AGRONOMY 300
Cropping Systems
2016 Course Information

Instructor: Dave Stoltenberg, Professor
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Class schedule: 11:00 - 11:50 AM MWF
351 Moore Hall

Prerequisites: Agronomy 100 or consent of instructor.

Course overview:

Cropping Systems is an intermediate-level, 3-credit course intended for students interested in crop production systems, the environmental impacts of crop production, agroecology, and sustainable agriculture. Topics include agricultural intensification, agroecosystem structure and function, aspects of technology adoption, soil erosion and conservation, tillage systems, weed ecology and management, nutrient dynamics and management, water quality, crop rotation, and cropping system diversification. An agroecological approach, the application of ecological concepts and principles for the improvement of cropping systems, is emphasized.

Learning objectives:

The course goal is to provide an opportunity to gain knowledge and a better understanding of cropping systems and approaches to their improvement. Major learning objectives are to:

1) gain an understanding of the dynamic history and unique characteristics of agriculture,

2) understand factors that drive change and those that constrain change in cropping systems,

3) use an agroecological approach to better understand, assess, and improve cropping systems

4) understand key components of cropping systems and their impact on agroecosystem services and sustainability, and

5) understand new and emerging approaches to crop management in the context of sustainability and potential tradeoffs.

Course materials:

A textbook is not required. Most course information will be available on-line at the course website:
https://ay15-16.moodle.wisc.edu/prod/course/index.php?categoryid=259

For background and supporting information, several books are on reserve in Steenbock Library (https://lcp.library.wisc.edu/viewer/show/46341) and include:

1) *Agroecology: The Ecology of Sustainable Food Systems.* 2007. Gliessman SR. CRC Press.

2) *Ecology of Weeds and Invasive Plants.* 2007. Radosevich SR, Holt JS, Ghersa CM. 3rd edn. Wiley Inter-Science.

3) *Food and the Mid-Level Farm: Renewing an Agriculture of the Middle*. 2008. Lyson TA, Stevenson GW, Welsh R (eds.) MIT Press.

4) *Impact of Genetically-Engineered Crops on Farm Sustainability in the United States.* 2010. National Research Council. National Academies Press. (On-line only)

5) *Introduction to Agronomy: Food, Crops, and Environment.* 2011. Sheaffer C, Moncada KM. 2nd edn. Delmar Cengage Learning.

6) *Modern Corn and Soybean Production.* 2000. Hoeft RG, Nafziger ED, Johnson RR, Aldrich SR. MCSP Publications.

7) *Organic Farming: The Ecological System.* 2009. Francis C. (ed.) Agronomy Monograph 54. ASA-CSSA-SSSA.

8) *Principles of Ecology in Plant Production.* 2010. Sinclair TR, Weiss A. 2nd edn. CAB International.

9) *Soil and Water Conservation for Productivity and Environmental Protection.* 2004. Troeh FR, Hobbs JA, Donahue RL. 4th edn. Pearson, Prentice Hall.

10) *Soil Management: Building a Stable Base for Agriculture*. 2011. Hatfield JL, Sauer TJ (eds.) ASA-SSSA.

11) *The Conversion to Sustainable Agriculture: Principles, Processes, and Practices.* 2010. Gliessman SR, Rosemeyer M (eds.) Advances in Agroecology. CRC Press, Taylor & Francis Group.

12) *Toward Sustainable Agricultural Systems in the 21st Century.* 2010. National Research Council. National Academies Press.

2016 lecture schedule (tentative):

