Nutrition 233: Agricultural Science and Policy I
Spring 2019

Class Time: Tuesday & Thursday, 10:30 – 12:00 noon in Room 118 Jaharis

Instructors: Tim Griffin 617-636-3613 (timothy.griffin@tufts.edu)
Office hours (Jaharis 125): Tu: 1:00 - 2:00 pm
Chris Peters 617-636-6908 (christian.peters@tufts.edu)
Office hours (Jaharis 124): Th; 1:00-2:00 pm

TA: Sabrina Kerin (sabrina.kerin@tufts.edu)
Office hours by appointment

Course Goals

This course is the first part of a two-semester sequence in agricultural policy and science. The major biological, chemical and physical components of agricultural systems are the topics. The main goal for this course is to develop an understanding of the primary physical inputs to agricultural production: Soil, Water, Nutrients, and Genetic Resources.

Who Can/Should Take This Course

This course is required for students in the Agriculture, Food, and Environment Program. The class is open to other Friedman students who have taken NUT215 (Fundamentals of U.S. Agriculture). We have extensively revised this course, and it is the second in a three-course sequence which also includes NUT215 and NUT333 (Agricultural Science and Policy II). Students from other Tufts University schools may petition for cross-registration with the instructor's permission.

Course Website

The course website is on Canvas: (https://canvas.tufts.edu/courses/860). If you are registered for this course, you should receive an e-mail from us with instructions. To log on to the site, enter your Tufts UTLN and password. If you have any problems logging onto Canvas, please let one of us know as soon as possible.

Readings & Resources

Readings are posted online, on the course Canvas site. They are grouped by class meeting date (see the schedule). Given the breadth of topics covered in NUTR 233, we often post a significant amount of reading material. We understand that not all of this material will be of equal value to you and that each student may have somewhat different needs in terms of supplemental readings. To this end, we prioritize the Course Readings as follows:

"For Discussion"	These are **required**, and in many cases will be used for in-class discussion. They are also appropriate for exam questions even if they were not the topic of class discussion.

"For Background"	These are **suggested** if you think you need additional content in a particular topical area. We will not develop exam questions directly from these readings, but you will have a greater comprehension of the topics if you at least skim these.
"For Reference"	Exactly what it sounds like. These sources provide specific examples or detailed information that you might use for your assignments, or in the future.

Classroom Conduct & Participation

Our number one priority for this class is to maximize your learning and long-term retention related to the above objectives. We aim to do this by creating a dynamic, active learning environment together with you. There will be frequent in-classroom discussions and activities, and it is critical that you do two things 1) actively and respectfully participate and 2) read or watch required materials prior to coming to class.

You can enhance your learning by participating actively and taking notes *thoughtfully and selectively*. Using a laptop to take notes will allow you to capture more information, but you may cognitively process, and thus retain, less information. As such, we encourage hand-written but permit electronic note taking. Laptops should not be used for personal purposes during class. Finally, please turn off your cell phone prior to the start of each class.

Academic Integrity

Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School's Policies and Procedures Handbook and Tufts University policies (http://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

In particular, plagiarism will not be tolerated under any circumstance. Avoiding plagiarism is outlined in section IV of the above booklet. We reserve the right to use the anti-plagiarism program, Turnitin.com, to evaluate student work. Please speak with one of the instructors if you have any questions about these policies.

Accommodation of Disabilities

Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations please contact the Friedman School Assistant Dean of Student Affairs at 617-636-6719 to make arrangements for determination of appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Diversity Statement

We believe that diverse student experiences and perspectives are essential to deepening our collective knowledge in this course. We consider it part of our responsibility as instructors to address the learning needs of all students in this course. It is our intent to present materials respectful of diversity: race, ethnicity and national origins, gender and gender identity, sexuality, socioeconomic status, religious beliefs, ability, political preference, and age, among other personal characteristics. Your suggestions on how we can improve are encouraged and appreciated.

Penalties for late or incomplete assignments:

Please notify one of the instructors at least 48 hours in advance if you know you will be unable to meet a deadline, or as soon as possible in the event of an emergency. Assignments that are turned in late without advanced notice will be reduced by 5% (half a letter grade) the first day they are past due, and 5% each day thereafter. If you anticipate being unable to complete an assignment on time, please contact the instructors immediately.

