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HERBERT COLLEGE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE, KNOXVILLE

PLSC 275 Organic & Sustainable Crop Production
Course Information & Syllabus
Spring 2020, 3 credit hours

Lecture/Lab Meeting Time: **Monday and Wednesday at 10:10 am to 12:05 pm**
Location: **South Greenhouse 124**

Contact Information:
Instructor: Dr. David Butler, Associate Professor, Plant Sciences Department
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Course Description:
Introduction to organic and sustainable production practices and principles for vegetable, fruit, field, and forage crops. Introduction to organic certification, soil fertility & quality, tillage systems, crop rotation, cover crops, propagation, composting, season extension, and management of weeds, insects, & diseases in organic cropping systems. 2 hr lecture, 2 hr lab.

Course Objectives:
Upon completion of this course, students will be able to:
1. Describe the USDA National Organic Program standards for crop production
2. Describe and apply basic principles of organic crop production, including soil management, crop rotation, cover crop use, and pest management
3. Apply the principles of agricultural sustainability to design and analysis of a varying crop production and food systems

Textbooks (optional, also available on reserve in Pendergrass library):
Francis, C. (ed.) 2009. *Organic farming- The ecological system*. Agronomy Monograph 54. ASA-CSSA-SSSA, Madison, WI, USA. Available for purchase online, or digitally from or agronomy.org.
Davies and Lennartsson (eds.) 2008. *Organic vegetable production: A complete guide*. Crowood Press, Wiltshire, UK. Available at the UT Bookstore or online; also available for free electronically through the UT library.
Kristiansen, Taji, and Reganold (eds.) 2006. Organic agriculture: A global perspective. Comstock/Cornell University Press, Ithaca, NY.

Technology Use in the Course: PLSC 275 will utilize Canvas via Online@UT. Find information about Canvas at http://online.utk.edu and login at https://utk.instructure.com. As a student, you are automatically loaded into the course Canvas site and it should appear on your homepage. I will post all announcements, handouts, supplemental readings, and lectures on Canvas.

Readings: Reading assignments for each lecture are indicated on the course schedule. It is important that all readings be completed ***prior*** to the lecture period. All readings on the syllabus will be posted on Canvas well in advance of the lecture period.

Examinations: Students will be evaluated on their progress through **two (2) 50-minute examinations during the semester and one (1) 90-minute final examination**. All exams count toward the final grade.

Lab problem sets/reports: There will be four lab problem sets or reports assigned during the semester, each worth 25 points.

Quizzes: There will be at least 10 quizzes/activities on Canvas throughout the semester. Each quiz is worth 5 points, with all but the 10 highest quiz scores being dropped for a total of 50 possible points. **There will be no make-up quizzes.**

Grading Policy:

Two 50-min exams ..... 200 points
Lab problem sets/reports ..... 100 points
Quizzes ..... 50 points
Final exam ..... 150 points
Total class points for grade determination ..... 500 points

Grading Scale:

Letter Grade	Performance Level	Quality points credit hour	Percentage (%)	Course Points Earned
A	Superior	4.00	95 - 100	473 - 500
A -	Intermediate Grade	3.70	90 - 94	448 - 472
B+	Very Good	3.30	87 – 89	433 - 447
B	Good	3.00	84 - 86	418 - 432
B -	Intermediate Grade	2.70	80 – 83	398 - 417
C+	Fair	2.30	77 - 79	383 - 397
C	Satisfactory	2.00	74 - 76	368 - 382
C -	Unsatisfactory	1.70	70 – 73	348 - 367
D +	Unsatisfactory	1.30	67 - 69	333 - 347
D	Unsatisfactory	1.00	64 - 66	318 - 332
D -	Unsatisfactory	0.70	60 - 63	**300** - 317
F	Failure	0.00	≤ 59	≤ 299

For further information on grading scales, see the 2019-2020 Undergraduate Catalog under section 'Academic Policies and Procedures', sub-section 'Grades, Credit Hours, and Grade Point Averages' (http://catalog.utk.edu/)

Class Policies: Attendance is expected during the lectures and class activities. Students will be responsible for all class material missed.

