

# PLS 150

## Sustainability and Agroecosystem Management

### Spring 2016

#### Bowley Lecture Hall - Room 101

**Lectures:** Monday 1:00 – 3:00; Wednesday 1:00 – 2:00pm

**Labs:** Wednesday 2:00– 5:00 pm, PLS field lot 7 (West Village)

#### Instructor

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#### Course Overview

The course is based on a framework of interdisciplinary analyses of agricultural production with primary emphasis on biophysical factors, ecological processes and interactions. Focus will be on understanding ecological processes governing the functioning of various agroecosystems in relation to resource availability and ecological sustainability. We will examine how to apply this knowledge towards the sustainable management of soils and farming systems worldwide and use case study to analyze the impact of management decision on resource use efficiency, environmental footprint, resilience to biotic and abiotic stresses and socio-economic viability of food production systems. Laboratory/field activities will provide hands-on experience in ecological analyses of agricultural systems with appraisal from the short to longer term, and from field to systems. We will use a newly established field experiment to conduct comparative analysis of approaches to agriculture, measure the impacts on various ecosystem services and explore how to holistically plan and manage systems for multiple goals.

#### Learning objectives

- 1- Examine the dynamic of natural processes regulating agricultural productivity across climates and scales.
- 2- Understand, discuss and critically appraise linkages between management decisions and the three pillars of agricultural sustainability.
- 3- Assess the impact of ecological approaches to agricultural production on productivity and the provision of multiple ecosystem services.
- 4- Develop research and communication skills through planning, sampling and analyzing data gathered in the field experiment, writing press releases and adopting a range of roles in discussion and class presentations.

## **Activities and Assignments – (TOTAL = 150 pts)**

### ***1- Press release – 15pts (5pts/press release)***

After each field visit, you will submit a short press release (250 words) written for the general public which 1) details the visit, operation and/or projects, 2) the growers' approach to sustainability and the practices he/she uses, 3) some of his/her results that interested you and 4) why is it important given the context and challenges facing agriculture in California and worldwide. You can illustrate with a picture, use quotes ect....Press releases are due the Monday after the farm visit (see schedule).

### ***2- Quizzes- 40pts (5pts/Quiz)***

A 5-minute quiz (2-3 questions) will be given at the beginning of each Monday class between week 2 and week 9 included (see schedule below, 8 quizzes total) to test basic understanding of the material presented in the lectures and readings. Questions will be centered on readings and lecture material from the week prior.

### ***3- Agroecosystem group presentation- 20 pts***

The aim of the group presentation is for you to explore in more depth a particular agroecosystem/cropping system of interest and its particular challenges. You will work as a group (5 students) and deliver a 10-minute presentation at the end of class from week 4 to week 9 (see schedule). A sign up sheet for groups will be handed out on April 4<sup>th</sup> and groups must be finalized on April 6<sup>th</sup>.

The agroecosystem you select must be of global or at least regional relevance (i.e., >100 farmers practicing some form of the system and/or >10,000 ha area covered). You can use media and presentation supports of your choice (power point, short video, samples, board, factsheets...) to present the following features of the agroecosystem/cropping system of your choice: (1) the biophysical context (location, climate, soils, terrain ect), 2) Socioeconomic context (farm/field size, land tenure, markets/consumers, income sources, gender roles ect), 3) main management practices (crops, inputs (e.g., water, tillage, labor)), 4) current production constraints and challenges for agricultural sustainability, 5) future issues facing this system and research needs. Presentation will be 10 minute with 2-3 minutes for questions (time keeping will be strict).

You will be evaluated in class by the course instructors and your peers using the following criteria: \* Clarity and organization of the overall presentation; \* Quality of the content and sources; \* Creativity in ideas and presentation; \* Effectiveness of communication (1 to 5)

5 = Presentation was awesome; presenters did a good job and kept the audience engaged!

4 = Presenters did a very good job, but I would suggest a couple of minor improvements.

3 = The presenters did a good job, but I would suggest minor improvements.

2 = The presenters did a good job, but some major improvements may be needed.

1 = The presenters did an acceptable job, but many major improvements are needed.

### ***4- Assignments related to field experiment***

The field experiment will focus on quantitative analyses of agricultural systems and will take place in field plot 7 next to the Plant Science Vegetable Crop Research Station (Front of West Village) every Wednesday from 1-5pm (see lab manual for more information). Activities will consist of hands-on measurements of various ecosystem services and agroecosystem functions in plots cultivated in

**monoculture or intercropping with or without winter cover crops prior to planting.** You will belong to two groups during the field activity:

- (1) *Measurement group*: During the first lab session, four groups will be formed according to the measurements to be performed during the course of the experiment. As a group you will decide how to sample and measure the following parameters with the help of the TA and instructor (more info on lab manual):

- Crop environment
- Crop growth and yield
- Associated biodiversity
- Soil fertility
- Soil biochemistry

- (2) *Block group*: After your measurement framework is set, you will be split in “block groups”, each of which will be responsible to perform the whole suite of measurement on one experimental block. You will be responsible to perform your set of measurements in your group and teach others how to do it and ensure consistency between blocks and time points.

You will perform two assignments related to your field activities:

***a. Group video – 20 pts.***

This assignment will be done with your “Measurement group”. As a group, you will make a 5 to 10 minute-video which:

- (1) Introduces the experiment and measurements you performed
- (2) Present your hypothesis for the different treatments
- (3) Describes your approach to sampling and material and methods used
- (4) Show some results and the implications for agricultural sustainability
- (5) Give advise to the next cohort!

