Food Systems for Poverty Reduction: Concepts and Themes
IARD 6040/AEM 6040
Fall 2012 (revised 1 October 2012)

When and Where: Tuesdays and Thursdays, 2:55 – 4:10, 145 Warren Hall

Lead Instructors: Address all general inquiries, including requests for permission to join the course, to:

Chris Barrett, Charles H. Dyson School of Applied Economics and Management, 435 Warren Hall, 255-4489, cbb2@cornell.edu . Office hours: Tuesdays 1:00-2:30 PM and Thursdays 10:30 AM-12:00 PM.

Rebecca Nelson, Departments of Plant Pathology and Plant-Microbe Biology and Plant Breeding & Genetics; 303A Plant Science; 254-7475; rjn7@cornell.edu; Office hours: by appointment.

Co-Instructors:

Rachel Bezner Kerr, Department of Development Sociology, 607-255-3213; rnb5@cornell.edu. Office hours: by appointment.

Carol J. Pierce Colfer, Cornell International Institute for Food, Agriculture and Development (CIIFAD); Mann Library basement; 607-291-4058 (home), 607-379-9977 (cell); cjc59@cornell.edu. Office hours: by appointment.

Andrew Jones, Division of Nutritional Sciences, 313 Savage Hall, 607-254-1289; adj23@cornell.edu. Office hours: by appointment.

Karim-Aly Kassam, Department of Natural Resources, 8A Fernow Hall; (607) 255-9757; ksk28@cornell.edu. Office hours: Wednesdays 1-2 pm or by appointment.

Johannes Lehmann, Department of Crop and Soil Sciences; 909 Bradfield Hall; 254-1236; CL273@cornell.edu Office hours: Wednesdays 11-12 and by appointment.

Beth Medvecky, Cornell International Institute for Food, Agriculture and Development; 31 Warren Hall; 254-6558; bam44@cornell.edu; Office hours: Wednesdays 9 am – noon or by appointment.

Alice Pell, Department of Animal Science, 115 Day Hall; 255-7993; ap19@cornell.edu Office hours: by appointment. Please contact Linda Schmidt (lms10@cornell.edu) for an appointment.

Per Pinstrup-Andersen, Division of Nutritional Sciences, 305 Savage Hall; 255-9429; pp94@cornell.edu Office hours: Tuesdays and Wednesdays 2:00-4:00 PM

Alison Power, Department of Ecology & Evolutionary Biology; 331 Corson Hall; 254-2333; agp4@cornell.edu Office hours: by appointment.

Tammo Steenhuis, Dept. of Biological and Environmental Engineering; 206 Riley Robb Hall; 255-2489; tss1@cornell.edu Office hours: By appointment.

Alex Travis, Department of Reproductive Biology; 120 Baker Institute West Wing; 256-5613; ajt32@cornell.edu. Office hours: by appointment.

Course overview: This course, which is part of the Food Systems and Poverty Reduction IGERT course and seminar sequence, will introduce concepts, empirical evidence and theories and methods from multiple disciplines. The objective in this first semester is to provide all IGERT Trainees and Associates with a common base knowledge across the whole food system, drawing on multiple disciplines. The course consists of eight modules, each focused on a different aspect of the food system. Necessarily, most of the material will push most students well outside their comfort zone; this is to be expected, indeed embraced. The objective is to familiarize students with basic concepts and terms in disciplines with which they will likely need to interact in due time, and to help students find the connections among the concepts, methods and themes of the various disciplines engaged in the study of food systems and poverty reduction. Given this orientation, most classes are instructor-led, but typically with substantial student engagement in discussion of key readings and identification of key research topics sparked by readings and concepts. The syllabus is punctuated by two sessions of student-led discussion of the integration of material presented to that point in the course. Cross-cutting themes will include gender issues, spatially explicit analysis, and the complementary roles of modern scientific research and development and of community-based institutions.

The course is three credits. IGERT trainees and associates must take it for a letter grade. Others can take course S/U with lead instructors' permission.

