



Cornell 2018 Animal Science Graduate Jordi Verhoeven Earns Honors in Research with Sulfur Mass Balance Project

By Lisa Fields

Jordi Verhoeven graduated from Cornell in May 2018 with a BS in Animal Science and Honors in Research. His college studies focused on dairy management. "My family came to Ohio from the Netherlands when I was six," Verhoeven said. "I grew up working closely with the cows and with an awareness of my parents' business decisions as the farm doubled in size from 700 to 1400 cows. I arrived at Cornell with a strong passion for dairy farming. Coming from a rural community to Ithaca was a sort of culture shock at first, but as I adjusted, I grew to really appreciate the academic atmosphere and opportunities."

Verhoeven took the opportunity to explore the realm of research by completing his Senior Honor's Thesis under the guidance of professor Quirine Ketterings, leader of the Nutrient Management Spear Program (NMSPP) in the Department of Animal Science. His project was 'Adding Sulfur to the Cornell Nutrient Mass Balance Software.' The objective was to evaluate the feasibility and practicality of adding sulfur (S) to the on-farm [Nutrient Mass Balance \(NMB\)](#) assessment tool.

"The only way I could discover whether I might want to work in research was to get involved with the process. I found the chance to do that with Quirine," Verhoeven noted.

The NMB calculates the difference between the nutrients in a farm's imported and exported products. This difference represents the quantity of nutrients that stay on-farm or are lost to the environment and can indicate nutrient efficiency.

"It serves as an annual nutrient management check-up that for a growing number of farms has become part of their feed and crop planning process," Ketterings commented. "Beyond its usefulness to individual farms, the NMB dataset we've compiled from farms across New York has provided documentation of reduced nitrogen and phosphorus imports by dairy farms in New York. That's been critical to the Chesapeake

Bay Watershed regulatory process for New York State."

"Jordi approached me because of his interest in being involved with and exposed to research," Ketterings added. "Given this interest, his background in dairy farming in Ohio, and knowledge of dairy farming in the Netherlands where a mass balance approach was introduced in the '90s, he was an ideal candidate to take on the sulfur project."



Jordi Verhoeven, Cornell University Animal Science graduate with Distinction in Research. His thesis work focused on adding a sulfur balance to the whole farm nutrient mass balance assessment tool.

"Through the project, I became familiar with the concept of mass balances. I also took Whole Farm Nutrient Management, a class where we completed balances for farms of our choice as a semester project," Verhoeven noted. "Although sulfur, unlike phosphorus, is not implicated in water quality issues, it is an essential plant nutrient needed to sustain crop health and forage quality. Atmospheric deposition from industrial air pollution met crop S requirements in the 1980s. Since then,

improved industry standards have decreased deposition rates to a point where manure and fertilizer inputs are now the primary sources of sulfur for crop growth. To meet my project's objective, I had to determine if information about the sulfur content of dairy farms' nutrient exports and imports would be available, and then develop a calculator tool based on the existing NMB assessment to determine sulfur balances."

Verhoeven found that he could obtain sulfur information from manure and feed analyses, and that the sulfur balance followed a trend similar to that of nitrogen and phosphorus. "For my project, I looked at just one farm, so more research is needed. It was challenging but also highly satisfying because it's so relevant for farmers. Those at risk of soil sulfur deficiency can track their sulfur balance each year and follow the trends. The NMSP staff were really supportive. I first worked with Steve Crittenden, postdoctoral researcher with the NMSP, and then with his successor Mart Ros. I learned about the research process, and although it's unlikely to be my career choice, I gained many valuable skills, and am thankful for the experience."

"Jordi brought an interesting case study farm to the table, and collected five years of consistent nutrient data," Ros said. "It was very interesting for me to see the differences between this farm and other dairies we have worked with in New York. With Jordi's efforts to develop a tool to calculate a farm's sulfur balance, we can start to incorporate another nutrient in our assessments and our database. We have been looking to update and further develop the current software, and now we can build in the calculations for sulfur as well."

Another important experience for Verhoeven was his junior year internship at the Department of the US Trade Representative (USTR) in Washington, D.C. "My work involved following the Farm Bill intensively to be aware of anything that could impact trade. I was assigned to research and sift through data in response to requests from

various colleagues in the Office of the Chief Ag Negotiator. It was a tremendous experience that also taught me that sitting behind a desk all day is not for me!"

Verhoeven's approach to making choices was strongly influenced by his father. "My Dad said to me, "When you go to college, many doors will be opened for you. You'll go through some, at times several at once, and then you'll figure out which doors you want to leave open, and which ones to close behind you."

His commitment to the dairy industry is a door that Verhoeven has left firmly open for the future. "The industry needs producers who are dedicated to management of the farm's nutrients and carbon footprint, and willing to outreach to the general public so they can see dairy farm sustainability as a reality, not just as a buzzword. I want to be one of the group of producers involved in the message that dairies can be part of a healthy environment."

Verhoeven spoke about his plans. "My parents' philosophy directs that I not be involved in the home farm for 5 years past graduation from Cornell. They believe I need to learn what it is like to be an employee rather than the boss's son, and to fully explore all my career options. With that information and experience behind me, when I return home to the farm I can make a strong commitment."

Verhoeven's first step is six months in Argentina. "I'll be embarking on an educational internship at an agricultural high school in Colonia Vignaud," he explained. "I chose this opportunity because I want to be immersed in the Spanish language, an essential skill for me as a dairy farm manager. This is also the perfect time to have the adventure of traveling to a part of the world that's new to me. It's both terrifying and incredibly exciting."

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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 or (607) 255-3061.