 2017-19 Orig. General Fund Appropriation to 2019-21 Engrossed HB1020

	Extension Service	Main Research Center	Branch Research Centers
2017-19 Original General Fund Appropriation(5/31/18 Approp.)	\$ 25,648,320	\$ 50,133,108	\$ 17,155,257
Base Adjustments:			
Less 2017-19 One-time Appropriations	(15,000)	-	-
Less 2017-19 Capital Projects		(575,693)	-
Total Base Adjustments	(15,000)	(575,693)	-
2017-19 Adjusted Appropriation, Less Base Adjustments- (2019-21 Base Budget)	25,633,320	49,557,415	17,155,257
Engrossed HB1020 Base Increases (Decreases):			
2%/2% salary/benefit increase and health insurance increases	1,084,918	1,837,917	663,856
Operating Expense Reduction		(2,955,742)	(1,200,560)
Capital Bond Payment adjustment		(65,091)	(23,091)
Williston Seed Cleaning Plant		250,000	
Miscellaneous Expense	100,000		
Road & Bridge Study			
Web strategy & content imaging project			
2019-21 Recommended Base General Fund Increases(Decreases)	1,184,918	(932,916)	(559,795)
2019-21 Total Engrossed HB1020 - General Fund	26,818,238	48,624,499	16,595,462
Increase (Decrease) From 2017-19 Base General Fund Budget*	\$ 1,184,918	\$ (932,916)	\$ (559,795)

Operating Expense Reduction as a % of Base Funding **-5.96%** **-7.00%**

* Overall increase (Decrease %) - this is all proposed changes including Operating Expense reduction and compensation and health insurance adjustment

4.62% -1.88% -3.26%

**North Dakota University System
 Extension Service, Main & Branch Research Centers, and Agronomy Seed Farm
 Reconciliation of 2017-19 Original Other Fund Budget Appropriation to 2019-21 Engrossed HB1020**

	Extension Service	Main Research Center	Branch Research Centers	Agronomy Seed Farm
2017-19 Original Other Fund Appropriation	\$ 26,646,689	\$ 59,084,828	\$ 21,781,691	\$ 1,536,129
Remove Capital Project & One Time funds		(5,997,398)	\$ (1,500,000)	
2017-19 Adjusted Appropriation, Less Base Adjustments: (2019-21 Base Budget)	\$ 26,646,689	\$ 53,087,430	\$ 20,281,691	\$ 1,536,129
Engrossed HB1020 Base Increases (Decreases):				
2%/2% salary/benefit increase and health insurance increases	982,267	1,214,472	259,338	26,205
One-time extraordinary repairs(SIF)	-	1,440,465		
Oakes irrigation site funding			200,000	
Williston Seed Cleaning Plant		500,000		
Miscellaneous Expense	-	3,000,000	-	
Total Engrossed HB1020 Increases	982,267	6,154,937	459,338	26,205
2019-21 Total Engrossed HB1020 - Other Funds	\$ 27,628,956	\$ 59,242,367	\$ 20,741,029	\$ 1,562,334

**North Dakota University System
Branch Research Centers
Reconciliation of 2017-19 Orig. General & Other Fund Appropriation to 2019-21 Engrossed HB1020**

