Science Transcending Boundaries: The Roles of Gender, Power, and Place in Community-Based Research and Adaptive Capacity

A Dissertation
Presented in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy
with a
Major in Water Resources Science & Management
in the
College of Graduate Studies
University of Idaho
by
Rebecca Witinok-Huber

Major Professor: Barbara Cosens, J.D.
Committee Members: Janet Henderson, Ph.D.; Steven Radil Ph.D.; and
Dilshani Sarathchandra, Ph.D.
Program Administrator: Matthew Morra, Ph.D.

December 2019

Authorization to Submit Dissertation

This dissertation of Rebecca Witinok-Huber, submitted for the degree of Doctor of Philosophy with a Major in Water Resources and titled "Science transcending boundaries: The roles of gender, power, and place in community-based research and adaptive capacity" has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor: _____ Date: _____
Barbara Cosens, J.D.

Committee Members: _____ Date: _____
Janet Henderson, Ph.D.

_____ Date: _____
Steven Radil, Ph.D.

_____ Date: _____
Dilshani Sarathchandra, Ph.D.

Program Administrator: _____ Date: _____
Matthew Morra, Ph.D.

Acknowledgements

My journey to craft, or as I've heard it described to 'birth' my dissertation often felt like a solo endeavor, but without the support and encouragement of so many amazing people it would not have been possible. To my fearless leader, Barbara Cosens, there are no words to describe nor express my gratitude. You wore countless hats as my advisor. Thank you for guiding me, pushing me, and believing in me. For taking the late night (or early morning I'm not sure) calls when I was in Liberia, guiding me through the uncertainty and discomfort of interdisciplinary research, pushing me to take risks, go deeper, think differently, and trust my gut, and most of all for believing in me. A special thank you to my committee member Janet Henderson, I'm not sure you knew what you were getting into when you agreed to walk this path with me. Thank you for virtually supporting me through all of the tears and heartache during my fieldwork, for being an amazing listener, for your expertise and moral support, and for accepting me as I am. Thank you to my other committee members: Steven Radil and Dilshani Sarathchandra for accepting my invitation to venture onto an unconventional path. Your willingness, flexibility, theoretical and methodological skills, and commitment have helped make this happen. Also, thank you to Jeannie Harvey for helping to build my capacity in international gender analysis and connecting me with other experts in the field.

Thank you to Austin Peterson, Caroline Nyaplue-Daywhea, Edward Perry, and Cleopatra Gibson-Jallay who selected and then trusted me to carry out this research project in Liberia. Especially, to Caroline, while we have our differences, your kindness, generosity, and strength helped me weather the challenges and stay the course. I will never forget seeing Ryan only moments after his birth, dancing with your family and community at Christmas, or the wonderful moments we shared in the field with the team. My gratitude goes out to the community at Cuttington University that made this research possible, including Chidi Omeze, Jim Gray, and Elliot Wreh-Wilson; in addition, thank you to our eight amazing student enumerators William Z. Boakai, Henry Brent, Dedee F. Cole, Dixie G. Darbenea, Albert S.B. Gbelee, Sheku N. Gbollie, Koluba Kollie, and Martin W. Woleh. Thank you for keeping us safe during fieldwork Oumar Therno (our trusted and patient driver). I would also like to thank the three County Agricultural Coordinators and numerous District Agricultural Officers in Bong, Lofa, and Nimba counties for their time and commitment to this project and their communities. Thank you to the elders and farmers that graciously invited our team into their communities and gave of their time; especially to the courageous women, who keep rural families going and also kept us fed. I would be remiss not to mention the expats that generously provided encouragement,

accommodation, and when needed, a shoulder to cry on; especially, Sayvanna Sfabian, Vincent Cleveland, Cori Maund, Katey King, Lyn Gray, and the numerous Peace Corps volunteers.

Funding for this dissertation was provided by the National Science Foundation (NSF) grant title: *"Adaptation to change in water resources: science to inform decision-making across disciplines, cultures and scales,"* award *#1249400.* Additional funding for my travel and personal expenses in Liberia was provided by the Research and Innovation Fellowship for Agriculture through the University of California Davis, and the Liberia research project was made possible by the United States Agency for International Development (USAID) under the Feed the Future "*Integrating Gender and Nutrition within Agricultural Extension and Advisory Services*" (INGENAES) project, award AID-OAA-LA-14-00008. Funding was also provided in the form of a research assistantship from the NSF-National Institute of Food and Agriculture Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) (2016-2020) grant title: "*Increasing regional to global-scale resilience in Food-Energy-Water systems through coordinated management, technology and institutions,*" award #1639458. Unique opportunities for conference travel and workshops, a return trip to Liberia to share project results with in-country partners, and ample space for collaboration were made possible by the IGERT program; I must thank Tim Link for his leadership on the IGERT, and Mary Schierman, for their endless patience and understanding.

I also want to thank my friends and community. To my Moscow Mountain exercise buddies, Casey Bartrem, Sophia Theodossiou, Eloise Zimbelman, and Courtney Cooper for waking up countless mornings at 5am to run or bike, you kept me sane! A special thanks to Lynne Carpenter-Boggs for your encouragement, emotional support, amazing example of how to balance strength and compassion, and for turning me onto the trampoline park. Thank you to my Soka Gakkai International Buddhist community, you kept me grounded; especially, to Jesse Morgaina for the countless mornings you chanted Nam-Myoho-Renge-Kyo with me and provided endless encouragement, and Rachael Elrod-Martinez for the late night diamoku. Also, thank you to Julian Matthews and Nimiipuu Protecting the Environment for including me. Thank you to my IGERT community for the intellectual challenges, technical support, and encouragement. Thank you, Meghan Foard, for opening your home when I moved to Moscow, you barely knew me and embraced me like a sister, and Sarah Olsen, thank you for the dinners, bike rides, Winco shopping trips and so much more. To my Ph.D. sister Courtney Cooper and her husband Albert Harrison, you have been my rocks through this journey and I'm extremely grateful. I would also like to thank TerraGraphics International Foundation for opening the door of environmental health to me and allowing me to be a part of the team in the Kyrgyz

Republic. I have learned so much, met many amazing people, and found incredible joy through our time in the field.

Last but certainly not least to my parents; without you both, none of this would be possible. Dad, we have not always seen eye to eye, but you have taught me more than you know and I'm so grateful. Thank you for not giving up on our relationship and continuing to be a part of my journey. Mom, we have been through so much together, thank you for never giving up on me. Your dedication to science, commitment to the next generation, and example of what it looks like to be a strong, capable, and intellectual woman has allowed me to carve out my path. Thank you for showing me that I never have to live small. You dedicated your dissertation to me in 1992, I was 7.

