

Course Syllabus: Sustainable Agriculture

Masters of Science in Sustainability Management Program
Columbia University
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Instructor Information:

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Course Overview:

This course is an introduction to how Global Agriculture and Sustainability issues are at the intersection of natural resource management and business. The course will devote a significant of time covering the fundamental principles of agribusiness and how sustainability issues are key factors in business decision making today and in the future.

Course Rationale:

The course will consider that agricultural production will need to double over the next three decades in order to meet growing demand. Demand for increased food, feed, fuel, and fiber is driven by increased population and an increase in the middle class in emerging economies. Coupled with a shift in dietary preferences from grains and staple carbohydrates to more protein-based diets including pork and beef (and perhaps fish), and biofuel production, more grains will be used to feed animals and fuel our automobiles. As an energy intensive sector, agriculture is closely linked to energy markets, with crop production and demand potentially adversely affected by higher oil prices, while crop inputs (such as fertilizer) may benefit from lower natural gas prices. These shifting dynamics will affect profit margins in different segments of the agricultural supply chain. In addition to energy prices, likely constraints to the productivity growth of agriculture include climate change, water resources, infrastructure, education and training of producers, and social / governmental policy that distort agricultural markets. New technologies, product platforms and innovative business models in agriculture technology and food systems will dominate the shift from industrial agriculture to a more socially just and environmentally sustainable food production and distribution system. The agricultural technology sector is large, comprising over 8,500 companies generating over \$1.3 trillion of revenue per year, in the US alone. Moreover the volume of transactions in the agricultural sector is greater than \$15 billion per year with an estimated peak of over \$70 billion in 2007.

Course Objectives

The primary goal for the course is to familiarize students with critical components of agribusiness and the metrics to evaluate the sustainability of these activities.

Students are assumed to have had no or little previous exposure to agriculture, agricultural economics or agriculture finance. A basic knowledge of Word, PowerPoint and Excel will be useful. By the end of the course, students should be able to:

- Demonstrate a solid understanding of the global sources of agricultural information such as production, yield and trade and how sustainability performance is quantified and translated into financial and economic performance.
- Understand how the global agriculture industry poses a great risk to sustainability but also a great investment opportunity across asset classes.
- Demonstrate an ability to evaluate, quantify and assess the sustainability of agribusinesses.
- Describe how sustainability issues affect the various sectors of agribusiness

- Demonstrate an understanding of how integrating sustainability principles and practices into agribusiness and can be used to make a business become more efficient, effective, reduce risks, create opportunities and provide competitive advantage, for companies.

Method of Instruction

The course will be imparted over 12 Sessions in 2-hour sessions each Session. Two introductory textbooks are recommended for the course; see Textbooks below. Additional readings from key reports, websites and magazine/news articles will be supplemented by real, practical examples of sustainability issues in today's agribusiness industry. Guest lectures by experts in their fields will be planned.

Method of Evaluation

Regular attendance in lectures is required and students are expected to have done the readings for each lecture before class. Attendance in the tutorial session is optional, but strongly recommended. Grading for the course will be determined by the following:

1. Participation (20%)

- Contribute to class discussions. This means enhancing the quality of the class experience for yourself and others. It involves making relevant, useful and non-obvious comments and posing pertinent questions in clear and succinct language.
- Be prepared to give 2-3 minute answers to impromptu questions regarding course readings.
- Provide at least 1 carefully considered and substantive (2-3 paragraphs) comment or response to discussions.

The attendance and participation grade will comprise a weighted index of numeric grades that combine performance under each of the three tasks above and actual attendance.

2. Short Assignments (30%)

Consists of a combination of problem sets, short answer questions, and in-class presentations covering key issues related to sustainability & agribusiness. Each problem set will be graded on a ten-point scale.

3. Mid-Term (25%)

Students will be given two Sessions to complete a take home mid-term exam that will cover all material presented in the first half of the semester. Expectations are for students to demonstrate their qualitative and quantitative knowledge of the material through a series of questions addressing the economic and sustainability information of global agricultural trends.

