



Agriculture, Ecology and Sustainable Futures

ENVI-3010 (4 Credits / 60 class hours)

Professor Name & Email

International Honors Program:

Rethinking Food Security: People, Agriculture, and Politics

PLEASE NOTE: This syllabus is representative of a typical term. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Course Description

Food production ranks among the most environmentally significant of human activities. Agriculture is practiced in every corner of the planet and in all but the most extreme of ecosystems. Life-sustaining agricultural practices are, however, often linked to habitat and biodiversity loss, deforestation and greenhouse gas emissions, and increasingly to the extensive use of chemicals and non-point source pollution. Producing food uses twice as much water as all other human activities combined. In this context, and given new challenges posed by climate change, rapid urbanization and shifts in the balance of the global economy, how can we hope to sustain or even increase food production to meet the needs of 9 billion people while ensuring the ecological health of our agricultural systems and the green infrastructure our communities rely on?

This comparative course will explore, among other questions:

- How to reach global food security objectives while taking into account local and global environmental imperatives and realities?
- What prospects do currently dominant agricultural models, including industrialized agriculture, offer in the quest for global food security?
- What do agroecology and alternative models of agriculture, including traditional methods and scales, have to offer in our search for solutions?
- What role will science, technology and innovation play in creating a more food secure world?
- How will global climate change and associated changes in weather patterns, including increasingly severe weather events, rising sea levels, and changes in long-predictable weather patterns affect productivity and local environments, creating new threats, vulnerabilities and opportunities?
- How will new technologies change landscapes and affect biodiversity, offer opportunities on marginal lands, accelerate or decelerate deforestation and degradation?
- What systems, methods and tools can we look to that empower local producers to promote both productivity and ecological health?
- In a rapidly urbanizing world, how can urban agriculture contribute to local food security?

Learning Outcomes

The *Agriculture, Ecology and Sustainable Futures* course comprises 60 class hours of instruction (4 credits). Upon completion of the course, students will be able to:

- *Identify and describe* the primary/common forms of agricultural production.
- *Demonstrate understanding* of basic ecological principles, cycles, and models.
- *Identify and compare* the ecological dimensions of various agricultural models.
- *Distinguish between* traditional, non-traditional and alternative agricultural systems.
- *Define and describe* the globalization of agricultural production/systems.
- *Discuss* the role of technology in driving agricultural change and emergent opportunities and challenges related to technological innovation.
- *Identify and describe* the relationships between, and the interrelatedness of, agricultural systems and climate change, resilience planning and food security.
- *Compare* challenges and best practices across the countries studied.

Course Schedule

Topics covered in each module will draw on site visits, guest lectures, and other activities, in addition to the assigned readings. The order of the modules may be rearranged to respond to activities or opportunities presented in each Country Program.

Oakland, CA, USA

Session 1: Traditional history of food provisioning: from hunting/gathering to industrial agriculture

Session 2: Introduction to agriculture: basic principles of ecology and ecosystem services

Tanzania

Session 3: Coastal ecology, marine ecosystems and ocean-based agriculture

Session 4: Grassland ecology, animal husbandry, biodiversity and conservation

Session 5: Deforestation, erosion, biofuels and land stewardship

Session 6: The food, water, energy nexus: The virtual cost of water and energy

Session 7: Water tables, salinization and soil degradation

India

Session 8: The Green Revolution: How India transformed its food system and the food system transformed India

Session 9: The new Green Revolution: Genetics, soil biology and emerging technologies

Session 10: Expanding the options: Agro-ecology and eco-agriculture

Session 11: Alternative agricultural systems: Permaculture, conservation farming, husbandry, urban food production, new green cities

Italy

Session 12: Global production trends and projections

Session 13: Micro-climates, biodiversity and climate change

Session 14: The ethical, nutritional and environmental calculus of feeding the world

Session 15: Growing sustainable food futures

Proposed Readings

Agroecology, Methods, Scale and Environmental Impact

FAO High Level Panel of Experts, *Sustainable fisheries and aquaculture for food security and nutrition* (Report 7, June 2014). Available online at: www.fao.org/3/a-i3844e.pdf

Garnett, T. et al. Sustainable intensification in agriculture: premises and policies. *Science* 2013; 341:33-34.

