

Final Progress Report
Sustainability Science Program
Term: September 1, 2013 – August 1, 2014

Name:

Rachael Garrett

Your fields:

Agricultural economics; economic geography; international economics; rural sociology

Your degree program, institution and graduation date:

PhD, Emmett Interdisciplinary Program in Environment and Resources, Stanford University, School of Earth Sciences, 2013

Faculty host at Harvard name and department:

William Clark, Kennedy School of Government

Description of SSP-related research activity:

Improving agricultural practices in Brazil for sustainable development: Enabling conditions for innovation through integration

Abstract:

Finding ways to increase the global food supply without further exacerbating climate change, reducing biodiversity, or degrading water resources is one of the most important challenges facing humanity. The overall goal of this research is to create information that can be used by policy makers to promote the adoption of more sustainable agricultural practices in the Brazilian Amazon and Cerrado; biomes that contribute immensely to the global food supply, but have experienced rapid environmental degradation in recent years due to agricultural expansion. Integrated crop, livestock, and forestry (ILPF) practices have the potential to greatly improve the sustainability of agriculture in Brazil, but it is not clear whether these systems meet the needs of local stakeholders. It is also not clear what supporting economic conditions and policies are necessary to move ILPF from limited to wide scale adoption in Brazil. I answer these questions through a number of different research designs, including comparative case studies at the national level, regional statistical and process models, and local field work that includes both household surveys and focus groups.

Identification of the problem you address:

Current industrial corn, soy, dairy, and beef systems in Brazil and the United States pose a multitude of environmental problems through area expansion and input intensification. There is a need to find agricultural technologies (or management practices) that reduce the environmental impact of production by reducing the need to expand area, reducing inputs, and better utilizing waste products.

Key question asked about the problem:

What policies, market mechanisms, and knowledge support systems are necessary to enable regional transitions to more sustainable agricultural systems in Brazil, in particular, through increased integration of specialized systems?

The methods by which you answered that question:

I use a few different designs and methods:

- National comparative analysis of the policies in Brazil and the United States that influence incentives to pursue integrated crop and livestock practices
- Statistical analysis of regional trends in crop and livestock integration
- Process models examining the profitability of integrated practices

- Statistical analysis of household surveys data to analyze the determinants of integrated crop and livestock production
- Qualitative analysis of focus group data regarding producers' perceptions of and barriers to integrated crop and livestock production

Principle literature upon which the research drew:

- Land systems science
- Rural sociology
- Sustainable agriculture
- Agronomy
- Animal science
- Crop and livestock modeling
- Innovation

Empirical data acquisition description:

I acquire data from a range of sources:

- New fieldwork: i) conducting interviews and focus groups about barriers to adoption, and ii) gathering data on farm inputs and outputs
- Old fieldwork from my collaborators at University of Cambridge that conducted household surveys
- Survey data from the Brazilian Agricultural Research Corporation on the profitability of ILPF in different regions of Brazil
- Municipal scale statistics compiled by the Brazilian government

Geographical region studied:

- Mainly Brazil

Recommendations that might be relevant for your problem:

- The barriers to ILPF adoption identified by farmers, experts, and researchers are very diverse. Quantitative evidence is needed to evaluate competing claims.

A description of the final product(s) you have/are aiming to produce:

- 2-4 articles in high impact journals, including PNAS, Global Environmental Change, Environmental Research Letters, World Development, etc..
- Non-technical reports for farmers and other stakeholders in the study regions
- A workshop on how to improve knowledge support systems for farmers with members from Embrapa and USDA

Description of major other intellectual or professional advancement activities over the past academic year, including working titles:

- I obtained a position as an **Assistant Professor** in the Department of Earth and Environment Boston University, starting July 1, 2015
- I was awarded a **National Science Foundation Science Engineering and Education for Sustainability Postdoctoral Fellowship**
- I was awarded a **Fulbright NEXUS Regional Scholar Award**
- I developed a long term partnership with three units of the Brazilian Agricultural Research Corporation (EMBRAPA): Embrapa Agrossilvopastoral, Embrapa Amazonia Oriental, and Embrapa Acre (with Judson Valentim)
- I published **Garrett, R., Rueda, X., and Lambin, E.** "Globalization's unexpected impact on soybean production in South America: Linkages between preferences for non-genetically modified crops, eco-certifications, and land use" in Environmental Research Letters

