



Integration of Crop and Animal Science Inspires Cornell Grad's Cover Crop Honors Thesis

By Lisa Fields

Shona Ort of Bradford, NY transformed her desire to become a veterinarian into a passion for sustainable agriculture. In January 2013 she graduated from Cornell University with a B.S. in Animal Science with distinction in Research. Ort's Honors thesis was entitled "Carbon and Nitrogen Pools and Yields of Cover and Double Crops in New York State". Her work was part of continuing research by the Nutrient Management Spear Program (NMSP) directed by Associate Professor, Dr. Quirine Ketterings. Project funding sources included a United States Department of Agriculture Conservation Innovation Grant (USDA-CIG) and the Northern New York Agriculture Development Program (NNYADP).

Ort explained her route from veterinary aspirations to agronomy work. "My family ran a greenhouse business and we four kids were involved with that and raised livestock, too. I had dairy goats since I was seven years old and enjoyed caring for all types of animals. That inspired my focus on science courses when I enrolled in Corning Community College at the age of 17. After earning my A.S. degree I came to Cornell as a pre-vet student. My courses at Corning prepared me very well academically, but my first Cornell semester was a struggle. It was a major adjustment from my small town, home-schooled background. I questioned my commitment to the veterinary science curriculum. The agriculture courses that I took that first year really caught my interest and inspired me to stay at Cornell and transition into agronomy along with animal science courses. I never dreamed I would be so involved with crop research but it's worked out really well."

Ketterings added "Shona joined a project that we started several years ago when farmers asked about the benefits of cover crops for nitrogen management and the potential for growing overwintering cereals as double crops, increasing the per acre production of forages. With her interest in both nutrition and agronomy, her background in

agriculture, and interest in being involved in applied research and extension, she was the perfect candidate to join our team".

Ort commented, "I was hired for a wide spectrum of tasks and gained exposure to all aspects of the research process. The interest I developed in cover crops morphed into my thesis choice when Quirine suggested I take on my own project."

Ort's research sought to quantify the carbon and nitrogen dynamics of winter cover crops and document their yields and quality when harvested as forage the next spring ("double crops"). Ort explained, "The benefits of cover crops to soil health are well recognized. They provide protection from erosion and contribute organic matter. Interest has recently increased in their potential to sequester nitrogen in the fall and carry it over for the next year's crop. That's been tough to quantify, and was a major part of the project as it's essential to establishing nutrient guidelines."



Shona Ort in a triticale field that was seeded after corn silage and harvested for forage the next spring.

Ort worked as part of a team for her thesis project, setting up plots in 60 farm fields across New York and collecting samples in the fall of 2011 and spring of 2012. The crops studied were cereal rye, winter wheat, triticale and one field each of barley and forage radishes. The project encompassed three study segments: 1) cover crop fall and early spring biomass and C and N pools; 2) forage quality and quantity of cereal rye, winter wheat and triticale seeded after corn silage harvest and harvested as "double crop" in May; and 3) impact of the winter cereals grown as double crop in corn silage rotations on nutrient availability for the following corn crop.

Ort's research required many hours of field sampling, digging up entire plants and washing roots and shoots prior to drying, grinding and analyzing them to get accurate carbon and nitrogen data. She noted her comfort level with the challenges involved. "I started working when I was 14, so I'm used to doing a wide variety of tasks. Being out in the field was by far my favorite part of research work, but I really didn't mind the lab tasks and data management, either. It was very satisfying to be involved first-hand in the full spectrum of the process."

Ort's results showed a significant difference in cover crop N accumulation with planting date. She stated, "Of the 60 fields, fall N accumulation ranged from 18-29 lbs/acre when planted after corn silage harvest, but reached up to 81 pounds per acre with earlier, mid-September planting, in this case after small grain harvest. Spring N measures were also impacted by timing of cover crop termination, with typical accumulation of 37 to 45 lbs/acre. When left to grow for forage harvest, N uptake ranged from 81 to 157 lbs/acre. This was reflected in crude protein levels exceeding 15% and yields exceeding 2.0 tons of dry matter per acre. The yields and quality achieved by the farms in our project show great potential for these winter cereals as double crops to boost field productivity and provide high quality forage. We also learned

that carbon to nitrogen ratio of roots and shoots was pretty consistent between fall and spring. Plant root C:N ratios ranged from 17 to 37. The ideal is no greater than 25 for N to be available for crop uptake that season. This means there could be some temporary tie-up of N after double crop forage harvest as root carbon is broken down by soil microbes."

In 2013, the NMSP will continue to work on winter cereals as double crops. The new project "Nitrogen Needs of Winter Cereals as Double Crops in Corn Rotations" will focus on determining the need for N fertilizer at green-up (breaking of dormancy) for optimal yield and forage quality.

Ort will remain involved as a Research Technician with the NMSP. "I chose to work for a year before continuing my studies towards a Master's degree. It's exciting to be able to continue work on my thesis topic. I think cover crops will be part of useful research long into the future. They play a mitigating role in the impacts of climate change on many types of agricultural production systems."

In addition to her studies, Ort has grown to enjoy the city life of Ithaca. She noted, "The diversity of cultures and ideas is something I love being part of." When asked about her future plans she said, "At this point I want to see how things unfold and be open to opportunities. I would like to continue involvement in animal agriculture, and the Peace Corps interests me, too. I'm very grateful for the opportunities I've had to be involved in research that's relevant and useful to farmers rather than work that ends up as data sitting on a shelf. My cover crop thesis wasn't just a project to fulfill a requirement, but something I truly have a passion for."

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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.