



Ben Lehman: Mapping out a Career Path in Agriculture

By Melanie Soberon

Graduating senior Ben Lehman grew up on a 500-acre family grain farm in Slater, Iowa. He came to Cornell University four years ago in pursuit of knowledge and work experience in crop research. This spring, he will be returning to Iowa with a bachelor's degree in Agricultural Sciences with distinction in research along with research experience that has helped him secure an on-farm research position that he recently accepted with a company in Iowa.

Lehman spent the past three and a half years working as a student researcher in the Cornell Nutrient Management Spear Program (NMSP), led by Professor Quirine Ketterings.

"I told my Agricultural Sciences advisor, Dr. Tim Setter, that I was looking for a work-study position," Lehman recounts. "Originally, I was going to apply to work at the bowling alley. I thought that sounded like the best work-study job but he said, 'No, no. Get something in your field where you can build skills and learn from people in your field.' He said Dr. Ketterings was the person to approach to learn about technology on farms, something I was interested in."



Ketterings recalled "Ben emailed me with the question if he could maybe join our team to gain experience with nutrient management in August of 2017. We have been tremendously fortunate to have him as a member of our team for the past four years. His growth has been incredibly rewarding to watch and be part of."

Lehman began assisting with corn yield monitor data processing and development of training materials for others to learn about yield data cleaning. He took on more hours working

part-time during semesters as class and exam schedules allowed and joined the team full time in the summers after his sophomore and junior years.

"I was given more opportunities to work directly with farmers and consultants, training them in crop yield data cleaning – with the goal of getting more accurate yield estimates for each field section," Lehman explained.

Ketterings nominated Lehman for the Rawlings Cornell Presidential Research Scholars (RCPRS) program. She explains "Ben's interest in research and learning in general made him a great candidate for the RCPRS program. When the opportunity surfaced to nominate him as a sophomore student, I approached Ben about this phenomenal program and we were able to get him admitted, giving him access to research support and networks."

At the end of July in 2019, Dr. Judith Fitzpatrick of Prolific Earth Sciences, Montgomery, NY, came to visit the NMSP, to talk about possibly evaluating the [MicroBIOMETER](#) approach that she and her partners had developed. This soil test determines microbial biomass and fungal to bacterial ratio with an easy to set up methodology and an app to read results, allowing for quick determination of microbial biomass as a soil health indicator. Following the visit of Dr. Fitzpatrick, Lehman's honor's thesis research project started to develop.

"The research project was brought about by observations by dairy farmers about crop yields," explains Lehman, "They found that some field sections had very consistent yields from year to year despite variation in weather, but other field sections tended to 'go with the weather' – if there was a drought, they had very poor yields...if there was a wet year, they would have very poor yields as well. Some of those differences were pretty obvious while in other cases, the variability didn't make much sense and they didn't see what was driving it."

Lehman went on to explain that use of yield monitors on combines and forage choppers now

allows farmers to track yield for each field section every single year. "They come away with a map every year that has the yield for each field section. And then they can compare those yields from year to year to see how much that yield varies. Our project was focused on creating a framework for farms to go in and do soil sampling and use free data and free software to see what's driving those differences in yield trends within fields."

"A study done by a prior NMSM graduate student, Emma Long, showed that phosphorus tended to be higher in stable yielding field sections. The higher phosphorus levels reflected a longer manure history and increased soil health which could have allowed those field sections to produce more consistently over time. In my study we also found higher phosphorus levels in the more stable yielding field sections, consistent with prior work."

Lehman explained the likelihood that secondary benefits of the manure, like the organic matter being incorporated with the manure, or the biology of the soil could be allowing for better soil condition to help buffer against environmental extremes.

To test this hypothesis, Lehman performed a study co-sponsored by Cornell University's JumpStart program and Fitzpatrick and Brady Trexler of Prolific Earth Sciences.

"We know that in just a teaspoon of soil, there can be billions of different soil bacteria," Lehman said. "But we didn't really know how much that would vary across a field or if that would be related to our yield stability zones."

The tests revealed higher microbial biomass in the higher yielding field sections, which the team thought might be related to some of the secondary benefits in the manure applications. "We think it could be an indicator of the field sections having more appropriate water and nutrient supply, as well as having enough food or energy available for the microbes," Lehman said.

Fitzpatrick added, "It was a great experience working with Ben and his team evaluating the effect of microbial biomass on yield. The data

generated in his study elucidated the many factors tying together the complex relationship between plant health, microbes, and soil fertility and made us very aware of the many benefits we reaped from working with Cornell scientists."

In his time with the NMSM, Lehman got involved in extension writing and practiced with oral presentations for a diversity of audiences. He wrote an agronomy factsheet ([How and why to clean corn yield monitor data](#)) and an article for Progressive Dairy ([Next steps for better silage yield maps](#)). He also interviewed Andy Miller, on-farm agronomist and certified crop advisor ([Andy Miller at Osterhoudt Farms and NMSM Collaborate on Zone Management](#)). He was elected Greenfield Scholar in 2020 and presented his research as a poster and short presentation at the Agronomy, Soil and Crop Science Societies of America Annual Conference that year, winning 3rd place in the student competition. He presented his honors thesis for the ANSC4020 honors class at the end of April.

"One thing that I really loved about working on this project was that I got to learn from a number of different graduate students and postdocs...getting a little chunk of their expertise in different subjects and being able to apply that in a way that would be reasonable for a farm to try to use," Lehman said.

Lehman's research experience with the NMSM contributed to a successful job application. "After graduation, I will start working for IN10T, a company in Iowa, close to my home farm, that works with farmers to accelerate adoption of new and emerging agricultural products through their [FarmerTrials](#) network. Hopefully, I can apply some more of the data skills I gained at Cornell not only in that job, but also on my home farm, to see what's driving these differences in yield trends there."

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The **Nutrient Management Spear Program** (NMSM) is an applied research, teaching and extension program for field crop fertilizer and manure management on dairy and livestock farms. It is a collaboration among faculty, staff and students in the Department of Animal Science, Cornell Cooperative Extension, and PRO-DAIRY. Our vision is to assess current knowledge, identify research and educational needs, facilitate new research, technology and knowledge transfer, and aid in the on-farm implementation of strategies for field crop nutrient management including timely application of organic and inorganic nutrient sources to improve farm profitability while protecting the environment. An integrated network approach is used to address research, extension and teaching priorities in nutrient management in New York State. For more information on NMSM projects and extension/teaching activities, visit the program website (<http://nmsm.cals.cornell.edu>) or contact Quirine Ketterings at qmk2@cornell.edu or (607) 255-3061.