

**Spring 2021 AOM 4932/6932**  
**Course title: Agricultural Intensification: Tradeoffs or Synergies with the Environment and Livelihoods**

**Instructor: Cheryl Palm Agricultural and Biological Engineering Department and Food Systems Institute**

COVID Response Statements For face to face courses a statement informing students of COVID related practices such as: We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions. • You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution. • This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations. • Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class. • Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom. • If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms. • Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

**Course Description:** 2 credits. This interdisciplinary course is designed to teach students about the principles of sustainable agricultural intensification (SAI) and to explore the challenges to achieve SAI. We will begin with the history, science and impact of agricultural intensification, including the Green Revolution that doubled global food supplies between 1970 and 1995. We explore the effects of agricultural intensification on the environment (water quality, greenhouse gases, biodiversity), and human livelihoods (income, food security, nutrition). Though the focus is on developing countries the course will include temperate and regional comparisons for a broader understanding of the global food production system.

The course will combine readings and discussions sessions with occasional assignments. There is an opportunity to take an additional section on data analysis that includes a specific topic of interest to the student.

- 1. Pre-requisites and Co-requisites:** Students should have familiarity with agricultural production systems; however the course will provide basic background and reading materials to cover the interdisciplinary areas of agricultural production, economics, environment, and livelihood considerations.

Those students selecting the lab section should be able to use Microsoft Excel. Experience with and/or some data analysis software including STATA, R, and such would be helpful but not necessary. Working knowledge of geospatial tools would also be of interest for projects.

## 2. Course Objectives and specific Student Learning Outcomes (SLOs):

We begin with an overview of 1) the core bio-physical resources for food production: climate, soils, nutrients, water and biodiversity and 2) the socioeconomic conditions needed for agricultural intensification, and 3) the implications of agricultural intensification strategies to the environment (soils, water, air, carbon and biodiversity) and human livelihoods or human wellbeing (income, food security, nutrition). We will spend much of the semester examining the tradeoffs and synergies among agricultural intensification strategies with the impact on environment and ecosystems services as well as socioeconomics and human wellbeing. The focus is primarily on the tropics and subtropics, where rapid population growth and expansion and intensification of agriculture is occurring, but we will also explore examples from the temperate region. The overall question is how to meet local and global food and fuel requirements that do not harm the long-term integrity of the environment while providing equitable access to healthy, nutritious food for all.

The lab course will follow the lectures and will explore the various ways to explore datasets and calculate the various indicators within the five domains of sustainability. Tools for analyzing tradeoffs and synergies among those domains and indicators will also be explored. *The objectives and student learning outcomes for the lab are designated in italics.*

Those successfully completing this course will be able to:

1. Describe the differences between agricultural extensification and intensification and the driving forces determining which will prevail in a landscape.
2. Describe the different domains and indicators of sustainable intensification.
3. Describe and give examples of policies and institutions that can be used to negotiate tradeoffs and synergies.

**SLO1/2/3:** Students discuss papers that explore both agricultural intensification/extensification, explain the reasons why they have different outcome indicators and potential policies that could change those outcomes.

4. Compare and discuss the tradeoffs and synergies among the five domains of sustainability that are associated with different agricultural systems.

**SLO4:** Students select a case study of an agricultural system of their choice that explores the different domains of sustainability.

5. Learn to prepare and give oral presentations.

**SLO5:** Students present the main points from an assigned reading to the class.

6. *(for the lab section) Learn to analyze, interpret, and compare (tradeoff and synergies) of different agriculture systems from a sustainable intensification perspective.*

**SLO6:** *Students assess tradeoffs and synergies among production, environment, economics, human and social domains for different farming systems or practices.*

## 3. Instructors contact information:

Dr. Cheryl Palm, Agricultural and Biological Engineering  
Rogers Hall 223, Cellphone: 646-244-1724;  
[cpalm@ufl.edu](mailto:cpalm@ufl.edu)

Preferred means of communication is by email. Dr. Palm will return email messages within 24 hours. Do not expect messages to be returned over the weekend. Office hours can be made by scheduling appointments. Scheduling can be done by email or in person after class  
Meeting Time: Wednesday 3:00 – 5:00p.m.

