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Before the United States Senate

Committee on Commerce, Science, and Transportation

"Transforming Rural America: A New Era of Innovation"

Good afternoon Chairman Thune. Thank you for the invitation to testify today. It is privilege to present on a topic that is so impactful for South Dakota and surrounding rural states.

As Vice President for Technology and Security, I am charged with supporting the mission of South Dakota State University, which as you know, has a tripart purpose around teaching, research and outreach. We also provide access to the benefits of higher education through our mission. Each of these, whether it's teaching, research or outreach, but access to broadband is a critical part of meeting that mission and serving the citizens of South Dakota.

I did not start on the administrative side of a university. Instead, I began as an Extension computer specialist teaching farmers and ranchers how to use computers and software. I also managed one of the first websites that provided digital access to Extension services and information. Anyone who wanted to have those publications then would have had to dial from a telephone line into 300-baud modem pools to get connected and download publications that would take several minutes, at best, to complete.

Today, my division at SDSU oversees the networks and technology on our main campus in Brookings, as well as at off-campus learning centers, regional Extension offices and various Agricultural Experiment Stations in the state. At many of these sites, we connect using 100-Megabyte circuits that aggregate back to campus on a 100-Gigabit connection. As you know, technology and the demands for enhanced technology continue to change and the need for better and faster connectivity is important.

As the world population continues to grow — some projections estimating an increase of 2 billion by 2050 (6/17/2019 United Nations), the need for an efficient and effective food and fiber production system will be essential. Precision Agriculture will be one of the building blocks on which the production system will be built.

A group of university professors from around the United States authored a paper titled, "Advancing U.S. Agricultural Competitiveness with Big Data and Agricultural Economic Market Information Analysis, and Research," for The Council on Food, Agricultural and Resource Economics. They describe Precision Agriculture as "a suite of information technologies used as management tools in agricultural production."

I interpret that statement to mean Agriculture is an evolving tech industry of today.

Continuing the analogy, broadband connectivity will be the mortar that will hold together those building blocks, enabling the various technologies necessary for a successful precision ag ecosystem. This ecosystem will consist of big data, artificial intelligence, GPS, digital maps, and the "internet of things."

The Council on Food, Agricultural and Resource Economics' paper noted that current advances in technology have increased the Total Factor Productivity – the efficiency of inputs being transformed into outputs – at an average of 1.47% annually. The increase can be attributed within the value of field-level data, but the opportunity for even greater increases exists by utilizing a wider range of aggregated data with other data sets suitable for pooled analysis. This type of data comparisons takes decisions out of a specific field and widens it to entire farms and potentially beyond.

The tractors of today are command centers that constantly receive data while operating and are able to adjust to the new information in a matter of seconds. This is valuable data, but also data that currently operate in a silo as much of that data transfers from tractor to tractor by hardware.

Imagine a scenario where the tractors' connectivity is done in the cloud through wireless technology from multiple sources in real time. When you add information being sent from drones and satellites to that system, it could create less time in the field for the farmers, meaning less overhead, less fuel and a more sustainable and efficient food production system.

Imaging from drones can be used to identify nutrient deficiencies in plants, weeds, insects, or diseases that can be treated immediately. The imaging comes from sensors that utilize complex software through Global Positioning Systems and Geographic Information Systems.

The use of drones extends beyond crop management to ranching by monitoring range conditions and virtual fencing to create precision grazing. Drones would monitor animal health and status of newborn livestock, field conditions, and overall performance to develop data useful in comparing range versus pasture settings.

Drones would also be utilized for field management and spraying by tracking weather conditions and weather forecasts to determine the optimal time for field treatments.

Imagine a scenario where farmers are able to better own clean data and provide information to industry, producers and universities like South Dakota State, which are working to develop the next generation of farming technology to meet the population demands of the future while working toward even more sustainable and greener farming practices that will benefit future generations.

Precision Agriculture is the site-specific implementation of management practices that will economically optimize yields while maintaining the soil, water, atmospheric, plants, and animal natural resources.

That future is now and high-speed connectivity to rural South Dakota and neighboring states is what is needed.

SDSU is a global leader in Precision Agriculture and Dr. John Killefer, dean of the College of Agriculture, Food and Biological Sciences, is an expert in the field. Dr. Killefer's recent presentation to the South Dakota Joint Appropriations stated that South Dakota "producers are early adopters of technology." According to a 2017 report from Agribusiness Consulting, Precision Agriculture is expected to increase gross state product by an additional $615 million to $1.5 billion from crop production alone in the next decade.

Precision Agriculture at SDSU is not new. Since 1968, there have been more than 750 publications from SDSU faculty and researchers that talked about some aspect of Precision Agriculture. A 1968 edition of Winter Farm and Home Research Magazine had an article titled "Precision Information for Irrigation Planning." The article discussed the utilization of a 16-square-foot lysimeter to measure water infiltration to a hardwired recorder that was placed on the edge of the field. Today, these measurements are done with an app on a smartphone to a wireless receiver.

More than 175 students are currently enrolled in the Precision Agriculture program, seeking either a bachelor's degree or minor in the field. These students are on the cutting edge of agronomics, high-speed sensor technology, data management and advanced machine learning using high performance computers. They are the next generation of farmers, engineers, producers and even business leaders. More importantly, they are the next generation of mostly South Dakotans who will support our state's largest industry.

Senator Thune, I want to thank you for the opportunity on behalf of not only South Dakota State University, but also the people of South Dakota we serve. Our passion in the area of Precision Agriculture is evident and we are prepared to lead not only the United States, but the world, in this growing industry.

Thank you for your consideration of this need and efforts to transform rural America.