We strongly recommend all students faithfully attend the CIIFAD weekly seminar, which is an excellent complement to this course. The schedule is available at http://ciifad.cornell.edu/seminars.cfm.

Assignments:

Readings will be posted to the course Blackboard (Bb) site, which students should consult regularly for announcements as well. A couple of longer, book-length readings are on reserve at Mann Library.

Grades will be based on the following:

- Class participation. The course requires active student engagement in discussing the assigned readings in class, and in helping each other understand the theories, methods, empirical evidence and traditions of their various disciplines. Active student engagement requires doing the required readings prior to the class meeting. Toward that end, all co-instructors are encouraged to call on all students individually to answer questions and discuss concepts, not just on volunteer respondents. So be prepared! Class participation counts for 20% of the final grade.
- Each student will submit a brief summary of the key terms (i.e., glossary) and messages for each of the seven modules, covering both the readings and the lectures. This summary (glossary and key messages in bullet form, for a total of 2-3 pages) is due by 5:00 PM one week after the close of the relevant module, submitted via email to the faculty member grading that assignment (dates and faculty are listed in the course calendar below). The seven summaries cumulatively count for 30% of the final grade.
- A final literature review paper that takes an explicitly interdisciplinary, food systems view on a selected problem (preferably, of potential relevance to the student's dissertation). This is due Wednesday, December 12, although extensions are permitted for students willing to receive a temporary grade of INC. This counts for 50% of the final grade.

Academic integrity statement: Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work. See Code of Academic Integrity http://cuinfo.cornell.edu/Academic/AIC.html).

Plagiarism will not be tolerated in this course (To avoid and recognize plagiarism visit the following website: http://plagiarism.arts.cornell.edu/tutorial/index.cfm).

You are encouraged to study together and to discuss information and concepts with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of a course assignment done by someone else, in the form of an e mail, an electronic file, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Code can also be extended to include failure of the course and University disciplinary action.

Lectures and Readings Calendar (required readings are listed following session objectives; supplementary readings are entirely optional for students who wish to plumb a topic in more depth)

Thursday, August 23 (C. Barrett). Introduction I

- Objectives: To introduce course and general approach; familiarization with basic ideas of food systems and of poverty analysis and poverty traps (core concepts and measures):
    - P. Pinstrup-Andersen and D. Watson (2011), "Food Policy for Developing Countries: The Role of Government in Global, National and Local Food Systems" Cornell University Press 2012, Chapter 1
    - C.B. Barrett (2008), "Poverty Traps and Resource Dynamics In Smallholder Agrarian Systems", in A. Ruis and R. Dellink, eds., *Economics of poverty, the environment and natural resource use.* Dordrecht: Springer.

  Supplementary readings:

    - Chen, S. and M. Ravallion (2009), "The Changing Profile of Poverty in the World," *Chap. 2 in J. von Braun, R.V. Hill and R. Pandya-Lorch, eds.,* The Poorest and Hungry (Washington: IFPRI).
    - Carter, M.R. and C.B. Barrett (2006), "The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach," *Journal of Development Studies*. 42, 2, pp. 178-199.
    - Lipton, M. and M. Ravallion (1995), "Poverty and Policy," chap. 42 in J. Behrman and T.N. Srinivasan, eds., *Handbook of Development Economics, vol. 3* (Amsterdam: Elsevier).

Tuesday, August 28 (R. Nelson)**.** Introduction II

- Objectives: To introduce course and general approach; familiarization with basics of food systems (core concepts and measures):
    - Erickson, P. 2008. Conceptualizing food systems for global environmental change research. Global Environmental Change 18: 234-245.
    - Whitbread, A.M., M.J. Robertson, P.S. Carberry and J.P. Dimes. 2010. How farming systems simulation can aid the development of more sustainable smallholder farming systems in southern Africa. European Journal of Agronomy 32: 51-58.

  Supplementary readings:

- Ruthenberg, H. and J. D. MacArthur (1980). Farming systems in the tropics. Chapter 2. Oxford; New York, Clarendon Press ; Oxford University Press.