**4. Training Location: In person** Room 283 Frazier Rogers Hall.

*Lab 211 Frazier Rogers Hall*

**Virtual** The virtual lectures will be held simultaneously to the in-person lecture via zoom. Zoom link:

Join Zoom Meeting

<https://ufl.zoom.us/j/98063754723?pwd=V3VhWGhwakJPV2hTNTJ4MXRhL2FwUT09>

**5. Meeting time:** Lecture section -Monday Periods 8-9 (3:00-4:55 p.m.)

*Lab section – Wednesday Periods 8-9 (3:00-4:55 p.m.)*

**6. Material and Supply Fees:** None.

**7. Textbooks and Software Required:**

No textbooks are required. All required reading material is available through websites or the UF library.

**8. Recommended Readings:**

Readings be assigned on a weekly basis. The core list is provided below with an \* in the lecture schedule. The other readings are for those interested in more information on the topic.

**9. Attendance and Expectations:** Students are expected to complete readings before class, actively participate in discussions, complete assignments, take exams and write a report on a specific case study.

*Those taking the lab on data analysis will be expected to actively engage in the weekly lab work, write a short report, including data output and interpretations.*

**MORE DETAILS ARE PROVIDED BELOW UNDER GRADING**

**10. Grading:** The grade for the lecture course will be determined by:

1. Participation (total 10 points) will be determined based on attendance in class (5 pts) and active participation in discussion of key reading assignments (5 pts). Those students

participating virtually are expected to have their cameras on. If a student cannot attend class they should advise the instructor.

2. Oral presentation (10 points) students will each make a 5 minute oral presentation of an assigned reading.
3. Exams (total 50 points): Two exams – one mid-semester, second end of semester - each worth 25 points.
4. A case study report – 10 pp max (30 points). The case study will consist of applying the information learned from the class to a specific agricultural system and or commodity. Details will be provided midsemester.

**Assignments, exams, reports not handed in on time will receive a -1 point for each day the assignment is late.**

The grade for the lab will depend on participation (50 points) in weekly activities to develop specific sustainability indicators for a chosen farming system/country. A 5 page report (50 points) by each student that will be a compilation of indicators and tradeoff/synergies for their chosen farming system/country. The report will be presented as tables and figures along with a discussion and interpretation of the results.

Any work that is submitted should be the product of the student. Any assignments that are not the individual student's work will be given a 0 grade and further disciplinary action per UF policy.

## 11. Grading Scale

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 – 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 – 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

## 12. Online Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.a.a.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their

Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>."

### 13. Honesty Policy – Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

14. Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting [disability.ufl.edu/students/get-started](http://disability.ufl.edu/students/get-started). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester

**14. Course Outline:** schedule, sequencing of topics may be changed with advanced notice. Readings with a \* are required readings for the week.

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<b>Week</b> <b>(lab/lecture)</b>	<b>Activities</b>
Week 1 Jan. 11/13	<b>Lecture:</b> Introduction to course, discussion of agricultural extensification and intensification  <b>Readings:</b>  Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. and Toulmin, C., 2010. Food security: the challenge of feeding 9 billion people. <i>Science</i> , 327(5967), pp.812-818.

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\*Foley JA, Defries R, Asner GP, Barford C, Bonan G, Carpenter SR, Chapin FS, Coe MT, Daily GC, Gibbs HK, Helkowski JH, Holloway T, Howard EA, Kucharik CJ, Monfreda C, Patz JA, Prentice IC, Ramankutty N, Snyder PK. 2005. Global consequences of land use. *Science*. 309(5734):570-4.