Assignments & Grading

The assignments and their contribution to your final grade are as follows:

Science Brief	30%
Oral Quiz	15%
Group Presentation	15%
Final Exam	25%
Participation	15%

The science brief and group presentation are described in detail in subsequent sections of the syllabus. An essay-style final exam will be given in-class during the exam period at the end of the semester. The exam will be comprehensive of all material in the course, but it will draw more heavily on subjects not covered in the other assignments.

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Grading Scale

The written assignment and the oral presentations will each be assigned a letter grade, which will be converted to a numeric value. The problem set and the final exams will be assigned a numeric score. The grade range used in this course is shown below:

A+	= 97 - 100
A	= 93 - 96.9
A-	= 90 - 92.9
B+	= 87 - 89.9
B	= 83 - 86.9
B-	= 80 - 82.9
C+	= 77 - 79.9
C	= 73 - 76.9
C -	= 70 - 72.9
D+	= 67 - 69.9
D	= 63 - 66.9
D-	= 60 - 62.9
F	= Below 60

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Schedule at a Glance

Date	Topic	Items Due
January 17	Introduction/course review Principles of crop production (begin)	
January 22	Principles of crop production (complete)	
January 24	Soil properties and soil function	
January 29	Tillage, erosion, and conservation practices	
January 31	Soil quality and management	
February 5	Conservation Programs I: Land retirement	**Science Brief Check-in**
February 7	Working session – Demystifying the science brief	
February 12	Conservation Programs II: Working lands	
February 14	Nitrogen and phosphorus cycles and losses	
February 19	Nutrients in Agriculture: nutrients and their sources	
February 21	No class – Monday Schedule	
February 26	Agriculture and water quality	
February 28	Regulating water quality: CWA and SDWA	**Science Brief DUE**
March 5	Nutrient management planning problem set (in class)	
March 7	Discussion – Policy tools and failures for nutrient management	**In Class Problem Set**
March 12	Water cycle, soil water management, and drought	
March 14	**Oral Quiz**	
March 20	No class – Spring Recess	
March 22	No class – Spring Recess	
March 26	Agricultural water use and irrigation technology	
March 28	Water rights and water use in arid regions	
April 2	State of Science and genetic tools	
April 4	Products of biotechnology and genetic engineering	
April 9	Governance of genetic material	
April 11	Biodiversity conservation	
April 16	**Group presentations**	
April 18	**Group presentations**	
April 23	Agroecology	
April 25	Discussion –The Green Revolution, Vers. 1 and 2	
May 1-2	Reading Period	
May 7	**Final Exam- 10:30AM, Jaharis 118**	

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Science Brief Assignment DUE February 28, 2019

Science Background:

Soil erosion continues to be an intractable problem within both U.S. and global agricultural systems. Soil movement due to water and wind are both geological processes that shape landscapes, even under native vegetation. Across agroecosystems, there are inherent differences in the vulnerability to erosion[1] However, these processes are greatly accelerated in many agricultural ecosystems, as demonstrated by Montgomery (2007)[2], and food security is threatened at all scales due to land degradation. Soil erosion is also the primary mechanism responsible for many off-site environmental impacts of agriculture, including sedimentation of waterways, and the transfer of organic matter, nutrients, and pesticides.

Soil erosion represents one of several types of non-point sources (NPS) of pollution from agriculture, and this adds to the complexity of addressing the problem on a landscape scale. There is clear documentation that many production practices (cover crops, construction of grass-covered waterways) and management systems (reduced- or no-tillage systems, inclusion of perennial sod crops in rotation, retention of crop residue) are effective at reducing soil erosion. Yet, adoption rates are low even in highly capitalized, intensive production systems.

Your Task:

The National Corn Board and the American Soybean Association issued a public statement that their organizations want to be part of the solution in addressing these problems, specifically focusing on water erosion. These organizations recognize that their member farmers account for about one-half the harvested cropland in the U.S., and their first step is to distribute a "State of the Science" brief to their members. They have contracted you (with a sizable financial incentive) to develop this brief, which should:

- Summarize the extent of soil erosion in the context of U.S. agriculture
- Document the consensus of the scientific community regarding the contribution of agriculture (quantitatively) to soil loss
- Identify one production practice and one management strategy that have significant potential to reduce soil loss from corn and soybean fields *while retaining land in production* (i.e. not land retirement)
- For each of these, document the magnitude of the potential reduction in soil erosion (using peer-reviewed science) and identify any significant barriers to adoption at the farm level

If you choose, you can also focus on the same issue outside of the U.S. To do so, you should do several things. First, let the Instructor know that you will be doing so. Second, clearly identify the country at the beginning of you brief. Third, your focus must be on one or more of the following staple grains/oilseeds: corn, wheat, rice, and/or soybean. And fourth, you must still address the items in the bulleted list above.