Module 1: Poverty, Policy and Institutions: Macro and market scales (C. Barrett/P.Pinstrup-Andersen)

Thursday, August 30 (C. Barrett). Objective: understand the place of agriculture and food systems in poverty reduction and the importance of macro-scale phenomena to the incentives and constraints faced by the poor.

- A. de Janvry and E. Sadoulet (2009), "Agricultural Growth and Poverty Reduction: Additional Evidence," *World Bank Research Observer* 25 (1): 1-20.
- R. Evenson and D. Gollin (2003), "Assessing the Impact of the Green Revolution, 1960 to 2000," *Science* 300, pp. 758-762.

Supplementary readings:

- World Bank (2008), *World Development Report 2008: Agriculture for Development*, especially chapters 1, 3, 5, 7 and 8.
- C.P. Timmer (1988), "The Agricultural Transformation." In H. Chenery and T.N. Srinivasan eds., *Handbook of Development Economics,* Vol. 1. Amsterdam: North-Holland, pp. 275-331.
- B. Minten and C.B. Barrett (2008), "Agricultural Technology, Productivity and Poverty in Madagascar," *World Development* 36: 797-822.
- Barrett, C.B. (2011), "The Economics of Agricultural Development: An Overview," chap. 1 in C.B. Barrett, ed., Agricultural Development: *Agricultural Development: Critical Concepts in Development Studies*, vol. 1 (London: Routledge).

Tuesday, September 4 (C. Barrett). Objectives: To learn about agricultural market institutions, how they function and how smallholder farmers and poor rural consumers engage with markets, with an emphasis on sub-Saharan Africa.

- J.-P. Platteau (1994), "Behind The Market Stage Where Real Societies Exist - Part I: The role of public and private order institutions," *Journal of Development Studies* 30(3): 533-577.
- J.-P. Platteau (1994), "Behind The Market Stage Where Real Societies Exist - Part II: The role of moral norms," *Journal of Development Studies* 30(4): 753-817.
- C.B. Barrett (2008), "Smallholder market participation: Concepts and evidence from eastern and southern Africa," *Food Policy* 33: 299–317

Supplementary readings:

- C.M. Moser, C.B. Barrett and B. Minten (2009), "Spatial Integration at Multiple Scales: Rice Markets in Madagascar," *Agricultural Economics* 40(3): 281-294.
- C.B. Barrett (1997), "Food Marketing Liberalization and Trader Entry: Evidence from Madagascar," *World Development* 25(5): 763-777.
- C.B. Barrett, M.E. Bachke, M.F. Bellemare, H.C. Michelson, S. Narayanan, T.F. Walker (2012) , "Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries," *World Development* 40(4): 715–730.

- T. Reardon and C.P. Timmer (2007), "Transformation of Markets for Agricultural Output in Developing Countries Since 1950: How Has Thinking Changed? " in R.Evenson and P. Pingali, eds., *Handbook of Agricultural Economics, vol. 3* (Amsterdam: Elsevier).

Thursday, September 6 (P. Pinstrup-Andersen). Objectives: To analyze a specific institutional case study in a role playing exercise.

- Vio, Fernando and Ricardo Uauy. The Sugar Controversy. Case 9-5 (http://cip.cornell.edu/gfs)

Module 2: Socio-Cultural Systems (C. Colfer / K.-A. Kassam)

Tuesday, September 11 (C. Colfer). Objectives: To explore the relevance of gender issues in food and agricultural systems, using the example of swidden agricultural systems (common in the tropics) in SE Asia; and to consider three methodological approaches to the study of gender.

- Shackleton, S., F. Paumgarten, H. Kassa, M. Husselman and M. Zida 2011. Opportunities for Enhancing Poor women's Socio-Economic Empowerment in the Value chains of Three African Non-Timber Forest Products (NTFPs). International Forestry Review 13: 136-151.
- Colfer, Carol J. Pierce and Rebakah Daro Minarchek (in press). Women, Men and Forest Research: A Review of Approaches, Resources, and Methods for Addressing Gender. CIFOR Occasional Paper, Bogor, Indonesia

Supplementary Readings:

- Djoudi, H. and M. Brockhaus 2011. Is Adaptation to Climate Change Gender Neutral? Lessons from Communities Dependent on Livestock and Forests in Northern Mali. International Forestry Review 13: 123-135.