University Diversity Statement: Diversity enriches the educational experience by providing students with the opportunity to learn from individuals who differ from themselves. Diversity strengthens communities and the workplace by preparing students for citizenship in an increasingly complex, pluralistic society, and by fostering mutual respect and teamwork.

Course Lecture & Lab Calendar:

January

8 (Lecture 1a) Introduction, syllabus, and course description (Heckman, 2006; Carson, 1962)

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13 (L1b) History of organic ag. (Kristiansen and Merfield, 2006)

15 (L2) Introduction to organic certification and labeling (Baier, 2008; USDA factsheets 1 to 4)

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20 No class, Dr. King holiday

22 (L3) Sustainability (Rigby & Cáceres, 2001; Pollan, 2006; Estabrook, 2009; Badgley et al., 2006; Seufert et al., 2012)
In class activity: Sustainability case studies (Alternative Ag. Case Studies 2 and 7)

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29 (L4) Soil quality and C cycling in organic agriculture (Magdoff and van Es, 2009, Ch. 1-3)
Lab 1: Crop response to soil type and organic matter

31 (L5) Soil fertility and nutrient cycles (Cavigelli et al., 1998)
Lab 2: Can diversity increase cover crop biomass?

February

3 (L6) Soil testing for organic agriculture (UGA circular 853; Explanation of soil test report)

5 (L7) Composting (Cooperband, 2002)

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10 (L8) Cover crops for organic agriculture (Snapp et al., 2005; Clark (ed.) et al., 2007)

12 *Lab 3: Agroforestry systems (at UT Organic Unit) (Farrell and Altieri, 1995)*
Exam 1 review

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17 EXAM 1 (Lectures 1-8).

19 (L9) Crop rotation (Johnson and Toensmeir, 2009; Porter, 2009); *monitor Lab 1 and 3*

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24 Crop rotation/cover crop exercise

26 (L10) Tillage systems and equipment (Grubinger, Ch. 9)

March

2 (L11) Reduced-tillage organic systems (Reberg-Horton et al., 2012)
Continue Lab 3

4 (L12) Organic weed management/weed ecology (Liebman and Davis, 2009; Turner, 2012)

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9 (L13) Organic management of arthropod pests (Altieri et al., 2005)
Lab 4: Weed seedbank and management

11 (L14) Organic management of plant pathogens (Butler and Rosskopf, 2015)

16-20 No class, Spring Break

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23 (L15, online) Organic fruit, nut and other specialty crop production (Philips, 2005)

25 *Lab 1 data and lab report instructions*

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30 (L16, online) Organic vegetable production (Rosenfeld et al., 2012; Davies et al., 2012)

April

1 **EXAM 2 (Lectures 9-16) (On Canvas!)**
Lab 4 data – weed seedbank

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6 (L17, online) Field crop production systems (Delate, 2009)
Lab 2 data – cover crops; ***Lab 1 report due***

8 (L18, online) Plant breeding for organic agriculture (Lammerts van Bueren and Verhoog, 2006)***; Lab 3 assigned***

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13 (L19, online) Marketing & business planning (Brandao et al., 2012; Hendrickson, 2005; Newman, 2019)

15 (L20, online) Organic food and human health (Brandt et al., 2011; Alavanja et al, 2004; Baudry et al., 2018); ***Lab 4 report due***

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20 (L21, online) Organic agriculture and social change (Allen and Kovach, 2000; Horst and Marion, 2018; Ray, 2018); ***Lab 2 report due***

22 (L22, online) Environmental impacts of organic farming (Kasperczyk and Knickel, 2006); ***Lab 3 report due***

May

1 **FINAL EXAM (comprehensive)**; ON CANVAS!

Lab activities:
Lab 1: Crop response to soil type and organic matter
Lab 2: Can diversity increase cover crop biomass?
Lab 3: Agroforestry system development (plan for southeastern US)
Lab 4: System management and the weed seedbank

***Course syllabus is subject to change by instructor at any time. Students will be given notice of any changes.

Readings & references:

(In order of use, lecture number indicated in parentheses; all are provided as pdf documents on the course Canvas site or available on reserve at the Pendergrass Library)

(1) Heckman, J. 2006. A history of organic farming: Transitions from Sir Albert Howard's *War in the Soil* to USDA National Organic Program. A review. Renew. Agric. Food Syst. 21:143-150.

