Soil-Crop Management Systems
CSS 462
Spring 2026
Tuesday and Thursday 11:45 am – 1:00 pm
Williams Hall 2405

Course description

CSS 462 is a capstone course in soil-crop management that requires students to combine agronomic knowledge with analytical, managerial, and communication skills to address real-world problems in crop management and natural resource stewardship. Factors that influence sustainability and economic viability of diverse cropping systems will be discussed.

Student Learning Outcomes

Students successfully completing this course will be able to:

1) Integrate soil and crop management principles and practices into profitable and ecologically sound cropping systems.
2) Utilize critical thinking skills for agronomic decision-making.
3) Apply contemporary agronomic and farm management principles to diverse crop production.

Prerequisites

CSS 462 is the capstone course for the agronomy-related curricula. As such, we assume that students enrolled in this course have attained an appropriate agronomic knowledge base. Courses that should be completed prior to taking CSS 462 include CS 213 Crops: Adaptation and Production, CS 415 Integrated Pest Management, SSC 341 Soil Fertility and Nutrient Management, and SSC 342 Soil and Plant Nutrient Analysis. Students lacking knowledge in these subject areas may encounter difficulties in this course.

Instructors

Dr. John Havlin
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Attendance policy

The course will have many exercises that require your participation. Thus, attendance is expected. If you must miss a class, contact the instructors prior to your absence to make arrangements for completing any missed assignments. The NCSU Attendance Policy can be found at:
http://www.ncsu.edu/policies/academic affairs/pols_regs/REG205.00.4.php
To encourage attendance, unannounced quizzes, most often associated with the previous lecture or subject, will be given periodically throughout the semester.

Required textbook

Instructors will provide supporting documentation and handouts.

Student conduct

The NCSU Code of Student Conduct describes the kind of student behavior that disrupts and inhibits the normal functioning of the University and the actions that the University will take to protect the community from such disruption. It is your duty as a member of the University community to read, understand, and adhere to the Code of Student Conduct found at. http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php

Academic integrity
Any attempt at unfairly influencing the grade received for an academic exercise is considered academic dishonesty and will not be tolerated.

Standard of Classroom Behavior
In order to maintain a positive learning atmosphere in this class, it is important that you respect your classmates, the instructors, class guests, and yourself at all times. As a student, you have the right to expect an atmosphere that is conducive to learning. And, you also have the responsibility to make sure that a positive environment is maintained. Please refrain from the use of tobacco products, speaking in a disruptive manner, entering the classroom late, and any other activity that may disrupt the class.

Students with Special Needs
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please refer to information found at the following website:
http://www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.28.php.

Grading Procedures

You are expected to complete assignments on time. All assignments are due on time. Considerations will be made for late completion of assignments, on a case-by-case basis, provided arrangements are made prior to the due date.

Component	**Points**
Data summary	200
Crop management presentation	200
Farm plan (written and oral)	400
Quiz, homework, class discussions, attendance	200
Total	**1000**

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Date	**Topic**
January 13	Introduction to course and financial returns for cropping systems (Jordan)
January 15	Financial returns, crop rotations and tillage systems (Jordan)
January 20	Crop overview example (Jordan) and Meetings Production Targets for 2050 (Havlin)
January 22	**In-class project discussion time for crop overview presentations (are your crops profitable?)**
January 27	Applied statistics in agriculture and *Data Summary* assignment (Jordan)
January 29	Crop overviews (Jordan and Havlin) (2 presentations)
February 3	Crop overviews (Jordan and Havlin) (2 presentations)
February 5	Crop overviews (Jordan and Havlin) (2 presentations)
February 10	Crop overviews (Jordan and Havlin) (2 presentations)
February 12	**In-class project discussion time for Farm Plan (written Data Summary due)**
February 17	**Wellness Day (No Class)**
February 19	Organic agriculture (Jordan and Havlin) **(field acreage due, initial rotation sequence due, estimate of crop financial returns per acre due)**
February 24	Soil Erosion Dynamics (Havlin)
February 26	RUSLE2 in Lab (Havlin)
March 3	RUSLE2 in Lab (Havlin)
March 5	**In-class project discussion time for Farm Plan**
March 10	Pest management (Jordan) **(lime and fertilizer calculations due)**
March 12	Value of cover crops in agriculture (Havlin and Jordan) **(action calendars due)**
March 16 March 20	**Spring Break**
March 24	Problem solving (Jordan and Havlin)
March 26	**In-class project discussion time for Farm Plan**
March 31	Problem solving (Jordan and Havlin) **(economic return tables due)**

April 1	**In-class project discussion time for Farm Plan**
April 7	Farm programs (Jordan)
April 9	**In-class project discussion time for Farm Plan**
April 14	**Farm plan presentations (1)**
April 16	**Farm plan presentations (1)**
April 21	**Farm plan presentations (1)**
April 23	**Farm plan presentations (1)**
April 28	**Farm plan presentations (1)**
May	**No exam**

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Data Summary

Students will be given a data set for a single study. Data will be analyzed by the instructor and the SAS analysis provided. Data sets will differ among students. The instructor will discuss a data set in class and demonstrate how to interpret the analysis. The instructor will also provide a video describing how to work through the data set to complete the assignment. Key components will include the analysis of variance (ANOVA), correlations, standard deviation and error, coefficient of variation, mean separation using the LSD test, and interpretation of results. The *Data Summary* is due to Dr. Jordan on February 12.

