

# AGROECOLOGY

BIOL/ENVI 310 - Fall 2021 - Macalester College



**Disclaimer:** Please consider this syllabus a living document! Moodle will serve as the formal record in this course, and we look forward to building a dynamic learning environment with you.

## KEY COURSE INFORMATION

- **Instructor:** Dr. Christine Sierra O'Connell (she/her/ella), [coconnell@macalester.edu](mailto:coconnell@macalester.edu)
- **Preceptor:** Hugh Gabriel, [hgabriel@macalester.edu](mailto:hgabriel@macalester.edu)
- **Class:** MWF 1:10 PM - 2:10 PM; OLRI 243
- **CSO's Office Hours:** TBD after class check (see moodle); by appt
- **Texts:** All readings will be available through Moodle
- **Course Prerequisites:** BIOL/ENVI 170 or permission of instructor

## COURSE DESCRIPTION AND LEARNING GOALS

Food production is a major force of environmental change across the planet. Agricultural activities occupy ~40% of the Earth's surface, produce ~25% of greenhouse gas emissions, require 2/3 of global water withdrawals, and have more than doubled reactive nitrogen in the environment. Despite the scale of contemporary food production, nearly a billion people remain undernourished. Balancing agricultural production and sustainability is a pressing global environmental challenge.

The science and practice of sustainable agriculture is interdisciplinary, science-driven, and solutions-based. In this course, we will focus on the ecological principles underpinning sustainable management of agricultural ecosystems, including interactions between soils, microbes, plants and animals, always in the context of climate change, land use change and other global change drivers. In addition to exploring the water and nutrient demands of agricultural systems from a physiological perspective and conventional agricultural systems, we will also discuss sustainable agricultural practices and resilience in the global food system. This is an exciting and important time to study sustainable agriculture; I am looking forward to diving in with you all!

*After completing this course, students should be able to:*

- Understand and apply basic ecological principles to agricultural ecosystems
- Explain and analyze the interactions between food production, management strategies, and environmental impacts
- Discuss, draw conclusions from and critique primary literature
- Investigate and analyze sustainable agricultural methods and present those analyses to peers
- Connect course learnings with sustainable agricultural practices and careers
- Work productively in groups and create supportive, effective communities based on open communication, engagement, and sharing of responsibilities
- Practice scientific communication skills
- Build a community of learning where challenges are met with thoughtful, open discussion and collaboration

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<sup>1</sup> All photos from the CGIAR (formerly the Consultative Group for International Agricultural Research) Flickr photo stream (Creative Commons designated). Specifically: cattle feeding, Laos; rice terraces, Vietnam; harvesting cassava root, Nigeria

## **COURSE REQUIREMENTS AND ASSESSMENTS**

Participation and Required Reading (30%): A large portion of this class relies on students participating in large and small groups, which requires people to be prepared and focused for class time, supportive of each other and engaged with the material. In order to ensure that we get as much as possible out of class time, please read all “required” readings, many of which will be accompanied by a low-stakes reading response assignment on Moodle. This grading category will include Mini-Quizzes, Reading Responses, and other low-stakes means of measuring participation.

MiniQuizzes (MQ): MQs will occur intermittently and test knowledge from the previous few class meetings. After completing each quiz, students will confer with their neighbor and resolve answers together. We will go over answers as a class after the paired discussions. MQs are graded Credit/No Credit.

Field Trips! (We hope!) (0%): We are hoping to get you out to farm environments multiple times during the semester! These will be outside of class time and thus not “for credit,” but, if we can pull the trips off, they will be epic. Don’t get your hopes too high, as COVID is unpredictable, but we’re close to finalizing some details. TBD!

Science-Led Group Mini Projects (40%): This class will involve deeper dives into the science of sustainable agriculture and will aim to improve your ability to engage with the scientific literature, work with ecological data, and consider scientific next steps. We’ll have two mini projects during the semester that you’ll work on in small groups. Oral presentations and clear scientific communication is a core skillset in agriculture, ecology and environmental studies (and beyond, of course!). Both of these projects will also include ways for you to practice your scientific communication, and learn from each other.

“Journal Club” Discussion Leading (20%): Reading scientific papers is a specific and learned skill. This semester, we’ll spend one day a week discussing a relevant scientific paper. Christine will lead the first “scientific journal club,” but subsequent papers and discussions will be led by small groups of our class community. Small groups will meet with Christine the week before their discussion lead day.

Agroecological Experimental Design (20%): Working in a small group, you’ll design a scientific study in that aims to answer a question in agroecology. You’ll present that study as a lightning talk proposal to your peers. This will involve in-class workshop time.

Sustainable Agricultural Solutions-A-Thon (30%): Investigating global agroecological trends can feel negative, but it doesn’t have to be so. We will decide as a class how we want to specifically engage with a project looking at sustainable agricultural solutions (Poster session? Lightning talks? Partnership with Common Harvest?), but this will certainly involve oral and written communication about an agroecological solution. Conceptual details forthcoming, because we’ll be exploring this together, including via in-class workshop time.