(1) Carson, R. 1962. *Silent Spring*, in Diane Ravitch, ed., *The American Reader: Words that Moved a Nation* (New York: HarperCollins, 1990), 323-325.

(1) Kristiansen, P. and C. Merfield. 2006. Overview of organic agriculture. *In* Organic Agriculture: A Global Perspective. Kristiansen, Taji, and Reganold (Eds.) CSIRO, Collingwood, Australia.

(2) Baier, A.H. 2008. Organic Standards for Crop Production: Highlights of the USDA's National Organic Program Regulations. ATTRA, 12 pp.

(2) USDA fact sheets on organic agriculture (see BlackBoard)

(3) Rigby, D. and D. Cáceres. 2001. Organic farming and the sustainability of agricultural systems. Agric. Syst. 68:21-40.

(3) Pollan, M. 2006. No Bar Code. Mother Jones. http://www.motherjones.com/environment/2006/05/no-bar-code. (accessed 12/19/12).

(3) Estabrook, B. 2009. Politics of the Plate: The Price of Tomatoes. Gourmet.com (accessed 12/10/12).

(activity) National Research Council. 1989. *Alternative Agriculture*. Pp. 266-274, 336-349. National Academy Press, Washington, DC.

(3) Badgley, B., J. Moghtader, E. Quintero, E. Zakem, M. Jahi Chappell, K. Avilés-Vázquez, A. Samulon, and I. Perfecto. 2006. Organic agriculture and the global food supply. Renew. Agric. Food Syst. 22:86-108.

(3) Suefert, V., N. Ramankutty and J.A. Foley. 2012. Comparing the yields of organic and conventional agriculture. Nature 485:229-232.

(4) Magdoff, F. and H. van Es. 2008. Building Soils for Better Crops. 2nd edition. Sustainable Agriculture Network, Baltimore, MD, Ch. 1-3.

(5) Cavigelli, M.A., S.R. Deming, L.K. Probyn, R.R. Harwood (eds.) 1998. Michigan Field Crop Ecology: Managing biological processes for productivity and environmental quality. Michigan State University Extension Bulletin E-2646, 92 pp.

(6) Gaskin, J. *et al.* 2011. How to convert an inorganic fertilizer recommendation to an organic one. The University of Georgia Cooperative Extension. UGA Cooperative Extension Circular 853. Athens, GA.

(7) Cooperband, L. 2002. The Art and Science of Composting: A resource for farmers and compost producers. Center for Integrated Agricultural Systems, University of Wisconsin-Madison.

(8) Snapp, S.S., S.M. Swinton, R. Labarta, D. Mutch, J.R. Black, R. Leep, J. Nyiraneza, and K. O'Neil. 2005. Evaluating Cover Crops for Benefits, Costs and Performance within Cropping System Niches. Agron. J. 97:322-332.

(8, supplement) Clark, A. (ed.) 2007. Managing Cover Crops Profitably, 3rd ed. Sustainable Agriculture Network, Beltsville, MD.

(lab 3, supplement) Farrell, J.G. and M.A. Altieri. 1995. Agroforestry Systems. In: Agroecology: The Science of Sustainable Agriculture, Boulder, CO.

