Integrated Cropping Systems: A Capstone Course Designed to Enhance Critical Thinking

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Abstract

CSS 488 Agricultural Cropping Systems: Integration and Problem Solving is a capstone course designed to enhance critical thinking skills in seniors completing a B.S. in Crop and Soil Sciences or an Agronomy Minor. Assignments include two semester long projects and one, two week assignment that require group work and collaboration. Groups are assigned based on academic majors, personal background, and student evaluation of their competence areas. For the Farm Report, students work in small groups to develop a farm report outline after reviewing three published case studies of farms. Students then write their own farm report throughout the semester. Grading is based on content of the farm report and inclusion of the reasoning behind various farm management practices. For the Crop Rotation exercise, student groups are given six crops in an envelope and initially decide a crop rotation. Throughout the semester, the agronomic and input cost information to design the cropping system including tillage operations, planting dates, seeding rates and row spacing, soil fertility programs, and pest management is added. Soil organic matter is calculated throughout the six-year rotation. For the final project, groups are required to convert to a county organic production. Current crop acreage and livestock numbers are provided and students may not export or import feed or manure. Critical thinking skills in nutrient and manure management are enhanced, as well as skills in managing cover crops. These assignments require students to take course content based material and apply it to integrated cropping systems projects, enhancing information gathering, data synthesis, communication, and team-building skills.

Objectives

• Design and teach a capstone course to agronomy majors and minors that builds on previous coursework, personal background and internship experiences
• Design and assign student group projects that enhance information gathering, data synthesis and analysis, communication, and team-building skills

Syllabus (abbreviated)

Date | Topics in Class | Assignments | Due Today:
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Weeks 4-5 | Sustainability of Cropping Systems: Economic, Environment and Social | Nitrogen fixation and carbon sequestration reading | N fertilizer and carbon sequestration worksheet
Weeks 6 | Agroecology: IPM and Cropping Systems: Weed, Insect, Disease and Nematode Decision Management | Integrated Crop Management Academy | Plant Life Cycle Study analysis
Weeks 7 | Climate Change: Convergence of Ag and Energy | Biological Switchgrass or Corn Stover | Biological conversion WS
Weeks 12 | Organic Agriculture, GMO, Nutrition Sustainable Food Systems | Crop Rotation Exercise: Discussion and synthesis
Weeks 13 | Multiple land use issues | Crop Rotation Exercise: Design and synthesis | 
Weeks 14 | Farm Reports: Group discussion and analysis | Crop Rotation Exercise: Discussion and synthesis | 
Weeks 15 | Organic Agriculture, GMO, Nutrition Sustainable Food Systems Final Exam | Organic Only Assigned | 

Crop Rotation Exercise: rotation; planting and harvest dates; SOM changes over time*

Farm Reports

Instructions:

1. Students have read examples of four farm case studies in class.
2. Students have discussed briefly the content of these farm case studies.
3. Students have lists of young Michigan farmer reports.
4. Students formulated a list of what should be included in a farm report.
5. Students will visit with a farmer. It is strongly suggested that the student visit the farm at least twice; once to meet with the farmer and ask questions about the farm, soil types, rotations, crop row spacing, varieties, populations, tillage system, etc. from the first seven weeks of class (late February) and then meet with the farmer again in late March to ask questions about pest management, future farming plans, etc.
6. It is important that the student not just ask “what” but also ask “Why?” This will provide the student insight into why these cropping system decisions were made. The goal of the farm report is to understand the integrated farming system operation.

Converting a County to Organic Production Only

3. Feed Needed for Livestock in the County

- Milk cow: 5,500 X 106 bushels corn = 583,000 bushels corn
- Milk cow: 5,500 X 5.7 tons forage dry matter = 31,350 tons forage dry matter
- Hogs: 9,000 X 4.5 lbs feed x 365 days = 14,782,500 lbs feed/year = 14,782,500 lbs feed/year = 14,782,500 lbs feed/year

4. Manure produced and NPK requirements for Organic Corn and Wheat

Student Comments from SIRS forms - anonymous

* A portion of the Crop Rotation Exercise assignment

The group projects helped me understand the dynamics behind actual farming operations and apply what I had learned in the past and in this class.”

“At first I didn’t like the crop rotation exercise but as it went on I realized I expanded my knowledge beyond corn and soybean and that is important to me.”

“I don’t have an ag background and the farm report probably helped me learn the most about farming”. “The farm report might have been a pain but I felt it helped me understand what goes into a farming operation.”