

**Testimony of Colleen Fitzgerald
Vice President for Research and Creative Activity at NDSU
House Appropriations Committee Hearing
9:00 a.m. February 8, 2023 in Bismarck, ND**

WELCOME

Chairman Vigesaa and members of the House Appropriations Committee, thank you for inviting me to give testimony. My name is Colleen Fitzgerald and I'm the Vice President for Research and Creative Activity at North Dakota State University. I'm here today to speak in favor of House Bill 1379 and the establishment of the Economic Diversification Research Fund.

NDSU'S RESEARCH AND COMMERCIALIZATION FRAMEWORK

I believe we have the elements of a framework for success, that we are poised to capitalize on with additional investment from Bill 1379.

FRAMEWORK (6 ELEMENTS)

- **RESEARCH 1 (R1) DESIGNATION**
- **RESEARCH SUCCESS IN KEY AREAS**
- **INNOVATION AND THE NDSU RESEARCH FOUNDATION**
- **ENTREPRENEURSHIP**
- **THE NDSU RESEARCH & TECHNOLOGY PARK**
- **NDSU'S LAND GRANT MISSION**

At a high-level: there are 4 areas where we continue to invest strategically, and all represent areas where NDSU has historically been successful and provide use cases for how we will bring this framework to realization:

1. **Food, Energy and Water Security (FEWS)**
2. **Cybersecurity, Computer Science and Software Engineering**
3. **Life Sciences**
4. **Entrepreneurship and Innovation**

FRAMEWORK PIECE #1: RESEARCH 1 (R1) DESIGNATION

NDSU has utilized these investments and leveraged them with federal programs to become a regional research leader, having been recently designated as one of only 146 Research 1 institutions in the U.S. by the Carnegie Classification of Institutions of Higher Education. Being R1 is a big deal – it puts NDSU competing head-to-head with the likes of University of Minnesota or University of Nebraska.

Why is an R1 designation important?

Federal and state investments in research coupled with the hard work of faculty and researchers took us to R1. The investment dollars directly provide increased opportunities for students to work on real-world problems, positioning them for success

in their future endeavors, whether in the workforce or in launching a venture of their own. These investments also lead to increased opportunities to translate ideas into new technologies, services, and startups – which in turn leads to increased tech-based economic development in the state. Finally, this designation opens the door for the expansion of high-tech industry and innovation in the region.

FRAMEWORK PIECE #2: RESEARCH SUCCESS IN KEY AREAS

From a federal perspective, NDSU leads all North Dakota higher education institutions in research funding from the U.S. Departments of Defense, Transportation, Agriculture, and the National Science Foundation. Some recent research successes include:

- **\$7.4 million** from two NSF awards to support Artificial Intelligence to safeguard energy infrastructure and healthcare technology
- **\$9.7 million** from the National Institutes of Health for early detection and therapeutic protocols for controlling pancreatic cancer.
- **\$2.9 million to build a STEM workforce** from recently graduated undergraduates; **\$4.8 million total since July 2022** for STEM education research (NSF)
- **\$6.4 million since 2016 for NDSU-Sanford Health collaboration on obesity-related research** funded by the NIH.
- **Nearly \$8 million** in multiple awards in cybersecurity to strengthen protections for sensitive systems such as protecting computer systems from online attacks (DOD, NSF, others).
- **\$2.4 million** of state appropriated funds have been invested in precision agriculture projects at NDSU Since 2015 in subjects including soils and natural resources, agronomics, plant breeding, crop and animal protection, livestock management, and economics of precision agriculture
- **A five year \$4.4 million** USDA-ARS research on impacts in soil fertility and health, breeding for phenotyping and varietal trait selection, and crop protection for site-specific and autonomous weed control has facilitated industry-university collaborations on soil health and autonomous data systems at the Grand Farm.

The projects identified here represent some of the work in those 4 identified areas of NDSU's past, present and future strengths:

5. **Food, Energy and Water Security (FEWS)**
6. **Cybersecurity, Computer Science and Software Engineering**
7. **Life Sciences**
8. **Entrepreneurship and Innovation**

FRAMEWORK PIECE #3: INNOVATION AND THE NDSU RESEARCH FOUNDATION

Bill 1379 looks for economic diversification from research. “Tech transfer and commercialization” – it is all about how technologies make it from the university into the hands of industry and eventually consumers.

NDSU has notable successes in new patents and plant variety protections. NDSU issued 92 patents and earned \$3.1 million in intellectual property licensing revenue in FY21 and FY22. Heartland Forward ranks NDSU at #117 in tech transfer, thanks to our NDSU Research Foundation.

