CropS/Pl P 403/503 Advanced Cropping Systems

Fall 2013, 3 Credits
Time: Tu,Th 1:25-2:40; Field trips required
Place: 204 Johnson Hall

INSTRUCTOR

Scot Hulbert, Cook Chair for Cropping Systems Pathology,
307 Johnson Hall. Phone 335-3722; Email scot_hulbert@wsu.edu

SECTIONS

The cross listing in two departments is a little confusing; basically you can enroll as a Plant Pathology class or a Crop Science class, whichever you prefer on your transcripts. Undergraduates generally enroll as 403 and graduates as 503; the requirements are slightly different (see GRADING, below). Pullman or Moscow folks are put in section 1; Wenatchee in section 2, Prosser in section 3 and Mount Vernon is section 4.

MATERIALS

Materials for the class can be accessed via the Angel Website: https://lms.wsu.edu/

OBJECTIVES

- Develop your **own opinions** about controversial agricultural issues like soil and water conservation, chemical use, organic certification, crop plants for energy generation, genetically modified organisms and legislation affecting farming methodology.
- Gain an understanding of the diverse dryland and irrigated cropping systems of the Pacific Northwest and other regions, and the factors that are changing these cropping systems.
- Learn to critically interpret agronomic literature.

GRADING:

403 and 503 Credit:

- Five quizzes (40 points each).
- Participation in class discussions and field trips (50 points). Three trips are required but special arrangements are made for students who are not in the Pullman/Moscow area.

503 Credit:

- One research or extension paper that is relevant to cropping systems will be presented by you to the class (~20 minutes plus discussion). Paper must be selected, or presentation done, before Thanksgiving. (worth 50 points)
- Create a notebook (electronic documents are fine) that details a cropping system you would consider professionally (for production or research). Describe the crop rotation (including flexible aspects), inputs applied for each crop and their costs, equipment and capital needed, profitability. (50 points)

403 Credit:

- Create a notebook that details a cropping system you would consider professionally. Draft of system should be done before thanksgiving. (50 points)

Cropping system notebook:

- Describe your cropping operation in general terms of location, rainfall, whether you have irrigation, the crop rotation, annual acreage of each crop, sequence of each crop in rotation and where you will be selling your product.
- Describe the inputs (fertilizers, herbicides, pesticides, etc.) you expect to use on each crop including amounts and where you will get them. You don't need to find the cost of each input.
- Describe all the operations you would expect to perform throughout the year for each of the crops and a calendar schedule for all of these operations.
- Describe the equipment you will be using to perform these operations.

It is OK to state what normal practices are for a certain cropping system in a given location, but these are not review articles: The notebook should state what YOU are going to do for management practices and why you are going to do it that way.

STUDY HABITS: Complete reading assignments prior to class. Be prepared to both discuss the papers and ask questions about things you don't understand. Quizzes will cover information from assigned reading as well as highlights of other papers presented by students or instructor in class. Any topics already covered in class are potential material for quizzes.

STUDENTS WITH DISABILITIES: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

CLASSROOM EMERGENCY (SAFETY): Please review these websites for emergencies.
http://safetyplan.wsu.edu
http://alert.wsu.edu
http://oem.wsu.edu/emergencies

COURSE TOPICS (in approximate order):

Introductions;

- Factors affecting changes in cropping systems
- Design of crop rotations
- Review of tillage implements and strategies
- Reviews of soil erosion problems

Regional agricultural issues

Environmental and economic effects of managing water

Conservation tillage and the environment

Impact of herbicide resistant (HR) crops

Weed management

Integrated approaches

Herbicide resistance in crops and weeds

Integrated methods for disease and pest control

Agroecosystem diversity and sustainability

Precision agriculture

Current uses, future potential

Nutrient management issues

Organic agriculture

The rules, sustainability, productivity, opportunities & challenges

Sustainable Ag: what is it?

Energy Crops

Pro's and Con's

Global warming and renewable energy**:** potential contributions from Ag

Perennial Crops

Advantages and disadvantages

Development of perennial varieties of annual crops

Animals in Agroecosystems

Perennial Crops

Advantages and disadvantages

Development of perennial varieties of annual crops

Working with the seed industry

Additional Topics (topics we may cover based on interest)

Effects of other transgenics (besides HR) on cropping systems
Fixation of nitrogen in cropping systems
Intercropping, including agroforestry and livestock
Developing crops for specific cropping systems: No-till; organic etc.
Insecticide resistance management
Legislation that affects cropping systems

Field Trips: To be decided; we will compare interests on the first day of class.

