

PLS 150
Sustainability and Agroecosystem Management
Spring 2018

Bowley Lecture Hall - Room 101

Lectures: Monday 1:00 – 3:00

Labs: Wednesday 1:00– 5:00 pm, Field behind Bowley building

Instructor

Amélie Gaudin

2136 PES

Email: agaudin@ucdavis.edu

Office hours: by appt.

Teaching Assistants

Leah Renwick

Email: lrenwick@ucdavis.edu

Office hours: Thursdays 10-11am, Asmundson 232 (Little Hanna)

Cynthia Creze

Email: cmcreze@ucdavis.edu

Office hours: Tuesdays 10-11am, Asmundson 232 (Little Hanna)

Course Overview

The course aims to understand ecological processes governing the functioning of various agroecosystems in relation to resource availability and the environment and how to apply this knowledge towards the sustainable management of soils and farming systems worldwide. We will integrate lectures, case studies and field visits to appraise 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 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.

We will use Canvas to upload all course documents, take-home assignments and to communicate.

Lectures, readings and study guide



Lectures: Lectures will be given on Mondays and cover processes regulating sustainability outcomes of agroecosystems. All lectures will be available in PDF within 24hr of the material being presented. 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 Canvas.

Readings: A reading tied to the lecture will be proposed each week and material from both the lecture and reading will subject to weekly quizzes (see below). The assigned readings are meant to provide background on the topics to be covered in the following classes, familiarize you with primary literature, and to encourage participation in the class. The readings will be made available on Canvas and should be consulted to prepare for class discussions, quizzes and exams.

Directed-study questions: Study questions are on canvas or will be posted by the Wednesday following the lecture. Answering these questions is optional but they will help you a great deal to study for the quiz.

Field experiment

Labs (Wednesdays) will be based on two field experiments and allow you to conduct quantitative analyses of agricultural systems. Activities will consist of hands-on measurements of various ecosystem services and agroecosystem functions in two separate experiments providing a diversification gradient. The following two experiments are set up in a field plot behind the Bowley teaching facility.

	Questions	Treatments
Experiment 1: intercropping 	How does greater biodiversity through intercropping impacts crop yield and productivity? What are some of the underlying mechanisms?	(1) Maize/Squash/Beans intercrop (2) Maize monoculture (3) Squash monoculture (4) Bean monoculture
Experiment 2: cover crop and grazing 	What are the impacts of cropping system diversification strategies such as cover crops and sheep grazing on pearl millet yields, soil functions and provision of ecosystem services ?	(1) No cover crop (2) Mowed cover crop green manure (3) Grazed cover crop green manure

This is the second year of the cover crop treatment and the first year half of the cover crop is grazed (experiment 2). The experiment 1 is set up on beds which have been left fallow over the winter. In the first class, you will be asked to sign up to one experiment and to a measurement group according to what variable you are interested in monitoring during the course of the quarter. As a group, under

TAs and instructor's guidance, you will decide what to measure, how to sample and the best protocol the assess differences between treatments in:

Experiment 1 (intercrop/monocrop):

- Crop growth and yield
- Above ground organisms including beneficials
- Weed pressure

Experiment 2 (cover crop +/- grazing, no cover crop):

- Soil physical properties
- Soil fertility and biochemistry
- Weed pressure and soil macro fauna

We will work with you to make material and lab space available and guide you to implement your protocol. Information will be compiled into a lab manual which will be made available to you before your first measurement date. All data will be compiled on a google sheet the TA and instructor will set up for you based on the measurements you are planning (outcome of lab week 2). More detailed information on the field experiment can be found under Lab 1 and in the Lab Manual.

Assignments

1- Participation - Packback (40 pts – 5/week)

We will have weekly discussion regarding the topics learned throughout the quarter making up your participation grade. In order to receive your points per week, you must post on Packback 1 Question and 2 Answers per week relevant to our class subject matter per week. Packback will be our online class community where you can be curious and ask big questions about how what we're studying relates to the real world. This will 1) help develop your writing skills, 2) critical thinking and 3) deepen your understanding of the course content by gaining diverse insights and perspectives from your peers. It will also teach you the importance of justifying thoughts and claims with credible evidence and help you study for the Quizzes.