(9) Johnson, S.E. and E. Toensmeir. 2009. How Expert Organic Farmers Manage Crop Rotations (Ch. 2). *In* Crop Rotation on Organic Farms: A Planning Manual. C.L. Mohler and S.E. Johnson (eds.). NRAES-177.
(10) Grubinger, V.P. 1999. Tillage Equipment and Field Preparation (Ch. 9) *In* Sustainable vegetable production from start-up to market. NRAES-104.
(11) Reberg-Horton, S.C., J.M. Grossman, T.S. Kornecki, A.D. Meijer, A.J. Price, G.T. Place, T.M. Webster. 2012. Utilizing cover crop mulches to reduce tillage in organic systems in the southeastern USA. Renew. Agric. and Food Syst. 27:41-48.
(12) Turner, B., 2012. Weed Management (Ch. 5) *In* Organic Vegetable Production: A Complete Guide. G. Davies and M. Lennartsson (eds.). The Crowood Press.
(12) Liebman, M. and A. S. Davis. 2009. Managing Weeds in Organic Farming Systems: An Ecolological Approach (Ch. 8) *In* Organic Farming: The Ecological System. C.A. Francis (ed.) No. 54. Am. Soc. Agronomy.
(13) Altieri, M.A. and C.I. Nicholls. 2005. Manage Insects on Your Farm: A Guide to ecological Strategies. Sustainable Agricultural Network, Beltsville, MD.
(14) Butler, D.M. and E.N. Rosskopf. 2015. Organic agriculture and plant disease (Ch. 28). In, Plant Pathology, Concepts and Laboratory Exercises, Trigiano and Ownley (Eds.) CRC Press, Boca Raton, USA.
(15) Phillips, M. 2012. The Apple Grower: A Guide for the Organic Orchardist. Chelsea Green Publishing Company, Vermont.
(16) Rosenfeld, A., Sumption, P. and G. Davies. 2012. Organic Vegetable Production Systems (Ch. 2) *In* Organic Vegetable Production: A Complete Guide. G. Davies and M. Lennartsson (eds.). The Crowood Press.
(16) Davies, G., P. Sumption, S. Harlock, T. Nunis. 2012. Crops, Seed and Varieties (Ch. 3) *In* Organic Vegetable Production: A Complete Guide. G. Davies and M. Lennartsson (eds.). The Crowood Press.
(17) Delate, K. 2009. Organic grains, oilseeds, and other specialty crops (Ch. 6) *In* Organic Farming: The Ecological System. C.A. Francis (ed.) No. 54. Am. Soc. Agronomy.
(18) Lammerts van Bueren, E. and H. Verhoog. 2006. Organic plant breeding and seed production:ecological and ethical aspects. *In* Organic Agriculture: A Global Perspective. Kristiansen, Taji, and Reganold (Eds.) CSIRO, Collingwood, Australia.
(19) Brandao, M., U. Schmutz, C. Firth. 2012. Farm Economics and Business Planning (Ch. 11) *In* Organic Vegetable Production: A Complete Guide. G. Davies and M. Lennartsson (eds.). The Crowood Press.
(19, supplement) Hendrickson, J. 2005. Grower to grower: Creating a livelihood on a fresh market vegetable farm. University of Wisconsin-Madison.
(19) Newman, C. Small Family Farms Aren't the Answer – Sylvanaqua Farms – Medium. Published 25 July 2019.
(20) Brandt, K., and J.P. Molgaard. 2011. Agroecosystem management and nutritional quality of plant foods: The case of organic fruits and vegetables. Crit. Rev. Plant Sci. 30:177-197.
(20) Alavanja, M.C.R., J. A. Hoppin and F. Kamel. 2004. Health effects of chronic pesticide exposure: Cancer and neurotoxicity. Annu. Rev. Public Health 25:155-197.
(20) Baudry, J., K.E. Assmann, M. Touvier, B. Allès, L. Seconda, P. Latino-Martel, K. Ezzedine et al. 2018. Association of frequency of organic food consumption with cancer risk: findings

from the NutriNet-Santé prospective cohort study. JAMA internal medicine 178:1597-1606.
(21) Allen, P. and M. Kovach. 2000. The capitalist composition of organic: The potential of markets in fulfilling the promise of organic agriculture. Agric. Human Values 17:221-232.
(21) Horst, M. and A. Marion. 2018. Racial, ethnic and gender inequities in farmland ownership and farming in the U.S. Agric. Human Values
(21) Ray, T. 2018. A Way Out. Popula. Published 18 Nov 2018.
(22) Kasperczyck, N., and K. Knickel. 2006. Environmental impacts of organic farming. *In* Organic Agriculture: A Global Perspective. Kristiansen, Taji, and Reganold (Eds.) CSIRO, Collingwood, Australia.