

**Final Progress Report  
Sustainability Science Program  
Term: September 1, 2014 – July 31, 2015**

**Name:** Meredith Niles

**Your fields:**

ecology, agriculture, policy, sustainability science

**Your degree program, institution and graduation date:**

PhD- Ecology, University of California, Davis, 2014.

**Faculty host at Harvard name and department:**

William Clark, Kennedy School of Government

**Description of SSP-related research activity:**

**1) *Assessing knowledge and innovation systems for climate smart agriculture***

This project aims to assess what drives the adoption of climate change innovations in developing countries through baseline survey data analysis.

Agriculture is both a contributor to and potential victim of climate change, the impacts of which will be most felt by smallholder farmers in the developing world. Efforts to advance “climate-smart” agriculture that aim to promote sustainable production, climate mitigation, and adaptation should be grounded in empirical data and analysis, which can be used to inform the successful implementation and adoption of climate change innovation interventions. This proposal aims to understand innovation systems for climate change mitigation and adaptation in the developing world. Existing baseline surveys (n=5454) from the Consultative Group for International Agricultural Research (CGIAR) will be analyzed using novel statistical approaches to assess the drivers of climate change innovations and adaptive responses. This analysis will focus particularly on how climate change shocks and other factors influence innovation adoption, adaptive capacity, and aim to elicit whether practices adopted for different reasons (e.g., climatic, government, markets) are affected by different drivers. Through the research peer-reviewed articles, research reports and policy briefs intended for managers, funders, and policymakers will be developed to contribute to both academic and applied contexts.

**2) *Diversifying and Integrating Agricultural Practices in Brazil, New Zealand, and the United States for Climate Smart Agriculture and Sustainable Development***

One of the core challenges of sustainable development is how countries can simultaneously promote rural livelihoods, increase agricultural output to meet growing food demand, and conserve natural resources. Integrated crop livestock systems have the capacity to meet this challenge by better recycling nutrients from crop and animal wastes within the farm system, while still producing high quantities of food. This research aims to assess the social costs and benefits of integrated crop livestock systems (ICLS) compared with specialized systems, as well as challenges and opportunities (including those presented by climate change) to adoption across three diverse regions: Brazil, the United States, and New Zealand. These three countries were selected for comparative analysis due to their significant agricultural production and varying climates and socio-economic systems. To understand the complex linkages between national agricultural policy, regional socio-economic conditions, and ICLS adoption in a changing climate we utilize a variety of research designs and methods, including both comparative analysis at the national level, statistical analysis and process models at the regional level, and local case studies. Through the combination of all of these methods we aim to achieve a systems level understanding of the rules, incentives, and knowledge services that will be necessary to promote transitions to integrated systems in the US, Brazil, and New Zealand. We strive to create a multi-faceted approach to understanding ICLS in these regions to make this work relevant both academically and for practitioners.

**Identification of the problem you address:**

1) Climate change is likely to threaten smallholder farmers in the developing world more than other regions in part because of these people’s locations within the tropics and also because of their lack of infrastructure and assets to adapt to these potential impacts. Yet despite these potential impacts, little empirical data has assessed the relationship between actual climate shocks

experienced by smallholders and its impact on food security. This project assesses the relationship between climate shocks and food security and the different bundles of assets and strategies that can best target help and interventions.

**Key question asked about the problem:**

- 1) How do climate shocks affect food security among developing world farmers. How does assistance and help affect the way farmers deal with shocks?
- 2) What are the benefits, costs, and tradeoffs of integrated crop and livestock systems across economic, production and environmental components? What are the different policy contexts that encourage or hinder adoption of integrated crop and livestock systems?

**The methods by which you answered that question:**

- 1) Statistical analysis of baseline survey data.
- 2) policy analysis, interviews and survey data collection, literature review.

**Principle literature upon which the research drew:**

- 1) development literature, food security, climate change resilience and adaptation
- 2) Adoption of innovations, policy drivers, agroecology

**Empirical data acquisition description:**

- 1) through baseline surveys
- 2) first person interviews, policy analysis, literature review

**Geographical region studied:**

14 countries in the developing world- Bangladesh, Nepal, India, Ethiopia, Tanzania, Uganda, Mozambique, Burkina Faso, Mali, Senegal, Nicaragua, Costa Rica, Kenya, Niger

**Recommendations that might be relevant for your problem:**

Forthcoming

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

- 1) Submitted 2 grant proposals related to ICLS
- 2) Several peer reviewed ICLS publications: a) potential of ICLS for climate smart agriculture; 2) synthesis of existing challenges and paths forward for ICLS work (outcome of international workshop at UC Davis); 3) policy analysis of different regions and ICLS.
- 3) Several climate smart ag and food security publications: 1) how climate shocks affect food security; 2) gender survey analysis to understand how limiting factors within a farm system influence adoption of climate smart practices and how women and men farmers differ in their climate perspectives and responses; 3) network analysis of climate change organizations and social capital analysis of climate change development organizations.
- 4) international working group on ICLS.