Cropping system project:

- Describe your cropping operation in general terms of location, rainfall, whether you have irrigation, the crop rotation, annual acreage of each crop, sequence of each crop in rotation and where you will be selling your product.
- Describe the inputs (fertilizers, herbicides, pesticides, etc.) you expect to use on each crop including amounts and where you will get them. You don't need to find the cost of each input.
- Describe all the operations you would expect to perform throughout the year for each of the crops and a calendar schedule for all of these operations.
- Describe the equipment you will be using to perform these operations.

READING MATERIAL (revisions in progress):

W.F. Schillinger, R.I. Papendick, S.O. Guy, P.E. Rasmussen and C. van Kessel (2003) Dryland cropping systems in the Western United States. PNW tillage handbook series # 28.

R. L. Anderson (2005) A Multi-Tactic Approach to Manage Weed Population Dynamics in Crop Rotations Agron J 97:1579-1583

Huggins, D.R., Reganold, J.P. (Scientific American) No-Till: the Quiet Revolution. July 70-77

Bewick, L.S., Young, F.L. Alldredge, J.R., Young, D.L. (2008) Agronomics and economics of no-till facultative wheat in the Pacific Northwest, USA. Crop Protection 27:923-942.

Lyon, D.J., Baltensperger, D.D., Blumenthal, J.M., Burgener, P.A. Harveson, R.M. (2004) Eliminating summer fallow reduces winter wheat yields, but not necessarily system profitability. Crop Sci. 44:855-860.

NAWG Weed Resistance Learning Module http://www.wheatworld.org/WRMC/

Mallory-Smith, C. et al. (2000) Herbicide-Resistant Weeds and their management. Pacific Northwest Extension publication.

Buhler, D.D. (2002) Challenges and opportunities for integrated weed management. Weed Science 50:273-280.

Mason, H., Navabi, A., Frick, B., O'Donovan, J., Spaner, D. (2007) Cultivar and seeding rate effects on the competitive ability of spring cereals grown under organic production in Northern Canada. Agron. J. 99:1199-1207.

Behrens, M.R. et al. (2007) Dicamba resistance: Enlarging and preserving biotechnology-based weed management strategies. Science: 316:1185-1187.

Clearfield Production systems: http://www.basf.com/group/corporate/en/innovations/innovation-award/2001/clearfield
http://www.agproducts.basf.com/products/clearfield-wheat.html

Paulitz T.C., et al. (2002) Insights into the prevalence and management of soilborne cereal pathogens under direct seeding in the PNW, USA. Can. J. Plant Pathol. 24:416-428.

Paulitz, T.C. (2006) Low input no-till cereal production in the Pacific Northwest of the U.S.: the challenges of root diseases. European Journal of Plant Pathology 115:271-281.

Gleisman, S.R. (2007) Agroecosystem diversity and stability: Chapter 16 in *Agroecology, the ecology of sustainable food systems.*

Barker, K.R, and Sorenson, C. (2003) Cropping Systems and Integrated Pest Management. Journal of Crop Production. 8: 271-305

Koch & Khosla (2003) Role of Precision Agriculture in Cropping Systems. Journal of Crop Production 9:361-381

Gebbers, R., Adamchuk, V.L. (2010) Precision Agriculture and Food Security. Science 327:828-831

Kristiansen, P., A. Taji, and J. Reganold. 2006.Organic Agriculture: opportunities and challenges In P. Kristiansen, A. Taji, and J. Reganold (eds.) Organic Agriculture: A Global Perspective. CSIRO Publishing, Collingwood, Victoria, Australia. In Press.

National Organic Program: Regulations: (*selected text*)

Hill et al. (2006) Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels. PNAS 130:11206-11210

Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The technical Feasibility of a Billion Ton Annual Supply. http://www.osti.gov/bridge

Lal, R., and Pimentel, D. (2007) Biofuels from crop residues. Soil & Tillage Research 93:237-238 (editorial)

Tilman, D. (2006) Carbon-negative biofuels from low-input high-diversity grassland biomass. Science 1598-1600

Baker, J.M., Ochsner, T.E., Venterea, R.T., Griffis, T.J. (2007). Tillage and soil carbon sequestration-What do we really know? Agriculture, Ecosystems and Environment 118☹207) 1-5.

Guide to environmental markets for farmers and ranchers
http://www.farmland.org/news/pressreleases/Guide-to-Environmental-Markets-for-Farmers-and-Ranchers.asp
Pienkos, P.T., Darzins, A., (2009) The promise and challenges of microalgal-derived biofuels. Biofuels, Bioprod. Bioref. 3:431-440.
Cox et al. (2006) Prospects for developing Perennial grain crops; Bioscience 56:649-659
Glover et al. (2007) Future Farming: A return to roots? Scientific American, August 82-89
Gleisman, S.R. (2007) Animals in Agroecosystems: Chapter 19 in *Agroecology, the ecology of sustainable food systems.*
Transgenic crops approved by federal agencies (nonregulated)
http://www.aphis.usda.gov/brs/not_reg.html