Dedication

To my Mom,

who has been my greatest support,

and #1 fan.

Table of Contents

Authorization to Submit Dissertation....ii

Acknowledgements....iii

Dedication....vi

Table of Contents....vii

List of Tables....x

List of Figures....xi

Abbreviations....xiii

Statement of Contribution....xiv

Preface....xv

Chapter 1: Interdisciplinary literature synthesis of power, gender, place, knowledge production, and action research....1

- Overview....1
- Part 1. Development: Illuminating historical power structures to address gender-power relations in research methodologies and development practice....3
- Part 2. Sociology: Understanding situated knowledge systems, mixed-methods, and communities of practice integration for scientific research and development practice....10
- Part 3. Geography: Exploring pluralistic methodologies, power, and situated knowledges through a spatial lens....17
- Part 4. Synthesis: For integration and application to the Liberia INGENAES project....26
- Literature Cited....36

Chapter 2: Enhancement of rural-urban linkages and gender equity through agricultural extension services to Liberian smallholder farmers....42

- Abstract....42
- Introduction....43
- Methods....48
- Results....49
- Discussion....53

Conclusion....56
Literature Cited....57
Chapter 3: What's gender or place have to do with it: Building adaptive capacity through agricultural extension in post-conflict settings....61
Abstract....61
Introduction....61
Methods....69
Results....76
Discussion & Conclusions....93
Literature Cited....99
Chapter 4: Bridging divides in transdisciplinary research: The roles of introspection and process reflection....105
Abstract....105
Introspection — My journey....106
Theoretical Underpinnings....111
Introspection and Process Reflection Using an Adapted FST Framework....115
Key Takeaways....124
Literature Cited....129
Appendix A: Additional Materials for Chapter 1....132
Appendix B: Additional Materials for Chapter 2....138
Appendix C: Additional Materials for Chapter 3....140
Appendix D: IRB Approval....144
Appendix E: Participatory Mapping Workshop....145
Appendix F: Enumerator Training Materials....148
Appendix G: Fieldwork....159
Appendix H: Community Deliverable of Preliminary Results....163
Appendix I: Liberia Smallholder Farmer Research Project Findings and Summary Report....166

Appendix J: Survey and Focus Group Instruments.....167

List of Tables

Chapter 2

Table 2.1. Farmers that had received AEAS visits from a DAO in the past three years, or from an NGO 50
Table 2.2. Overall farmer adoption rates and comfort contacting the DAO or NGO about agricultural information 50
Table 2.3. Non-farm employment by gender 51
Table 2.4. Farmer involvement and leadership in FBOs and Kuu groups 52
Table 2.5. Type of production that farmers carry out by gender 52
Table 2.6. Self-identified empowerment to make agricultural decisions [a] 53

Chapter 3

Table 3.1. L-API and farmer access to Ministry extension services [a] 74
Table 3.2. Farmer participant demographics 77
Table 3.3. Gender disaggregated participant level of education, relationship status, and age 78
Table 3.4. Variations by gender for L-API and additional variables of interest 86
Table 3.5. Analysis of Variance main effects for L-API and variables of interest 87
Table 3.6. Variations by county for L-API and additional variables of interest 88
Table 3.7. Mantel test for autocorrelation 90

Appendix A

Table A.1. Literature synthesis 132

List of Figures

Chapter 1

Figure 1.1. Interdisciplinary research process from Repko (2012, p. 73-74) 2

Chapter 2

Figure 2.1. Household gender roles and agency 53

Chapter 3

Figure 3.1. Liberia study area (Lofa, Bong, and Nimba counties) in grey and 22 surveyed communities (black dots). 70
Figure 3.2. Access to ICT devices 79
Figure 3.3. Satisfaction with the 'amount of use' for farmer owned ICT devices 79
Figure 3.4. Farmer ICT access/use quotes 80
Figure 3.5. Percent of all respondents' (n=352) with access to Ministry extension services via a DAO in the past three years 81
Figure 3.6. Percent of all respondents' (n=352) with access to agricultural resources and information via an NGO 82
Figure 3.7. Respondent gender preference for Liberian extension officers 82
Figure 3.8. Succeeding farmer explanations to the Likert survey question, "If you could 85
Figure 3.9. Spatial trend in mean L-API scores across 22 surveyed communities 89
Figure 3.10. Farmer advice for the Ministry of Agriculture on access and extension support 91
Figure 3.11. Focus group interview insights related to adaptive capacity, community, and gender. 92

Chapter 4

Figure 4.1. Definitions for multi, inter, and transdisciplinary research. 108
Figure 4.2. Adapted FST principles including place matters, self-introspection, and research-process 116
Figure 4.3. Introspection, process reflection, and overlap takeaways 125

Appendix A

Figure A.1. Figure A.1. MAXQDA word cloud of overall word frequency. 137
Figure A.2. MAXQDA word cloud by document count. 137

Appendix B

Figure B.1. Map of the study area that includes Lofa, Bong, Nimba counties in north-central Liberia 138
Figure B.2. Conceptual diagram of the governance structure and actors related to this project.....139

Appendix C

Figure C.1. Conceptual diagram of study concepts, linked phrases, and (directional) connections..140
Figure C.2. Linear regression for an ANOVA Type II model of L-API residuals. 141
Figure C.3. Mantel test for L-API differences compared to community distance (m) from a primary road.....142
Figure C.4. Mantel test for L-API differences compared to community distance (m) from Monrovia. 142
Figure C.5. Mantel test for L-API differences compared to community distance (m) from a city with over 5000 people. 143
Figure C.6. Mantel Test place points. 143

Abbreviations

Abbreviation	Book Part
AEAS	agricultural extension and advisory services
DAO	District Agricultural Officer - Liberia
FST	Feminist Systems Thinking
GIS	Geographic Information Systems
ICT	information and communication technology
INGENAES	Integrating Gender and Nutrition within Agricultural Extension Services
L-API	Liberian Agricultural Potential Index
MOA	Ministry of Agriculture - Liberia
NGO	non-governmental organization
PAR	participatory action research
USAID	United States Agency for International Development

Statement of Contribution

Data analyzed in Chapter 2 and Chapter 3 of this dissertation was collected in Bong, Lofa, and Nimba, Liberia, between November 2017 and April 2018. Caroline Nyaplue-Daywhea, a researcher and lecturer in the College of Agriculture and Sustainable Development at Cuttington University in Liberia helped to select and guide our field team; this included four student enumerators, 23 communities, and 26 days in the field. Mrs. Nyaplue-Daywhea facilitated the partnership with Cuttington University and was influential to the success of project fieldwork and cultural awareness/sensitivity. Guidance on the methodological selection and data analysis for Chapter 3 included disciplinary experts in geography, sociology, and statistics. Dr. Steven Radil assisted in the conceptualization of place and spatial analysis, Dr. Dilshani Sarathchandra contributed her expertise on sociological methodologies and analysis, and Dr. Julia Piaskowski provided assistance with statistical analysis using R software.

