



## Cornell Grad Julia Knight Involved in Phosphorus Research Project Critical to NY Dairy Farms

*By Lisa Fields*

Growing up on a 60-cow dairy in western New York inspired Julia Knight's initial dream to become a veterinarian. She recently graduated from Cornell with a Bachelors of Science degree in Animal Science with distinction in research, and a job offer to work with Western New York Crop Management Association (WNYCMA) as a crop technician.

Knight reflected on her aspirations and how they changed during college. "I was always in the barn as a kid and I loved working with the cows. I started at Cornell as a pre-vet student, but when I realized the years involved I decided to explore other options." Knight's open attitude led her to work in the realm of soil fertility and nutrient management. She noted, "When I was seeking part-time work as a sophomore I applied at the Nutrient Management Spear Program (NMSP) in the Department of Animal Science. I worked there for five semesters on various projects and then completed a research honors thesis in 2010 on phosphorus management strategies and their impact on manure and fertilizer management in New York. My experiences with NMSP led to my work as a field crop scout with WNYCMA in the summer of my junior year, resulting in my current employment."



Julia Knight graduated from Cornell University with distinction in research after completion of an honors thesis on "Phosphorus management strategies and their impact on manure and fertilizer management in New York".

Dr. Quirine Ketterings, Associate Professor and Director of NMSP commented on Knight's work with the program. "Julia asked if she could join our program when she was a sophomore student. She had learned about us from one of our former undergraduates who highly recommended her to me. Julia worked very well with our staff and helped out with numerous projects so in her final year at Cornell, I approached her about doing an independent research project with us."

Knight discussed the project. "It was very relevant to my interests. The purpose was to explore the impact on New York State farms if the Phosphorus Saturation strategy, "P<sub>sat</sub>" gets applied as a regulatory tool rather than the Phosphorus (P) Index currently used in nutrient management planning. After a May 2009 Executive Order by President Obama to address impaired water quality in the Chesapeake Bay and its watersheds, EPA [Environmental Protection Agency] proposed implementing the P<sub>sat</sub> approach on federal lands. They deemed the P Index insufficient because water quality concerns were unresolved after 25 years of nutrient management programs."

The New York P index, introduced in 2001, uses soil test P, manure and fertilizer application rate, timing and method, and field transport risk factors to evaluate the risk of particulate and dissolved P entering water resources. Risk is scored numerically with ratings ranging from Low to Very High. Fields with high soil test, typically from past manure and/or fertilizer inputs, and high transport risk receive a high P index score. If fields get scored  $\geq 100$ , they are rated as "Very High" in P runoff risk potential. New York State regulations dictate that these fields cannot receive any additional P inputs. In contrast, the P<sub>sat</sub> approach was originally developed in the Netherlands where leaching of P from sandy soils can be an issue. The concept was tested in various studies in the US using different laboratory procedures. P<sub>sat</sub> is now

usually determined as Mehlich-3 Phosphorus divided by iron (Fe) and aluminum (Al) in molar ratio ( $P/[Fe+Al]$ ).

Ketterings explained, "The EPA guidance document said that for federal cropland, grazing or pasture land, no manure or P fertilizer can be applied if Psat exceeds 20%. This raised serious concerns among scientists all over the United States as the Psat approach does not consider the transport factors considered in the P index."

Ketterings added, "Since 2001, use of the P Index along with on-farm research has shown that no additional P fertilizer is needed for soils testing optimal or high in P. Along with other Extension and Industry initiatives in crop management and herd nutrition, this has contributed to a major reduction in P fertilizer use and P content of dairy rations. On a statewide basis, the manure and fertilizer P annually applied to farmland is roughly equal to the amount removed by crop harvest from that land."

Knight said, "For the project objective we needed to make a sound comparison between the two P management strategies. We worked cooperatively with Agricultural Consulting Services (ACS) to obtain soil samples from 92 farm fields. Samples were analyzed for the Cornell Morgan test and for Mehlich-3 extractable P, Fe and Al. The Mehlich-3 data were used to determine Psat." Knight found that a 20% Psat roughly equated to a Morgan soil test P level of 80 lbs/acre.

Ketterings explained, "This means implementation of a 20% Psat cutoff here in New York is more restrictive than our P Index which would allow application to such fields if the P transport risk is low. A recent survey of nutrient management planners certified in NYS indicates that less than 5% of the state's crop acreage would be affected. This could, however, be significant for an individual farm with high P index, low transport risk fields. Julia's project indicated that the P index remains the most effective and scientifically defensible approach to managing phosphorus."

Knight described some of the learning experiences gained from the project. "Being from the era of technology, it was really eye-opening for me to learn that you can't find every piece of information you need on the internet. For the background research I spent a lot of time reading journals and references from technical papers in the library. I also learned to be patient through the process of doing the lab work and analyzing the data to compile the results, with lots of guidance from Quirine. I presented my project and findings to Cornell Cooperative Extension Educators at their Annual In-service in November last year. It was a challenge, because my previous presentations were to 4-H audiences who didn't necessarily know the topic, or to peers in college classes. I was especially pleased and proud that it went well with such a knowledgeable audience."

In January, Knight started work as a crop technician for WNYCMA. "I'm using Arcview to delineate field features needed for nutrient management plans. I'm definitely applying concepts I learned while working on my honors thesis research with the NMSP." Knight looks forward to crop season when the boots hit the ground and plants start to grow. "I love seeing the crops change from week to week. Farmers are super busy people who often don't have time to check fields, so scouts are their eyes and ears."

Knight's future may include a crop management career, and she plans to keep involved with her family's dairy farm. "I'm keeping my options open at this stage. Whatever I decide to do as the future unfolds, the skills I gained working with Quirine and the NMSP staff will serve me well."

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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://nmssp.cals.cornell.edu>) or contact Quirine Ketterings at [qmk2@cornell.edu](mailto:qmk2@cornell.edu) or (607) 255-3061.