Cornell Students Gain Real-Life Experience in Agricultural Environmental Management

Recognizing the critical importance of farm nutrient management, the departments of Animal Science and Crop and Soil Sciences in the College of Agriculture and Life Sciences at Cornell teach a class on Whole Farm Nutrient Management (ANSC/CSS412). The course provides juniors, seniors and graduate students with a working knowledge of agricultural environmental management and its importance to protect water and air quality and to ensure agriculture's profitability and sustainability.

Since its inception as a course in Agriculture and the Environment in 1997, 412 has evolved to incorporate government policies regarding animal agriculture, including regulations that require concentrated animal feeding operations (CAFO) to operate according to comprehensive nutrient management plans (CNMP). A CNMP must meet guidelines designed to reduce soil and nutrient losses to water resources and to increase on-farm nutrient recycling.

Since 2002, Whole Farm Nutrient Management is being taught in two modules:

- Module 1, Soil and Crop Nutrient Management: Addresses agricultural environmental policy and the basics of soil and crop nutrient management. Students apply the concepts and skills learned in lectures and lab exercises to develop a CNMP for EZ Acres, a 650-cow dairy in Homer, N.Y.
- Module 2, Dairy Herd Nutrient Management: Teaches students how to manage nutrients more efficiently through the development of a dairy herd feeding program.

"With ANSC/CSS412 we try to give students an appreciation of the complexity of farming systems and an understanding of federal and state environmental regulations as they pertain to dairy farms," said Quirine Ketterings, associate professor in Animal Science and principle lecturer for Module 1. "In 412, we instill an appreciation of the importance of agricultural environmental management, environmental stewardship and neighbor relations. And we try to give students knowledge and skills to develop nutrient management plans that are practical and effective."

Ketterings teaches Module 1 together with Karl Czymmek, senior extension associate with PRO-DAIRY. "In my extension role, I interact with many former 412 students who are working in the dairy industry," Czymmek said. "I see these students have a competitive advantage when it comes to understanding environmental impacts and the need to integrate environmental protection, neighbor relations, dairy science and economics. The 412 course helps to provide a critical foundation during undergraduate studies that makes my extension efforts that much easier!"

Practical and practiced

Students particularly appreciate and benefit from 412's hands-on, real-world approach. "In school we read about things, and they can seem like fantasy," said David McCray, an animal science senior who will become a dairy herd manager upon graduation. "But 412 was real life."

As part of ANSC/CSS412, students visit EZ Acres, a 650-cow dairy in Homer, N.Y. From left to right: Mark Ochs (certified planner), Mike McMahon (dairy farmer), and 412 students David McGray, Nathan Mitchell, and Ryan Higgs.

McCray is speaking specifically about the case study done with EZ Acres, owned by the McMahon family, and Mark Ochs, the dairy's certified planner. Developing and maintaining CNMPs for 21 CAFO clients, Ochs draws upon a wealth of experience to tell 412 students about

the environmental concerns certified planners must address.

"One of the best things about the class is partnering with the McMahon family to look at the real world," said Ochs, a 1979 soil science graduate of Cornell. "The students complete Module 1 with a well-rounded understanding of CAFOs and how CAFO regulations will impact their business and careers." (Of the 24 students in 2008, 18 are animal science majors planning to pursue careers related to production agriculture.)

Ochs also pointed out that students gain a deep understanding of how certified planners must communicate to farmers what changes and practices are required to meet their CAFO obligations. A nutrient management plan must be both practical and allow a dairy to be CAFO compliant.

McCray gained an appreciation for the challenges certified planners face. "We were able to understand and see things from the CAFO planner's and farmer's perspectives," he said.

Greg Albrecht, CNMP specialist with the New York State Soil and Water Conservation Committee in the Department of Agriculture and Markets, concurs. "412 students walk in the planner's shoes. It's a valuable experience, because these students graduate to leadership roles in dairy and do so with agricultural environmental management knowledge in their toolkit," Albrecht said.

Albrecht participates in 412 on the day students present their nutrient management plans to McMahon. "He provides students with a big-picture perspective of nutrient management issues," said Ketterings.

Nathan Mitchell and his 412 team discuss the fertilizer and manure nutrient management plan they developed for EZ Acres with Mike McMahon (front row left), Greg Albrecht (second from left), and fellow classmates and instructors.