Any errors in this dissertation are my own.

Preface

As life often does, this dissertation process did not take a linear path, but instead opened unconventionally and led me in an unexpected direction. After one year as a doctoral student studying climate change, water, and local knowledge, an opportunity to return to Africa in 2017 came about. It afforded additional funding that I required and would lead me down the path of gender and agricultural extension services in Liberia, a small country in West Africa. The door opened, and despite some reservations I walked through it. At the onset, it wasn't clear that the project would become the core of this dissertation; however, the study, research process as a whole, and my personal experience in Liberia drove me to ask more questions about both the data collected and how development research and reciprocity are conducted.

Inevitably, these questions directed me into a space of power and gender literature, specifically, related to methodological selection and knowledge production. I also came to recognize the relevance and interconnection of place on power-gender dynamics. While it wasn't necessarily intentional at the onset, it became clear through the analysis process that targeted agricultural extension practices in Liberia (farmer and place specific), and possibly elsewhere, can play a greater role in preparing communities for social and environmental change by building adaptive capacity and improving connections between rural and urban populations. Further, that appropriately developed and targeted extension services may have the potential to disrupt and transform long-standing gender inequalities entrenched through years of cultural, religious, and political influence. These issues and processes became the driving force for my dissertation.

My dissertation is composed of four complimentary yet stand-alone chapters. Chapter 1 is a literature review and synthesis of gender, power, place, knowledge production scholarship, and action research from multiple disciplinary lenses including development, sociology, and geography. It uses an interdisciplinary research process to lay the theoretical and methodological groundwork for the research project in Liberia.

Chapters 2-4 are based on the experiences and data collected in an Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) project in Liberia. The project was a collaboration between the Liberian Ministry of Agriculture (MOA), Cuttington University, the United States Agency for International Development (USAID) Feed the Future program, and me as the lead researcher. During the project I lived in Liberia for five months (November 2017-April 2018) and worked with in-country partners to solidify methodologies and train the research team. Together we conducted 352 surveys and 46 focus groups in 22 communities across three counties in north-central

Liberia. In the two years following data collection, further mixed-methods and exploratory spatial analysis and reflection were conducted for Chapters 3 and 4.

Chapter 2 discusses the research process, preliminary findings, and recommendations for both the Liberian MOA and other cross-cultural research undertakings. A rural-urban linkages framework is used to describe the challenges and opportunities for improvement to the dynamic roles of Liberia's agricultural extension and advisory services. Using this framework, connections between rural farmers/producers and urban industry, consumers, and governance decision-makers are described through the flows of people, information, goods, and capital. Chapter 2 was co-authored with Liberian researcher and Cuttington University lecturer Caroline Nyaplue-Daywhea and was accepted for publication as a book chapter in "Relating urban-rural landscapes through ecosystem governance." L. Vasseur (Ed). 2020, IUCN Publication, Gland, Switzerland (in press).

Three bodies of research including local gender contracts, rural-urban linkages, and adaptive capacity come to bear in Chapter 3 to build a case for agricultural extension service transformation in post-conflict settings, with attention to gender and place. Chapter 3 uses multiple data analysis methods that include qualitative methods, quantitative methods, and spatial analysis to conduct a comprehensive examination of the data collected in Liberia. A multidimensional index called the Liberian Agricultural Potential Index (L-API) is developed to facilitate these analyses and identify latent variables; L-API gleans insights from indices which are used in agriculture and development studies to understand women's empowerment. L-API provides a localized approach to understanding subtleties in farmers' access to agricultural resources and extension services, leadership opportunities, household agency, and time allocation that all contribute to agricultural production potential. Moreover, Chapter 3 uses L-API to determine where and how extension services can be improved to support the needs of women and men farmers across the study area and to build adaptive capacity. Chapter 3 is co-authored with Steven Radil, Dilshani Sarathchandra, and Julia Piaskowski.

Chapter 4 uses a narrative writing style to carry out an in-depth research process reflection and personal researcher introspection. An adapted version of the Feminist Systems Thinking framework provides the basis for the reflection. Guiding principles include being sensitive to gender, valuing the voices from the margins, selecting appropriate methodologies, centering nature, and conducting research for social action; to encompass place and space the place matters principle was created and integrated. While this chapter is an effort to deeply acknowledge the challenges in conducting transdisciplinary action research in post-conflict settings, it also provides acknowledgement and hopefully ideas for other researchers and practitioners. For it remains clear that international and local researchers, assistants, field techs, collaborators, and practitioners battle with some of the same questions and concerns; the dialogue toward more equitable processes for

knowledge production, power diffusion, and safety for all involved must be a constant source of conversation and negotiation.

Chapter 1: Interdisciplinary literature synthesis of power, gender, place, knowledge production, and action research

Overview

The following literature review and synthesis forms the theoretical backdrop for the analysis and research praxes used in Chapters 2-4. A purposefully selected sub-set of development, sociology, and geography literature is reviewed and synthesized through an interdisciplinary research process, to establish common ground and tackle methodological quandaries at the nexus of power, gender, place, knowledge production, and action research. Findings guide analysis and interpretation of the Liberian smallholder farmer community research project that was designed to understand farmers' gendered opinions and experiences of agricultural extension service reach and quality. This study was conceived as part of a larger multi-national project grant, the INGENAES USAID-funded project.

Designed to assist partners in Feed the Future countries, INGENAES is focused on improving agricultural extension and advisory services (AEAS) through:

> building more robust, gender-responsive, and nutrition-sensitive institutions, projects and programs capable of assessing and responding to the needs of both men and women farmers through improving extension and advisory services at multiple levels. (USAID, n.d.)

Principal INGENAES investigators at the University of Illinois at Urbana-Champaign started working in Liberia under the Modernizing Extension and Advisory Services project in 2011 and continued through the end of the INGENAES project in 2018. In the spring of 2017, the primary author and lead researcher was selected to develop and guide the smallholder farmer community research project that this dissertation is focused on. The diverse interests of project partners and the multi-faceted nature of research questions and objectives led to the use of an interdisciplinary research approach. Fresh perspectives that emerge from interdisciplinary processes and local knowledge can help to solve complex and multifaceted problems.