Sept.13: Module 1 key terms and messages assignment due to Prof. Barrett.

Thursday, September 13 (K.-A. Kassam). Objectives: To appreciate the complex interconnectivity between the ecological and the socio-cultural; and, To comprehend that individual actions informed by cultural systems manifest themselves in social structures that rely on ecological foundations.

- Kassam, Karim-Aly. 2009. "Chapter 1: Introduction, Chapter 2: Relations Between Culture and Nature: A Critical Consideration; and Chapter 3: Human Ecology Reconceptualised: A Lens of Relationships Between Biological and Cultural Diversity." In *Biocultural Diversity and Indigenous Ways of Knowing: Human Ecology in the Arctic*. Calgary: University of Calgary Press. pp.1-91. Electronic copy freely available (https://dspace.ucalgary.ca/bitstream/1880/47782/3/UofCPress_BioculturalDiversity_2009.pdf).

Supplementary readings:

- Miller, Thaddeus, Timothy D. Baird, Caitlin M. Littlefield, Gary Kofinas, F. Stuart Chapin III and Charles Redman. 2008. Epistemological Pluralism: Reorganizing Interdisciplinary Research. Ecology and Society 13(2): 46. http://www.ecologyandsociety.org/vol13/iss2/art46/.

Tuesday, September 18 (K.-A. Kassam). Objective: To illustrate the participatory and experiential basis of indigenous and local knowledge.

- Kassam, Karim-Aly. 2009. "Chapter 5: "The Weather is Going Under" – Human Ecology, *Phronesis*, and Climate Change in Wainwright, Alaska. In *Biocultural Diversity and Indigenous Ways of Knowing: Human Ecology in the Arctic*. Calgary: University of Calgary Press. pp.159-189. Electronic copy freely available (https://dspace.ucalgary.ca/bitstream/1880/47782/3/UofCPress_BioculturalDiversity_2009.pdf).

Supplementary readings:

- Davis A., and Ruddle K. 2010. "Constructing confidence: Rational skepticism and systematic enquiry in local ecological knowledge research". *Ecological Applications.* 20 (3): 880-894.

Module 3: Agroecology (A. Power)

Thursday, September 20: (A. Power). Objectives: To introduce agriculture as an ecological system, with human management as a major system influence; familiarization with ecological processes that influence the productivity and environmental impacts of agricultural systems.

- Kibblewhite, M. G., K. Ritz and M. J. Swift. 2008. Soil health in agricultural systems**.** *Phil. Trans. R. Soc. B* 363: 685–701
- Vitousek, P. M., Naylor, R., Crews, T., David, M. B., Drinkwater, L. E., Holland, E., Johnes, P. J., Katzenberger, J., Martinelli, L. A., Matson, P. A., Nziguheba, G., Ojima, D., Palm, C. A., Robertson, G. P., Sanchez, P. A., Townsend, A. R. & Zhang, F. S. 2009 Nutrient imbalances in agricultural development. *Science* 324: 1519-1520.
- Shennan**,** C 2008. Biotic interactions, ecological knowledge and agriculture. *Phil. Trans. R. Soc. B* 2008 363, 717-739.

Sept.25: Module 2 key terms and messages assignment due to Dr. Colfer.

Tuesday, September 25: (A. Power) Objectives: To introduce major groups of organisms that influence agroecosystem function, including plant communities, soil microbial and invertebrate communities, and communities of above-ground consumers (herbivores, pathogens, and natural enemies).

- Drinkwater LE, Snapp SS. 2007. Nutrients in agroecosystems: Rethinking the management paradigm. *Adv. Agron*. 92:163–86.

- 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.

Supplementary reading

- Glover, J.D., S. W. Culman, S. T. DuPont, W. Broussard, L. Young, M. E. Mangan, J. G. Mai, T. E. Crews, L. R. DeHaan, D. H. Buckley, H. Ferris, R. E. Turner, H. L. Reynolds, D. L. Wyse. 2010. Harvested perennial grasslands provide ecological benchmarks for agricultural sustainability. *Agriculture, Ecosystems and Environment* 137: 3–12.