- I submitted **Garrett, R. D.**, Carlson, K. M. & Rueda, X. “Sustainable by design? Assessing effectiveness of oilseed roundtable certifications,” which is in its first round of review at Global Environmental Change
- I submitted **Garrett, R. D.** & Rausch, L. “Green for gold: social and ecological tradeoffs influencing the sustainability of the Brazilian soy industry,” which is in its first round of review at Journal of Peasant Studies
- My co-author re-submitted Rueda, X., **Garrett, R.** and Lambin, E. "Supply chain organization, perceived risks and market opportunities define corporate investment in sustainable food production," which is in its third round of review (minor revisions) at Organization and Environment.
- My co-author submitted Carlson, K., Gaskell, J., Bennett, E. Gibbs, H. Walker, N., DeFries, R. **Garrett, R.**, Giam, X., Iles, A., Luskin, M. Mandle, L. Kremen, C. “Ecosystem services and supply chains for agriculture,” which is in first round of review at Ecology and Society.

Please list citations for reports, papers, publications and presentations that built on your fellowship research:

PAPER

- **Garrett, R. D.**, Rueda, X. & Lambin, E. F. Globalization’s unexpected impact on soybean production in South America: Linkages between preferences for non-genetically modified crops, eco-certifications, and land use. *Environ. Res. Lett.* **8**, (2013). Available at: <http://iopscience.iop.org/1748-9326/8/4/044055>
- **Garrett, R.**, Gardner, T., Ferreira, J. et al. 2014. Agricultural diversity and social-ecological well-being in the Eastern Amazon. *Sustainability Science Program Working Paper No. 2013-2014*. Sustainability Science Program, Kennedy School of Government, Harvard University, Cambridge, MA.

INVITED PRESENTATIONS [most of these presentations were on past work, but they occurred during the fellowship period]

- **Stockholm Environment Institute Brown Bag Lunch.** Stockholm, Sweden. Mar. 2014.
- **University of Colorado Boulder Environment Studies Seminar Series (Job Talk).** Boulder, USA Feb. 2014.
- **Boston University Earth and Environment Seminar Series (Job Talk).** Boston, USA Feb. 2014.
- **University of California Davis Community and Regional Development Seminar Series (Job Talk).** Davis, USA Feb. 2014.
- **University of California Berkeley Faculty Workshop on Sustainable Farming Systems.** Berkeley, USA. Oct. 2014.
- **Third Annual Lemann Dialogues “Agricultural and Environmental Issues in Brazil”.** Champagne, USA. Nov. 2014.
- **Harvard University David Rockefeller Center for Latin American Studies Brazil Seminar Series.** Cambridge, USA. Nov., 2014.
- **Association for Tropical Biology & Conservation Annual Meeting.** Bonito, Brazil, June 2012
- **Feeding 9 Billion Conference: the Future of Intensive Agriculture in Brazil.** Providence, USA, Mar. 2012.
- **Stanford University Center for Latin American Studies Weekly Seminar Series.** Stanford, USA. Nov. 2011.

Please describe any collaborative activities with other SSP Fellows that you are involved with.

- Collaborative research on integrated crop livestock forestry production as a rural development, climate mitigation, and adaptation strategy (with Judson Valentim)
- Innovation and Access to Technology for Sustainable Development (with Bill Clark, Alicia Harley, Judson Valentim, and Pam Templer)

- Harvard Colloquium on Innovative Adaptation to Climate Change (with Nigel Asquith, Zhu Liu, Pam Templer, and Judson Valentim)

Principal collaborators outside Harvard (list name and institution):

- Julio Cesar do Reis, Embrapa Agrosilvopastoral
- Joice Ferreira, Embrapa Amazonia Oriente
- Toby Gardner, University of Cambridge
- Ximena Rueda, Universidad de Los Andes
- Eric Lambin, Stanford University
- Kim Carlson, University of Minnesota
- Lisa Rausch, University of Wisconsin - Madison

List any awards or grants that you have received this year for the current or coming year. Please provide details regarding title of award, financial amount, and date of award:

- National Science Foundation #1415352, *“Improving agricultural practices in the US and Brazil for sustainable development: Enabling conditions for innovation through integration,”* (PI - Rachael Garrett, Host Mentor - William Clark at Harvard University, Direct costs: \$213,990). Dates: 2014-2016.
- Fulbright Foundation NEXUS Regional Scholar Program, *“Back to the future: Innovation and adaptation in Brazilian agriculture through the adoption of integrated crop-livestock-forestry systems,”* (PI - Rachael Garrett, Direct costs: \$35,000). Dates: 2014-2016.

If you are moving to a new position, please list your contact information there:

- *As of July 1, 2015:*
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