Piloting NMB curriculum helps the next generation of farmers assess their environmental sustainability

By Melanie Soberon

"Dairy is definitely my biggest background and passion," states Cornell graduate, Isaac Habermehl.

Habermehl has been an agricultural educator at Pine Valley School in South Dayton, NY, for 19 years. He teaches courses in animal science, plant science, agricultural mechanics and welding, principles of engineering and entrepreneurship, in addition to being the advisor for the national FFA Organization.

Besides being a teacher, Habermehl has maintained an active role in management of his family's dairy farm, Rush Around Acres, in Lawtons, NY, where they milk approximately 150 head of Holsteins.

Habermehl first became aware of the Nutrient Mass Balance (NMB) high school curriculum through Dr. Jeff Perry, Senior Lecturer in Instruction and Education, Department of Global Development at Cornell University.

The curriculum, entitled "Assessing Environmental Sustainability of Farming through Whole Farm Nutrient Mass Balances was developed for 9th through 12th graders by the Nutrient Management Spear Program (NMSP) at Cornell University under leadership of Dr. Quirine Ketterings. The team had developed training materials for farmers and farm advisors in past years. Cornell PhD student Agustin Olivo, who joined the NMSP in fall of 2020, took the lead in development of a curriculum that could be used in high school classes, in collaboration with Perry.

Habermehl's love of the dairy industry combined with his desire to show his students how numbers can be applied to farm management to make a difference, motivated him to implement this curriculum.

"Most of my students either work on a dairy farm or their family owns a farm," said Habermehl. "The kids have the animal background, but the business side is lacking, and just seeing how the numbers can be applied. And that's one of the things I loved about just looking at the different scenarios between all the farms (in the curriculum)."

Olivo shares, "Students in Isaac's class had connections with dairy businesses, but also with horticultural and beef operations. It was great to hear from Isaac that as the students worked through the activities in the curriculum calculating a whole farm nutrient mass balance for a dairy farm, they connected the concepts learned on nutrient mass balancing to other agricultural activities they were more familiar with. Nutrient mass balances are a great tool to assess nutrient use efficiency and the environmental footprint of multiple types of agricultural operations".

Isaac Habermehl, agricultural teacher at Pine Valley School in South Dayton, NY, was one of the first teachers to pilot test the whole farm NMB curriculum in spring 2021.

Habermehl was one of five New York agricultural educators to pilot the NMB curriculum in the spring of 2021. "I created a class called Ag Exploration with this curriculum in mind," said Habermehl. "I had about 13 students in 10th through 12th grade that worked through the curriculum."

The curriculum combines hands-on activities and discussions into four main lessons with four accompanying laboratory sessions. Throughout eleven sessions (40 min each), students 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.

"Going through the curriculum itself was really solid," comments Habermehl. Habermehl noted that the curriculum did trigger discussions about actual applications on the home farm for the students. "It was a good connection for them to see where their NPK inputs were going as they flowed through the farm."

"One of the goals we have with this curriculum is to make the students aware of connections among various aspects of dairy farming including crop and feed production, animal nutrition, and manure management, using a systemic, whole-farm approach. We wanted to develop a curriculum that helps students make connections and identify opportunities to improve on whole farm nutrient management," Olivo shares.

Perry added, "The underlying NMB model is clearly presented in the curriculum and then demonstrated in two model farms. The math involved is connected to data found on farms. This is where production agriculture is moving so it is great to have this project help students understand how data is used on the farm."

The whole farm NMB assessment is currently being used by about 80-90 farms annually to evaluate and identify opportunities for improvement and document progress made. Ketterings explained, "The number of dairy farms participating in the annual assessment has grown in recent years, reflecting the interest in the dairy sector to address inefficiencies and reduce its environmental footprint. What was missing until recently was a curriculum that would expose high school students to whole farm analyses and use of the assessment tool. It has been great to work with Agustin, Jeff, Isaac and several other teachers and learn from their experiences with the students."

Working through the curriculum with the students this past spring triggered some ideas for improvement. For example, one of the improvements suggested by Habermehl for the type of students that he works with was to expand some of the activities to other agricultural enterprises, so that the students could make more explicit connections between whole farm nutrient mass balances and different types of agricultural businesses. Another suggestion was to include more assessment pieces and additional guidance on the use of the nutrient mass balance software.

"Input from Isaac and other agricultural teachers that tested the curriculum during the spring of 2021 has been very valuable for us to improve the materials we have; based on that, we have a 2.0 version ready to be implemented by more agricultural educators around the state this Fall," Olivo shares.

As for the fall of 2021, Habermehl says, "I recommend the curriculum. I am scheduled to do an Ag Business class next year and will be utilizing it, and I will definitely be using some type of modification of this for a distance learning class next year as well."

(September 20, 2021)

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.