You must post your 1 question and two answers by Friday 11:59 PM each week. Each Wednesday, we will spend time in class highlighting discussions from Packback and encouraging feedback so even though Questions and Answers are officially due on Friday, use it as an opportunity and you are strongly encouraged to post your questions early in the week. Use "Sparks" to "Like" a question-answer. TAs and Professor will feature some of the best/most relevant Q & A for Wednesday discussion.

You will receive a welcome email from holla@packback.co prompting you to finish registration and payment (\$18- keep in mind your course fees are low thanks to kind sponsor for the Department of Plant Sciences and we require no textbook). Packback has already created an account for you with your school email, all you need to do is reset your password. This email may be directed to spam or filtered out, so make sure you do a thorough scan of your inbox if you can't find the email.

If you have ANY questions or concerns regarding Packback throughout the quarter, please contact the customer support team at holla@packback.co. For a brief introduction to Packback Questions and why we are using it in class, watch this video: vimeo.com/packback/Welcome-to-Packback-Questions

2- Personal reflection on field visits (10 pts)

Present a 2 page-reflection on our visit to growers (Scott Park and Russ Lester). Guiding questions for growers and more information on this assignment will be provided to you on April 25th. Your thoughts are due on May 14th.

3- Quizzes- (35pts, 5pts/Quiz, drop lowest grade)

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. Packback participation and the directed study questions posted online will be a great resource to study for the quiz. There is no mid-term and these quizzes have to be taken seriously. If you miss a quiz you will not be given the opportunity to retake it. Instead, we will drop the lowest grade for all students at the end of the quarter.

4- 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 10 (see schedule). A sign up sheet is available on Canvas (collaboration) and groups must be finalized on April 9th.

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.

5- Assignments related to field experiment

a. Group video – 20 pts.

As a group, you will make a 5 to 10 minute-video which:

- (1) Introduces the experiment and measurements you performed
- (2) Describes your approach to sampling and material and methods used
- (3) Show some results and the implications for agricultural sustainability

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 6st). 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). You can have access to videos from last the previous years here:

<https://www.youtube.com/playlist?list=PL0d0qaSnlFOaP6so59V88DJBGdDV4Vjhg>

b. Personal Final paper – 70 pts (Obj/hypothesis= 10pts, Outline and M&M= 15pts final 45 pts)

This report of your field results will be your final paper for the course and is due on Canvas on June 11th at 1pm. 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, 10 pages maximum not counting figures).

- (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)

To help you with this assignment, you will be given two opportunities to get feedback from TAs and instructor. You will provide a 1 page description of your hypothetic and objectives on April 16th (10 pts) and a draft on May 16th (15 pts). We will be providing feedback so you can effectively write up your term paper

Expectations and Administrative notes

- 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. We will be taking attendance (2pts). 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 and let the instructors know.
- We will not be answering emails requests for last minute clarifications. You can reach out to us in class and during office hours. Most of the information is on this syllabus.
- Take home assignments must be turned in canvas. Please do not send assignments via email. They will not be accepted.
- 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.
- 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. However, if you miss a quiz you will not be given the opportunity to retake it. Instead, we will drop the lowest grade for all students at the end of the quarter.
- 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.

- If you do not already, please be sure to check your email and Canvas regularly. Important announcements will be communicated via the class email list.
- University policy forbids academic dishonesty including copying other student's work, plagiarism in all forms, cheating, etc.
- 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

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.