\*Geist, H. J., E. F. Lambin. 2002. Proximate Causes and Underlying Driving Forces of Tropical Deforestation: Tropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations, *BioScience* 52: 143–150, [https://doi.org/10.1641/0006-3568\(2002\)052\[0143:PCAUDF\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2)

FAO. The future of food and agriculture – Trends and challenges. Rome.

**Lab:** Introduction to lab course. Overview of sustainability indicators and calculations, datasets.

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Week 2	<b>Lecture - holiday</b>
Jan. 18 (holiday)/15	<b>Lab:</b> Select country, find statistics for production, yields (and potential yields), areas in production for 3 crops.

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Week 3	<b>Lecture:</b> Agricultural Intensification and Sustainability.
Jan 25 / 27	<b>Readings:</b>  *Pingali, P.L., 2012. Green Revolution: Impacts, limits, and the path ahead. <i>Proceedings of the National Academy of Sciences</i> , 109(31), pp.12302-12308.  Garnett, T., Appleby, M.C., Balmford, A., Bateman, I.J., Benton, T.G., Bloomer, P., Burlingame, B., Dawkins, M., Dolan, L., Fraser, D. and Herrero, M., 2013. Sustainable intensification in agriculture: premises and policies. <i>Science</i> , 341(6141), pp.33-34.  *Tilman, D., Balzer, C., Hill, J. and Befort, B.L., 2011. Global food demand and the sustainable intensification of agriculture. <i>Proceedings of the National Academy of Sciences</i> , 108(50), pp.20260-20264.  Musumba, M, Grabowski, P., Snapp, S, Palm, C. 2017; Guide for the Sustainable Intensification Assessment Framework. <a href="http://www.k-state.edu/siil/resources/framework/index.html">http://www.k-state.edu/siil/resources/framework/index.html</a>  Rockström, J., Williams, J., Daily, G., Noble, A., Matthews, N., Gordon, L., Wetterstrand, H., DeClerck, F., Shah, M., Steduto, P. and de Fraiture, C., 2017. Sustainable intensification of agriculture for human prosperity and global sustainability. <i>Ambio</i> , 46(1), pp.4-17.

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DfID, U.K., 1999. Sustainable livelihoods guidance sheets. London: DFID.

**Lab :** Continue with FAOStats; Learn to develop tradeoff diagrams (spidergrams)

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Week 4  
Feb 1/3

**Lecture:** Sustainable Intensification: Domain, Indicators, Tradeoffs and Synergies

**Readings:**

\*Power, A. G., 2010. Ecosystem services and agriculture: tradeoffs and synergies. *Philos. T. R. Soc. B.* 365, 2959-2971.

\*Kanter, D.R., Musumba, M., Wood, S.L., Palm, C., Antle, J., Balvanera, P., Dale, V.H., Havlik, P., Kline, K.L., Scholes, R.J. and Thornton, P., 2016. Evaluating agricultural trade-offs in the age of sustainable development. *Agricultural Systems.* pp 1-16.

Musumba, M, Grabowski, P., Snapp, S, Palm, C. 2017; Guide for the Sustainable Intensification Assessment Framework. <http://www.k-state.edu/siil/resources/framework/index.html>. **See example for indicator selection and tradeoff analysis.**

Dale, V.H. and Polasky, S., 2007. Measures of the effects of agricultural practices on ecosystem services. *Ecological economics*, 64(2), pp.286-296.

Klapwijk, C.J., van Wijk, M.T., Rosenstock, T.S., Van Asten, P.J.A., Thornton, P.K. and Giller, K.E., 2014. Analysis of trade-offs in agricultural systems: current status and way forward. *Current Opinion in Environmental Sustainability*, 6, pp.110-115.

Stoorvogel, J.J., Antle, J.M., Crissman, C.C. and Bowen, W., 2004. The tradeoff analysis model: integrated bio-physical and economic modeling of agricultural production systems. *Agricultural Systems*, 80(1), pp.43-66.