The interdisciplinary research process

Interdisciplinary research requires both disciplinary insights (concepts, theories, perspectives) and a means to integrate insights from disparate disciplines to construct a more comprehensive understanding or perspective of a topic or problem (Newell & Meek, 2003; Repko, 2012). Newell & Meek (2003) noted that there is not a consensus on the interdisciplinary research process, however, they postulated a 13-step process that Repko (2012) distilled into 10 steps. Repko's (2012) two phase

interdisciplinary research process allows the researcher(s) to draw on disciplinary insights (6 steps) and integrate (4 steps) those insights. Phase 1 includes the following six steps: 1) define the problem or state the research questions, 2) justify using an interdisciplinary approach, 3) select relevant disciplines, 4) complete a literature review, 5) develop disciplinary adequacy, and 6) analyze the problem and evaluate each insight or theory (p. 74). Phase 2 includes four additional steps meant to help with integration, understanding, and reflection: 7) identify inconsistencies between insights, theories, or sources, 8) build common ground, 9) construct a comprehensive understanding, and 10) reflect, test, and communicate the understanding (p. 74). Repko (2012) noted that the interdisciplinary research process is fluid and the steps can overlap. While order is not essential, and nonlinearity is assumed when solving complex systems problems, it is important for the researcher(s) to constantly reevaluate previous steps and incorporate insights as they go (Newell, 2000). I apply Repko's conceptualization of the interdisciplinary research process to develop the theoretical and methodological frameworks for this dissertation.

Figure 1.1 shows the overall interdisciplinary research process progression from problem identification to integrated understanding (Repko, 2012, p. 73). The six steps in Phase 1 assist in defining and solving non-linear problems in complex systems (Newell & Meek, 2003; Repko, 2012), akin to the complexities faced within gender and power research and development dilemmas. Parts 1-3 of this chapter focus on literature review and disciplinary adequacy in development research, sociology, and geography; they also walk through the interdisciplinary research process for each discipline selected. Part 4 uses Phase 2 of the process to synthesize and build common ground between key disciplinary findings toward a more comprehensive understanding; this includes a personal and research process reflection of the Liberia case study fully described in Chapter 4. Of the steps, finding common ground during integration is a key step in building the theoretical and methodological underpinnings for Chapters 2-4.

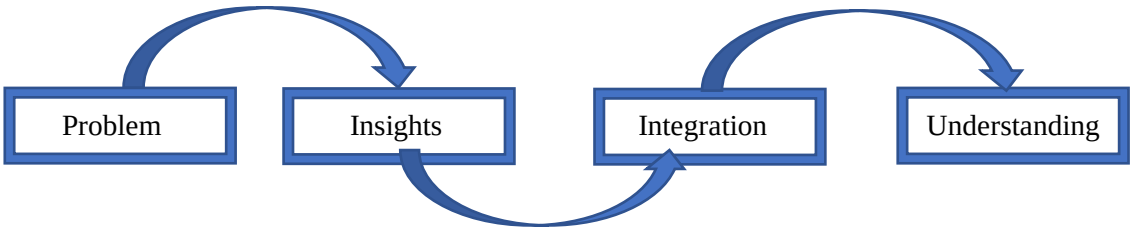


Figure 1.1. Interdisciplinary research process from Repko (2012, p. 73)

Common ground is a prerequisite for interdisciplinary integration that creates an enabling environment for collaboration (Broome, 2000; Clark, 1996; Clark & Brennan, 1991; Newell & Meek, 2003; Repko, 2012). Establishing common ground is facilitated through modification of concepts, theories or assumptions, by addressing disciplinary insight conflicts, using unconventional thinking and intuition, and through ample communication (Repko, 2012). Repko (2012) noted that building common ground is the responsibility of an interdisciplinary researcher. For this dissertation project, the complexity of understanding power, gender, and research processes to address social injustice and adaptive capacity[1] have required finding common ground in a sub-set of purposefully selected literature; it includes development literature focused on gender and action research, sociology specific to feminist theories and mixed-methods, and geography related to spatial analysis, participatory geographic information systems (GIS), and mixed-methods (Appendix A). Supplemental texts on decolonizing and indigenous methodologies[2] (Berkes, 2008; Smith, 2013), critical systems and feminist thinking (Midgley, 2000; Stephens, 2010, 2013), interdisciplinary research processes (Repko, 2012), and adaptive capacity for governance (Cosens, Gunderson, & Chaffin, 2018) were also used (Appendix A).

Part 1. Development: Illuminating historical power structures to address gender-power relations in research methodologies and development practice

Power is commonly accepted as the heartbeat of the social sciences (Koester, 2015) yet its meaning remains a heated topic among academics and development practitioners (IDS, 2018a; Koester, 2015), specifically, in relation to gender and research methodologies. Part 1 explores the ways in which power shapes gender and development research and vice versa; it also looks to understand community-based research praxes that deconstruct historical power structures. For example, the use of participatory methodologies to address historical (and current) systemic power structures that oppress women and Indigenous peoples, and opportunities to illuminate intersections

[1] In this context *adaptive capacity* refers to the ability of rural Liberian farmers, farming households, and communities to build strategies using available resources and knowledge, in order to manage and change in the face of current and future social and environmental stress while maintaining livelihoods.

[2] A *method* is a set of techniques operated in a sequence to achieve a goal/purpose and a *methodology* is theoretical ideas and assumptions that justify the use of certain method(s) (Midgely, 2000).

of power to deconstruct gender-power and researcher-researched relations toward social change and justice.

Roles of power in gender and development research

In the English language the word *power* can be used as a noun or verb and takes on a multitude of meanings that remain a source of controversy within academic and development communities. Social or political power is very much a conscious, or often unconscious, social construct. Power is exuded and altered in relation to individuals, societies, and systems that are shaped in relation to culture, history, ways of knowing, politics, economics, and gender for example (Haugaard, 2010; Koester, 2015; Lukes, 2005; Maguire, 2006). Therefore, power is exercised through something or some action that is often not consistent across time or space. As a result, power is controversial and maintains no normative cross-cutting definition (Koester, 2015).There are three dimensions of power. The first dimension is open or visible[3] decision-making and the second is hidden, behind closed doors agenda setting power. While the first two dimensions are observable manifestations of power, Lukes (2005) uniquely describes the third dimension of unobservable or 'ideological' power as the most insidious and supreme exercise of power. He also suggests that unobservable power shapes people's sense of self and understanding of the world in conscious and unconscious ways. What I refer to as "invisible" power (Koester, 2015) in this dissertation has roots in Foucault's previous work on relationships between power and knowledge (Haugaard, 2017) and what Nye (2004) calls "soft power" and Lukes (2005) calls the "third dimension" of power. Invisible power is the power to shape or influence others' beliefs and desires, thereby securing their compliance (Koester, 2015; Lukes, 2005). The multiplicity of definitions for power make it all the more important to develop common understandings and definitions in interdisciplinary research. Using the aforementioned definitions, we will look at ways that power is used and abused in relation to gender and development work.