Module 4: Farming systems (R. Nelson/B. Medvecky)

Tuesday, September 27 (R. Nelson). Objective: To introduce basic concepts and frameworks for understanding African farming systems. Environmental drivers and systems evolution under human management will be considered.

- Dixon, J. A., D. P. Gibbon, et al. (2001). Farming systems and poverty : improving farmers' livelihoods in a changing world. Rome; Washington D.C., FAO. (Introduction and SSA chapter)
- Keating, B. A., P. S. Carberry, et al. (2010). "Eco-efficient Agriculture: Concepts, Challenges, and Opportunities." Crop Science 50(Supplement_1): S-109-119.

Supplementary readings:

- Ruthenberg, H. and J. D. MacArthur (1980). Farming systems in the tropics. Chapters 1 and 2. Oxford; New York, Clarendon Press ; Oxford University Press.

Oct. 2: Module 3 key terms and messages assignment due to Prof. Power.

Tuesday, October 2 (B. Medvecky). Objective: To illustrate how interaction among biophysical and socioeconomic factors can contribute to poverty and food insecurity in African cropping systems, using cassava as an example.

- Hillocks, R. J. (2002). Cassava in Africa. Cassava: Biology, Production and Utilization. R. J. Hillocks, J.M. Thresh, A.C. Belloti, CAB International.
- Fermont, A. M., P. J. A. van Asten, et al. (2008). "Increasing land pressure in East Africa: The changing role of cassava and consequences for sustainability of farming systems." Agriculture, Ecosystems & Environment 128(4): 239-250.

Supplementary reading

- Fermont, A. M., Obiero, H.M., van Asten, P.J.A., Baguma, Y., Okwuosa E (2007). Improved cassava varieties increase the risk of soil nutrient mining: an ex-ante analysis for western Kenya and Uganda. Advances in Integrated Soil Fertility Management in Sub-Saharan Africa: Challenges and Opportunities. A. Bationo, Springer: 511-519.

- Legg, J. P. (2010). Epidemiology of aWhitefly-Transmitted Cassava Mosaic Geminivirus Pandemic in Africa. In: Bemisia: Bionomics and Management of a Global Pest. Springer.p. 233-257.
- Legg, J. P. and J. M. Thresh. (2001). Cassava virus diseases in Africa. Plant Virology in Sun-Saharan Africa, Conference Proceedings, Ibadan, Nigeria, International Institute of Tropical Agriculture (IITA).

Thursday, October 4 (B. Medvecky). Objective: To explore the consequences of staple crop domination and the potential (and obstacles) of leguminous crops to enhance ecosystems services in cereal-based, small-holder production systems

- McCann, J. (2005). Maize and grace: Africa's encounter with a New World crop, 1500-2000. Cambridge, Mass., Harvard University Press. (p 1-22)
- Ruthenberg, H. and J. D. MacArthur (1980). Farming systems in the tropics. (Oxford; New York, Clarendon Press ; Oxford University Press. (Chapter 6. Systems with Permanent upland cultivation).
- Snapp, S.S. and S.M. Silim. (2002) Farmer preferences and legume intensification for low nutrient environments. Plant and Soil 245(1): 181-192.

Supplementary readings:

- Ojiem, J. O. (2006). Exploring socio-ecological niches for legumes in western Kenya smallholder farming systems. Wageningen, Wageningen University and Research Centre.
- Wortmann, C.S., and B.A.M. Kirungu. 1999. Adoption of soil improving and forage legumes by smallholder farmers in Africa. In: Stur, W.W., Horne, P.M, Hacker, J.P., Kerridge, P.C. (Eds.), Working with farmers: the key to adoption of forage technologies. Mindano, Philippines, ACIAR, Canberra. pp.140-148.
- Snapp, S. S., M. J. Blackie, et al. (2003). "Realigning research and extension to focus on farmers' constraints and opportunities." Food Policy 28(4): 349-363.