## **COURSE NORMS AND EXPECTATIONS**

### **Minute Mingle!**

At the start of each synchronous class, we will meet each other in random Breakout rooms of 2-3. This is your chance to listen and learn about your peers and discuss silly topics.

### **Office/Student Hours and supporting each other’s learning**

You are busy with activities, clubs, jobs, family and friend responsibilities, and figuring out who you are and what you want to be. We expect you all to be respectful, and kind to each other and use this course as an opportunity to model best practices of student interactions. We want to make sure we are able to support your learning, especially during a challenging semester, in a pandemic, as we readjust after over a year of remote learning. Please check in with Christine and Hugh to chat during student hours or by appointment for any reason at all.

### **Out of class work expectations**

Readings and daily assignments should take ~1+ hrs. Longer assignments will require more time to be scheduled. If you are having trouble due to work or class scheduling conflicts, let us know as soon as possible. ***We are especially mindful of how the pandemic has impacted our lives, and the expectation is to extend grace and generosity to everyone.***

### **In class attendance**

Attendance plays an essential role in learning; you are warmly invited, encouraged, and expected to attend all synchronous class meetings. I recognize that there are unavoidable circumstances that sometimes make it impossible for you to attend class. I also recognize that there are likely to be public health situations that will make missing class the responsible course of action for you. In both instances, please email me to inform me in advance. See also: “safety norms” below.

### **Late work policy**

During the module system, my personal policy was to waive point deductions for late work, and I tended to have a “final deadline” cutoff after which small assignments received a zero. I am inclined to continue with this policy as we continue to operate under extraordinary learning conditions, but I do ask that if you need accommodation or flexibility on deadlines, please email or see me ahead of time and accommodations can be arranged.

### **Developing your voice in science**

Science requires a balance of courage and humility – this is as true for undergraduates as it is for researchers at leading institutions. You need courage and confidence to pursue and develop new ideas and approaches, confidence to critique others’ ideas, confidence to follow your curiosity. But science also requires humility – identifying limitations, asking for advice, help and guidance, accepting appropriate criticism from others, and reflecting on potential improvement. Science is a process of realizing you don’t have all the answers, seeking information from other sources, and developing new questions to build on existing experience.

## **SAFETY AND HEALTH AND WELLNESS**

On our first day, we will be discussing our class community norms around community health.

I am strongly committed to the health and safety of all of you, myself, and everyone in our respective communities and beyond. When we are in class together on campus, we will follow the college’s [Face Coverings Policy](#).

If you do not feel well for any reason or are exhibiting any symptoms of COVID-19, please do not come to class.

Please adhere to the [Mac Stays Safer Community Commitment](#), which outlines practices to maintain your own health and that of others around you: wear a mask, maintain a 6 foot distance from others, wash your hands frequently, use hand sanitizer when handwashing is not available.

## **COURSE ENVIRONMENT AND RESOURCES**

**Learning environment and inclusivity.** Our goal is to promote an inclusive learning environment where diverse perspectives are recognized, respected, and contribute to our strength as a class. If something in or about this class makes you feel unwelcome, please see Christine, Hugh, or a college administrator you trust.

**Names and pronouns.** You should be addressed in the manner that you prefer. If you want to make sure we address you with a particular name and/or pronoun please let us know through the first-week survey.

**Title IX.** Macalester College is committed to providing a *safe learning environment* for all students that is free of discrimination, sexual harassment, sexual assault, domestic violence, dating violence, and stalking. Further details are explained in the college’s Title IX regulations (<https://www.macalester.edu/titleix>). If you, or someone you know, experiences a Title IX violation, know that Macalester has staff trained to support you. Macalester faculty

members are “responsible employees,” which means that if you tell me about a Title IX violation, I must share that information with the Title IX Coordinator. Still, you will control how your case is handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need (Title IX Office, 651-696-6258) including, if you wish, confidential sources on campus who are not subject to the mandatory reporting requirement (see list of “Confidential On-Campus Support” at <https://www.macalester.edu/violenceprevention/support/>).

**Accessibility.** I want all students to have fair and equitable access to the learning opportunities in this course. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or to accurate assessment of achievement, please notify me as soon as possible. Students are also welcome to contact the disability service office to discuss a range of options to removing barriers in the course, including accommodations (contact Disability Services, 651-696-6275 or [disabilityservices@macalester.edu](mailto:disabilityservices@macalester.edu)). Once you have a letter of accommodations, please see me so that we can implement an action plan. Furthermore, I know that at times personal issues, stress, health problems or life circumstances may impact your ability to perform academically. Please contact the Office of Student Affairs at 651-696-6220 ([studentaffairs@macalester.edu](mailto:studentaffairs@macalester.edu)) for support and ask them to get in touch with your instructors.