Liebman, M. et al. 2013. Using biodiversity to link agricultural productivity with environmental quality: Results from three field experiments in Iowa. *Renewable Agriculture and Food Systems*, 28(2): 115-128.

S. D. Williams and Heidi Fritschel, *Farming Smarter* (Insights, Vol. 2 no. 2, 2012). Available online at: <http://ebrary.ifpri.org/cdm/singleitem/collection/p15738coll2/id/126967/rec/9>

Tomich, T.P. et al. 2011. Agroecology: A review from a global change perspective. *Annu. Rev. Environ. Resourc.* 36:193-222.

M. Herrero, *Smart Investments in Sustainable Food Production: Revisiting Mixed Crop-Livestock Systems* (Science, Vol. 327 no. 5967, pp. 822-825: February 12, 2010).

NV Fedoroff, *Radically Rethinking Agriculture For the 21st Century* (Science, Vol. 327, No. 5967, pp. 833-834: February 12, 2010).

Miguel A. Altieri, *Agroecology, Small Farms, and Food Sovereignty* (Monthly Review, 2009). Available online at: <http://monthlyreview.org/author/miguelaltieri>

Magdoff and van Es. 2009. Building Soils for Better Crops. Sustainable Agriculture Network Publication.

OECD. *Environmental Performance of Agriculture in OECD Countries since 1990* (2008). Available online at: www.oecd.org/tad/env/indicators

- Hassanali, A. et al. 2008. Integrated pest management: the push–pull approach for controlling insect pests and weeds of cereals, and its potential for other agricultural systems including animal husbandry. *Phil. Trans. R. Soc. B*, 363:611–621.
- Pretty, J. 2008. Agricultural sustainability: concepts, principles and evidence. *Phil. Trans. R. Soc. B*, 363:447-465.
- Shennan, C. 2008. Biotic interactions, ecological knowledge and agriculture. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 363:717-739.
- Drinkwater, L. E. et al. 2008. Ecologically-based nutrient management. In: *Agricultural Systems: Agroecology and Rural Innovation for Development*. Snapp, S. and B. Pound, Eds. pgs. 161-210.
- Wilke, B.J. and S.S. Snapp, 2008. Winter cover crops for local ecosystems: linking plant traits and ecosystem function. *Journal of the Science of Food and Agriculture*, 88: 551–557.
- Jackson, L. E. et al. 2007. Utilizing and conserving agrobiodiversity in agricultural landscapes. *Agriculture Ecosystems & Environment*, 121:196-210.
- Herbert Koepf, *What is Biodynamic Agriculture?* (Biodynamics: Summer/Fall 2007). Available online at: <https://www.biodynamics.com/pdf/f07bd/f07bd-koepfwhatisbdag.pdf>
- FAO. *Livestock's Long Shadow* (Parts III, IV, V, 2006). Available online at: www.fao.org/docrep/010/a0701e/a0701e00.HTM
- Hooper, D. U. et al. 2005. Effects of biodiversity on ecosystem functioning, a consensus of current knowledge. *Ecological Monographs*, 75:3–35.
- Adrian Myers, *Organic Futures: The Case For Organic Farming* (Green Books Ltd: 2005).
- Chapter 1: The ecosystem concept in Chapin, F. S., Matson, P.A. and H. A. Mooney. 2002. *Principles of Terrestrial Ecosystem Ecology*. New York: Springer.
- Meadows, D. 1998. Indicators and information systems for sustainable development. The Sustainability Institute. Chapters 1-4, pages 1-21.
- Liebman, M. and E. R. Gallandt. 1997. Many little hammers: ecological management of crop-weed interactions. Pages 291-343 in L. E. Jackson, ed. *Ecology in Agriculture*. Required reading: pages 307-330.
- Matson, P. A., Parton, W. J., Power, A. G. and Swift, M. J. 1997. Agricultural intensification and ecosystem properties. *Science* 277: 504–509.
- Holling, C. S., and G. K. Meffe. 1996. Command and control and the pathology of natural resource management. *Conservation Biology* 10:328-337.
- Capra, F. 1994. From the parts to the whole: systems thinking in ecology and education. *Elmwood Quarterly*. Summer/Fall - 35-41.
- Bill Mollinson, *Permaculture: A Designers Manual* (Tagari Publications: 1988).