Evaluation

Final marks will reflect the grades on:

Assignments	Points	%	Notes
Packback participation	40	20%	8 weeks x 5 pts
Quizzes	35	17.5%	8 weeks x 5 pts = 40 - 1 week = 35
Field visit reflection	10	5%	
Agroecosystem presentation	20	10%	Group grade
Video	20	10%	Group grade
Final paper	70	35%	Total for this assignment
<i>Final</i>	<i>45</i>	<i>22.5%</i>	
<i>Draft outline</i>	<i>15</i>	<i>7.5%</i>	
<i>Hypothesis and objectives</i>	<i>10</i>	<i>5%</i>	
Attendance and curiosity	5	2.5%	attendance = 3 , curiosity points (Packback) = 2
TOTAL	200	100%	

Course outline and assignment/presentation schedule

Week	Date	Location	Lectures topic	Instructor	Lab activities	AEsystem presentation	Quizz (Q)	Assignments / things to do	Packback due Friday midnight
1	2-Apr	101 Bowley	Welcome and course outline, Introduction to cropping systems: Evolution, diversity and considerations for management	A.Gaudin				Sign ups (lab and Aesystem groups)	
	4-Apr	101 Bowley - Field		TAs, Gaudin	Introduction to lab and measurements, Transplanting of the experiment, Group discussion of measurements			Sign ups (lab and Aesystem groups)	Packback Q&A due 04/06
2	9-Apr	101 Bowley	Sustainable soil and fertility management: Recoupling the Carbon an Nitrogen cycle	A.Gaudin			Q1		
	11-Apr	101 Bowley - Winters		TAs, Gaudin	1) Discussion session, 2) Determine and share measurements and material needs 4) Hands on field visit: Russell Ranch			(group, not graded) 1 page measurement protocol due	Packback Q&A due 04/13
3	16-Apr	101 Bowley	Sustainable soil and fertility management: Recoupling the Carbon an Nitrogen cycle	A.Gaudin			Q2	Objectives and hypothesis writup	
	18-Apr	Field	Biophysical context of the experiment- soil pit (Cynthia)	TAs, Gaudin	1) Safety training, 1) Discussion session, 3) First set of measurements, lab manual available for download. Expert weed ID (Cao Brunharo)				Packback Q&A due 04/20
4	23-Apr	101 Bowley	Sustainable soil and fertility management: Recoupling the Carbon an Nitrogen cycle (Guest, Rebecca Burgess)	A.Gaudin		Group 1 and 2	Q3		
	25-Apr	101 Bowley - winters		TAs, Gaudin	1) Discussion session 2) Field visit: sustainable management options for orchard systems : Russ Lester				Packback Q&A due 04/27
5	30-Apr	101 Bowley	Soil Biodiversity and Ecosystem Functioning in Agricultural Systems.	Franz Bender		Group 3 and 4	Q4		
	2-May	Field		TAs, Gaudin	1) Disucssion session, 2) Update on measurements, protocol and data processing , 3) Second set of measurements, 4) Expert insect ID (Amanda Hodson)				Packback Q&A due 05/04
6	7-May	101 Bowley	Sustainable Weed management	B.Hansen		Group 5 and 6	Q5		
	9-May	101 Bowley - Meridian		TAs, Gaudin	1) Discussion session, 2) Field visit: On farm research and sustainable management options for vegetable systems : Scott Park				Packback Q&A due 05/11
7	14-May	101 Bowley	From soil to above ground organisms: impact on pollination and insect pest management	R.Vannette		Group 7 and 8	Q6	Farm visit reflection,	
	16-May	Field		TAs, Gaudin	1) Disucssion session, 2) Update on measurements, protocol and data processing , third set of measurements			Final paper: Outline and Material and methods due	Packback Q&A due 05/18
8	21-May	101 Bowley	Sustainable Water Management	D.Zaccaria		Group 9 and 10	Q7		
	23-May	Field		TAs, Gaudin	1) Discussion session, 2) Final harvest				
9	28-May	Memorial							
	30-May	101 Bowley	Workshop about result analysis, work on your video	TAs, Gaudin					Packback Q&A due Friday 06/01
10	4-Jun		Wrap up- Building sustainable and climate smart systems. Challenges and knowledge gaps	A.Gaudin		Group 11,12, 13	Q8		
	6-Jun	101 Bowley	Discussion, Present videos and Wrap up results, survey	TAs, Gaudin				Video presentation	
11	11-Jun	Final paper report due						Final paper due @ 1pm	