**Description of major other intellectual or professional advancement activities over the past academic year:**

- 1) Obtained a faculty position; tenure track assistant professor of food policy at the University of Vermont
- 2) Harvard Business School Case Study:

**Niles, M.T.** and Goldberg, R. 2015. The China Dairy Farming Institute: New frontiers in innovative collaborations. Harvard Business School Case Study. No. N1-915-418.

- 3) Appointed to the Board of Directors of the Public Library of Science (PLOS) September 2014.
- 4) Advising:

- Master's Thesis Co-Advisor to Gabrielle Bastien, "*Ecological and economic sustainability of regenerative agroecosystems: An analysis of the Whole Systems Design permaculture farm in Rochester, VT.*" Harvard Extension School, Cambridge, MA

- Research Advisor, Advising and management of 3 graduate and 1 undergraduate research assistants. *Project: Diversifying and integrating agricultural practices in Brazil, New Zealand and the United States for climate smart agriculture and sustainable development.* Sustainability Science Program, Harvard University, Cambridge, MA

5) Grant Reviewer: European Research Council (2015), Global Center for Food Systems Innovation (2015)  
Manuscript Referee- *Agriculture and Human Values, Renewable Agriculture and Food Systems, PLOS Biology, Journal of Society and Natural Resources, Environment and Behavior, Climatic Change, Journal of Environmental Studies and Science, Environmental Management, Journal of Environmental Planning and Management, Sustainability,*

**Please list citations for reports, papers, publications and presentations that built on your fellowship research (please list full citations here, paragraph length abstracts, and attach copies of URLs if possible):**

Invited Lectures, Panels and Workshops:

- 1) Invited Speaker. 2015. Gund Institute of Ecological Economics, *Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, Vermont*, "The Psychological Distance of Climate Change."
- 2) Invited Lecturer. 2015. Agribusiness and Food Policy Course, *Harvard University, Cambridge, Massachusetts*, "Dairy sustainability in China: A case study of Nestlé's farm training programs."
- 3) Invited Webinar. 2015. "Open Access Research: Opportunities to Broaden your Impact." *Switzer Foundation*.
- 4) Invited Speaker. 2014. Open Ambassadors Conference, *Max Planck Institute, Munich, Germany*, "Talking open access with your colleagues and advisors."
- 5) Invited Panelist. 2014. OpenCon Open Access to Research Conference, *American University School of Law, Washington, D.C.*, "Successful student initiatives for open access."
- 6) Invited Workshop Presenter. 2014. National Association of Graduate-Professional Students National Conference, *University of Missouri, Columbia, Missouri*, "Developing strategic and effective advocacy initiatives and campaigns."
- 7) Invited Moderator. 2014. *The World Bank, Washington D.C.* "Generation Open", Kickoff event for International Open Access Week.

Organized Sessions and Workshops

- 1) Selected Short Course Participant. "Teaching Socio-Ecological Systems". *National Center for Socio-Ecological Synthesis (SESYNC). Annapolis, MD. July 2015.*
- 2) **Niles, M.T.** and R. Garrett. "Synergies for food production, conservation and rural development in a changing climate." Co-organizer, Organized Oral Session. *Accepted at the Ecological Society of America Conference. Baltimore, MD. August 2015.*
- 3) Hillis, V., T. Waring, J. Brooks, **M.T. Niles**. "Evolutionary approaches to the commons: Empirical applications of a multi-level evolutionary framework." Co-organizer, Organized Oral Session. *International Society for the Study of the Commons Conference. Alberta, CN. May 2015.*
- 4) Garrett, R. and **M.T. Niles**. "Workshop on integrative social and ecological modeling of crop and livestock systems" Co-organizer. International Workshop funded by the National Science Foundation. *University of California, Davis, Davis CA. April 2015.*

Presentations:

- 1) **Niles, M.T.** and R. Garrett. "Climate Shocks and Food Security Among Developing World Farmers." Oral Presentation. *Accepted at the Ecological Society of America Conference. Baltimore, MD. August 2015.*
- 2) Garrett, R., **M.T. Niles**, J. Gil, J. Valentim. "Enabling conditions for integrated crop and livestock systems the United States, Brazil, and New Zealand: A comparative analysis of incentives and barriers across three regions." World Congress on Integrated Crop-Livestock-Forest Systems (WCCLF) and the 3rd International Symposium on Integrated Crop-Livestock Systems (ICLS3) - Brasilia, Brazil on July 12-17, 2015
- 3) Hillis, V., T. Waring, J. Brooks, **M.T. Niles**. "Evolutionary approaches to the commons: Empirical applications of a multi-level evolutionary framework." Co-organizer, Organized Oral Session. *Accepted at the International Society for the Study of the Commons Conference. Alberta, CN. May 2015.*
- 4) **Niles, M.T.** "How do farmers view climate change and its challenges? Poster Presentation. *American Association for the Advancement of Science Conference. San Jose, CA. February 2015.*
- 5) **Niles, M.T.** "Achieving global and local climate change cooperation among New Zealand and California farmers." Oral Presentation. *Society for Human Ecology International Conference. Bar Harbor, ME. October 2014.*

