This syllabus is subject to modification and exact lecture topics will be determined as we make progress through the course. However, this will provide for you an overview of what to expect.

COURSE DESCRIPTION

Roughly 40% of our Earth’s land surface is devoted to agriculture. Grasslands have been plowed over for industrial sized farming operations; forests have been razed to make fuel and high-value commodities. The food we eat has a significant environmental impact, and, in turn, our food system stands to be tested with a changing environment. Food Production and Climate Change provides an overview of our current global food system embedded within larger environmental systems that it both impacts and depends on. We will explore the evolution of intensive food production, specifically in how humans have changed the land surface, and the environment, in order to meet increasing food demand. We will also learn how climate change, and the associated extreme events and variability, will challenge our ability to grow and harvest crops in a timely fashion to meet nutrition standards across the world. The impacts of climate change on food production vary largely across geographic, economic and even gender space. Finally, this course will review the environmental footprint of emerging food movements, their efficacy, and a host of alternative future food production trajectories that promise a range of environmental, socio-economic and nutritional impacts.

REQUIRED MATERIALS:

This course will require weekly readings (prescribed below per lecture), alongside a new, online resource: The Food Climate Research Network FoodSource, by the Oxford-Martin Programme on Food: [https://www.foodsource.org.uk/](https://www.foodsource.org.uk/)
Specific chapters and readings are prescribed by lecture below. Aside from FoodSource, readings may be a combination of peer-reviewed studies, popular articles, white and concept papers and book chapters. Readings outside of the FoodSource resource will be provided for you on NYUClasses as a pdf.

As an aside: the variety of publication mediums is meant to serve a multi-fold purpose for you: it will familiarize you with the field’s cutting-edge research; enable you to evaluate the public’s response to such research and how it is communicated; and allow you to understand more deeply the implications of such research on food producers, consumers and processors. Some of these readings, particularly those taken from scientific literature, may be dense and may prove initially challenging. In these cases, other materials will be supplied to help you gain a more complete understanding of the findings and implications. You will also be required, and encouraged, to conduct literature searches to access more information and delve more deeply into weekly topics.

STUDENT EXPECTATIONS

On-time attendance to Lecture and Participation
Completion of weekly readings
Completion of five (5) written assignments
One Final Term Paper

It is NYU policy that all work is expected to be your own. Plagiarism of any kind will result in a failing grade for the class, and referral to an academic dean. Plagiarism includes: copying sentences or fragments from any source without quotes or references; not citing every source used in your papers; citing internet information without proper citation; presenting someone else’s work as your own; or copying verbatim from any source. You are subject to CAS’s guidelines for Academic Integrity: http://cas.nyu.edu/page/ug.academicintegrity

You will be expected to attend every class, as the readings will cover some of the topics we discuss in class in more detail, but not all topics. Your active listening in class will help you to create a more thorough response to some of the homework prompts. This is college, and so I also expect that you will take initiative to look further into terms and topics you are unfamiliar with in the readings (this includes asking me). Active participation will be encouraged, and there will be many opportunities to do so, as an individual and as discussions questions posed to groups of students in class, so please be ready to take advantage of these opportunities. I also encourage out-of-class discussion on readings and response topics, and if several are you are pursuing similar lines of research for your final paper, I expect that you will discuss this amongst yourselves. However, at all times, all work should be your own.

PREREQUISITES

ENVST-UA 100 - Environmental Systems Science, or Permission of Instructor
GRADING CRITERIA

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Percent of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>50</td>
</tr>
<tr>
<td>Integrated Assessment Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Term Paper</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

This course is equivalent to 4.0 credits.

ASSIGNMENTS
You will have an assignment approximate every other week. When assigned, you will have approximately one (1) week to complete each assignment. These will comprise of short answer questions designed to test your comprehension and critical thinking of the assigned readings and issues discussed in class. The questions will generally ask you to summarize or describe various concepts in your own words, and then challenge you to apply these concepts in thinking about climate-agriculture interactions. The responses will most often be written, in short-answer form. You will also be asked to provide overviews and references for your final paper, and this will help you to plan for it in advance.

The assignment will generally be posted on NYU Classes on Friday, and is due by 5:00 pm the following Friday. Assignments are expected to be typed using 12 pt font and 1.5 spacing (double spacing is NOT acceptable). Assignments should either be emailed to me or uploaded via the NYU Classes webpage (please do not share a Google Doc with me). Please note: all assignments MUST have your last name in the filename. Assignments that do not have a name in the filename will automatically be deducted points. Late homework will not be accepted, unless you have discussed an extension with me prior.