**Discussion:** Tradeoffs and Synergies

**Lab: Assignment:** compare data among countries  
Soil maps; find major soils in your selected study area

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Week 5

**Lecture:** Soils, nutrients, and environment

Feb 8/10

**Readings:**

\*Palm, C.A., P.A. Sanchez, S. Ahmed, A. Awiti. 2007. Soils: A Contemporary Perspective. *The Annual Review of Environment and Resources.* 32:**only pp 99-1102 and 115-121.**

\*Vitousek, Peter M., R. L. Naylor, T. Crews, M. B. David, L. E. Drinkwater, E. Holland, P. J. Johnes, J. Katzenberger, L. A. Martinelli, P. A. Matson, G. Nziguheba, D. Ojima, C. A. Palm, G. P. Robertson, P. A. Sanchez, A. R.

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Townsend, F. Zhang. 2009. Nutrient Imbalances Along Trajectories of Agricultural Development. *Science* 324: 1519-1520.

Chen, X., Cui, Z., Fan, M., Vitousek, P., Zhao, M., Ma, W., Wang, Z., Zhang, W., Yan, X., Yang, J. and Deng, X., 2014. Producing more grain with lower environmental costs. *Nature*, 514(7523), pp.486-489.

Palm, C., Neill, C., Lefebvre, P. and Tully, K., 2017. Targeting sustainable intensification of maize-based agriculture in East Africa. *Tropical Conservation Science*, 10, p.1940082917720670.

**Lab:** Digital soil maps, Soil health

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Week 6

**Lecture:** Agriculture, Climate, Carbon

Feb. 15, 17

**Readings:**

\*Griscom et al. 2017. Natural climate solutions. *PNAS* 114: 11645-11650.

Schlesinger, W.H. 2000. Carbon sequestration in soils: some cautions amidst optimism. *Agriculture, Ecosystems, Environment* 82: 121-127.

\*Schlesinger, W. H. and R. Amundson. 2019. Managing for soil carbon sequestration: Let's get realistic. *Global Change Biology* 25: 386-389.

Giller, K.E., Witter, E., Corbeels, M. and Tittonell, P., 2009. Conservation agriculture and smallholder farming in Africa: the heretics' view. *Field crops research*, 114(1), pp.23-34.

Soussanna et al. 2019. Matching policy and science : Rationale for the '4 per 1000 -soils for food security and climate' initiative. *Soil & Tillage Research*: 188: 3-15.

Smith, P. et al. . in press. Which practices co-deliver food security, climate change mitigation and adaptation, and combat land-degradation and desertification?

Thornton, P.K. and Herrero, M., 2010. Potential for reduced methane and carbon dioxide emissions from livestock and pasture management in the tropics. *Proceedings of the National Academy of Sciences*, 107(46), pp.19667-19672.

Beddington J, Asaduzzaman M, Clark M, Fernández A, Guillou M, Jahn M, Erda L, Mamo T, Van Bo N, Nobre C, Scholes R, Sharma R, Wakhungu J: Achieving Food Security in the Face of Climate Change: Final Report from the Commission on Sustainable Agriculture and Climate Change. 2012,