Date(s)	Topic
Jan. 20	**Introduction**
Jan. 22-Feb. 3	**Cropping systems – a perspective:** *What is agriculture?* The origin and spread of agriculture; agricultural intensification; aspects of technology adoption; the

	technology treadmill; dynamics of agriculture – U.S. and WI trends in farm number, farm size, productivity; polarization and loss of the agriculture of the middle; factors that drive intensification.
Feb. 5-17	**Agroecology and agroecosystems:** *What is agroecology?* Introduction to an agroecological approach to cropping system improvement; systems vs. reductionist approaches; agroecosystem structure and function – natural ecosystems vs. agroecosystems; evaluating agroecosystems over time: productivity, stability (variability), sustainability, and equitability.
Feb. 19-24	**The agroecological approach – moving towards sustainability:** *What is sustainable agriculture?* Sustainable agriculture in the context of an agroecological approach; natural ecosystems, sustainable agroecosystems, and conventional agroecosystems; the sustainable agriculture continuum; moving towards sustainable agriculture – making the transition.
Feb. 26-Mar. 2	**Subsystems – soil erosion and conservation:** The problem of soil erosion; mechanisms of soil erosion by water; estimating (predicting) soil losses by water and wind; management practices to reduce soil loss.
Mar. 4 (tentative)	**Exam 1**
Mar. 7-18	**Subsystems – tillage and tillage systems:** The importance and impact of tillage; tillage implements, tillage systems, crop residue management; tillage by crop interactions; tillage x weed interactions.
Mar. 19-27	**Spring recess**
Mar. 28-Apr. 8	**Subsystems – weed biology, ecology, and management:** *What are weeds?* The role of weeds in agroecosystems; the selection for herbicide-resistant weeds; crop-weed interactions – factors that determine outcomes of competition; approaches to weed management – industrial, integrated, and agroecological.
Apr. 11 (tentative)	**Exam 2**
Apr. 13-25	**Subsystems – nutrient management and environmental quality:** Nutrients and water quality; the nitrogen (N) cycle and N management; improved N use efficiency – soil testing, nutrient crediting, application timing; the phosphorus (P) cycle; P management strategies; N and P management on Wisconsin farms.
Apr. 27-May 6	**Cropping system diversification:** Historical context; impacts of cropping system simplification; crop rotation risks and benefits; the rotation effect; soil quality, pests, and pathogens; cropping system diversification; simple vs. complex rotations – long-term productivity, profitability, and environmental impacts; organic cropping systems.
May 13	**Final exam:** 2:45-4:45 PM

Exams, quizzes, and graduate student review paper:

Two exams will be given during the semester and a final exam will be given during the summary period (finals week). Exams will address lecture material and assigned readings. The course will also include four quizzes addressing lecture material and/or assigned readings. No makeup exams or quizzes will be given for unexcused absences.

Graduate student review paper:

Graduate students will be required to write a review paper addressing a topic pertinent to cropping systems. A concise outline of the proposed review paper will be required by March 11. The review paper will be due no later than the last scheduled class period of the semester. The review paper is expected to include the following components:

1) An introduction that clearly conveys the background and objectives of the paper.
2) A concise, thorough review of pertinent literature.
3) A critical assessment of the cited literature as it relates to the intent of the paper.
4) A summary that clearly states appropriate conclusions and inferences.

A comprehensive list of pertinent literature citations (references) must be included. Evaluation will be based on the components listed above, as well as spelling and grammar.

Points and grading:

Undergraduate students:

Four quizzes (each 5% of total course points) =	20%
Two exams (each 25% of total course points) =	50%
Final exam (30% of total course points) =	30%
	100%

Graduate students:

Four quizzes (each 5% of total course points) =	20%
Two exams (each 20% of total course points) =	40%
Final exam (25% of total course points) =	25%
Review paper (15% of total course points) =	15%
	100%

Course grades will be based on the scale below. The instructor may adjust grading to be based on the class curve.

A:	90-100%
AB:	87-89%
B:	80-86%
BC:	77-79%
C:	70-76%
D:	60-69%
F:	≤59%

Academic integrity:

Academic Integrity is critical to the mission of the University of Wisconsin-Madison, an institution with high academic standards and rigor. All members of the University community play a role in fostering an environment in which learning is achieved in a fair, just, and honest way. Students are expected to uphold the core values of academic integrity which include honesty, trust, fairness, respect, and responsibility (https://www.students.wisc.edu/doso/academic-integrity/).

Student academic misconduct is governed by state law (UWS Chapter 14) and is subject to disciplinary action. Examples of academic misconduct include, but are not limited to: cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; submitting work previously presented in another course; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.