As with power, the concept of gender can take on multiple meanings that have resulted in controversy and confusion. The terms sex and gender are distinct yet interconnected. Distinguished from 'sex', the biological characteristics that differentiate females from males (Reeves & Baden, 2000), 'gender' denotes what it means to be a woman (feminine) or man (masculine) through social and cultural distinctions such as behavior, social roles, position, or identity (Reeves & Baden, 2000; Maguire, 2006). Gender is a construct used to separate people into distinct categories, it is not a trait

[3] *Visible power* refers to formal intuitions, official decision-making, and power that can be seen. *Hidden power* is more obscured and allows powerful actors to shape formal process outcomes by controlling who gets to make decisions, what is discussed, and whose voices count (Koester, 2015).

(Hess & Ferree, 1987). In their 'Glossary of Terms' for the USAID-INGEANES project Rubin and Manfre (2015) define gender as:

> A concept referring to the social identity and roles associated with being a man or a woman that are usually learned through early socialization and reinforced by social norms. In some countries, additional gender categories are recognized [e.g. transgender]. The constellation of characteristics linked to men and/or women may change over time and place. The concept of gender includes the recognition that the social categories of man and woman are often defined in relationship to each other. To refer to people's gender roles or categories, use the terms "man/men" and "woman/women." For example, a "woman" may be responsible (a social role) for preparing the morning meal each day. Policy makers and development practitioners sometimes interpret "gender" as referring only to women or as a women's issue. This is incorrect, as the concept of gender encompasses everyone, affecting all opportunities and life-choices. (p. 8)

Diverging from the sole biological characteristics referred to by the term sex, this dissertation relies on the stated definition of gender to understand the differences between women and men in relation to their abilities to gain access to resources and information and exert agency in their households and communities. Agency is a process by which an individual or group is able to define their goals and act on them (Kaber, 1999). Agency is closely connected to power as Naila Kabeer (1999) describes negative (deception, manipulation, 'power-over') and positive (negotiation, bargaining, 'power to') agency.

Contextual factors such as culture, politics, and geography shape the way that gender is understood and expressed. Despite the contextual social uniqueness of gender, global acceptance of patriarchal norms and neo-liberal[4] policies have solidified the intimate partnership between gender and power. The construct of gender shapes all types of power and vice versa to create societal inequalities for women in public and private milieus (Haugaard, 2010; Koester, 2012). Such inequalities may be amplified when they intersect with other social characteristics used to establish power hierarchies such as race, class, or disability (for example) (Crenshaw, 1991). Koester (2015) concluded that "gender is fundamentally a question of power" making it inherently political. Further, she concluded that gender "is the most persistent form of 'invisible power' in the world."

[4] People or systems that tend to favor free market capitalism; associated with laissez-faire economic liberalism.

Invisible power has been directly linked to household or private contexts. While male dominant (i.e. power-over) societal norms can be seen (i.e. visible and/or hidden power) in the public sphere, private or household dynamics are often noted to host invisible power (Koester, 2015). There is a need for those in development to study how complex webs of power impact women in public and private contexts. In development work, the importance of acknowledging the interplay between gender and power in both the public and private spheres may be the difference between serving "…to reproduce and reinforce power structures and relations, or challenging and subverting them" (Lukes, 2005). Therefore, the ability of a researcher to acknowledge both overt and invisible power is central to working for social change. Action research that includes participatory methodologies has been identified as an approach to address concerns related to power and work for social change.

Action research, participatory methodologies, and power

Action Research includes methodological tools, paradigms, and praxes. Action research is rooted in pragmatism, qualitative and mixed-methodologies, and provides inclusive, iterative processes that democratically engage stakeholders through participation. Action research methods may include focus groups, surveys, questionnaires, participant observation, interviews, and/or field journals. Reciprocity is a primary concern in action research; action research praxes work to solve locally driven problems and to actively challenge dominant positivistic paradigms toward transformation of societal structures and relationships (MacDonald, 2012; Maguire, 1987). Multiple realities, truths, and ways of developing and legitimizing knowledge are welcomed in action research, along with the use of pluralistic methodologies (MacDonald, 2012; Midgley, 2000; Stephens, 2013). Action research often address inequalities resulting from power-over hierarchies that oppress women and indigenous peoples and threaten environments. Some literature suggests that participatory action research (PAR), a subset of action research, is solely a qualitative inquiry (MacDonald, 2012; Maguire, 2006). Qualitative methodologies are used as a means to describe and understand as opposed to control or predict social phenomena (MacDonald, 2012). PAR is focused on using methods that allow study participants to have their voices heard and be an integral part of the research process. Despite being used almost synonymously, PAR, participatory research, and action research have slightly different histories (Hall, 1992; IDS, 2018a; MacDonald, 2012).

The Prussian psychologist Kurt Lewin (1940s) is considered to be the founder of action research and its philosophy (MacDonald, 2012). The term 'action research' was expounded from his systematic approach to impart changes on a social system while studying the system (MacDonald, 2012). Disparate participatory research efforts between the 1960s (Latin America) and 1980s (India, Africa, United States of America, Canada, Mexico and elsewhere) provide the first recorded efforts of

research practitioners actively addressing power inequalities through engagement and partnerships fostered with local communities rooted in research, education, and action (Hall, 1992; IDS, 2018a). Many participatory researchers give credence to Paulo Freire who actively engaged in spaces of power inequality, and utilized, presented on, and later became one of the first to write about alternative (to positivist) research methodologies (Freire, 1970; Hall, 1992; MacDonald, 2012). Budd Hall (1992) contended that the 'participatory research' concept came out of the work he and colleagues conducted in the 1970s in Tanzania and was further nurtured through the Participatory Research Project he cofounded with Dian Marino and Ted Jackson (Hall, 1992). Around the same time (1970s) the British academic and international development practitioner Robert Chambers, in concert with others, developed the Participatory Rural Appraisal (also known as Participatory Learning and Action) based on work in the UK and Kenya (IDS, 2018a). Chambers is widely touted for his work in development using participatory methods and coined the term "putting the last first" that urged development practitioners to be critically self-aware (IDS, 2018a). In light of these histories, PAR emerges as one of the best participatory methodologies to achieve social change in a manner sought by those affected.