**Lab:** Carbon stocks -soil and biomass, GHG values/IPCC carbon default values; partial nutrient balances

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<p>Week 7 Feb 22, 24</p>	<p><b>Lecture:</b> Climate, Water, and Agriculture</p> <p><b>Readings:</b></p> <p>* Gordon, L. J., C.M. Finlayson, M.Falkenmark. 2010. Managing water in agriculture for food production and other ecosystem services. <i>Agricultural Water Management</i>: doi:10.1016/j.agwat.2009.03.017</p> <p>De Fraiture, C., D. Molden, D. Wicelns. 2010. Investing in water for food, ecosystems and livelihoods. <i>Agricultural Water Management</i> 97: 495-501.</p> <p>*Falkenmark, M. and Rockstrom, J. 2006. The new blue and green water paradigm. <i>Journal of Water Resources Planning and Management</i> 132.</p> <p>Grafton et al. 2018. The paradox of irrigation efficiency. <i>Science</i> 361: 748-750.</p> <p>Gathala, M.K., Kumar, V., Sharma, P.C., Saharawat, Y.S., Jat, H.S., Singh, M., Kumar, A., Jat, M.L., Humphreys, E., Sharma, D.K. and Sharma, S., 2014. Optimizing intensive cereal-based cropping systems addressing current and future drivers of agricultural change in the Northwestern Indo-Gangetic Plains of India. <i>Agriculture, Ecosystems &amp; Environment</i>, 187, pp.33-46.</p> <p><b>Lab:</b> Agroecological zones, Climate maps, irrigation maps</p>
<p>Week 8 Mar 1, 3</p>	<p><b>Lecture:</b> Biodiversity and Intensification - Tradeoffs and Synergies; Land sharing/Land sparing</p> <p><b>Readings:</b></p> <p>*Grass, I., J. Loos, S. Baensch, P. Batary, F Libran-Embid, et al. 2018. Land-sharing/land-sparing connectivity landscapes for ecosystem services and biodiversity conservation. <i>People and Nature</i> 1:262-272.</p> <p>*Kremen, C. and A. M. Merenlender. 2018. Landscapes that work for biodiversity and people. <i>Science</i> 362</p> <p>Phelan et al. 2011. Reconciling food production and biodiversity conservation: Land sharing and land sparing compared. <i>Science</i> 333: 1289-1291.</p> <p>Green, R. E., S. J. Cornell, J. P. W. Scharelemann, A. Balmford. 2005. Farming and the fate of nature. <i>Science</i> 307: 550-555.</p> <p><b>Lab:</b></p>
<p>Week 9</p>	<p><b>General Discussion about production and environmental domains</b></p>

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Mar 8, 10	<p><b>Readings:</b></p> <p>*Springmann, M. et al. 2018. Options for keeping the food system within environmental limits. <i>Nature</i> 562: 519-525.</p> <p>*Clark, M. and D. Tilman. 2017. Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice. <i>Environmental Research Letters</i> 12:111002</p> <p><b>Assignment:</b> Exam – handed out – due Friday Mar 12</p> <p><b>Lab:</b> Organize ,compare, and discuss data to date</p>
<p>Week 10 Mar. 15, 17</p>	<p><b>Lecture:</b> Agriculture as the Engine of Economic Growth: production and economic domains</p> <p><b>Readings</b></p> <p>*Barrett, C.B., Carter, M.R. and Timmer, C.P., 2010. A century-long perspective on agricultural development. <i>American Journal of Agricultural Economics</i>, 92(2), pp.447-468.</p> <p>Christiaensen, L., Demery, L. and Kuhl, J., 2011. The (evolving) role of agriculture in poverty reduction—An empirical perspective. <i>Journal of Development Economics</i>, 96(2), pp.239-254.</p> <p>Reardon, T., Barrett, C., Kelly, V. and Savadogo, K., 1999. Policy reforms and sustainable agricultural intensification in Africa. <i>Development policy review</i>, 17(4), pp.375-395.</p> <p>Jayne, T.S., S. Snapp, F.Place, N. Sitko. 2019. Sustainable agricultural intensification in an era of rural transformation in Africa. <i>Global Food Security</i> 20: 105-113.</p> <p>Pingali, P.L. and Rosegrant, M.W., 1995. Agricultural commercialization and diversification: processes and policies. <i>Food policy</i>, 20(3), pp.171-185.</p> <p>Dorward, A., Fan, S., Kydd, J., Lofgren, H., Morrison, J., Poulton, C., Rao, N., Smith, L., Tchale, H., Thorat, S. and Urey, I., 2004. Institutions and Policies for Pro-poor Agricultural Growth. <i>Development Policy Review</i>, 22(6), pp.611-622.</p> <p>Barrett, C.B., Christian, P. and Shiferaw, B.A., 2017. The structural transformation of African agriculture and rural spaces: introduction to a special section. <i>Agricultural Economics</i>, 48(S1), pp.5-10.</p> <p><b>Lab:</b> Poverty and income</p>
<p>Week 11 Mar. 22, 24</p>	<p><b>Lecture:</b> Agriculture as the Engine of Economic Growth: production and economic domains - continued</p> <p>*Lee, D.R. 2005. Agricultural sustainability and technology adoption:</p>