Tuesday, October 9: Fall Break (Enjoy!)

Thursday, October 11 (R. Nelson). Objectives: To become familiar with issues and methods related to plant breeding as related to current and past efforts to address food insecurity in the developing world; consider the biological and institutional issues surrounding improvement of staple crops. (R. Nelson)

- Weltzien, E. and A. Christinck. 2008. Participatory plant breeding: developing improved and relevant crop varieties with farmers. Chapter 7 (pp. 211-251) in Agricultural Systems: Agroecology and Rural Innovation for Development. Academic Press, 2008.

Supplementary readings

- DeVries, J. and G. Toenniessen. 2001. Securing the Harvest: Biotechnology, Breeding and Seed Systems for African Crop. CABI.
  - Chapter 4: Breeding – Between and Art and a Science
  - Chapter 5: Biotechnology: Expanded Possibilities

Tuesday, October 16. Synthesis Discussion 1: Discussion on linking social and technical innovation processes.

Module 5: Microeconomics; Agriculture and Nutrition (C. Barrett / A.Jones / R. Bezner Kerr)

Thursday, October 18 (C. Barrett)**:** Objectives: To understand the microeconomic behaviors of agricultural households.

- A. de Janvry, Fafchamps, M., and Sadoulet, E. (1991), "Peasant household behavior with missing markets: Some paradoxes explained". *Economic Journal* 101: 1400-1417.
- L.Haddad and R. Kanbur (1990), "How serious is the neglect of intra-household inequality? ", *Economic Journal* 100 (402): 866-881.

Supplementary readings:

- H.P. Binswanger and M. Rosenzweig (1986), "Behavioural and Material Determinants of Production Relations in Agriculture". *Journal of Development Studies* 22: 503-539.
- C.B. Barrett (2011), "Displaced Distortions: Financial Market Failures and Seemingly Inefficient Resource Allocation in Low-Income Rural Communities," in E. Bulte and R. Ruben, eds., *Development Economics Between Markets and Institutions: Incentives for growth, food security and sustainable use of the environment* (Wageningen: Wageningen Academic Publishers).

Oct.23: Module 4 key terms and messages assignment due to Prof. Nelson.

Tuesday, October 23 (A. Jones): Objective: To understand the linkages between the food systems and nutrition from a policy perspective

- Anna Herforth, Andrew Jones and Per Pinstrup-Andersen (2012), Prioritzing Nutrition in Agriculture and Rural Development: Guiding Principles for Operational Investments. World Bank Health, Nutrition and Population Discussion Paper.

Supplementary readings:

- Per Pinstrup-Andersen (forthcoming), Guiding Food System Policies for Better Nutrition. Background paper prepared for FAO's SOFA 2013

Thursday, October 25 (R. Bezner Kerr): A case study – links between agriculture and nutrition in rural Malawi.

- Bezner Kerr, R., Berti, P.R. and Shumba, L. 2010. 'Effects of Participatory Agriculture and Nutrition project on Child Growth in Northern Malawi' **Public Health Nutrition 14(8):1466-1472.** doi:10.1017/S1368980010002545.
- Satzinger, F, R. Bezner Kerr and L. Shumba.(2009). "Farmers integrate nutrition, social issues and agriculture through knowledge exchange in northern Malawi." Ecology of Food and Nutrition 48 (5): 369-382.
- Bezner Kerr, R. (2008). "Gender and Agrarian Inequality at the Local Scale" In: S.S. Snapp and B. Pound (eds). Agricultural Systems: Agroecology and Rural Innovation, pp. 279-306. San Diego: Elsevier Press.

Tuesday, October 30: Discussion of issues to date.

Module 6: Livestock (A. Pell/A. Travis)

Thursday, November 1 (A. Pell). Objectives: To introduce the important roles of livestock in rural and agricultural development. To provide overviews of the social and public health benefits, systems of production, constraints on production, and environmental tradeoffs associated with livestock. To introduce household and national-scale economic issues and policy aspects of livestock production.

