Testing New Manure Sensing Technology

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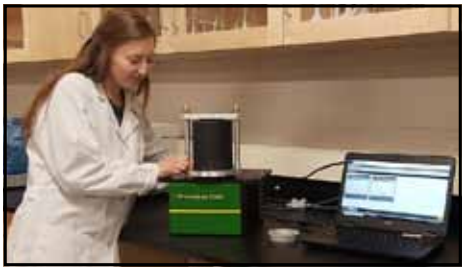

Allyssa Frahm calibrates a near-infrared reflectance spectrometer, the underlying technology of the Deere & Company HarvestLab™ 3000 manure sensing system.

Another advancement in precision ag technology was made recently with the assistance of students at the University of Wisconsin-River Falls. In June, John Deere announced the release of its HarvestLab™ 3000 with Manure Constituent Sensing. Manure is a useful byproduct of livestock industries, which contains valuable crop production nutrients and reduces the reliance on synthetic fertilizers. But manure composition is highly variable and dependent on many factors, including animal species, age, diet, bedding, climate, and manure handling practices. The Manure Constituent Sensing technology from John Deere uses near-infrared sensors to provide real-time measurement of total nitrogen, ammonium-nitrogen, potassium, phosphorus, and dry matter content of the manure as it is being applied in the field. Farmers can adjust the volume being applied to meet the specific nutrient requirements for their fields.

To ensure the new technology would provide farmers with accurate information on important manure nutrient constituents, John Deere approached Matthew Digman, assistant professor of agricultural engineering, for assistance in collecting and analyzing Wisconsin dairy manure samples. Although John Deere was already using the technology in Europe, livestock manure in the U.S. is compositionally different. So manure from U.S. farms needed to be sampled, analyzed, and compared to the predicted composition from the Manure Constituent Sensor system.

Beginning in fall 2017, Digman and his students identified farmers willing to participate and then collected samples. Back on campus, they processed the samples through the John Deere Manure Constituent Sensing test stand and sent sub-samples to the University of Wisconsin Soil and Forage Lab in Marshfield for wet chemical analysis. The students handled the data collection and organization, maintained the database of metadata collected along with each sample, and participated in meetings with the John Deere staff overseeing the project.

Eventually John Deere expanded this effort, with UW-River Falls as the sole North American collaborator on this project to sample and test dairy and swine manure across the U.S. and Canada. This necessitated a change in the collection process. One of the students developed a "manure by mail" program with easy to follow instructions and all necessary supplies, including instant ice packs to keep samples chilled while en route.

Over the nearly two years this project has been in existence, seven UWRF undergraduates have been involved: Julia Rogers, Allyssa Frahm, Miriam Zarling, Aaron Timm, Madison Schochenmaier, Jacob Burg, and Samantha Payne.

"It was a really great learning experience to be able to work directly with the engineers and John Deere to solve problems and meet their goals," said Rogers, who was involved with this project from the beginning. "It was fun to apply information I learned in classes to the project and things I learned on the project to my classes. And now it's really exciting to see something I've worked on go to market!"

It was Schochenmaier who used her organizational and planning skills to create the manure-by-mail protocol.

"Now that the technology is released, I am super excited to finally be able to say I was part of the development," Schochenmaier said. "Though we may have been doing what some consider the 'grunt work,' I feel we learned a lot about how much effort it takes when launching a new product."

The completion of this phase of the work was well-timed for Digman, as he accepted a position at UW-Madison beginning fall 2019.

"We already get along very well with our sister department at UW-Madison," Joe Shakal, professor of agricultural engineering and chair of the department said. "Matt's transition will strengthen the ties between our two departments and better enable us to work together to provide research and development solutions for our corporate stakeholders, while giving students meaningful hands-on laboratory experiences."