

**North Dakota State Board of Agricultural Research and Education**

**Testimony Presented December 12, 2023**

**Dr. Colleen Fitzgerald, NDSU Vice President for Research and Creative Activity**

**Introduction.** I am Colleen Fitzgerald, **Vice President for Research and Creative Activity** at North Dakota State University. I want to express gratitude for **all of SBARE's support and want to partner on initiatives.** I am also serving as the Principal Investigator of the National Science Foundation (NSF) Regional Innovation Engines Type-2 proposal focused on North Dakota advanced agriculture technology. The project, the "Northern Plains AgTech Engine: Food systems adapted for Resilience and Maximized Security (FARMS) was submitted by a North Dakota coalition led by NDSU and including core partners GFMEDC, FMWF Chamber, Grand Farm and, most recently, a fifth core partner, the North Dakota Tribal College System (NDTCS), which is the nation's only Tribal College system and consists of the state's five Tribal Colleges. We had a highly successful NSF Site Visit in September with NSF program officers and external panelists reviewing our project and meeting with partners over three days. Many thanks to those of you who participated.

Since shortly after my arrival at NDSU in October 2021, Greg Lardy and I have been developing a partnership between Agricultural Affairs and the Office of Research and Creative Activity (RCA). The partnership has been leveraging our status as a powerhouse in agricultural research, which generates around 60% of NDSU's research expenditures to propel NDSU's research to new heights. One part of that collaboration has been a recently announced Transdisciplinary Food, Energy and Water Research Initiative at NDSU that will advance partnerships with industry, other land grant institutions, and with North Dakota's tribal colleges while solidifying NDSU's reputation as a national thought leader in AgTech. Dr. Lardy and I also conferred on the research ask for the state's Legacy Funds the last session, leading to HB1003 appropriating \$2.5M (out of \$5.5M total) to NDSU for research over the current biennium through the Economic Diversification Research Funds. We have also been partnering on developing USDA programmatic requests for cooperative agreements. And Agricultural Affairs has been a robust partner on the FARMS proposal, which Drs. Frank Casey and Lynette Flage have regularly provided updates on to SBARE.

**As NDSU's Chief Research Officer, I am incredibly grateful for all of SBARE's advocacy.** Most especially, I see the impact of SBARE's forward-thinking investments in digital agriculture and the data sciences under the North Dakota Agricultural Experiment Station and ND Extension, including the Big Data Pipeline Unit (BDPU). The impact of investment and ROI into initiatives agriculture analytics and related tools, infrastructure, and FTEs has been significant in supporting North Dakota producers and in generating federal funding from the USDA to further enhance our capacity in this space. It has provided the foundation for the FARMS project. Applying digital tools with real-time decision-making power has the potential to increase production and profit. Infrastructure for ag data is supporting farmers and ranchers through valuable data insights and empowering stakeholders with data-driven decisions to enhance the agriculture industry in North Dakota, especially the BDPU (<https://www.ag.ndsu.edu/bpdm>) under the North Dakota Agricultural Experiment Station (NDAES). BDPU activities and precision agriculture are foundational to advancing agricultural technologies in

North Dakota through the FARMS Engine but also in terms of accelerating the support and impact for North Dakota producers.

**Background.** Digital agriculture, data and computational sciences, precision agriculture and other ag technologies are rapidly accelerating due to power and potential of tools from Artificial Intelligence (AI) and Machine Learning (ML). Through the FARMS initiative, we see some key opportunities, due to partnerships with industry such as Microsoft, Appareo, RDO and John Deere, to leverage additional state investments with the support of SBARE. SBARE's advocacy and investment in the Big Data Pipeline Unit has made possible the foundation for modernizing plant breeding through machine learning analysis of crop genomics and phenotyping. **Additional investments in critical technologies, FTEs, tools and infrastructure will more quickly accelerate research in sensor usage and the plant breeding research as well as precision livestock and related digital initiatives.**

**Request for Priority Investments in 2025-2027.** I am here to ask for your support in advancing further funding in advanced digital agriculture: An increased investment is critical to develop even better infrastructure and capabilities for working with big data and AI with agricultural data. We are in a terrific position to plan for the next legislative session in a forward-looking way, building upon the foundational support that SBARE and the State has made into big data and agriculture and precision ag, and that the State and funds through the National Science Foundation have made to support NDSU's high performance computing center, the Center for Computationally-Assisted Science and Technology (CCAST).

Currently the gaps/areas for increased investment we have identified are in the following areas:

1. VAST Data System (high performance data storage system)
2. Additional storage (servers – not high performance)
3. Data Management (software - iRods)
4. Microsoft Azure Management for Agriculture (upon release) and Microsoft Intelligent Data Platform tools
5. Equipment and materials: Cameras, sensors and related equipment for drone, sensors and robots development
6. 5G connectivity at RECs (through Dakota Carrier Network)
7. Software Engineer (FTE)
8. Software Develop (FTE)
9. Systems Engineer (FTE)
10. Cloud Engineer (FTE)
11. Network Engineer (FTE)
12. Data science (FTEs)
13. iRods Support (FTE)
14. Other (FTEs)

Prioritization from SBARE and the NDAES are part of the support picture. We are strategically looking to leverage FARMS NSF funding, industry partnerships, especially

potentially in-kind personnel; increase in Economic Diversification Research Funds (appropriated in HB 1003) along with SBARE prioritization to address those gaps.

Agriculture affects 1 out of every 5 people in the state. It is a multi-billion primary sector industry in North Dakota. The ROI on an even more substantial investment into computational sciences and infrastructure at NDSU will give North Dakotans even better infrastructure and capabilities for working with big data and AI with agricultural data and the kinds of tools, apps and automated machinery that North Dakota producers can use to increase the dollars in their pockets.

Select) projects related to agriculture supported by the Center for Computationally-Assisted Science and Technology (CCAST) include the following. They show how NDSU's Information Technology works in partnership with NDAES and how the critical investment by the state and NSF into high performance computing supports the mission of NDSU AgTech research:

1. Future farming by artificial intelligence, robotic, and cloud computing
2. Increasing pulse crop productivity using genomics, phenotyping, and modeling
3. Mapping and cloning disease resistance genes in barley and wheat
4. Genomic basis of fetal programming in beef cattle

The FARMS Engine's focus on combining advanced crop data, genetic data, climate modeling and sensor technologies will surpass the current state of practice and our current capabilities. The unique capacity of this Engine and region will apply cutting edge technologies to public crops that are critically important to the region and nation's economy yet have had historical underinvestment. The advances also have the potential to have significant impact in other domains, extended to other relevant areas or crops, such as soybeans and livestock. The FARMS team proposes using real-time decision making and advanced technologies to significantly increase innovation and crop-related decision making in the agriculture space.

With the momentum from the FARMS site visit in September, the feedback from industry partners and the NSF program officers and panelists, we have a clear vision of North Dakota recognized as the epicenter of AgTech. Data is at the center of all this, and today, data is all about computing power. However, as reflected by the FTEs above, the human infrastructure is vital to using data and using it well. Thank you for allowing me to submit this testimony to SBARE.