- Randolph, T. F., et al., Role of livestock in human nutrition and health for poverty reduction in developing countries, J. Anim. Sci. 85:2788-2800 (2007)
- Jones, P. G. and Thornton, P. K. Croppers to livestock keepers: livelihood transitions to 2050 in African due to climate change. Environmental Science and Policy 12: 427-437 (2009)
- Kristjanson,P., et al., Pathways out of Poverty in Western Kenya and the Role of Livestock. ILRI, PPLPI Working Paper # 14

Supplementary reading:

- Otte, M. J., Nugent, R., McLeod, A., Transboundary Animal Diseases: Assessment of socio-economic impacts and institutional responses, FAO, UN, Livestock Policy Discussion Paper #9 (2004)
- *Livestock's Long Shadow*, Food and Agriculture Organization of the United Nations, 2006
- Allen, L.H. Interventions for Micronutrient Deficiency Control in Developing Countries: Past, Present and Future. J. Nutr. 133:3875S-3878S, 2003

Nov. 6: Module 5 key terms and messages assignment due to Dr. Jones.

Tuesday, November 6 (A. Travis). Objectives: To describe and contrast pastoral and integrated cattle production systems.

- Behnke R.H. and Scoones I. 1993. Rethinking range ecology: Implications for rangeland management in Africa. In: Behnke R.H., Scoones I. and Kerven C. (eds), *Range ecology at*

disequilibrium: New models of natural variability and pastoral adaptation in African savannas. ODI (Overseas Development Institute), London, UK. pp. 1–30.

- Herrero, M. et al., Smart investments in Sustainable Food Production: Revisiting Mixed Crop-Livestock Systems, Science, 327:822-825 (2010)
- Lekasi, J. K., et al., Manure Management in the Kenya Highlands: Practices and Potential. 2nd Ed., 2001

Supplementary reading:

- Powell, J. M., Pearson, R. A., and Hiernaux, P. H., Crop-Livestock Interactions in the West African Drylands. Agron. J., 96:469-483 (2004)
- Bebe, B.O., et al., Smallholder dairy systems in the Kenya highlands: cattle population dynamics under increasing intensification, Livestock Production Science 82: 211-221 (2003)
- Lanyasunya, T.P., et al., Factors limiting optimization of smallholder peri-urban dairy herd production in Kenya, Livestock Community and Environment, Proceedings of the 10th Conference of the Association of Institutions for Tropical Veterinary Medicine, Copenhagen, Denmark, 2001

Thursday, November 8 (A. Travis). Objectives: To present an overview of the production, constraints on production, and environmental tradeoffs associated with other livestock species, including chickens, goats, and fish.

- Kitalyi, A. J. Village chicken production systems in rural Africa: household food security and gender issues. FAO UN, Animal Production and Health Paper #142.
- Harrison, J. L. and Alder, R. G. As assessment of chicken husbandry including NewCastledisease control in rural areas of Chibuto, Mozambique, Trop Anim Health Prod 42;729-736 (2010)

Supplementary reading:

- Wambwa, E., Diseases of Importance at the Wildlife/livestock Interface in Kenya, Ch. 3

Module 7: Soil and Water (J. Lehmann/T. Steenhuis/B. Medvecky)

Tuesday, November 13 (J. Lehmann)**.** Objectives: To convey key concepts regarding soils and soil productivity. To identify constraints to soil nutrient fertility in tropical soil with focus on eastern Africa. To provide an overview of current approaches to address constraints: mineral fertilizers; agroforestry.

- Sanchez PA 2002 Soil Fertility and Hunger in Africa. Science 295, 2019 - 2020
- Sanchez, P. A. 1999. "Delivering on the Promise of Agroforestry." Environment, Development and Sustainability 1(3): 275-284
- Vanlauwe and Giller 2006 Popular myths around soil fertility management in sub-Saharan Africa . Agriculture, Ecosystems and Environment 116, 34-46

Supplementary readings:

- Sanchez P 1995 Science in Agroforestry. 1995. Agroforestry System 30(1-2):5-55
- Schroth G 1999 Tree root characteristics as criteria for species selection and systems design in agroforestry. Agroforestry System 30, pp. 125-143

Nov.15: Module 6 key terms and messages assignment due to Prof. Pell

Thursday, November 15: (J. Lehmann)**:** Objectives: To understand the potential and limitations of conservation agriculture.