The case study with EZ Acres impressed Ryan Higgs, one of two international graduate students in 412. He is in awe of how much a CAFO farmer must understand about the regulations. "They're under a great deal of pressure to manage nutrients," Higgs said.

Given that nutrient management is an issue in his home country of New Zealand, Higgs expects to make good use of what he learned in 412 when he becomes a consultant for New Zealand dairies after finishing his master's degree next year. The course content also aligns with Higgs' master's research on how to improve the efficiency of both cows and nutrient use.

Mark Ochs (second from left) and Mike McMahon (third from left) welcome 412 students to EZ Acres at the end of March.

Students aren't the only beneficiaries of 412. Mike McMahon and his dairy also profit, even after five years as the case study dairy, he said. "I get a lot out of it and the students do, too. It's always interesting to see their points of view. The students get to be CAFO inspectors for a day. During the second half of the day at our dairy, they look at agronomic issues here. They ask tough questions and make good observations," McMahon said.

Knowledge integration

"This is a hands-on course that focuses on integration of the knowledge students gain," said Ketterings. "Students apply the concepts and skills they learn in lectures and laboratory exercises to develop a nutrient management plan for EZ Acres, according to CAFO requirements and using Cornell Cropware, a real-world nutrient management planning tool. They are given the necessary farm data and management challenges of the farm, and they have to work in teams to develop a practical nutrient management plan for EZ Acres."

Instructors assign students to teams so dairy science majors work with other majors and graduate students, creating multidisciplinary groups. "Development of teamwork skills is essential for addressing complex problems," said Ketterings. "We find it important that students learn to work productively with classmates, as well as with instructors, the dairy farmer and the CNMP planner and crop consultant who participate in the course."

Mike McMahon, co-owner of EZ Acres (left), talks with 412 students and Mike van Amburgh (third from left) about dairy farm environmental compliance issues.

Through 412's two modules, students see the link between the animal side and environmental side, giving them a big-picture look at the whole farm nutrient cycle. "This course provides the opportunity we need to tie soil management, crop production, animal nutrition and dairy herd management together to create an integrated package for decision making and critical thinking," says Mike van Amburgh, an associate professor in the Department of Animal Science. He is the lead instructor for Module 2 of 412.

"In Module 2 we focus not only on management strategies to maximize the use of homegrown feeds and reduced feed purchases, but also the role herd and nutrition management play to reduce the environmental impact of dairy cows," said Van Amburgh. "In fact, we started to incorporate factors like the global warming potential of milk production into this module to provide the students with the appropriate data for decision making. This came about because of new pressures from major milk retailers for this information. So our approach is both farm-based and more global in nature in an effort to respond to the demands of the market and society."

Nathan Mitchell, an animal science senior from a small hay and grain farm in Skaneateles, N.Y., with work experience on both a 75-cow and a 1,200-cow dairy farm, took 412 because he wanted to understand and learn how to implement CAFO regulations and policies. Mitchell wants to manage, and one day own, a dairy farm. "Manure is going to be a problem in the Northeast, and I wanted to learn new methods to deal with it," said Mitchell. "I once thought the best thing was to give it away, but now I realize it has value, especially with high fertilizer costs. Best of all I learned what each nutrient is, what it does, what the value of soil testing is, and how herd nutrition ties in with whole farm nutrient management."

By Eleanor Jacobs

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ANSC/CSS412 is a capstone course taught at Cornell University. The course provides students with an understanding of the concepts underlying whole-farm nutrient management planning to improve farm profitability while protecting water and air quality. Students will learn about and apply concepts of soil fertility and field crop nutrient management in the development of a Nutrient Management Plan (NMP) that is a required component of the Comprehensive Nutrient Management Plan (CNMP) for CAFO (Concentrated Animal Feeding Operation) operations to meet environmental regulations. Students will develop a NMP for a case study dairy farm, using the Cornell University Nutrient Management Planning System (*cu*NMPS) and other tools. The course is open to juniors, seniors, and graduate students only and offered as two modules (2 or 4 credit option). Students will learn about the concepts and processes of developing the crop and manure NMP component of a CNMP and a whole farm nutrient balance during Module 1. In Module 2, they gain knowledge and skills in integration of crop production and herd nutrition management for reduced nutrient imports on farms. For more information about the course, contact Quirine Ketterings (qmk2@cornell.edu or (607) 255-3061) or Mike van Amburgh (mev1@cornell.edu or (607) 254-4910) in the Department of Animal Science at Cornell University.