	(1) Dickinson	(2) Central Grasslands	(3) Hettinger	(4) Langdon	(5) North Central	(6) Williston	(7) Carrington	(8) Total
General Fund:								
2017-19 Original General Fund Appropriation	\$ 3,383,862	\$ 1,991,605	\$ 2,167,501	\$ 1,559,510	\$ 1,875,900	\$ 2,737,313	\$ 3,439,566	\$ 17,155,257
Base Adjustments:								
Base Payroll adjustments								
2019-21 Adjusted Appropriation, Less Base Adjustments	3,383,862	1,991,605	2,167,501	1,559,510	1,875,900	2,737,313	3,439,566	17,155,257
Engrossed HB1020 Increases (Decreases):								
Restore funding								
Operating Expense Reduction	(263,386)	(130,969)	(141,750)	(93,451)	(103,316)	(198,731)	(268,957)	(1,200,560)
2%/2% salary/benefit increase and health insurance increases	100,414	79,214	89,904	70,738	67,367	115,392	140,827	663,856
Capital Bond Payment adjustment		(8,782)			(14,309)			(23,091)
SBARE Initiatives								
2019-21 Recommended Base General Fund (Decreases)	(162,972)	(60,537)	(51,846)	(22,713)	(50,258)	(83,339)	(128,130)	(559,795)
2017-19 Adjusted Appropriation, Less Base Adjustments: (2019-21 Base Budget)	\$ 3,220,890	\$ 1,931,068	\$ 2,115,655	\$ 1,536,797	\$ 1,825,642	\$ 2,653,974	\$ 3,311,436	\$ 16,595,462
2019-21 (Decrease) From 2017-19 Base Budget*	\$ (162,972)	\$ (60,537)	\$ (51,846)	\$ (22,713)	\$ (50,258)	\$ (83,339)	\$ (128,130)	\$ (559,795)
Operating Expense Reduction as a % of Base Funding	-7.78%	-6.58%	-6.54%	-5.99%	-5.51%	-7.26%	-7.82%	-7.00%
*Overall increase (Decrease %) - this is all proposed changes including Operating Expense reduction and compensation/health insurance adjustments	-4.82%	-3.04%	-2.39%	-1.46%	-2.68%	-3.04%	-3.73%	-3.26%
Other Funds:								
2017-19 Original Other Fund Appropriation	\$ 3,441,689	\$ 1,432,019	\$ 2,807,632	\$ 1,405,097	\$ 3,077,752	\$ 3,881,577	\$ 5,735,925	\$ 21,781,691
Remove Capital Project						(1,500,000)		(1,500,000)
2017-19 Adjusted Appropriation, Less Base Adjustments: (2019-21 Base Budget)	\$ 3,441,689	\$ 1,432,019	\$ 2,807,632	\$ 1,405,097	\$ 3,077,752	\$ 2,381,577	\$ 5,735,925	\$ 20,281,691
Engrossed HB1020 Increases (Decreases):								
5%/10% reduction	(344,169)	(143,202)	(280,763)	(140,510)	(307,775)	(238,158)	(573,593)	(2,028,170)
Restore funding	344,169	143,202	280,763	140,510	307,775	238,158	573,593	2,028,170
2%/2% salary/benefit increase and health insurance increases	10,503	3,656	28,946	6,017	50,572	33,214	126,430	259,338
Oakes irrigation site funding						200,000		200,000
2019-21 Recommended Base Other Fund Increases	10,503	3,656	28,946	6,017	50,572	33,214	326,430	459,338
2019-21 Total Engrossed HB1020 - Other Funds	\$ 3,452,192	\$ 1,435,675	\$ 2,836,578	\$ 1,411,114	\$ 3,128,324	\$ 2,414,791	\$ 6,062,355	\$ 20,741,029

Proposed budget reductions to meet the governor's 90 or 95 percent budget request guidelines

Main Research Center (\$4,955,742 General Fund; \$5,908,483 Special Funds)

The Main Research Center would not be able to function as in the past with cuts of this magnitude. Last Session's cut included a reduction of 30.28 FTE and significant operating cuts. To cut additional amounts this Session would require closure of programs, elimination of related FTEs, and severely impact service to North Dakota citizens.

Branch RECs (\$1,700,560 General Funds; \$2,028,169 Special Funds)

The Branch RECs would not be able to function as in the past with cuts of this magnitude. Last Session's cut included a reduction of 10.25 FTE and significant operating cuts. To cut additional amounts in both General and Special Funds this Session would likely require closure of research programs, elimination of related FTEs, and severely impact service to North Dakota citizens.

NDSU Extension (\$2,563,332 General Funds; \$2,664,669 Special Funds)

NDSU Extension would not be able to function as in the past with cuts of this magnitude. Last Session's cut included a reduction of 12.47 FTE and significant operating cuts. In addition, a review of NDSU Extension was undertaken by SBARE in conjunction with the Governor's Office, and many changes have been implemented. To cut additional amounts in both General and Special Funds this Session would require closure of programs, elimination of related FTEs, and severely impact service to North Dakota citizens.



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