---

[1] For example, see Reich, R., H. Eswaran, and F. Beinroth. (2001) *Global Dimensions of Vulnerability to Wind and Water Erosion.* pp. 838-846 in D.R. Stott et al. (eds). **Sustaining the Global Farm**. May 24-29, 1999, Purdue University.
[2] Montgomery, D.R. (2007). Soil erosion and agricultural sustainability. *Proceedings of the National Academies of Science.* 104:13268-13272.

Because of your reputation for being unbiased as a scientist, they have made what can only be seen as a significant concession: they have no editorial control over your work. Congratulations, your Science Brief will be posted *verbatim* on their websites. The only stipulations are that it must be a maximum of three pages long (single spaced, 12 pt Times New Roman font, 1 inch margins), not including the list of cited articles

Check-in: DUE February 5, 2018

To help you prepare for your Science Brief please prepare a short, annotated list of two scientific research articles that you will be using for your paper. This should include the following:

- One citation for your suggested **production practice**, plus one citation for your suggested **management strategy**. Each citation must include the following: authors, date of publication, title of paper, journal title, volume number, and page range. The format of your citation is up to you, but must be consistent.

- A very brief (approximately 100 words) annotation of each research paper, which should include the research topic, why it is being studied, methods, and results.

You may ask, "What is the difference between a production practice and a management strategy?" For the purposes of this assignment, a **production practice** is a technique a farmer can implement without fundamentally changing the way the farm operates. Cover cropping, for example, can be performed with minimal changes to the equipment used or the crops grown on a farm. In contrast, a **management strategy** requires significant changes in the farming system. No-till agriculture, for example, requires investment in new types of equipment for field preparation and planting and possibly may also involve a shift in seed varieties and pest management. Feel free to ask the instructor or a teaching assistant if you are unsure how to differentiate a production practice from a management strategy.

What do I look for in writing?

Content

Comprehensiveness: The paper must address all components identified in the assignment.

Accuracy of the information: The paper must not include any obvious factual errors and should present the best available data. In general, this means obtaining information from recent articles from respected sources such as peer-reviewed journals and government reports. However, data on some subjects may be sparse, and in such cases, students should pay close attention to possible deficiencies with the available data.

Quality of the information: Students will be judged primarily on how well they summarize the current state of the science on a subject. They should be thorough and identify areas where considerable uncertainty still exists. Achieving this level of familiarity generally requires a student to read a significant number of papers. The minimum number of cited references is meant to help students decide when they have done "enough" reading.

Communication of the information: Papers should be well-organized, and main points should be clear. The assignment will be judged on the relevance of the data to the author's mainpoints and how well these data strengthen the author's arguments.

Style

Clarity and brevity: Given the strict page limits, the efficiency of one's writing dictates the depth to which the subject can be covered. Sentences should be unambiguous, and ideas should flow in a logical manner. Good use of section headings can help to organize the paper and save space.

Word choice: When possible, use a variety of words to describe the same action or object. A good example would be using the synonyms decrease, reduce, and lessen. A poor example would be to use the words "soil" and "dirt" synonymously.

Voice: Good use of the active voice makes writing more engaging. Avoid the use of the passive voice wherever possible.

Grammar: Technical writing requires both proper grammar and correct spelling. Be sure to check all words highlighted by the spell-check and grammar-check tools.

Technical details

Citation number (Science brief only): All papers must contain a minimum of 15 total references. At least 10 of these references should be from the last five years.

Page limit: Papers must not exceed 3 pages yet demonstrate sufficient detail. They must be single spaced, 12 pt Times New Roman font, 1 inch margins, not including the list of cited articles.

