To: Keith Peltier, Chairman and State Board of Agriculture Research and Education Members  
RE: Support of Precision Ag Degree Program by NDSU Dept. of Agriculture and Biosystems Engineering

With the cutbacks in state funding, I know you folks have a challenging job. I would like to share some information with you that I hope is helpful in your decision-making process:

The development of a Precision Ag Program at NDSU is a critical, and heretofore missing, piece of both agricultural and engineering research, extension, and educational offerings in ND. I encourage you to support this effort.

Let me share some background. In 2005, after several years of leading marketing clubs, I thought farmers may be interested in a similar program for the emerging field of precision agriculture. I had started using satellite imager for field zone mapping on my farm in 2004 and in 2007 we added sales of Farm Works software (now Trimble Ag) and Raven guidance. My plan was to sell product at ag shows and provide training classes on using them.

Some early adopter farmers like me were willing to do the work necessary to go through the learning curve and implement precision ag for their farming operations. But there were many more who asked me, “Can you do this for me?” Or, “Will you come to my farm and set this up?” That raised the issue that I would have to provide extensive training to potential employees before they would even be capable of helping farmer customers, along with showing farmers how to maximize the benefits.

Rising commodity prices created an explosion in new tractors with auto steer and “precision ag capable” machinery. We saw an uptick in demand for software sales and training as well. But I didn’t service the “in cab monitors.” Demand by equipment companies and farmers for staff who could help finally initiated a response by education institutions to provide education. Our business also provided software training to several implement dealer technicians. And we also provided VRA zone maps to farmers.

There are now several excellent two-year programs available to students from ND and surrounding states. One of the services that Trimble Ag Software provides is a very reasonably priced software package for education programs, so I have had the opportunity to help with the precision ag education programs at Bismarck State College, Lake Region State College, and North Dakota State School of Science as well as ag programs at Dickinson State University and University of Minnesota-Crookston. At NDSU I have guest lectured for a class on “Introduction to Precision Ag.”

But the missing piece in North Dakota is a full Precision Ag Research & Extension Program with an affiliated four-year degree Program for students to either start in or transfer into from these other programs. I was delighted to learn of this NDSU effort!

The past 25 years that I have been in farming would have to be characterized as evolutionary. The next 25 years are going to be revolutionary, probably akin to switching from horsepower to machine power. We see hints of it, but by 2042 I believe these changes will be fully in place. Here are some of the opportunities and challenges for precision agriculture:

**Sensors** on equipment, in the soil, and in the biosphere, will be fully in place, providing farmers with information to help tailor decision making on application, or not, of fertility, water and pesticides. Some of these sensors will be on machines for “on the go” data, some in the air; some will require decisions,
and some will inform computerized modelling that will eventually be a source of artificial intelligence for robotic decision making.

**Data** management, already a key challenge, will become more so. Engine operations, equipment performance, soil properties, sensors, weather and forecasting models all generate data. Data will enable artificial learning to operate machinery, which is why John Deere recently made such an investment in Blue River Technology.

For example, planter “seed singulation” errors can be caused by equipment bounce and reduce yields. Currently an operator seeing this on the monitor can slow down. Soon, the tractor may automatically downshift, or make other adjustments, without driver input; in the future, by accumulating and “learning” about this part of the field, the equipment will be anticipating the issue before it enters that part of the field, and start proactively adjusting based on sensors, rather than react to a seed singulation problem after the fact.

Another source of data will come from human involvement in fields and crops. With machinery operation becoming more automated, more time will be spent on field and crop scouting, including use of UAV’s, for making management decisions on tablets and other hand-held devices.

**Robotics.** Autonomous machines are still some ways off from implementation, but some of the things mentioned above are becoming realities. We will see machines capable of making many decisions even if there is an operator in the cab. This will eventually transform into autonomous vehicle operation. Equipment of the future could look quite different than the tractors, planters, and harvesters of today!

The role of Precision Ag in cattle production and in Sustainability are also emerging areas!

A fully realized Precision Ag Program at NDSU is essential if North Dakota is going to be a player in the future of agriculture. Many programs already exist around the country and we will need to catch up. South Dakota State recently announced a $500,000 contribution from CHS and a $5 million partnership with Raven Industries. But with the strong support of the agricultural, technology, and industry base that exists in our state, I believe North Dakota can also develop a viable Program.

Research and Extension play key roles. Farmers have routinely turned to NDSU to evaluate and “prove” the claims of private industry. And private industry has often partnered with NDSU to understand the needs of farmers as well as to collaborate on innovation. Because of all the technical, and fast moving, pieces this interaction between farmers, NDSU Research and Extension, and industry is critical.

And, of course, this effort is going to require future students with multiple levels of learning, including opportunities to participate in applied research and extension. These students will become our future leaders in developing, producing, and refining these technologies, from agronomy to natural resources to computer skills and engineering skills. And these will all be high paying jobs.

Some final notes. As I reviewed the proposed curriculum that would be developed on a parallel track with the Precision Ag Research and Extension component, it was important to me that it be compatible with existing two-year degree programs, especially for students who wish to transfer or who may later attend NDSU to pursue a Bachelor’s degree. I am pleased that this Program has a good fit with those existing programs. I have visited with several programs about this initiative and they are supportive!
It was also important that the Program be integrated with several related disciplines, allowing students to double-major or minor with the Precision Ag Degree Program. Again, I am very pleased to see the integration of crops, soils, natural resources, sustainability, computer science, and engineering into the curriculum. This broad base is necessary for the Program with elective opportunities for a student to create a focus area as well as all incorporate the disciplines that are needed for research and extension.

I strongly encourage the members of SBARE to endorse this proposal for a Precision Ag Program at NDSU as a priority, and seek funding for its implementation.

Thank you.

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