COLUMBIA UNIVERSITY
School of Professional Studies

Master of Science in Sustainability Management

Sustainable Agriculture - PS5240
3 Credits

Instructor: Bruce Kahn, PhD

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.

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.

The course will satisfy the MS in Sustainability Management program's General and Financial Management curriculum requirement and the program's Integrative Sustainability Management requirement.

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 will be able to: (1) Demonstrate a solid understanding of the global sources of agricultural information such as production, yield and trade, (2) Understand how the global agriculture industry is challenged by sustainability risks, and (3) Apply a working knowledge of the rules and regulations that govern agriculture.

Readings

Recommended Textbooks:

Conkin, P.K. A revolution down on the farm: The Transformation of American Agriculture since 1929. The University Press of Kentucky. 2009.

Hillel, Daniel. Out of the Earth. Civilization and the Life of the Soil, N.P.: Aurum, 1992.

Morgan, Dan. Merchants of Grain. The Power and Profits of Five Giant Companies at the Center of the World's Food Supply. New York: Viking, 1979.

Smil, Vaclav. Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production. Cambridge, MA: MIT, 2001.

Additional Readings (General):

- Caldecott, B., Howarth, N. & McSharry, P. (2013) Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks. Smith School of Enterprise and the Environment: University of Oxford. Oxford.
- FAO (2015) Natural Capital Impacts in Agriculture. Food and Agriculture Organization of the United Nations, Rome.
- FAO. (2013) Global agriculture towards 2050. Rome, FAO. OECD/FAO (2013), OECD-FAO Agricultural Outlook 2013–2022, OECD Publishing and FAO.
- Rockström, J. et al. (2015) Sustainable intensification of agriculture for human prosperity and global sustainability. Ambio 2017. Vol 46: 4-17.
- 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.
- World Economic Forum. (2012) Putting the New Vision for Agriculture into Action: A Transformation is Happening. World Economic Forum. Geneva.
- McKinsey: Resource Revolution (2011)
- UCS (2013) The Healthy Farm: A Vision for US Agriculture. Union of Concerned Scientists Policy Brief
- World Economic Forum. (2012) Putting the New Vision for Agriculture into Action: A Transformation is Happening. World Economic Forum. Geneva.

Method of Instruction - Evaluation

The course will be imparted over 12 two-hour sessions. Introductory textbooks are recommended for the course and 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.

Course Requirements: Assignments & Method of Evaluation

Regular attendance in class is required and students are expected to have done the readings for each class. Grading for the course will be determined by the following:

Participation

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.

Research Projects:

You will complete 10 short assignments that consist of a research paper and in-class presentations covering key issues related to sustainability & agribusiness. Each paper will be graded on a twenty-point scale.

The class will be organized by Modules. Each Module will contain a 30 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+. Projects will be evaluated for demonstration of knowledge of agribusiness and the implications for sustainability, and the demonstration of the use and analysis of agricultural data both quantitative and qualitative. 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 4-5 and will be assigned a project topic, assessing a sustainable agriculture theme.

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

Grading Policies

The following identifies how points awarded to individual assignments translate into letter grades for the course: A= 93-100, A-= 90-92, B+=87-89, B= 84-86, B-=80-83, C+=77-79, C=74-76, C=70-73, D=66-69,

F= 65 or fewer

Course Policies

Attendance

Students are expected to arrive on time, attend all classes, and to stay until the end of class unless they have notified the instructor at the beginning of the session that they will be leaving early. Each unexcused absence will result in a 1 point deduction from the participation grade.

Late Assignment Policy

Assignments are due on the dates/times identified. One letter grade will be deducted from any assignment submitted after the due date/time. No assignment will be accepted after the deadline for submitting final grades.

Incompletes

As outlined in the School's grading and academic starts policy, "A grade of 'I' (incomplete) is a temporary grade indicating failure to complete assigned work. The mark is given only upon the request of the student and at the discretion of the instructor. The student and faculty member must sign a completed 'Request for Grade of Incomplete Form' before the final class session. The 'I' must be removed within one year after the end of the semester in which the student received the grade. Students seeking an extension of this time limit must have the approval of the instruction and successfully petition of the director of their program. If no petition is made, of if the petition is unsuccessful, the grade is chanced to an N-Permanent Incomplete- which remains on the student's permanent record.

School Policies

Copyright Policy

Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

Academic Integrity

Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at http://sps.columbia.edu/student-life-and-alumni-relations/academic-integrity-and-community-standards. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

Accessibility

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: http://health.columbia.edu/services/ods/support.

Course Schedule/Course Calendar

Session 1: Introduction to Agriculture

- OECD & FAO 2013-2022 Agriculture Outlook

Session 2: What is agriculture and how has it evolved

- (TEXTBOOK) Merchants of Grain
- 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.