Crossley, D.A., G. J. House, R. M. Snider, R.J. Snider, and B.E. Stinner. 1984. The positive interactions in agroecosystems. In: *Agricultural Ecosystems: Unifying Concepts*, pg. 73–81.

Lee Fryer, *The Bio-Gardener's Bible* (1982).

Masanobu Fukuoka, *The One-Straw Revolution*. (The New York Review Books: 1975).

Green Tech and the Green Revolution

Keith Kloor, *The GMO-Suicide Myth* (Issues in Science and Technology: Winter 2014). Available online at: www.google.com/?gws_rd=ssl#q=the+gmo-suicide+myth

Drake Bennett, *Inside Monsanto, America's Third-Most-Hated Company* (Bloomberg Businessweek, July 3, 2014). Available online at: www.businessweek.com/articles/2014-07-03/gmo-factory-monsantos-high-tech-plans-to-feed-the-world

Pamela Ronald, "Plant Genetics, Sustainable Agriculture and Global Food Security" (2011).

R.A. Fischer, Derek Byerlee, and G. O. Edmeades, *Can Technology Deliver on the Yield Challenge to 2050?* (FAO: 2009). Available online at: [ftp.fao.org/docrep/fao/012/ak977e/ak977e00.pdf](ftp://ftp.fao.org/docrep/fao/012/ak977e/ak977e00.pdf)

Vandana Shiva, *The Future of Food and Seed* (Lecture in Portland, Oregon, 2009). Available online at: www.youtube.com/watch?v=yYwOTLopWlw

Marsden, Terry, *Agri-food contestations in rural space: GM in its regulatory context* (Geoforum, Volume 39, Issue 1, Pages 191–203: January 2008).

Ian Scoones: 2007 Can GM crops prevent famine in Africa? In *The New Famines* Routledge, NY: 312-336.

Lipton, Micheal. 2007. Plant Breeding and the Poor. *Journal of Development Studies*. 43: 31-62.

Johan Rockstrom, *Assessing the Water Challenge of a New Green Revolution in developing Countries* (Proceedings of the National Academy of Sciences, Vol. 104 No. 15: April 10, 2007).

Ruttan, Vernon W., *Controversy about Agricultural Technology: Lessons from the Green Revolution* (International Journal of Biotechnology, 6(1), pp. 43-54: 2004).

Evenson, R.E., and D. Gollin, *Assessing the Impact of the Green Revolution, 1960 to 2000* (Science Vol. 300, no. 5620, pp. 758-762: 2003).

Uma Lele *Biotechnology: Opportunities and Challenges for Developing Countries* (American Journal of Agricultural Economics. 85: 1119-1125: 2003). Available online at: <http://www.umalele.org/publications/biotechnology.pdf>

Peter Rosset, *Do We Need New Technology to End Hunger?* (Institute for Agriculture and Trade Policy: January 10, 2001). Available online at: www.foodfirst.org/media/opeds/2000/4-greenrev.html

Food and Energy

United Nations High Level Panel of Experts, *Biofuels and Food Security*, (June 2013). Available online at: www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf

McMichael, P. Ch. 5 – Biofuels and the financialization of the global food system. In Rosin, C., Stock, P. and Campbell, H. 2012 *Food Systems Failure: The Global Food Crisis and the Future of Agriculture*. NY: Earthscan.

C. Ford Runge, *The Browning of Biofuels: The Political Economy of Policy Failure* (World Politics Review, February 2010). Available online at: www.worldpoliticsreview.com/features/show/33

David Tilman, *Beneficial Biofuels: The Food, Energy, and Environment Trilemma* (Science, Vol. 325, No. 5938, pp. 270-271: July 17, 2009).

Charles, M., Ryan, R., Ryan, N. and Oloruntoba, R. Public policy and biofuels: The way forward? *Energy Policy*, 35, 2007.