PAR continues to provide a set of methods and counter approaches to traditional positivistic, binary, quantitative scientific research that had been at the epicenter of accepted methods until the 1960s (Freire, 1970; Hall, 1992; IDS, 2018a; MacDonald, 2012). Over time, PAR has evolved and been influenced by critical theorists, systems thinkers, indigenous and decolonizing researchers, and Hall (1992) highlights the influence of feminist critiques and theories on participatory research (MacDonald, 2012; Maguire, 1987). Despite the efforts and suggested successes of PAR to address spaces of power and inequality toward social change, such as, between researcher and researched, and the global North and South, Maguire (1987, 2006) drew attention to the precluded voices of women and the feminist perspective. Additionally, Narayanaswamy's (2017) research on knowledge for development in the global South drew the startling conclusion that local Southern NGOs engaging on behalf of gender development efforts were reinforcing power inequalities despite being tasked with challenging the inequalities. Both of these authors suggest that multiple social systems influence power and the efficacy of PAR in action. Acknowledging these concerns, the barriers and opportunities for a researcher or practitioner, through PAR, to illuminate intersections of power to help deconstruct gender-power and researcher-researched power hierarchies in efforts for social change and justice will be further discussed.

Toward social change and justice

When reflecting on the barriers and opportunities for PAR and collaborative partnerships between researchers or practitioners and local communities there are mixed empirical and antidotal results toward social change. Past literature has described links between gender inequality and power structures (Reeves & Baden, 2000; Koester, 2015; Maguire, 2006; Stephens, 2013, 2018). Authors claim that PAR provides effective tools to overcome social inequalities that may have result in social change for marginalized people and communities such as rural and urban poor, women, and indigenous communities (Fortman, 1996; Hall, 1992; IDS, 2018a; Stephens, 2012, 2013). However, it remains unclear what evaluation metrics accurately assess how participants, namely women, experience development and research intervention processes and the results of PAR.

In relation to international development and aid, IDS (2018b) suggests that there are two types of accountability in relation to international development aid. One is 'accounting for aid' that calls on funding agencies to be accountable to aid-giving countries and organizations to prove that donor money was used for its intended purposes (IDS, 2018b). The second type, 'accountable aid', is meant to provide a mechanism for recipients of aid to hold donor organizations accountable for their aid-giving practices (IDS, 2018b). It shouldn't come as a surprise that the latter is rarely 'accounted' for. Narayanaswamy (2017) corroborates this sobering sentiment in her recent book.

Narayanaswamy (2017) reports unsettling results that draw into question the assumptions around knowledge for development efficacy for poverty reduction and gender equality through development aid organizations in the global South. Her work in India draws attention to the power dynamics between researchers or practitioners and local marginalized peoples, funding agencies, Northern NGOs, and Southern-based women's NGOs. She concludes that current business as usual for knowledge for development is not working and seems to be reinforcing local inequalities. Narayanaswamy (2017) highlights some of the very things that participatory and locally based efforts claim to address, such as, who has access to the plethora of information written in English and supplied electronically to "Southern knowledge intermediaries" (i.e. Southern-based women's NGO) (in affect, is there any trickle-down), what is the nature of that knowledge, and with access and relevance could local people act on it? Her greatest criticism and concern about knowledge for development is the overarching effort of Northern NGOs to partner with local Southern-based women's NGOs. The following sentiment provides an account of good intentions that reproduced structural inequalities through exclusion of women and indigenous voices despite local partners working participatorily with communities. "In other words, the empirical evidence here would suggest that these exclusions are no longer circumscribed by a North-South divide, but rather, that

embedded exclusions are both emerging and also being continually reproduced between elites and subalterns[5] within Southern contexts" (p. 248). Despite sounding pessimistic and conflicted throughout her book, Narayanaswamy (2017) suggests a few opportunities to address knowledge for development initiative deficiencies to facilitate social change and poverty reduction.

Narayanaswamy suggests opportunities to move development aid interventions toward local equality and social change. They include the interrogation of one's own practice (similar to Chambers critical self-reflection), listen first and work backwards with local input, and identify and build capacity to overcome systemic power imbalances that constrain local information uptake, action, and participation in decision-making. Through dialogue with local communities she advises learning what information locals want, in what format and language, and when. She also concludes that monitoring and evaluation of Southern knowledge intermediaries is vital yet may require alternative, innovative strategies from funders and evaluators alike. Most importantly, she explains that "pathways to create more inclusive knowledge societies must start and end in dialogue with those people most marginalized by dominant knowledge systems" (p. 254). Her suggestions echo language used in PAR.

Heeding to the warnings of Narayanaswamy (2017) and following Chambers advice on critical self-reflection, it is important to develop a self-aware and empathetic research practice. Selecting pragmatic research paradigms can facilitate collaboration on locally driven research toward usefulness and social justice. Drawing from power, gender, and development literature, PAR may provide more effective opportunities for both researchers and practitioners to engage in efforts that actively seek to uncover and expose systems of power in research contexts, and one's personal experience. It can be described as the researcher's ethical responsibility to acknowledge the role of power (her own and systemic) in the research processes. The use of PAR may serve to temper the influences of power and in the best-case scenarios, lead to mutually beneficial outcomes, social change, and justice.

It is important to understand that there are underlying power structures that influence all social research, methodological selection is one way to help address them. Rooted in a Liberian case study, the key components of this dissertation are related to power, gender, place and action research methods. It is of vital importance to illuminate the connections between these three components because power lies at the heart of the social sciences, gender shapes power relations that define societal interactions in public and private spheres (MacDonald, 2012; Reeves & Baden, 2000), and PAR that utilizes pluralistic methodologies has further potential to address power inequities toward

[5] Populations (postcolonialism) that are marginalized socially, politically, or geographically on their homeland (Narayanaswamy, 2017).

social change. The development and acknowledgement of different knowledge systems or ways of knowing is one way to shift power and understand its historical evolution.

Part 2. Sociology: Understanding situated knowledge systems, mixed-methods, and communities of practice integration for scientific research and development practice

Part 2 looks at the use of mixed-methods research to translate theory into practice for action research through a sociological lens, specifically, how to build equitable and inclusive processes. Further, it uses the communities of practice approach to acknowledge different situated knowledges.