- Giller KE, Witter E, Marc Corbeels M, Tittonell P (2009) Conservation agriculture and smallholder farming in Africa: The heretics' view. Field Crops Research 114, 23-34
- Hobbs P, Ken S, Raj G 2008 The role of conservation agriculture in sustainable agriculture Phil. Trans. R. Soc. B 12 February 2008 vol. 363 no. 1491 543-555

Supplementary readings:

- D Knowler, B Bradshaw 2007 Farmers' adoption of conservation agriculture: A review and synthesis of recent research. Food Policy 32, 25–48

Tuesday, November 20: (T. Steenhuis): Objectives: Become familiar with various forms of water (green, blue, grey and virtual) and how this is linked with food production, public health and hence economic well-being. In addition, an overview will be given of the movement of water in the landscape with a focus on the Ethiopian highlands, underscoring that steep slopes are not necessarily the source of all surface runoff. Discussion of the success and failures of different management approaches to conserve soil and water.

- Rockström. J. Green water security for the food makers of tomorrow: windows of opportunity in drought-prone savannahs. Water Science and Technology Vol 43 No4 pp 71–78
- Steenhuis TS, Collick AS, Easton ZM, Leggesse ES, Bayabil HK, White ED, Awulachew SB, Adgo E, Ahmed AA. 2009. Predicting Discharge and Erosion for the Abay (Blue Nile) with a Simple Model. Hydrological Processes 23, 3728-3737
- Mitiku, H., Herweg, K., Stillhardt, B., 2006. Sustainable Land Management – A New Approach to Soil and Water Conservation in Ethiopia. Mekelle, Ethiopia: Land Resources Management and Environmental Protection Department, Mekelle University; Bern, Switzerland: Centre for Development and Environment (CDE), University of Bern, and Swiss National Centre of Competence in Research (NCCR) North-South. 269 pp. http://www.nccr-north-south.unibe.ch/publications/Infosystem/On-line%20Dokumente/Upload/haile,%20herweg,%20stillhardt_2006_Sustainable%20land%20management%20%E2%80%93%20a%20new%20approach%20to%20soil%20and%20water%20conservation%20in%20Ethiopia.pdf
  Please read the following sections: Section 1.4 p 24-25; sections 2.4 and 2.5, p39-50; section 9.1 p 164.165; sections 9.4 -9.6 p 173-179; sections 10.1 and 10.2, p181-191.

Thursday, November 22: Happy Thanksgiving!

Wrap-up: Linking subsystems (C. Barrett/R.Nelson)

Tuesday, November 27 (R. Nelson): Objective: Student-led discussion of integration of concepts discussed in course, with an emphasis on farm-level natural resources management issues, especially concerning soil fertility, pests and pathogens.

- Giller, K. E., P. Tittonell, et al. (2011). "Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development." Agricultural Systems 104(2, Sp. Iss. SI): 191-203.

*Nov. 27: Module 7 key terms and messages assignment due to Dr. Medvecky***.**

Thursday, November 29 (C.Barrett): Objective: Student-led discussion of integration of concepts discussed in course, with an emphasis on health, food security and nutrition issues.

- A.P. Gutierrez, G. Gilioli and J. Baumgartner (2009), "Ecosocial consequences and policy implications of disease management in East African agropastoral systems," *Proceedings of the National Academy of Sciences* 106(31): 13136-13141.
- C.B. Barrett (2010), "Measuring Food Insecurity," Science 327(5967): 825-828.
- E.C.Stephens et al. (in press), "Modeling the impact of natural resource-based poverty traps on food security in Kenya: The Crops, Livestock and Soils in Smallholder Economic Systems (CLASSES) model," *Food Security*.

Dec. 12: Term paper due to Profs. Barrett and Nelson (extensions permissible by prior arrangement)