

# AGROECOLOGY

BIOL/ENVI 294 - Spring 2020 - Macalester College



1

**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/hers), [coconnell@macalester.edu](mailto:coconnell@macalester.edu)
- **Preceptor:** Rachel Gralnek, [rgralnek@macalester.edu](mailto:rgralnek@macalester.edu)
- **Class:** MWF 9:40-10:40 AM; OLRI 243
- **CSO's Office Hours:** OIRi 248; T 1:15-2:15 PM; F 11 AM-12 PM; by appt
- **Texts:** All readings will be available through Moodle
- **Course Prerequisites:** BIOL/ENVI 285 or ENVI/GEOG 232 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

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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

- 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

## COURSE REQUIREMENTS AND ASSESSMENTS

Participation and Required Reading (20%): 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.

Peer-Led Presentations (30%): Oral presentations and clear scientific communication is a core skillset in agriculture, ecology and environmental studies (and beyond, of course!). We will have two ways for you to practice your scientific communication, both of which will also serve to ensure that in this course we are learning from each other.

Crop and Livestock Highlight (5%): We will divide up some of the world's most important crops and livestock products and have five-minute summary presentations spread over the semester in which you highlight your crop/livestock product and its global context. Logistical details forthcoming.

Sustainable Agricultural Solutions-A-Thon (25%): Investigating global agroecological trends can feel negative, but it ought not 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?), 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.

Examinations – Midterm 1 (15%), Midterm 2 (15%) and Final (20%): There will be three "closed book" exams that will take place during class time. Exam questions will require you to think critically and synthesize information presented during the course, and therefore, all exams are cumulative (though I think synthetic is a more helpful way to think about them).

## COURSE NORMS AND EXPECTATIONS

Class meetings and attendance: You are expected to attend every class. If you are unable to attend class for an academic (ie - a field trip for another class) or personal (your discretion) reason, please email Christine \*before\* that class meeting.

Late work policy: Some assignments in this class cannot be accepted if they are missed – MiniQuizzes are completed in class (no make ups) and Reading Responses are meant to support in-class discussion. For most other assignments (and unless otherwise noted), your grade will be lowered by half a letter grade for every day late. If you need accommodation or flexibility on deadlines, please email or see me ahead of time and accommodations can be arranged.

Developing your voice and being a team member: Science requires a balance of confidence and humility – this is as true for undergraduates as it is for researchers at leading institutions. We will need confidence to pursue and develop new ideas and approaches, to thoughtfully critique ideas, and to follow your curiosity. Science also requires humility and patience - with yourself, others, and the material. Individually, in groups, and as a class, we will identify our limitations, ask for help and guidance, listen to thoughtful, appropriate criticism from others, and reflect on our improvement and setbacks. As you develop your thoughts and opinions in this class, be mindful that we are also collectively creating an open, accepting community of learning and growth.

Agroecology is a new class 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 ENVIRONMENT

Learning environment and inclusivity. My goal is to promote an inclusive learning environment where diverse perspectives are recognized, respected, and seen as a source of strength. Part of that effort includes a recognition that all humans have implicit biases, and it is our responsibility to do our best to identify them in ourselves and take actions to mediate them. If something in or about this class makes you feel unwelcome, please see me, a TA, a trusted faculty or staff member, or a college administrator.

Names and pronouns. You should be addressed in the manner that you prefer. If you want to make sure I address you with a particular name and/or pronoun please let me know.

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.

Other helpful information to support your experience in the class:

- Concerns on content or experience in the class → find me or our TA before/after class; attend office hours; email to set up a time to meet in person
- Need additional writing support → Check out MAX Center for writing tutors or Works in Progress peer review program (Kagin Commons, first floor)
- Are you absent due to an unexpected event (sickness, family issue) → Contact me or a TA by email as soon as possible to set up a time to talk about options
- Absence due to religious observance → Please let me 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 me know.

**COURSE SCHEDULE (VERY TENTATIVE!) – SEE NEXT PAGE**

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<br><a href="#">Mini-Quiz</a>                         | 2/5 Soils and agriculture  | 2/7 Primary literature discussion (see Moodle)                                   |
|                                      | 2/10 Nutrients and agriculture<br><a href="#">Mini-Quiz</a>                          | 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<br><a href="#">Mini-Quiz</a>                  | 3/4 Animals in agriculture I                                     | 3/6 Mid-Course Interview   |
|                                      | 3/9 Animals in agriculture II<br><a href="#">Mini-Quiz</a>                           | 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<br><a href="#">Mini-Quiz</a>       | 3/27 Primary literature discussion (see Moodle)                                  |
|                                      | 3/30 <b>MIDTERM 2</b>  | 4/1 Genetically engineered organisms and techno-optimism         | 4/3 Primary literature discussion (see Moodle)                                   |
| E: Realizing sustainable agriculture | 4/6 Food security  | 4/8 Sustainable agriculture policies                             | 4/10 Primary literature discussion (see Moodle)                                  |
|                                      | 4/13 Buffer time (including workshop time)<br><a href="#">Mini-Quiz</a>              | 4/15 Buffer time (including workshop time)                       | 4/17 Primary literature discussion (see Moodle)                                  |
|                                      | 4/20 Buffer time (including workshop time)<br><a href="#">Mini-Quiz</a>              | 4/22 Buffer time (including workshop time)                       | 4/24 <b>No Class meeting (Earth Day climate strike)*</b> Possible swap with 4/22 |
| 14: Solutions-A-Thon!                | 4/27 Solutions-A-Thon I  | 4/29 Solutions-A-Thon II   | 5/1 Final discussion   |
| 15: Last Week                        | 5/4 <b>FINAL EXAM*</b><br><i>Note that this takes place on the last day of class</i> |  |  |