Sagar, Ambuj and Kartha Sivan. 2007 Bioenergy and sustainable development? *Annual review of environment and resources*. 32: 131-67.

Mol, Arthur (2007) Boundless Biofuels? *Sociologia Ruralis* 47: 297-315.

Peskett, Slater et al. 2007 Biofuels, Agriculture and Poverty Reduction. *Natural Resource Perspectives*. 107.
<http://www.scidev.net/dossiers/index.cfm?fuseaction=keydocs&dossier=6&doctype=45>

Heller, M and Keoleian, G. 2000. Life Cycle-Based Sustainability Indicators for Assessment of the US Food System. Ann Arbor, MI: University of Michigan Center for Sustainable Systems.

Agriculture, Food Systems and Climate Change

Oxfam, *Hot and Hungry – how to stop climate change derailing the fight against hunger* (Media Briefing 06/2014). Available online at: www.oxfam.org/en/grow/policy/hot-and-hungry

Chicago Council on Global Affairs, *Advancing Global Food Security in the Face of a Changing Climate* (2014). Available online at: http://www.thechicagocouncil.org/files/Studies_Publications/TaskForcesandStudies/GADI/advancing_global_foodsecurity_in_face_climate_change.aspx

Sonja Vermeulen et al., *Climate Change and Food Systems* (Annual Review of Environment and Resources, Vol. 37, pp. 195-222: November 2012).

Munir Hanjra, *Global Water Crisis and Food Security in an Era of Climate Change* (Food Policy, Vol. 35, Issue 5, pp. 365-377: October, 2010).

Eriksen P in press. Global Environmental Change and Food Systems. *Global Environmental Change*. 2008.

Anthony McMichael, *Food, livestock production, energy, climate change, and health* (Lancet, Volume 370, No. 9594, pp1253–1263: October 6, 2007).

Johannes Lehmann, *A Handful of Carbon* (Nature, 447, pp.143-144: May 10, 2007).

Morton et al., 2007. The impact of climate change on smallholder and subsistence agriculture. PNAS. 104: 19680-19685.

Tubiello et al. 2007 Crop and Pasture responses to climate change. PNAS. 104: 19686-19690.

Plummer, R. and D. Armitage (2007). "A resilience-based framework for evaluating adaptive comanagement: Linking ecology, economics and society in a complex world." *Ecological Economics* 61: 62-74.

Metzger, Leemans, Schroter (2005) A multidisciplinary multi-scale framework for assessing vulnerabilities to global change. *International Journal of Applied Earth Observation and Geoinformation*. 7: 253-267.

Rattan Lal, *Soil Carbon Sequestration Impacts on Global Climate Change and Food Security* (Science, Vol. 304 no. 5677, pp. 1623-1627: June 11, 2004).

Aggarwal, PK, PK Joshi, JSI Ingram, RK Gupta. 2004. Adapting food systems of the Indo-Gangetic plains to global environmental change. *Environmental Science and Policy*. 7: 487-498.

Reilly, J. and D. Schimmelpfenning (2000). "Irreversibility, uncertainty, and learning: Portraits of adaptation to long-term climate change." *Climatic Change* 45: 253-278.

Examples of Field Study Sites and Resources

The following list includes organizations and sites that may be included in the program. Due to IHP Rethinking Food Security's interdisciplinary nature, –study sites and guest lecturers will correspond to multiple courses. This list is preliminary and represents many contacts that have been made to help inform the program development. The final schedule of contacts will evolve.

United States

- Food First Institute for Food and Development Policy, Oakland
- Berkeley Food Policy Institute
- California Certified Organic Farmers, Santa Cruz
- Roots of Change, Oakland
- Oakland Food Policy Council, Oakland
- Chez Panisse Foundation, The Edible Schoolyard Project, Berkeley
- The Trust for Public Land, San Francisco
- Gill Tract Farm Coalition, Gill Tract, Albany
- AG Innovations Network, Sebastopol
- Center for Ecoliteracy, Berkeley
- Berkeley Bowl Market Place, Berkeley
- Ecology Center Farmers' Markets, Berkeley
- People's Grocery, Oakland
- California Fresh Works Fund