Situated knowledges

Historical 'facts' are undoubtedly recorded through the victors' perspectives (Smith, 2013) and as a result present partial or distorted accounts of the experiences of the resistance (Smith, 2013; Harding, 1991). Therefore, the production of what is accepted as knowledge most directly represents the dominant or victorious viewpoint at a certain time and place in history (Haraway, 1988). Knowledge is historically situated in political, cultural, spiritual/cosmological, and social spaces. For example, the culturally accepted and politically influenced domestic roles of women, over time, have directly impacted women's access to education and employment opportunities (outside of the home) that then constrain what women may have access to learn and know (Harding, 1991). As long as the Western education systems and sciences describe and explain the world primarily through one dominant knowledge system, the information will remain biased (Harding, 1991).

Homogenized ways of knowing and being that solely reflect the colonized paradigm of the "white capitalist patriarchy" (Haraway, 1988) are the result of efforts to maintain the status quo in scientific research and education that codifies knowledge development, acceptance, and dissemination through limited dominant perspectives (Smith, 2013). This not only maintains but reinforces historically oppressive power structures that promote socially and environmentally destructive patterns and beliefs (Berkes, 2008; Harding, 1991, Shiva & Mies, 2014). Feminist theorist Donna Haraway (1988) called on the use of 'situated knowledges' as one way to combat the dominant paradigm and create a more dynamic and truthful picture of the realities that underpin scientific assumptions. Haraway (1988) contends that honoring multiple viewpoints through situated knowledge systems will avoid disseminating partial knowledge and inaccuracy through a biased scientific lens.

The fervent call to honor ‘situated knowledges’ or multiple ‘ways of knowing’ is also highlighted in indigenous science and research that includes decolonizing methodologies literature (Berkes, 2008; Smith, 2013). In her book, “Decolonizing Methodologies: Research and Indigenous Peoples,” Smith (2013) expresses that over time colonization has resulted in immense benefits to Western knowledge and science through exerting invisible power on indigenous peoples (Koester, 2015). Meaning that, through deceit or coercion, Western powers (i.e., military, colonial education, Western knowledge and language, and religion) have influenced the beliefs and desires of indigenous communities (Smith, 2015). Smith (2015) calls this Ngugi wa Thiong’o or colonization of the mind (p. 62). What has come to be ‘universally’ accepted within the Western scientific community as knowledge is therefore not at all universal but rather a partially privileged understanding of what counts as knowledge, who controls and contributes to knowledge, and who has access to knowledge (Smith, 2013). Berkes (2008) said that indigenous ways of knowing (what he called Traditional Ecological Knowledge or Indigenous Knowledge) are expressed though a complex knowledge-practice-belief system. He concludes that indigenous knowledge holders have long been practicing their formed, yet adaptive, theories and do not need unsolicited (often binary) philosophies imparted on them (p. 270).

Feminist theory and indigenous science literature share common threads in their call to acknowledge multiple ways of knowing that are temporally and geographically situated, highlight the importance of giving agency and voice to nature (Berkes, 2008; Stephens, 2013; Smith, 2013), and describe knowledge as a living, dynamic system that is about communities not isolated individuals (Berkes, 2008; Haraway, 1988). The collective and holistic manner in which situated knowledges are described by feminist and indigenous theorists show potential to embrace multiple situated knowledge systems. In reality, they already do. The boundaries and borders of knowledge systems and disciplines working on complex problems toward social change show that mixing methods may provide credence to inter and transdisciplinary science and practice.

Mixed-methods

To date, mixed-methods research has evolved into a third research paradigm with its own worldview, vocabulary, and techniques (Denscombe, 2008). Johnson, Onwuegbuzie, & Turner, (2007) suggest that the fundamental principles of mixed-methods research purposefully combine “qualitative and quantitative methods, approaches, and concepts in a way that produces complementary strengths and nonoverlapping weaknesses.” Mixed-methods research is used in many academic disciplines and is a preferred technique for inter and transdisciplinary research (Johnson et al., 2007). It’s also congruent with participatory methodologies and provides a unique template for

projects that must navigate inequitable power structures such as development or community-based research. For these reasons, the structured flexibility of mixed-methods research provides an appropriate setting to discuss the need to understand and incorporate situated knowledges within social inquiry.

On the surface mixed-methods may appear to be a somewhat simple combination of qualitative and quantitative methods. However, the mixed-methods approach used in social inquiry is rooted deeply in philosophical debates about ways of knowing, validity, paradigms, and situated knowledge systems (Greene, 2007; Johnson et al., 2007). Johnson et al. (2007) describe the pragmatic approach often used for mixed-methods research as lying between the philosophical edges of Plato's (quantitative research, positivist paradigm) singular or universal truth that explains man as central to all life, and the Sophists (qualitative research, constructivist paradigm) that acknowledged multiple or relative truths. Mixed-methods were initially used, albeit not formalized in the literature, by anthropologists and sociologists in the early twentieth century (Johnson et al., 2007). In line with pragmatism, historical use of combined methods was found useful to answer contextually specific research questions (Johnson et al., 2007).

In mixed-methods research, Campbell and Fiske (1959) are recognized for introducing the concept of 'multiple operationalism' (Denscombe, 2008; Greene, 2007; Johnson et al., 2007) that morphed into triangulation coined by Webb, Campbell, Schwartz, & Sechrest (1966) by using quantitative traditions to support and cross-validate intentional measurements (Greene, 2007). Denzin (1978) presents the first structured triangulation of methods to study a single phenomenon and established *within-methods* triangulation, the use of multiple qualitative or multiple quantitative methods, and *between-methods* triangulation to combine qualitative and quantitative methods. Acknowledgement of qualitative and quantitative research compatibility (Cook & Reichardt, 1979) was followed by the pivotal mixed-methods use typology (Greene, 2007; Greene, Caracelli, & Graham, 1989).

The Greene et al. (1989) typology laid out five purposes for mixed-methods that include triangulation (i.e., convergence, corroboration, correspondence), complementarity (i.e., test different facets of the same phenomena), development (i.e., results of one method used to develop another), initiation (i.e., reveal a paradox of contradiction for fresh insights, similar to complementary but for dissonance), and expansion (i.e., different methods to assess different phenomena) (Greene, 2007; Greene et. al, 1989). She has since distinguished four main criteria to guide what she calls "Mixed Methods Social Inquiry." The criteria include 1) philosophical assumptions (i.e., epistemological assumptions for what valid knowledge is and how it can be developed), 2) inquiry logistics (i.e.,

objectives, questions, quality standards), 3) practice guidelines (i.e., tools and procedures for the practice of mixed-methods selection and use), and 4) sociopolitical commitments (i.e., situate the research and questions in the broader context, acknowledgement of power) (Greene, 2007; Johnson et al., 2007). Morse (1991) distinguishes between the *simultaneous (*i.e., using two methods at the same time) *and sequential (*e.g., conducting an interview and using the results to develop a quantitative survey) uses of mixed-methods. While many researchers addressed the needs to utilize both qualitative and quantitative methods in various orders and contexts, the issue of researchers' perspectives, knowledge justification, and paradigms have also been central to mixed-methods deliberation.