Total value 200 points

Proper interpretation of the following information from the analysis:

ANOVA: (40)

Correlations: (40)

Coefficient of variation: (20)

Mean separation: (20)

Interpretation of analysis: (40)

Discussion in context of other trials with recommendation including caveats: (40)

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Crop Management Presentations

Students will work individually to prepare a presentation designed for farmers and their advisors for major agronomic crops in North Carolina (see below.) Topics and point value are listed below. You will have a minimum of 30 minutes and 5 minutes for questions for each crop presentation, and all students in the group will be expected to present a portion of the information. It will be important to present key issues that are pertinent to growers. The purpose of this assignment is to give you greater exposure to how recommendations are developed and used to manage the major agronomic crops in North Carolina, to help you gain a greater appreciation for the process of taking research-based information and presenting it to growers and their advisors, and to give you an opportunity to speak before your peers. As you move into an agriculturally related career, this type of interaction will be important. Also, the class will be expected to ask you pertinent questions about the information you present and this will help you gain experience "speaking on your feet." Finally, as you prepare your farm plan, going through this assignment will help you be more accurate in your development of the plan and will certainly help you prepare your crop calendars.

Note that there is an expectation of professional dress during the presentation.

Crops:
Cotton: Boyd, May
Corn and grain sorghum: Clough, Orr
Soybean: Eubanks, Owas
Tobacco: Fugle, Rahman, Stone
Sweetpotato and white potato: Gurt, Robertson
Pastures and Forages: Mabrey, Stocks
Small grains: Jones, Spencer
Vegetables: West, Woodard

Criteria for grade: (total 200 points)

Readability of slides and staying on time: (60)

Proper overview of importance of the crop to North Carolina: (35)

Discussion of markets and budgets: (35)

Discussion of pests and their management: (35)

Discussion of key production practices: (35)

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Farm Plan

Objective: To provide students with an appreciation of critical management decisions related to nutrient management, soil resources, cropping systems, pest management, and marketing of crops in the Coastal Plain and Piedmont of North Carolina. The project is also designed to help students gain a greater appreciation of the complexity of modern farming and to give students experience at pulling many aspects of farming together into central plan.

Procedure: Students will work individually on an example farm from North Carolina representing major geographical production areas. A topographical map from Google Earth surveys will be provided representing multiple fields. Using appropriate resources, students will develop a comprehensive plan for implementing management strategies to protect soil and environmental resources and ensure a viable economic farming enterprise. Students will prepare a written report and present a thorough description to the class. Each student will be assigned a management zone. In most cases, there will be four zones and four students in the group.

Criteria that should be considered include soil loss, nutrient management, production and pest management strategies for each crop, and economic viability of each crop and the rotation scheme for each year and across all years. The plan must cover seven years with 3 scenarios of crop yield including: 1) high yields over 7 years; 2) medium yields over 7 years; and 3) low yields over 7 years. Crop budgets should be considered in development of cropping systems and crop/acreage mix. A complete crop calendar needs to be developed (as discussed in class) for each crop including activities and pests. A narrative that explains each of the major decisions and assumptions presented in the plan. More in-depth descriptions will be provided during the semester. There needs to be no less than five crops/enterprises for the farming operation.

A small portion of the farm must include certified organic production. The organic unit can be placed in one zone. Students will need to determine soil loss for that unit based on the crops they plan to grow under organic certification.

Progress throughout the semester will be expected with a specific timeline (see course schedule.) The information provided to the instructors most likely will not be in the final version and significant changes can be made for the final version. The goal is to make sure students are on track for a good presentation of the farm plan. The tendency to procrastinate is ever present.

Note that there is an expectation of professional dress during the presentation.

400 Total Points

	Description	Points	Score
	Written presentation		
1	Farm name	5	
2	Farm managers	5	
3	Description of county	5	
4	Yield potential of crops selected, source of information	5	
5	Map of farm and designation of management zones and fields	10	
6	Tillage systems with description	15	
7	Soil loss calculations	45	
8	Rotation sequence	15	
9	Action calendars	15	
10	Stress calendars	15	
11	Sample budget for each crop	15	
12	Fertilizer and lime calculations	15	
13	Budget summary for each crop in each management zone	15	
14	Assumptions for high, medium and low yield	10	
15	Table of economic return for each field in each management zone over 7 years for the 3 yield scenarios	60	
16	Summary table of total farm income for each yield scenarios for each year and over the 7 years	20	
18	Assumptions throughout farm plan that may not hold true	15	
17	Investment strategies for the future	15	
	Oral presentation		
20	Appropriate format of slides	30	
21	Presentation of essential elements of farm plan	70	
22	Total	400	

Counties

Anson: Boyd, Woodard, Clough

Duplin: Eubanks, Stone, Owens

Northampton: Fugle, Stocks, Gurt, Rahman

Washington: Jones, Spencer, Mabrey, Robertson

Iredell: May, Orr, West

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Dailey Quiz, In-Class Discussions, and Homework

Participation in class is essential. A short quiz will be given almost every lecture based on discussions from the previous lecture or the assigned reading. The quiz will be given at the beginning of class. On some occasions attendance will be the quiz.

Total points for the semester are 200