PRESENTATION
You will also work in groups of 4(ish) to sketch out an “Integrated Assessment” of climate and agriculture for a region/area of your choice. For this project, you will be evaluated (10% of grade) based on your presentation as a group (how effectively you communicated your work and how you worked to make the disparate pieces “fit” together) and your independent contribution in the form of a 2-3 page, 12 pt font, 1.5 spacing summary. More details on this component of your grade will be provided in class, and a rubric will be posted by mid-semester. Groups will be assigned in the 2nd week of the course, and you will be expected to work on this and coordinate outside of class.

TERM PAPER
Due Monday, May 18th by midnight. The term paper will be “open topic”, in that the student may choose any topic related to the themes discussed in class. As part of the homework assignments, students will submit a topic proposal and preliminary list of
references to the instructor for approval. If the topic does not meet instructor approval, the student may seek the instructor’s guidance on how to construct a topic that is appropriate. A template/rubric for the final paper will be provided during the course. The term paper is to be 12 pages, 1.5 line spacing, including references. You may choose whatever citation style you like, but please use it consistently. A minimum of 7 primary references are required, but you may choose to include more.

DISABILITY DISCLOSURE STATEMENT
Academic accommodations are available to any student with a chronic, psychological, visual, mobility, learning disability, or who is deaf or hard of hearing. Students should please register with the Moses Center for Students with Disabilities at 212-998-4980.

NYU's Henry and Lucy Moses Center for Students with Disabilities
726 Broadway, 2nd Floor
New York, NY 10003-6675
Telephone: 212-998-4980
Voice/TTY Fax: 212-995-4114
Web site: http://www.nyu.edu/csd

ACADEMIC INTEGRITY, PLAGIARISM, AND CHEATING
https://cas.nyu.edu/content/nyu-as/cas/academic-integrity.html

Academic integrity means that the work you submit is original. Obviously, bringing answers into an examination or copying all or part of a paper straight from a book, the Internet, or a fellow student is a violation of this principle. But there are other forms of cheating or plagiarizing which are just as serious — for example, presenting an oral report drawn without attribution from other sources (oral or written); writing a sentence or paragraph which, despite being in different words, expresses someone else’s idea(s) without a reference to the source of the idea(s); or submitting essentially the same paper in two different courses (unless both instructors have given their permission in advance). Receiving or giving help on a take-home paper, examination, or quiz is also cheating, unless expressly permitted by the instructor (as in collaborative projects).
GENERAL COURSE OUTLINE AND READINGS

Please check your readings at the beginning of every week to ensure you have the most up-to-date assignments. Readings highlighted in green have been provided in the appropriate folder on NYU Classes.

I have specified what parts of the readings to focus on in bold text at the end of the reference. The term “Skim” means you should read the Abstract, Intro, Figures+Captions, Discussion/Conclusion sections. You are responsible for acquiring all non-highlighted readings.

I would encourage you to use your librarians at Bobst for help in conducting a proper literature search for your papers. For the citations below, you can search for them specifically using this page:
http://bobcat.library.nyu.edu/primo-explore/citationlinker?vid=NYU

Week 1 (1/27) – Overview: Syllabus review; systems thinking in agriculture; Understanding and utilizing concepts of Food Security

Readings:

1) FoodSource Chapters 1, Sections 1.1 – 1.4, Building Block on Food Security
4) FAO Introduction to Food Security - All

Week 2 (2/3) – Environment and Agriculture: The climate and environmental determinants of global and regional agricultural production: climate zones and prevailing conditions, distribution of energy and water, natural climate variability; crop physiology

Readings:

1) FoodSource: Chapter 6.1
2) IPCC Third Assessment Report (TAR) Overview of Climate System; http://www.climate.be/textbook/chapter1_node5.html - All
3) Handbook of Climate Change and Agroecosystems Vol. 1, Chapter 1, eds. Rosenzweig and Hillel - All
4) IRI Primer on ENSO: http://iri.columbia.edu/climate/ENSO/background/basics.html; The Australian Bureau of Meteorology ENSO webpage:
Week 3 (2/10) - **Current Agricultural Production**: Soil Health and Fertility; The Green Revolution

**Readings:**

3. The Green Revolution: Curse or Blessing? The International Food Policy Research Institute - All

Week 4 (2/17) - **Current Agricultural Production con’t**: Soil Health and Fertility; The Green Revolution

No class 2/17
**Week 5 (2/24)** - **Climate-Agriculture Interactions**: Natural climate variability and crop production; Regional Perspectives from AgMIP; Food Shocks and vulnerabilities; supply chain impacts; impacts on nutrition and distribution

*Guest lecture by Dr. Michael Puma, NASA Goddard Institute for Space Studies on 2/24*