**Recording policy.** In order to accommodate students who will not be able to attend synchronous class meetings during this module, we plan to record our synchronous class sessions in a manner consistent with Macalester’s classroom recording policy. I will share these recordings in a password-protected (and not public) place. If you download any class recordings, you must store them in a password-protected location or on a password-protected site. Please note that the recording policy clearly states that you may not share, replicate, or publish any class recording, in whole or in part, or use any of the recordings for any purpose besides knowing what happened during the class period, without my written approval. If I use any recorded content from any of our classes for purposes beyond our class, I will – in accordance with the policy – obtain your written permission to do so.

**Other helpful information to support your experience in the class:**

- **Concerns on content or experience in the class** → contact Christine or a TA before/after class; attend office hours (group or solo by appt); email to set up a time to meet over Zoom.
- **Need additional writing support** → Check out MAX Center for writing tutors or Works in Progress peer review program
- **Are you unable to attend synchronous activities due to an unexpected event (sickness, family issue, schedule)** → Contact Christine by email as soon as possible to set up a time to talk about options.
- **Absence due to religious observance** → Please let us know you will be observing ahead of time, so that you can obtain course materials ahead of the absence.
- **Do you need to sleep? Of course you do. Take care of yourself. If you are feeling overwhelmed about the scheduling or pace of this course, please let us know.**

**Many additional questions will be addressed on Moodle.**

Agroecology is being redesigned based on student feedback and I envision it as a place to grow and experiment with how you all can get the most out of this course experience. For everyone to do that successfully, the class needs to be a welcoming, supportive, and inclusive environment grounded in mutual respect of the individuals that comprise the class and their ideas.

If you at any point feel there is something about the class that is keeping you from success, I encourage you to reach me by email, in person, or through a designated student 'ombudsman'.

I also encourage you to take care of yourselves through the semester - eat well, sleep well, and take breaks as needed. If you are feeling overwhelmed, need academic or mental health support, prioritize those needs.

Academic support: Works in Progress peer-support or MAX Center

Disability Services: 651-696-6275 or [disabilityservices@macalester.edu](mailto:disabilityservices@macalester.edu)

Student Support: Office of Student Affairs at 651-696-6220 [studentaffairs@macalester.edu](mailto:studentaffairs@macalester.edu)

**COURSE SCHEDULE (VERY TENTATIVE!) WILL BE FORTHCOMING ON MOODLE**

All readings, assignment descriptions, and other information about the course will be on Moodle.

Week: Topic	Monday	Wednesday	Friday
		1/24 First day!	
A: Global Overview	1/27 Intro: Food demand, system stresses, sustainability	1/29 Conservation and agriculture: Land sparing and land sharing	1/31 Primary literature discussion (see Moodle)
B: Crops and resources	2/3 Crops and their environment Mini-Quiz	2/5 Soils and agriculture	2/7 Primary literature discussion (see Moodle)
	2/10 Nutrients and agriculture Mini-Quiz	2/12 Managing soil organic matter	2/14 Primary literature discussion (see Moodle)
	2/17 <b>MIDTERM 1</b>	2/19 Water and agriculture	2/21 Primary literature discussion (see Moodle)
C: System interactions	2/24 Managing water quality	2/26 Managing biodiversity and pests I	2/28 Primary literature discussion (see Moodle)
	3/2 Managing biodiversity and pests II Mini-Quiz	3/4 Animals in agriculture I	3/6 Mid-Course Interview
	3/9 Animals in agriculture II Mini-Quiz	3/11 Ag and energy	3/13 Primary literature discussion (see Moodle)
SPRING BREAK	3/16 Happy Spring Break!	3/18 Happy Spring Break!	3/20 Happy Spring Break!
D: Into the future	3/23 Climate change and ag I	3/25 Climate change and ag II Mini-Quiz	3/27 Primary literature discussion (see Moodle)
	3/30 Remote learning practice day	4/1 <u>Solutions Project</u> : Identify case study/solution to look into, begin looking for citations, establish group vs. solo	4/3 <b>Farmworkers and COVID-19</b>
E: Realizing sustainable agriculture	4/6 <b>Genetic engineering</b>	4/8 <u>Solutions Project</u> : Draft summary paper draft <b>due*</b> , including citations <b>*not due</b> , <b>this will be the assignment for that day</b>	4/10 <b>Ag and Energy</b>
	4/13 Dr. <b>Manbir Rakkar, guest lecture re: Kernza</b>	4/15 <u>Solutions Project</u> : Creative science communication workshop day	4/17 <b>Climate Change and Ag</b>
	4/20 <b>Food security - Marie Schaedel Guest Lecture</b>	4/22 <u>Solutions Project</u> : Science communication product peer review <b>NO OFFICE HOURS*</b>	4/24 <u>Solutions Project</u> : Science communication product peer review
14: Solutions-A-Thon!	4/27 <b>Urban farming!</b>	4/29 <u>Solutions-A-Thon I*</u> *Asynchronous folks pre-record a short video, synchronous folks present over zoom	5/1 <u>Solutions-A-Thon II*</u> *Asynchronous folks pre-record a short video, synchronous folks present over zoom

15: Last Week	5/4 <b><u>NO CLASS*</u></b> *Christine is participating in a review panel for a DOE grant		
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