Feel free to compile video recordings taken with your cell phones and/or digital cameras during the course of the experiment and/or cartoon animations and/or power point/infographic styles and/or newsroom style.... Be creative but keep on target. We will show the videos in class week 10 (June 1<sup>st</sup>). The videos will be evaluated in class by the instructor, TAs and your peers using the following criteria: \* Clarity and organization of the overall presentation; \* Quality of the content and sources; \* Creativity in ideas and presentation; \* Effectiveness of communication (1 to 5 – see above)

***b. Final paper – 55 pts***

This report of your field results will be your final paper for the course and is due on June 6<sup>th</sup>. TAs will compile data obtained from each block and share it with you. You are asked to analyze results and write about findings for your set of measurements. You will follow a scientific paper format (single space, 12 pts, 15 pages maximum).

- (1) Introduction (why do we do this experiment, hypothesis)
- (2) Material and methods (experiment, design and measurements)
- (3) Results (use graphs and tables)
- (4) Discussion (use what you have learned in class)

**Expectations**

You are expected to attend class and labs, do the assigned readings before class meeting, and be prepared to engage in thoughtful and critical discussion of the material. You are responsible for

material covered in lectures, class discussions, and assigned readings. If you miss class or labs it is your responsibility to talk to another student to get notes and find out what you missed.

Whenever we are in the classroom together, everyone is expected to treat one another with courtesy and respect. Each of us brings a unique perspective to the classroom that can enrich the learning experience of everyone. These perspectives will be used for insightful debates rather than stigmatization.

Lectures. All lectures will be available in PDF within 24hr of the material being presented. Consequently, no reader is available, but can be compiled by the students based on the different lectures and readings.

Readings. The assigned readings and practice exams are meant to provide background on the topics to be covered in the following class(es), familiarize you with primary literature, and to encourage participation in the class. The readings will be made available on Smartsite and should be consulted to prepare for class discussions, quizzes and exams. A list of references will often be provided at the end of the lectures and should be consulted for more background reading along with supplementary reading on the Smartsite.

Material fees. The material fees for this class are \$41 per student. A fee waiver form is available at [http://www.plantsciences.ucdavis.edu/plantsciences/undergrad\\_students/forms.htm](http://www.plantsciences.ucdavis.edu/plantsciences/undergrad_students/forms.htm)

### **Administrative notes**

- If you are a student with a learning disability or similar difficulty and would like to discuss alternative academic accommodations, please let me know as soon as possible and we will make appropriate arrangements.
- All quizzes and exams have firm due dates and times. Any assignments turned in after the class period in which it is due will be counted as late. Late assignments will be downgraded 10% per day.
- If you do not already, please be sure to check your email regularly. Important announcements will be communicated via the class email list.
- Recognizing that students have other responsibilities apart from this class, we will consider extensions, within reason, when they are requested prior to the due date.
- Quizzes and papers must be turned in as hard copy. Please do not send assignments via email. They will not be accepted.
- University policy forbids academic dishonesty including copying other student's work, plagiarism in all forms, cheating, etc.

### **Evaluation**

Final marks will reflect the grades on: press releases (10%), quizzes (25%), agroecosystem presentations (15%), video project (15%) and final paper (35%).

## Course outline and assignment/presentation schedule

Week	Date	Location	Lectures topic	Instructor	Quizz and assignments	Lab activities	AEsystem presentation
1	28-Mar	101 Bowley	Welcome and course outline Introduction to cropping systems: Evolution, diversity and considerations for management	A.Gaudin			
	30-Mar	Field	<i>Introduction to lab and measurements</i>	TAs, A.Gaudin		Transplanting of the experiment	
2	4-Apr	101 Bowley	Soil Carbon and sustainability	A.Gaudin	Q1, lecture 1		
	6-Apr	UCD campus	Field visit: Russell Ranch Agricultural Sustainability Facility				
3	11-Apr	101 Bowley	P cycling and agroecological management	A.Gaudin	Q2, Lecture 2, Press release 1 due		
	13-Apr	Field	<i>Biophysical context of the experiment</i>	TAs, A.Gaudin		First set of measurements, lab manual available for download	
4	18-Apr	101 Bowley	N cycling and agroecological management	A.Gaudin	Q3, Lecture 3		Group 1 and 2
	20-Apr	Meridian	Field Visit: Scott Park Farm, Vegetable grower				
5	25-Apr	101 Bowley	Soil bioprocesses: impact of climate change and implications for sustainability	A.Gaudin	Q4, Lecture 4, Press release 2 due		Group 3 and 4
	27-Apr	Field	<i>Training on weed and insect ID</i>	B.Hansen		Second set of measurements	
6	2-May	101 Bowley	Water use and sustainable management: the case of California	D.Zaccaria	Q5, Lecture 5		Group 5 and 6

	4-May	Winters	Field Visit: Russ Lester, Walnut grower				
7	9-May	101 Bowley	Biodiversity and ecosystem services: why should we care?	A.Gaudin	Q6, Lecture 6 Press release 3 due		Group 7 and 8
	11-May	Field	<i>Soil health workshop</i>	TAs, Gaudin		Third set of measurements	
8	16-May	101 Bowley	Rangeland management and Carbon Sequestration: the Marin carbon project	J.Wick	Q7, Lecture 7		Group 9
	18-May	Field	Fourth set of measurements and final harvest				
9	23-May	101 Bowley	Organic Ag and holistic alternatives	E.Brennan	Q8, Lecture 8		Group 10
	25-May	101 Bowley	<i>How to analyze your results?</i>	TAs, Gaudin		Result analysis, work on your video	
10	30-May	<b>Memorial Day</b>					
	1-Jun	101 Bowley	<i>Present videos and Wrap up results</i>				
11	6-Jun	<b>Final paper report due</b>					