**Readings:**
5) Mueller et al (2012) Closing yield gaps through nutrient and water management. DOI:10.1038/nature11420 - **Skim**

**Week 6 (3/2)** – **Climate Impacts on Food Production**: A primer on climate change; impacts of climate change and extremes on food production (a global overview of methods and findings); AgMIP and stakeholder driven research

**Readings:**
1) FoodSource: Chapter 6.2 onwards
2) IPCC AR5 WG2 Food Security and Production - **All**

**Week 7 (3/9)** – **Climate Impacts on Food Production (con’t)**: CO2 fertilization effects; pests and diseases; air pollution impacts; Potential Production; Yield Gaps;

**Readings:**
1) Deryng, Delphine, Elliott, Joshua, Folberth, Christian, Müller, Christoph, Pugh, Thomas A. M., Boote, Kenneth J., Conway, Declan, Ruane, Alex C., Gerten, Dieter, Jones, James W., Khabarov, Nikolay, Olin, Stefan, Schaphoff, Sibyll, Schmid, Erwin, Yang, Hong and Rosenzweig, Cynthia (2016) Regional disparities in the beneficial effects of rising CO2 concentrations on crop water productivity. Nature Climate Change, 6 (8). pp. 786-790. - Skim


Week 8 (3/16) – Spring Break, No Class

Week 9 (3/23) - Climate Impacts on Food Production (con’t): Regional perspectives on climate change impacts to food production and food security; Student case studies; Case studies from AgMIP

Guest Lecture by Dr. Elisabeth Kago Nebie, Columbia University on 3/23

Readings:


3) 4th National Climate Assessment (NCA4) Agriculture and Rural Communities - Chapter 10


Week 10 (3/30) - Environmental Footprint of Agriculture: Animal agriculture; the role of diets; defining the global foot print of agriculture

Guest lecture by Prof. Chris Schlottmann, NYU on 4/1 on animal agriculture
Readings:

2) Garnett et al., FCRN Grazed and Confused Report: https://www.fcrn.org.uk/sites/default/files/project-files/fcrn_gnc_report.pdf, Section 1, 2, 4, and 5
3) GRAIN/IATP Emissions Impossible Report, Pages 1-17: https://www.grain.org/article/entries/5976-emissions-impossible-how-big-meat-and-dairy-are-heating-up-the-planet

Week 11 (4/6) – Environmental Footprint of Agriculture (con’t): Landuse and land cover change; land-based mitigation; food waste; regional considerations; marine systems and aquaculture; GHG emissions and intensity; water and resource use; impacts on biodiversity; role of non-food crops

Guest lecture by Prof. Jennifer Jacquet on 4/6 on Marine systems

Readings:

3) FoodSource: Chapter 7, Sections 1 and 3-8
4) FoodSource Chapter 9
5) EAT-Lancet Report, Introduction and Section on “Targets” Only
6) FAO SOFIA Report, Part 1 Overview; Capture Fisheries; Aquaculture; The status of fishery resources; Governance and policy

Week 12 (4/13) - Environmental Footprint of Agriculture (con’t): Landuse and land cover change; land-based mitigation; food waste; regional considerations; marine systems and aquaculture; GHG emissions and intensity; water and resource use; impacts on biodiversity; role of non-food crops

Readings:

1) FoodSource: Chapter 3 all
2) FoodSource: “What is landuse and landuse change” Building Block
Optional Field Trip to Stone Barns Agriculture Education Center at Pocantico Hills, New York (4/17, 10 AM -12:30 PM)

Week 13 (4/20) – Alternative/modified production and food system regimes: GMOs and “sustainable intensification”; conservation agriculture; organic and regenerative agriculture; agro-forestry; metrics for success and improvement, data limitation and uncertainties

Readings:
1) FoodSource: Chapter 5 all
2) FoodSource: Chapter 8 all
5) Seneviratne et al., Nature Geoscience, volume 11, pages 88–96 (2018). 10.1038/s41561-017-0057-5 Abstract and Table 2 comparing Solar Radiation Management to Land-Based Mitigation

Week 14 (4/27) - Alternative/modified production and food system regimes (con’t): GMOs and “sustainable intensification”; conservation agriculture; organic and regenerative agriculture; agro-forestry; metrics for success and improvement, data limitation and uncertainties

Readings:


Week 15 (5/5) – Ending Lecture to tie loose ends; Start Integrated Assessment Presentations

Readings:
1) FoodSource: Chapter 10

Week 16 (5/11) - Start Integrated Assessment Presentations; Wrap-up Discussion and Comments; Future Foods Tasting