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Issues and policies for developing countries. *American Journal of Agricultural Economics* 87: 1325-1334.

\*\*Lotte et al. 2014. Adoptability of sustainable intensification technologies – Drylands – West Africa

De Janvry, A., Fafchamps, M. and Sadoulet, E., 1991. Peasant household behaviour with missing markets: some paradoxes explained. *The Economic Journal*, 101(409), pp.1400-1417.

Fafchamps, M. 2003. Market Institutions in SubSaharan Africa: Theory and Evidence (selected portions)

Jayne, T. and Rashid, S. 2013. Input subsidy programs in Sub-Saharan Africa: a synthesis of recent evidence. *Agricultural Economics* 44: 547 - 562.

Grabowski, P., L. S. Olabisi, J. Adebisi, K. Waldman, R. Richardson, L. Rusinamhodzi, S. Snapp. 2019. Assessing adoption potential in a risky environment: The case of perennial pigeonpea. *Ag. Sys.* 171: 89-99.

**Lab:** poverty and income continued

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Week 12  
Mar. 29, 31

**Lecture:** Food Security, Nutrition, and Health – Agriculture and Human Domains

**Readings:**

\*\* Jones, A.D., Ngure, F.M., Pelto, G. and Young, S.L., 2013. What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition: An International Review Journal*, 4(5), pp.481-505.

\*\* Jones, Andrew D. 2017. Critical review of the emerging research evidence on agricultural biodiversity, diet diversity, and nutritional status in low-and middle-income countries. *Nutrition Reviews* 75: 769-782.

FAO, IFAD, UNICEF, WFP and WHO. 2019. *The State of Food Security and Nutrition in the World 2019. Building resilience for peace and food security*. Rome, FAO.

Webb, P. and Kennedy, E., 2014. Impacts of agriculture on nutrition: nature of the evidence and research gaps. *Food and nutrition bulletin*, 35(1), pp.126-132.

Frelat, R. S. Lopez-Ridaura, K. E. Giller, M. Herrero, S. Douchamps, A. A. Djurfeldt, O. Erenstein, B. Henderson, M. Kassie, B. K. Paul, C. Rigolot, R. S. Ritzema, D. Rodriguez, P. J. A. van Asten, and M. T. van Wijk. 2016.

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Drivers of household food availability in sub-Saharan Africa based on big data from small farms. PNAS 113: 458-463.

**Lab:** food security, nutrition

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Week 13

**Lecture:** Food Security, Nutrition, and Health – continued

Apr 5, 7

Carletto, G., M. Ruel, P. Winters & A. Zezza (2015) Farm-Level Pathways to Improved Nutritional Status: Introduction to the Special Issue, *The Journal of Development Studies*, 51:8, 945-957, DOI: 10.1080/00220388.2015.1018908

\*\*Webb, P. and Kennedy, E., 2014. Impacts of agriculture on nutrition: nature of the evidence and research gaps. *Food and nutrition bulletin*, 35(1), pp.126-132.

DeFries, R., Fanzo, J., Remans, R., Palm, C., Wood, S. and Anderman, T.L., 2015. Metrics for land-scarce agriculture. *Science*, 349(6245), pp.238-240.