Bibliographic style: The citation style must be consistent throughout the paper. Either author/year or numerical citations are acceptable. Each source should only appear once in the reference list, either in alphabetical order (author/year) or in the order in which sources are cited in the text (numerical). The reference list must be placed at the end of the document and is not counted toward the page limit. Footnotes may not be used.

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Group Presentation Assignment

Written and verbal communication skills are essential to most careers in science or policy. They are especially important when trying to promote honest and constructive discussion of contentious issues. To this end, part of your grade will be based on your contribution to a group presentation on a timely issue.

The class will be divided into six groups. At three times during the semester, we devote an entire class period to presentations from two groups, on related topics. Each group will have the challenge of making a coherent, multi-person presentation that concisely but substantively answers a question related to this general topic. Presentations will be moderated by one of the faculty, who will introduce all speakers, provide a summary of the topic, and keep each speaker on time. The following procedural rules will apply:

- Each group will be limited to a total of 20 minutes to present the case. The clock starts with the first presenter. Note that transition time between speakers is counted toward the total time limit.
- Each member of the group will serve as an expert on one issue within the larger topic and is expected to speak for 4 to 5 minutes (maximum).
- A moderator will keep each speaker on time. A warning will be given to each speaker at 4 minutes. At 20 minutes, the moderator will thank the speaker and the group's presentation will be over.
- There will be 10 minutes of Q and A.

Sample topic: U.S. Federal mandate for biofuels

The Energy Independence and Security Act of 2007 sets a target for renewable fuel production of 36 billion gallons by the year 2022[3]. The current debate on the implications of increased reliance on bioenergy suggests that meeting such targets will be difficult and may have many negative consequences. Each group will make a presentation to a "model" Congress (i.e. the rest of the class) which addresses one of the following two questions.

> Q1: What is the current capacity of the U.S. to produce biofuels and will improvements in technology enable the targets to be achieved? Identify key uncertainties that influence the accuracy of these estimates or which may bias the results.
>
> Q2: What are the likely impacts of trying to meet these targets? Be sure to address implications for the food supply, land use, and greenhouse gas emissions.

In this case, the members of "Congress" will have 10 minutes to ask questions at the conclusion of each group's presentation. An additional 10 minutes will be allowed for general discussion and clarification and will concluded with a vote on whether or not to repeal the current mandate. More time could be allowed for discussion if the class is eager to debate certain points raised in the presentations.

[3] For more information, see: http://www.epa.gov/OMS/renewablefuels/

What do I look for in presentations?

Content:

Accuracy of the information: For full credit, the speaker must not make any obvious factual errors and should (to the extent possible) present the best available data. In general, this means obtaining information from recent articles from respected sources such as peer-reviewed journals and government reports. However, in some cases, data on a subject may be sparse, and speakers will need to pay close attention to possible deficiencies with the available data.

Quality of the information: Time is limited, and speakers must focus on the essential information. Presentations will be judged on the relevance of the data to the speaker's main points and how well these data strengthen the speaker's arguments. Good quality visuals or striking statistics are examples of information that makes an impact.

Communication of the information: Presentations should be well-organized, and main points should be clear. Data should be explained sufficiently for the target audience.

Style:

Speech: For full credit, one must speak clearly and pronounce technical terms correctly. Because the presentation is short, you should not rely on written notes or prompts – instead, use the visuals as your guide. The presentation should be well-paced and the tone of the presentation should be matched to the audience and the venue. For example, heavy use of jargon may be appropriate in a technical presentation but not in a public meeting.

Presence: Speakers should maintain good posture, look at the audience, point out key information on slides, and appear confident. Attire should be appropriate for a professional meeting.

Technical details:

Speakers must:

- Send draft presentation to TA by 5pm on the day before the presentation
- Include complete reference information for work cited in the presentation
- Complete their remarks within the five minute window

Group dynamics:

The group presentation as a whole should be:

- *Cohesive*: Individual presentations are clearly related and flow in a logical manner.
- *Comprehensive*: All main points of the assignment have been covered.
- *Consistent*: Individual presentations do not contradict one another.

Nutrition 233: Agricultural Science and Policy I
Spring 2019

Final Exam: (Exam Date: May 7, 2018)

The final exam will be "in person" and is scheduled for a 90 minute period. The exam will contain eight (8) questions, and you will be required to answer exactly five (5).