Papers published while an SSP fellow:

- 1) Prokopy, L., J. Arbuckle, A. Barnes, V. Haden, A. Hogan, **M.T. Niles**, J. Tyndall. 2015. Farmers and climate change: A cross-national comparison of belief and risk perceptions in developed countries. *Environmental Management*. 56: 492-504
- 2) **Niles, M.T.**, M. Lubell, M. Brown. 2015. How limiting factors drive agricultural adaptation to climate change. *Agriculture, Ecosystems & Environment*. 200: 178-185.
- 3) Lubell, M., **M.T. Niles**, M. Hoffman. 2014. Agricultural education and outreach in the age of connectivity. *Journal of Society and Natural Resources*. 27: 1089-1103.

Papers submitted while an SSP fellow:

- 1) **Niles, M.T.**, Brown, M., Dynes, R. Applying the theory of planned behavior to assess farmer's stated and actual adoption of climate mitigation and adaptation strategies. In Review at *Climatic Change*.
- 2) **Niles, M.T.**, J. Abbott, J. Balachowski, S. Chen, C. Cortez. A framework for emerging environmental and public health issues and behavior change. In review at *PLOS One*.
- 3) **Niles, M.T.**, M. Lubell, M. Brown, R. Dynes. Assessing farmer support for climate change policies in New Zealand. In review at *Policy Studies Journal*.

Papers in preparation:

- 1) **Niles, M.T.**, and J. Salerno. A cross country analysis of the differing effects of climate shocks on smallholder food security. To be submitted to *Proceedings of the National Academy of Sciences*.
- 2) **Niles, M.T.** and N. Mueller. How Irrigation May Influence Farmer's Perceptions of Climate Change, Belief and its Risks. To be submitted to *Global Environmental Change*.
- 3) Niles, M.T. and R. Garrett. Integrated Crop and Livestock Systems as Climate Smart Agriculture.

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

Rachael Garrett and I embarked on a project together related to Integrated Crops and Livestock systems as described above.

Also a side project with Nathan Mueller- HUCE fellow.

**Principal collaborators outside Harvard:**

Margaret Brown- AgResearch New Zealand  
Robyn Dynes- AgResearch New Zealand  
Jon Salerno- UC Davis  
Nick Cradock Henry- Landcare New Zealand  
Daniel Tisch- University of Auckland  
Steven Gray- Michigan State University  
Tim Waring- University of Maine  
Vicken Hillis- Arizona State University  
Thomas Tomich- UC Davis  
Ermias Kebeab- UC Davis  
Will Horwath- UC Davis  
Thomas Harter- UC Davis  
Sonja Brodt- UC Davis  
Joshua Faulkner- UVM  
Juan Alvez- UVM  
Carole Adair- UVM  
Linda Berlin- UVM

**List any awards or grants that you have received this year for the current or coming year:**

Award: 2014 Next Generation Leadership Award, Right to Research Coalition

Grants In Review:

In Review Young, C., Howitt, R., MacEwan, D., Mehta, V., **Niles, M.T.** "Implementing California's Sustainable Groundwater Management Act: Farmer Perceptions and the Balance of Groundwater and Economic Sustainability". Proposal submitted to USDA Water for Agriculture Program. *Total award: \$500,000. Total amount for Co-PD Niles: \$154,927.*

In Review Liang, X., et al. "A Dynamic Agrohydrosystem to Support Improved Agriculture and Water Sustainability Practices across the Teleconnected U.S. Corn and Cotton Belts." Proposal submitted to USDA Water for Agriculture Program. *Total award: \$10,000,000. Total amount for Co-PD Niles: \$798,497.*

In Review **Niles, M.T.**, R. Garrett, J. Alvez, C. Adair, S. Brodt, J. Faulkner, T. Harter, W. Horwath, T. Tomich. "Assessing Integrated Dairy Cropping Systems in California and Vermont for Production, Environmental and Economic Tradeoffs." Proposal submitted to the USDA Food Security Program. *Total award: \$3,749,479.*

Received: **Niles, M.T.** and R. Garrett. Diversifying and integrating agricultural practices in Brazil, New Zealand and the United States for climate smart agriculture and sustainable development. Harvard University Sustainability Science Program. *\$20,000*

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

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