



High School Student Completes Cover Crop Nitrogen Study with Cornell's Nutrient Management Spear Program

By Lisa Fields

Cornell Agricultural Science Freshman Sarah McIlvennie's career choice will surely be guided by her passion for agriculture and the future of the planet's resources. In the spring of 2011, as a high school senior, McIlvennie completed an internship with the Nutrient Management Spear Program (NMSP) in Cornell's Department of Animal Science. At that time she was in the Tompkins-Seneca-Tioga BOCES New Visions Life Sciences Program at Cornell. Michele Sutton, New Visions Teacher, explained the program. "High school seniors have an internship opportunity and can earn up to 9 college credits. The selection process is stringent as we're limited to 14 students. Candidates must be highly self-motivated. Sarah was a clear fit, as she articulated her passion for science and agriculture and demonstrated a strong motivation to learn."

Dr. Quirine Ketterings, Associate Professor and NMSP Director commented, "Michele contacted me in the fall of 2010 and told me about the New Visions program and Sarah. Sarah's interests matched our program and she was highly motivated to tackle a project, so I immediately said yes".

During her NMSP internship, McIlvennie completed a study on the nitrogen (N) and carbon (C) content of winter cover crops. She commented, "The project was a great fit with my interest in sustainable agriculture." Cover crops are used to replace or reduce N fertilizer and to protect soil from erosion. The objective was to determine the effect of cover crops on the Illinois Soil Nitrogen Test (ISNT), used to determine soil N supply potential for corn. The study evaluated whether the test's reliability in predicting soil N supply was compromised by N-containing cover crop residues.

McIlvennie explained, "I had 127 samples from 14 commonly used species: winter rye, ryegrass, oats, sorghum-sudangrass, triticale, clover, forage turnips and radishes. Plant stem and root tissues had to be analyzed separately. I determined the relationship between the total

N content and ISNT-N, and the C:N ratio of the plant residues and ISNT-N. It was a tremendous learning experience that I really enjoyed."

McIlvennie noted two major influences that fostered her interest in the natural sciences. "The time I spent at the Lehman Alternative Community School in Ithaca out of doors studying biology and ecology definitely inspired me and shaped my direction." Also influential was McIlvennie's late grandfather, Dr. Robert Lucey, Cornell emeritus professor in Crop and Soil Sciences. He obtained legislative funding in 1961 for Cornell's Research station at SUNY Canton and founded the Northern New York Agriculture Development Program (NNYADP). Lucey's legacy was his success in connecting faculty, farmers, students and Extension staff in the research process.



Sarah McIlvennie earned college credits by completing a research project with Cornell's Nutrient Management Spear Program in her senior year at High School.

McIlvennie's NMSP study fit well with her grandfather's inclusive approach. She described the process. "My first task was to get up to speed on the technical information. I had to learn all about the ISNT and I read a lot about carbon and nitrogen and how they behave in soil and plant residues. Before I even started the lab work, the depth of the subject matter was truly eye-opening. It was a

transition from the more general knowledge acquired in high school to the highly specific information about one topic at the college level." McIlvennie was apprehensive at first, but the NMSP staff put her at ease. "My first day was at the lab organizing, weighing out and grinding the cover crop samples with Greg Godwin, NMSP Research Associate. We were covered in green dust by the end of the day, and I had a blast! It was all new to me and it really was fun."

The next step in McIlvennie's research project was to analyze the ground-up samples for ISNT-N with guidance from Dr. Sanjay Gami, NMSP lab manager. McIlvennie noted, "I was nervous about the titration process in the procedure, but it was cool and exciting to gain understanding of the test readings."

Sutton noted that lab research involves repetitive procedures that can be monotonous. "It's a valuable experience for students. If they understand the reasons for the procedures and grasp the research goal, the lab work isn't just drudgery." McIlvennie concurred, "The tasks weren't always exciting, but I could see them as a process leading to results. It was exciting to take the huge datasets to the point of clear correlations".

Ketterings commented: "It's important for students to see how the scientific process works, from development of a proposal with a hypothesis and objectives, to compiling the findings in a final report or presentation. Sarah's project allowed her to go through the research stages in a leading role with help from the staff and me along the way. It's quite rewarding to see students discover what the data they gathered means. Sarah did an outstanding job, working through each step and eventually delivering a talk, report, and research poster."

McIlvennie's study conclusions matched her hypothesis. "The lower the N content of the fresh cover crop, the higher the C:N ratio, the lower the plant ISNT-N." McIlvennie concluded that with high N cover crops, the soil ISNT should be done either prior to cover

termination, or long enough after termination to avoid plant residue influencing the test. As the timespan of plant residue breakdown is influenced by environmental factors and difficult to quantify, she noted this as a topic for further study.

Sutton commented on McIlvennie's NMSP experience. "Connecting each student with a faculty mentor to complete a meaningful college level project is challenging. The team environment and technical challenges Quirine provides are an excellent fit."

McIlvennie noted, "I learned that there's no stupid question. I didn't understand the terms being used in the research literature, and now I do because I asked. The staff were willing to spend the time to make sure I clearly understood anything I asked about." Sutton added, "Sarah didn't just go along and fulfill her requirement, she pursued a greater depth of understanding."

McIlvennie summarized her experience. "One of the things I'm most proud of is being in charge of the data master sheet. I worked on the spreadsheet from day one through project completion, a highly rewarding challenge. By working hands-on through the research process I definitely gained a foundational understanding and many useful and marketable skills. Cooperative Extension is highly important because it pursues research that's of tangible use to farmers. The study may not answer a defined question but is valuable information regarding nutrient applications, cover crop choice and timing of termination to fine tune N management. The project furthered my learning in the arena of my keenest interest; to be part of increasing agriculture's sustainability."

(January 19, 2012)



Cornell University
Cooperative Extension



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.