- Migration and labor rights organizations

Tanzania

- Ministry of Agriculture, Food Security and Cooperatives
- Ministry of Livestock and Fisheries Development
- SWIOFish Project
- Tanzania Investment Centre
- Tanzania Food and Nutrition Centre
- Tanzania Association of Microfinance Institutions
- Sugar Board of Tanzania
- International Crops Research Institute for the Semi-Arid Tropics (Nairobi)
- Tanganyika Farmers Association
- Mviwata Arusha
- Ministry of Livestock - Livestock Training Insititute
- Soil Conservation and Agroforestry Project (SCAPA)
- Traditional Irrigation Improvement Project
- Serengetti National Park
- Ngorongoro Conservation Area
- Lake Manyara National Park
- Southern Agricultural Corridor of Tanzania (Sagcot)
- Pelum Tanzania (Morogoro)
- Mviwata Iringa
- Hifadhi Maziringa Project (HIMA)
- Concern Tanzania
- Savings and Credit Cooperative
- Marti-Uyole Ag Center
- Indigenous Soil and Water Conservation Program
- Tanzania Media Women's Association
- Darajani and Forodhani food markets
- Jozani Chwaka Bay National Park

India

- International Food Policy Research Institute, New Delhi
- Center for Environmental Planning and Technology, Ahmadabad
- Research Foundation for Science, Technology and Ecology
- National Commission on Agriculture, Food and Nutrition Security of India
- Institute of Rural Management
- Right to Food Campaign
- Junagadh Agricultural University
- Siddi communities
- Gir Forest National Park
- International Crops Research Institute for the Semi-Arid Tropics (CGIAR), Patancheru

Italy

- Committee on World Food Security, United Nations, Rome
- International Food Security & Nutrition Civil Society Mechanism, UN, Rome
- World Food Program, United Nations, Rome

- Food and Agriculture Organization of the United Nations, Rome
- International Fund for Agriculture and Development, United Nations, Rome
- Codex Alimentarius International Food Standards, United Nations, Rome
- Italian Ministry for Agriculture, Food and Forestry, Rome
- Slow Food Foundation for Biodiversity, Bra
- Eataly Alti Cibi, Torino
- University of Gastronomical Sciences, Pollenzo, Torino
- Turin Metropolitan Food Commission
- University of Torino
- Coldiretti, Torino
- Laboratorio Chimico della Camera di Commercio di Torino
- Istituto Zooprofilattico Sperimentale del Piemonte, Torino
- Centro Agro Alimentari di Torino, Torino
- Gruppi di Acquisto Solidale, Torino
- Movimento Consumatori, Torino
- Ristorazione Collettiva Sostenibile, Torino
- Cooperativa Agricola Il Frutto Permessso, Bibiana

Evaluation and Grading Criteria

Description of Assignments:

Participation

Participation in the course activities is evaluated based on punctual attendance at all activities; informed participation in all activities, including group discussions, field trips, and lectures; and encouragement and support of group members in their studies and contribution to maintaining a positive learning atmosphere in the group.

Assessment:

Field Notes	20%
Synthesis Reports	30%
Group Research Project	40%
Participation	10%

Grading Scale

94-100%	A	Excellent
90-93%	A-	
87-89%	B+	
84-86%	B	Above Average
80-83%	B-	
77-79%	C+	
74-76%	C	Average
70-73%	C-	
67-69%	D+	
64-66%	D	Below Average
below 64	F	Fail

Expectations and Policies

- Show up prepared. Be on time, have your readings completed and points in mind for discussion or clarification. Complying with these elements raises the level of class discussion for everyone.
- Have assignments completed on schedule, printed, and done accordingly to the specified requirements. This will help ensure that your assignments are returned in a timely manner.
- Ask questions in class. Engage the lecturer. These are often very busy professionals who are doing us an honor by coming to speak....
- Comply with academic integrity policies (no plagiarism or cheating, nothing unethical).
- Respect differences of opinion (classmates', lecturers, local constituents engaged with on the visits). You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.

Please refer to the SIT Study Abroad Student Handbook for policies on academic integrity, ethics, warning and probation, diversity and disability, sexual harassment, and the academic appeals process.