4. Final Report & Presentation (25%)

The final deliverable for the course will be a 15-20 minute in-class presentation and written report (maximum 25 pages). The report and oral presentation will be graded on a letter grade scale from F to A+. All students in a group receive the same grade for the written report and an individual grade for their oral presentation. Students will form groups of 3-4 and choose a project will be an assessment of a sustainable agriculture project or set of investments with regards to feasibility, corporate partners, supply chains and distribution markets.

The final course grade will be computed using a weighted index of numeric grades that combine the grades for papers, attendance and participation, midterm exam, report and oral presentation, scaled into a letter final grade scale from F to A+ .

Required Textbooks:

Smil, Vaclav, Enriching the Earth: Fritz Haber, Carl Bosch and the Transformation of World Food Production.

Morgan, Dan. Merchants of Grain: The Power and Profits of Five Giant Companies at the Center of the World's Food Supply.

Hillel, Daniel. Out of the Earth: Civilization and the Life of the Soil

Select Readings (Subject to Revision):

Thomas W. Hertel. The Global Supply and Demand for Agricultural Land in 2050. American Journal of Agricultural Economics. January 2011.

Godfray HCJ, Beddington JR, Crute IR, Haddad L, Lawrence D, et al. (2010) Food security: The challenge of feeding 9 billion people. Science 327:812–818.

Tilman D, Balzer C, Hill J, Befort BL (2011) Global food demand and the sustainable intensification of agriculture. Proc Natl Acad Sci USA 108: 20260–20264.

Foley JA, Ramankutty N, Brauman KA, Cassidy ES, Gerber JS, et al. (2011) Solutions for a cultivated planet. Nature 478: 337–342.

FAO (2013) Global agriculture towards 2050. Rome, FAO. OECD/FAO (2013), OECD-FAO Agricultural Outlook 2013–2022, OECD Publishing and FAO.

DBCCA, 2009. Investing in Agriculture. Far-Reaching Challenge, Significant Opportunity: An Asset Management Perspective

Sessions:

- Session 1: Introduction to Agriculture
Reading: OECD Agriculture Outlook 2013-2022
- Session 2: What is agriculture and how has it evolved
Reading: Merchants of Grain.
- Session 3: Fertilizer through the Green Revolution
Reading: Enriching the Earth, Vaclav Smil
- Session 4: Policy: The US Farm Bill, the Food and Agriculture Organization and the World Trade Organization
Reading: Union of Concerned Scientists, 2012.
- Session 5: Land and Deforestation
Reading: Hertel et al., 2011, Hillel, Out of the Earth
- Session 6: Food for Fuel, GMO's and Biodiversity
Reading: Foley et al., 2011,
Failure to Yield: Evaluating the Performance of Genetically Engineered Crops. Union of Concerned Scientists
Case Study on Monsanto and SunOpta using Financial and Sustainability Analyses.
- Session 7: Labor and Migrant Workers
Reading: Food Sovereignty from Grassroots International
- Session 8: Agriculture, Climate Change, and Water
Reading: DBCCA Investing in Agriculture
- Session 9: Supply Chains, Food and Health: Localvores, diet and obesity, vegetarianism and organic production.

Reading: "CDP Supply Chain Report 2012." Carbon Disclosure Project, 2012.
<https://www.cdproject.net/CDPResults/CDP-Supply-Chain-Report-2012.pdf>

- Session 10: Commodities Trading and Sustainability
Reading: "The 2050 Criteria." World Wildlife Fund, 2012.
- Session 11: Animal Husbandry, Aquaculture (fish, algae, etc...), and Greenhouse technologies.
Reading: Animal Husbandry in Focus of Sustainability, 2011 in Sustainable Agricultural Development, Behnassi, Mohamed, Shahid, Shabbir A., and D'Silva, Joyce
- Session 12: Student Presentations – no required readings.