FRAMEWORK PIECE #4: ENTREPRENEURSHIP

NDSU has a long-standing commitment to technology transfer coupled with entrepreneurship training. This has been recently strengthened by the **NDSU-led NSF Great Plains I-Corps Hub**, a program that directly supports entrepreneurship at NDSU and 7 universities, including our partner UND. Teams with new ideas gain access to entrepreneurship training, mentoring, and customer discovery initiatives.

FRAMEWORK PIECE #5: THE NDSU RESEARCH & TECHNOLOGY PARK

A key component of our future is the NDSU-supported private-public partnership NDSU Research and Technology Park. The Technology Incubator opened in 2007 with 7 clients and since that time there have been over 70 companies located in the facility.

- Two recent success stories got their start in the Incubator:
 - Be More Colorful - virtual reality platform, including their CareerViewXR product, a tenant in the Incubator whose growth has benefitted from support services in the Incubator as well as support from the state, including new LIFT funding from the state - \$725,000.
 - Elinor Coatings (Co-Founder Holly Anderson is here and offered testimony) – anticorrosion coatings and materials especially for defense application

FRAMEWORK PIECE #6: NDSU'S LAND GRANT MISSION

NDSU's impact reaches into every county in the state – extension offices in 53 counties and 7 Research Extension Centers – offering a testing ground for prototypes and a platform to serve and support citizens and a way for them to reach back to NDSU.

FUTURE RESEARCH GROWTH

This framework provides the underpinnings for us to serve North Dakota's needs through House Bill 1379. Thanks to your efforts to create a business-friendly environment in North Dakota, our state attracts new companies, and we can expect even more with investments from House Bill 1379.

STATE NEEDS & ECONOMIC OPPORTUNITIES

Focused on the needs of our state, these areas will couple with existing economic drivers to create new economic opportunity. In more detail, NDSU's select key investment areas include:

- Water distribution (like drought and flood risk mitigation)
- Distribution of electricity in the grid
- Digital technologies for Agriculture and Smart Greenhouses
- Robotics and Drones

- Transportation
- Advanced materials (biofuels, biomaterials, bioplastics, biopolymers, nanomaterials, and materials that fight corrosion)
- Construction
- Manufacturing
- Smart Health
- Medical devices
- Cybersecurity

Each of these represent areas of our strength where we are poised to carry out research with the potential to move technologies into market. However, they also share aspects in common: they all have digital or cyber dimensions to how they operate.

Consider what those systems have in common, the way they are carried out in today's world, they all function in part due to the following areas we have also identified for growth:

- Software – Cyber (software engineering)
- Hardware – Physical (electrical engineering, computer engineering, computer science)
- Connected to the Internet
- Sensors and other similar components (like actuators)
- Generating data that is then stored, accessed, and processed (and that data has value)
- Automated tasks which happen when certain circumstances trigger it (like when a sensor detects soil is dry, that triggers irrigation to the area)

CYBERSECURITY OF CRITICAL IMPORTANCE

All of these growth areas are vulnerable to cyberattack. It is imperative that investments are made in cyber initiatives. NDSU's new **Cyber-Physical Systems Initiative** will advance what we are already doing with cybersecurity by developing tools to simulate how new technologies fare in the real world.

In addition, the **CyberFEWS Initiative** involves ensuring cyber safety for North Dakota's Food-Energy-Water-Security (FEWS). NDSU will use, process, and store the state's heavy data sets to support Food-Energy-Water industries like our Big Data Pipeline for Plant Breeding. These are crucial industries that must be protected to ensure the ongoing health and livelihood of North Dakotans.

THE FUTURE

In the next years, NDSU envisions building on these foundational investments and growing existing strengths in areas as I have laid out.

In an intentional way, as evidenced by our research and commercialization framework, we are strategically positioned to leverage new investments from the state.

CLOSING

In closing, let me summarize what we need to take that success to the next level for the state.

Speaking broadly, we want to increase investment in these 4 key strengths, along with the **Cyber-Physical Systems Initiative** and **Cyber-FEWS Initiative**:

1. **Food, Energy and Water Security (FEWS)**
2. **Cybersecurity, Computer Science and Software Engineering**
3. **Life Sciences**
4. **Entrepreneurship and Innovation**

We have the pieces and have demonstrated success. We have identified gaps and areas where we can do better, and we are doing that work. **We need your support** for the establishment of the Economic Diversification Research Fund within House Bill 1379 to build upon this framework and take it to the next level, make it pop.

Thank you for your time today and I would be happy to answer questions from the Committee.