Agroecology

Applied Research and the use of Ecosystem Services in Agriculture

Dr. Jessica Schackermann and Dr. Oren Hoffmann

3 weekly hours, 3 academic credits

Course description

This course introduces the concept of agroecology, how ecological understanding can be applied to agricultural systems and how this can lead to new management approaches. The students will discover the differences between agribusiness and agroecology and how the principles of agroecology can be applied to small scale and big scale farms. The course includes field trips and hands-on sessions in which the students will use the information learned.

Course Requirements and Class Structure

Each week consists of 3 hours, which include lectures, student's oral presentations, discussions, short projects in teamwork, presentation of teamwork. The course includes three field trips including hands on lessons. Students will be asked to submit a short report for each of the field trips, do teamwork assignments that will be presented to the class, and present and answer a few questions regarding chosen publications.

Grading components

Attendance and punctuality	15%
Teamwork assignment	25%
Personal assignment and oral presentation	20%
Field trip report	10%
Final exam	30%
Total	100%

Recommended books and links for course preparation:

Agroecology: the ecology of sustainable food systems, SR Gliessman, 2014

Essentials of Ecology, 4th Edition, Michael Begon, Robert W. Howarth, Colin R. Townsend
ISBN: 978-0-470-90913-3, 2014

www.agroecology.org, www.agroeco.org , www.ecologyandsociety.org

Lesson 1 – Dr. Oren and Dr. Jessica 12.02
Part 1: Agroecology, food systems, and interdisciplinarity. The Agroecosystem concepts.
Part 2: Biotic and abiotic factors to agriculture in an overview.
Part 3: Field trip to Ketura date plantations. The importance of date agriculture in the Arava, approaches, problems, and research. Introduction to the course, the syllabus, expectations, assignments, and field trips.

Lesson 2 – Dr. Jessica 19.02
The agroecosystem, ecosystem functions, food webs and ecosystem services.
Biological pest control and pollination: pollinators, predators, and parasitoids in the insect kingdom, understanding, and helping beneficial insects.

Lesson 3 – Dr. Oren 26.02
Differences between industrial and sustainable agriculture.
Conventional and alternative cropping systems. How does an agroecologist look at a cropping system?
Introduction to the personal assignment poster or presentation, 10min each student. How to include native desert plants (to be presented on 11.05)

Lesson 4 – Dr. Jessica 11.03
The importance of the landscape, the habitat, and their elements in agro-ecosystems. A tale of flower strips, water sources, perches, and shelter.
Answering questions about the personal assignment.

Lesson 5 –Dr. Oren 18.03
The importance of healthy soil. The crop plant environment. Species traits.
Chemicals in agriculture, advantages, disadvantages, limitations, and alternatives to chemical control.

Lesson 5 Field trip– Dr. Oren, Dr. Jessica, and Shelly Zvern by Samar (5 hours) Friday 22.03
Field trip to Samar date plantation – organic date farming and its challenges. Research in commercial fields. Field trip report – due 31.03

Lesson 6 - Dr. Jessica 25.03
Ecosystem services provided by bats – international and local examples
Integrated pest management (IPM).

Lesson 7– Dr. Oren 01.04

Technological approaches to sustainable agriculture: GMO, additives, ag-tech, precision agriculture. What problems are they trying to solve? What problems are they ignoring? Agriculture within the local landscape and biophysical constrains. Indigenous systems as agroecological labs.
Visiting the CSA grounds. Exploring our own "agroecosystem": what services do we want to enhance? What disservices can we reduce?
Group assignment: Enhance the CSA (due on 29.04)

Bonus lesson guest lecture by Prof. Michael Kotutwa - The Hopi farmer, channeling indigenous agricultural knowledge

Lesson 8 – guest lecture by Noam Weiss 08.04
Ecosystem services provided by birds – international and local examples.
How to convince farmers to do nature conservation?

Lesson 9 – 30.04 and 01.05 by Dr. Jessica and Dr. Maor Matzrafi from Neve Yaar research center. Field trip and fieldwork!!! (details will be explained before)
Invasive weeds in agriculture – problems and research-based solutions. Students will join the fieldwork in Yahel and Ketura date plantation. Get an introduction to the project and the goals, meet the research team including Master student Garet. Each student will join at least one session (morning or afternoon).

Lesson 10 - (hands on 7:30-12:30) – Dr. Oren 06.05
Exploring our own "agroecosystem": what services do we want to enhance? What disservices can we reduce?

Lesson 11 – Dr. Jessica 20.05
Student presentations
AND
How can we take scientific results out of the bubble and into the world of agriculture? How applicable is applied research?

Expectations from the students:

Participation, attendance, and punctuality

Be on time for class, you will lose points if you are late!

Teamwork assignment

This course includes one teamwork assignment. The sizes of teams are dependent on course size.

The students will visit the CSA garden and surroundings, learning about our use of that small managed ecosystem. During the visit we will go over ecosystem services that might be missing for our needs (or disservices that can be reduced). The students will then split into groups, each one developing a plan with 3-4 interventions to tackle those challenges. Those may include habitat for beneficials (nesting boxes, insect hotels), adding species to boost ES, soil mulching, and any other creative ideas. You can also rely on the information you gathered for the individual assignment.

Each group will prepare a paper (1-2pages) or padlet presenting each of their suggestions. The presentation should include a brief introduction of the challenge, a description of the proposed intervention(s), and some graphic information (photo of the proposed site for the intervention, photos of the species expected to supply the ES).

You will be graded on your ability to refer correctly to ES and use of a relevant literary source (at least 1-2 for each intervention), as well as on presentation (make it look nice, informative, and brief, include a title and all your names).

We will work together to implement one or more of these ideas in lesson #10.

Why do we do this? To enhance teamwork abilities, to learn planning skills and to apply newly gained knowledge on site.

Personal assignment and oral presentation

Each student will have to work on one individual assignment. This assignment does not include a written report but will include a **presentation or a poster**.

Each student will choose one local plant species and present possible ecosystem services we can gain by adding it into agroecosystems, and an idea of how it can be integrated. Questions to be answered include:

- General info on the species: scientific name, growth form, family, phenology
- What kind of system could it fit (date orchards, filed crops, argan orchards)?
- Where/when in the system (field margins, between crops, in rotation)?
- Why (what are the possible benefits and challenges?)

Presentations in the last class are supposed to be 10min in length. I recommend 1-2 slides per point. Whether presenting a poster or presentation, make sure to proofread your English, and try to make it aesthetically pleasing. When using a photo you did not take, reference the source in the bottom.

Useful sources for potential species include:

Flora.org.il (distribution maps, general information)

Wildflowers.co.il (general information and some potential uses)

Florapal.org (ethnobotanical index: medicinal and eating usage)

Why do we do this? To enhance our scientific reading and understanding and to train our scientific presentation skills.

Field trip report

Trip report is to be submitted for the S**amar trip**. These reports are supposed to cover the different stations and topics of the trip and summarize in **1-2 pages** what was learned on the trip. The trip report will be written in a simple report style and needs to be submitted at the latest one week after the trip.

Final exam

The final exam will include questions from all aspects of the course. More information about the style of the exam will be given in the last week of class.

Literature for course preparation

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