Herrero, M., Thornton, P.K., Power, B., Bogard, J.R., Remans, R., Fritz, S., Gerber, J.S., Nelson, G., See, L., Waha, K. and Watson, R.A., 2017. Farming and the geography of nutrient production for human use: a transdisciplinary analysis. *The Lancet Planetary Health*, 1(1), pp.e33-e42.

Headey, D., 2011. Turning economic growth into nutrition-sensitive growth. Washington, DC: International Food Policy Research Institute.

Anderman, T. L., R. Remans, S. A. Wood, K. DeRosa, R. S. DeFries. 2014. Synergies and tradeoffs between cash crop production and food security: a case study in rural Ghana. *Food Sec.* DOI 10.1007/s12571-014-0360-6

**DISCUSSION: be prepared to discuss these papers**

Adegbola, A. T., A. H. Havelaar, S. L. McKune, M. Eilitta, G. E. Dahl. 2019. Animal source foods: Sustainability problem or malnutrition and sustainability solution? *Perspective matters Global Food Security*.

Herrero, M., Thornton, P.K., Gerber, P. and Reid, R.S., 2009. Livestock, livelihoods and the environment: understanding the trade-offs. *Current Opinion in Environmental Sustainability*, 1(2), pp.111-120.

Willett, W., J. Rockström, B. Loken, M. Springmann, et al.. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*(January):1–49.

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Adesogan, A., A. H. Havelaar, S. L. McCune, M. Eilitta. 2019? Animal source foods: Sustainability problem or malnutrition sustainability solution? Perspective matters. *Global Food Security*

Clark, M. A., M. Springmann, J. Hill, D. Tilman. 2019. Multiple health and environmental impacts of foods. *PNAS*.

Hirvonen, K., Y. Bai, D. Headey, and W. A. Masters. 2019. Affordability of the EAT-Lancet reference diet: a global analysis. *The Lancet Global Health* 19:1–8.

Sanchez, P. A. 2020. Time to increase production of nutrient-rich foods. *Food Policy*

**Lab:** food and nutrition security

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Week 14 **Lecture:** Social Domain.

Apr. 12, 14 \*Grootaert, C. et al. 2004. Measuring Social Capital: An integrated questionnaire. The World Bank Working Paper No. 18

\*Alkire et al. 2015. The Women’s Empowerment in Agriculture Index. IFPRI

**Discussion of Policy Papers**

Some Suggested Readings:

Reardon et al. Policy Reformss and Sustainable Agricultural Intensification in Africa

DeFries et al. Is voluntary certification of tropical agricultural commodities achieving sustainability goals for small-scale producers? A review of evidence.

Bellemare, M. F. and F. R. Bloem. 2017. Does contract farming improve welfare? A review. *World Development* 112: 259-271.

Smith: Producer Insurance and Risk Management Options for Smallholder Farmers

Kozar and Scherr: WFP promotes resilience in chronic food insecure areas of Ethiopia

Leach et al. 2016. Environmental impact food labels combining carbon, nitrogen, and water footprints. *Food Policy* 61: 213-223.

**Lab:** Social domain and csummarize data

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Week 15 **Wrap up:** Discussion overview, key points of semester

Apr. 19, 21 **Hand out exam:** Due April 23

**Case study:** Hand in case study report 26 April

**Lab:** Present case study

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### **15. Services for Students with Disabilities**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

**16. Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### 17. Services for Students with Disabilities.

#### Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

### 18. Your well-being is important to the University of Florida.

#### Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu](http://www.counseling.ufl.edu)

#### Counseling Services

#### Groups and Workshops

#### Outreach and Consultation

Self-Help Library  
Wellness Coaching

- U Matter We Care, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)
- Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/next-level](http://www.crc.ufl.edu/next-level)

19. Student Complaints:

- Residential Course: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)
- Online Course: <http://www.distance.ufl.edu/student-complaint-process>