Session 3: Agriculture Asset Classes & Investment Trends; Global Trade Flows; Agricultural Finance

- DBCCA. (2009) Investing in Agriculture. Far-Reaching Challenge, Significant Opportunity: An Asset Management Perspective
- Chen et al. (2013) Investing in Agriculture as an Asset Class. Agribusiness and Applied Economics Report 711, North Dakota State University.
- Geman, H. and Martin, G. (2011) Understanding Farmland Investment as Part of a Diversified Portfolio. Bunge Global Agribusiness.
- Hertel et al. (2012) Real Asset Replication
- Lang et al. (2017) Investing in Sustainable Food & Agriculture.
- TIAA-CREF (2014) Real Assets White Paper
- USSEC (2011) How the Global Oilseed and Grain Trade Works. HighQuest Partners, Danvers, CA.

Session 4: Soil fertility & fertilizers; GMOs and Organics; Chemicals: Pesticides, Insecticides, Fungicides

- Smil, V. (2011) Nitrogen cycle and world food production. World Agriculture 2:9-1.
- Foley J. A., Ramankutty, N., Brauman,K.A., Cassidy, E.S., Gerber, J.S., et al. (2011) Solutions for a cultivated planet. Nature 478: 337–342.
- UCS (2009) Failure to Yield: Evaluating the Performance of Genetically Engineered Crops. Union of Concerned Scientists.
- MSCI: Bayer AG. Report
- MSCI (2016) Specialty Chemicals
- (TEXTBOOK) Enriching the Earth, Vaclav Smil
- Whiting, D. et al. (2011) Estimating Soil Texture. Colorado State University.

Session 5: The US Farm Bill & Export Tariffs; Land Grab and Farmland Investment Principles, Infrastructure

- Hertel, T. W. (2011, January) The Global Supply and Demand for Agricultural Land in 2050. American Journal of Agricultural Economics.
- Murray, L. & McGrath, M. (2016) Sustainable Farmland Investment Strategies: An Introduction to Current Conditions. Independent Study - Yale School of Management and Yale School of Forestry.
- Speller, W. et al. (2017) The Impact of Larger-Scale Agricultural Investments on Local Communities: Updated Voices from the Field. World Bank Group. Report Number 114431-GLB. Washington, D.C.

Session 6: Ranching & Rotational Grazing; Animals Husbandry and Antibiotics; Dairy

- Behnassi, M., Shahid, Shabbir, A., and D'Silva, J. (2011) Animal Husbandry in Focus of Sustainability, 2011 in Sustainable Agricultural Development.
- Eisler, M. C. & Lee, R. F. M. (2014, March 6) Steps to sustainable livestock. Nature. Vol: 507: 32 – 34.

Session 7: Commodities Trading: Futures & Forwards; Coffee & Cocoa; Palm Oil

- WWF (2012) The 2050 Criteria. World Wildlife Fund.
- CES (2016) Ag. Markets Drivers into 2016 and Beyond
- Murphy, S., Burch, D. and Clapp, J. (2012) Cereal Secrets: The world's largest grain traders and global agriculture. Oxfam Research Reports.

Session 8: Biofuels & Biomass; Food for fuel; Migrant workers and Labor

- Speller, W. et al. (2017) The Impact of Larger-Scale Agricultural Investments on Local Communities: Updated Voices from the Field. World Bank Group. Report Number 114431-GLB. Washington, D.C.
- Grassroots International (2010) Food Sovereignty Booklet.

Session 9: Greenhouses, vertical farming & indoor farming; Aquaculture & Hydroponics; Ag. Tech

- Payne, L. (2012, November) Latest Agriculture Technology Innovation. Kachan & Co.
- DBCCA (2012) Cleaner Technologies Evolving Towards a Sustainable End-State Excerpt

Session 10: Climate Change; Water; Deforestation

- FAO. (2016) The State of Food and Agriculture 2016: Climate Change, Agriculture and Food Security. Food and Agriculture Organization of the United Nations. Rome.
- DBCCA (2012) Cleaner Technologies Evolving Towards a Sustainable End-State Excerpt
- Hertel, T. W. (2011) Global Supply and Demand for Agricultural Land in 2050. American Journal of Agricultural Economics.
- CERES (2014) Water & Climate Risk Facing US Corn Production: How Companies and Investors and Cultivate Sustainability.
- (TEXTBOOK) Out of the Earth

Session 11: Food Manufacturing & Supply Chains; Food Waste and Food Service; Farmers Markets & CSAs

- Gunders, Dana. (2012) Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill. Natural Resources Defense Council.
- Lipinski, B., Hanson, C., Waite, R., Searchinger, T., Lomax, J. and Kitinoja, L. (2013) Creating a Sustainable Food Future, Reducing Food Loss and Waste. World Resources Institute.
- UCS (2013, August) The $11 trillion dollar reward. Union of Concerned Scientists.
- CDP (2016) Supply Chain Report: Harnessing the Power of a Sustainable Future, Carbon Disclosure Project.
- Stice et al. (2016) De-risking protein strategies using a systems approach. Lux Research.

Session 12: Open Ideas