



DAIRYCAP Research Internship Helps Shape Cornell Agricultural Sciences Graduate Andrew Lefever's Future

By Lisa Fields

The Crop Production and Management concentration seemed an ideal fit for Andrew Lefever, a May 2016 Cornell Agricultural Sciences graduate. He explained, "I grew up in Lancaster County, PA, and although my parents didn't farm, I was surrounded by agriculture. Many of the farms were small dairies and diverse poultry and crop operations run by Amish and Mennonite families. During high school summers I worked with the tobacco harvest and unloaded hay and straw. I always wanted to farm and I loved the work."

Lefever noted how his career path developed during college, influenced by his internships and jobs. "The summer after my freshman year, I worked close to home preparing soil samples at the Agri-Analysis soil testing lab. That really piqued my interest in soil sampling and analysis. The next summer I participated in corn seed research, hand planting and pollinating for DuPont Pioneer in New Holland, PA. That added to my knowledge and experience of plant breeding."

Lefever outlined his 2015, junior year college internship. "That summer I interned with the Nutrient Management Spear Program (NMSP) on the Sustainable Dairy Coordinated Agricultural Project (DAIRYCAP). I worked on long-term crop rotation, manure management and greenhouse gas emissions studies under direct leadership of Dr. Amir Sadeghpour, postdoctoral associate with the NMSP. We took air samples for greenhouse gas analyses and in addition, compared the impacts on soil health from manure versus compost in a corn and alfalfa forage rotation. An objective was to determine whether soil health scores could be useful in predicting corn silage yields. It is important work both for long term farm economics and environmental health, and helped me decide that I wanted to work directly with the dynamic connection between animal and crop production."

Lefever was one of four undergraduate students who earned the opportunity to

participate in the multi-institutional DAIRYCAP project working with principal investigators, post-doctoral research associates, and graduate students. Interns were placed at Penn State, North Carolina Ag and Tech State University, the University of Wisconsin-Madison, and at Cornell. The program at Cornell was jointly funded by USDA's National Institute of Food and Agriculture (NIFA), and Federal Formula Funds.

Professor Quirine Ketterings, who leads the NMSP and is lead-principle investigator for DAIRYCAP at Cornell commented, "It's great to offer motivated students like Andrew the opportunity to be part of our research team. They build valuable skills no matter what their future path is, and we actively invest in agriculture's future by engaging students in the research process."



Andrew Lefever, Agricultural Sciences major collects air samples for the DAIRYCAP greenhouse gas emission study with the Nutrient Management Spear Program at Cornell University.

"I had taken a fairly broad spectrum of courses in the Agricultural Sciences major, and didn't have in-depth exposure to research, but I wanted to dive in and get immersed in the

process,” Lefever said. “It was a whole new world for me to be involved with an intensive research project from field to laboratory work and to learn how to do statistical analysis.”

The manure and crop rotation study was established in 2001 at Cornell’s Musgrave Research Farm in Aurora, NY. Ketterings explained, “This is a corn and alfalfa rotation study, with five years of each, that is now in its 16th year. We have liquid manure versus separated and semi-composted dairy solids, or nitrogen (N) fertilizer applications, during the corn years, allowing for soil test phosphorus (P) buildup over time where manure or solids are applied. This is followed by alfalfa where nutrient levels are drawn down again through crop uptake and export with harvest. We study the impact of changing from N-based manure rates with surface application to P-removal based rates with incorporation of the manure directly after application to conserve N. The latter results in lower application rates which will reduce soil test P buildup and is good for the environment, but may also impact yield.”

In 2014 and 2015, the team measured greenhouse gas emissions from the manure and crop rotation study as well as from a project on manure application methods for grass and alfalfa fields, as part of the DAIRYCAP project. The objective is to build a database of emission data combining work at Cornell University, Penn State, and the University of Wisconsin-Madison, that can be used to evaluate sustainable manure management practices.

Lefever noted, “I learned how to collect the emissions samples and soil health samples. It was exciting to be involved in a project with the goal of helping dairy farmers manage impacts on climate change.”

Commenting on the initial results of the soil health testing, Lefever said, “We found that the soil health score was significantly higher in the fields that received the dairy solids rather than manure or inorganic N fertilizer. The connection between soil health score and crop yields was not straightforward, so this area requires further research with more years of data at

multiple sites.” He added, “It was a complex project and it was challenging to get a good grasp of what needed to be done. It was a great learning experience to be exposed to the scientists’ discussions of what the best approach was. I worked with research staff from the US, Greece, Iran, Nepal, Spain, and from the Netherlands, where Quirine grew up. The exposure to different cultures was a fantastic and mind-opening experience for me, along with all the skills I gained.”

A poster prepared by Lefever and Sadeghpour entitled “Effect of Nitrogen vs Phosphorus Based Manure and Compost Management on Soil Health” won 1st place in the undergraduate poster competition at the American Society of Agronomy meetings in Minneapolis, MN in November of 2015. Lefever said, “Organizing the information and clearly describing the project and outcomes was a big challenge. Amir was tremendously helpful. Attending the conference was a great exposure to the world of agricultural research that I had no idea was so vast.”

After graduation this May, Lefever will begin working for Agri-King as a Dairy Nutrition Consultant in Southeastern PA. He noted, “I have a strong interest in going to graduate school. First I need a few years of work experience to get exposure to fieldwork before deciding on a college and the topic to focus on.”

Lefever spoke of the impact of his NMSP internship. “I would strongly encourage other students to take on an internship with the NMSP. It adds so much to the college experience. I really had to stretch my mind, as I was continually learning new skills. Having the opportunity to work with people from various cultural backgrounds as well as different perspectives about the research process was an enriching experience that will always stay with me.”

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The **Nutrient Management Spear Program (NMSP)** 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 NMSP projects and extension/teaching activities, visit the program website (<http://nmsp.cals.cornell.edu>) or contact Quirine Ketterings at qmk2@cornell.edu or (607) 255-3061.