



## Students in Royalton-Hartland Central High School Benefit from Nutrient Mass Balance Curriculum in Capstone Course

*By Melanie Soberon*

Matthew Sweeney, an agricultural educator at Royalton-Hartland School in Middleport, NY, was seeking a capstone course for his upper-level agricultural students that would help his students synthesize what they had learned in their previous courses and demonstrate that knowledge in a meaningful way that was impactful for the students. He was invited to pilot the Whole Farm Nutrient Mass Balance (NMB) curriculum developed by the [Nutrient Management Spear Program](#) (NSMP) at Cornell University in collaboration with Dr. Jeff Perry, Senior Lecturer in Instruction and Education, Department of Global Development at Cornell. Through this curriculum, developed under leadership of Agustin Olivo, PhD student with the NSMP at Cornell University, he discovered a way to integrate data analysis with understanding of challenges and opportunities in agriculture and environmental management, even allowing the students to make on-farm recommendations by the end of the course.

The curriculum, entitled "Assessing Environmental Sustainability of Farming through Whole Farm Nutrient Mass Balances", is designed to provide students with a combination of hands-on activities and discussions, as they cover the fundamentals of the whole farm NMB concept and conduct a whole farm NMB, identifying opportunities for efficiency and sustainability improvement at the farm level. Organized into four main lessons with four accompanying laboratory sessions, the curriculum is designed to require a minimum of eleven sessions (40 min each) to cover the content. Sweeney was one of six New York state agricultural educators to pilot the NMB curriculum in the spring of 2021.

"Our goal was to develop this capstone agricultural advanced class for those students that have completed coursework that I've taught in agricultural science, public speaking and leadership development, as well as in animal science and food science," said Sweeney. "I thought that this would be an

excellent opportunity to incorporate this new curriculum into this advanced agri-science course. I had 14, all college-bound, top-of-the-class type students that didn't necessarily have the strongest ag background but were extremely interested in learning more about agriculture and being able to apply things that they've learned in the classroom and see how it works in the real world."



Matthew Sweeney, agricultural educator at Royalton-Hartland School in Middleport, NY, was one of the first teachers to pilot test the whole farm NMB curriculum in spring 2021.

Of the fourteen students in the class, only two had real experience working on an operating farm and some had never actually been on an operating large-scale production facility. He said, "Because my students didn't have that hands-on knowledge of understanding how the operation works and the importance of, for example, environmental sustainability, I actually created a couple additional assignments at the beginning

to bridge the gap between their knowledge and what they needed to know for the curriculum. It was essentially understanding what environmental sustainability is and we actually took it away from agriculture, using the example of the construction of the San Francisco 49ers stadium in California to talk about environmental sustainability outside of just dairy." After covering what sustainability is, Sweeney moved into the curriculum itself, focusing on dairy farming.

"In my personal experience, kids today are very, very interested in where their food is coming from," reflects Sweeney. "We are seeing that in the decisions that students are making about what they're buying and where it's coming from...So we're obviously looking at our milk production (with this curriculum) and they're very curious about that because they're curious about the practices that are being employed, as well as how that operation is helping and/or sustaining the environment."

Olivo shares "I think it is very relevant to engage youth in different aspects of agriculture. Sustainability is a major component of it. Growing awareness about sustainability among new generations is very relevant to get them interested in learning more about the complexity of agriculture, and also promote the changes the agricultural industry needs in the short and long term. The whole farm NMB curriculum was created with the goal of introducing to students the value of data collection and analysis to improve management decisions at the farm level that impact environmental sustainability. I think introducing to younger students the value of data-driven decision-making, associated with opportunities to train their critical thinking skills, is very important".

Sweeney described the student response to working with real data in the realm of environmental sustainability favorably, saying "Students enjoyed the curriculum. They really, really did. And I think what really helps drive it home for my students is that I was showing them that this is real data. This is something

that was collected... The students are able to take the information, analyze it, apply it, and then make recommendations. And I think in today's day and age, what really helps students is to know that what they're doing matters and is applicable to the real world."

When his students reached the point in the curriculum where they could make actual recommendations to farmers about their NMBs, he found them eager to do so. Class discussions involved using social skills to make a recommendation appropriately to an agriculturist that has been working in this field their entire life.

Sweeney affirmed his appreciation for the multi-disciplinary approach of the curriculum, covering elements of mathematics, science, economics and social skills. He says, "It incorporates everything and there is a level of rigor that is with it as well." The class, composed primarily of seniors in high school, rated the rigor of the course to be 3 to 4 out of 5, on a scale of 1 to 5, with 5 being most rigorous. Sweeney found it worked very well for his 11<sup>th</sup> and 12<sup>th</sup> graders, and that they respected the caliber of being taught course material that could be straight out of a Cornell course. "One of my other goals is to make sure that I bridge the gap between high school and college... So, by implementing this curriculum, which I feel is very much taught like a lot of the professors are doing at Cornell, I think it helps students see how it's going to be at that next level, especially in the Dairy Science program."

The final test of the pilot program is whether the curriculum will be used in the future. To that end, Sweeney states, "I have already started to plan my course for next year, and we will definitely be starting this curriculum in September."

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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](mailto:qmk2@cornell.edu) or (607) 255-3061.