As Greene (2007) and others note, the *methods* in mixed-methods research refers to a much broader use of methods or methodology (i.e., system of methods). Denscombe (2008) explains mixed-methods as an idea and practice that encompasses worldviews, vocabulary, and techniques. Mixed-methods research is recognized as what Kuhn (1970) first labeled a *paradigm* or conceptual/modeled understanding constructed through theories, methods, and philological stances that a community agrees upon. While the term paradigm can take on different meanings, in social sciences the term is frequently used to refer to epistemological stances such as questions of knowledge validity and reality (Denscombe, 2008; Morgan, 2007). Proponents of mixed-methods research recognize that paradigms are not the sole determinant of method or methodology choice; as Greene (2007) so eloquently put it "methodology is ever the servant of purpose, never the master" (p. 97).

Mixed-methods research is not constrained by a particular set of methods, assumptions, or an inflexible paradigm (Denscombe, 2008; Greene, 2007; Johnson et al., 2007; Guba & Lincoln, 2005). Multiple worldviews and paradigms can, and should, be acknowledged to address the complex goals that the utilization of mixed-methods allows for. For these reasons, pragmatism is often recognized as the philosophical underpinning of mixed-methods research (Denscombe, 2008). Systems theorists have found common ground in mixed-methods, broadly, through what they termed pluralistic methodologies (Flood, 2010; Midgley, 1996, 2000; Ulrich, 2003).

Systems theorists (i.e., critical systems thinking) call for 'pluralistic methodologies' to address complex problems and incorporate multiple paradigms in research processes. One critical systems thinker refers to this as 'deep complementarism' a reflective and adaptive practice that focuses on solving real-world problems (Ulrich, 2003). Another, Gerald Midgley (1996, 2000), suggests that multiple appropriate methodologies should be used in a complementary fashion for different contexts. In her grounded theory research between ecofeminism and critical systems thinking, Stephens (2012, 2013) highlights the use of methodological pluralism in both approaches; it is one of the guiding

principles (select appropriate methodologies) in her FST (Stephens, Jacobson, & King, 2010). Ecofeminists have collectively called on both PAR and context specific methodological selection to address gender and environmental inequalities rooted in local contexts (Maguire, 1987; Shiva & Mies, 2014; Tong, 2013).

As described, the mixed-methods research approach requires researchers and non-academic stakeholders to be reflective, aware, and adaptive in project contexts. The inclusion of multiple situated knowledge systems is not only appropriate but welcomed in mixed-methods research. However, caution must be advised because situated knowledges are not homogenous but rather living systems; without acknowledging power structures within knowledge systems, social research may reinforce structures that marginalize individual or collective voices. Communities of practice may provide an appropriate paradigm to account for these complexities (Denscombe, 2008). The communities of practice framework can accommodate practitioner and researcher constraints that may stem from funder or academic obligations, or political or cultural sensitivities (Denscombe, 2008), as well as help to incorporate multiple perspectives that make up heterogenous groups/communities.

Communities of practice

Communities of practice was coined by Lave and Wenger (1991) and later distilled by Wenger (2011) as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly." A community of practice is cultivated through the dynamic development of the three key aspects: domain, community, and practice (Wenger, 2011). *Domain* refers to the common identity shared among people around an area of interest, *community* describes the intentional interactions and shared information between people while pursuing their domain of interest, and (shared) *practice* explains the shared repertoire of resources that the community develops around their domain (Wenger, 2011). A shared practice can include things such as tools, stories, lessons and experiences, information, and ways of addressing or defining problems (Denscombe, 2008; Wenger, 2000, 2011).

Denscombe (2008) discusses communities of practice as a community-based research paradigm to complement the use of mixed-methods in research. He highlights that the use of mixed-methods within the communities of practice paradigm can temper issues related to variations or inconsistencies that occur around the mixed-methods paradigm. The ability of researchers and practitioners to integrate their theories and findings into a greater context determines their capacity to influence change and inform or develop potential communities around their particular milieu, theory, tool, or area of interest. The ability to form such communities of practice are especially valuable for

three main reasons in the context of inter and transdisciplinary research and development practice. First, within the traditional siloed academic setting, in can be valuable to build knowledge and support communities with others that study similar domains or in parallel contexts. Second, the communities of practice paradigm and framework allows for diverse individuals to come together around common interests providing a forum that may facilitate power deconstruction and inclusion of diversity (i.e., in-line with critical, systems, feminist, and indigenous theories). Third, communities of practice and mixed-methods lend themselves toward practical application, also known as, a pragmatic philosophy.

As discussed in the situated knowledge systems section, academic institutions can be very siloed and positivistic, resulting in distorted or biased 'facts' occurring within their own walls and between institutions around the world (Berkes, 2008; Haraway, 1988; Harding, 1991; Smith, 2013). The communities of practice framework inherently provide opportunities for individuals with common areas of interest to coalesce (Denscombe, 2008; Wenger, 2000, 2011), a potentially useful way to cultivate new ideas and increase accountability within a discipline. For example, social scientists housed in different colleges or departments across a university campus may not have formalized opportunities to share knowledge or research experiences. Another example may be that women within or between academic institutions have few chances to connect about research and academic experiences. Facilitating such groups through the communities of practice framework may increase chances for fruitful dialogues, and for people with common interests but possibly varying knowledge systems to connect. Additionally, building communities of practice through the use of mixed-methods can provide opportunities for different disciplines to amalgamate on inter and transdisciplinary projects. Communities of practice is especially helpful in the context of applied research and development practice in social and natural sciences due to the complexity of real-world problems rooted in locally situated contexts.

In line with critical systems thinking described above, the communities of practice approach is by default about systems or communities as opposed to individuals (Denscombe, 2008). The acceptance of situated knowledge systems within the communities of practice framework affords a process to mitigate power that can manipulate and form social groups around dominant viewpoints. Within collaborative or transdisciplinary projects that form between multiple actors (i.e., community, academic researchers, government, private organizations), accounting for inconsistencies and inequitable power structures (both visible and invisible) within and among agencies is important. Acknowledging and mitigating for inequitable power structures is especially vital in community-based and development research. The communities of practice framework in combination with

mixed-methods can provide researchers with options, through processes that acknowledge different viewpoints within informal groups (e.g., local farmers groups or cooperatives, water associations etc.) and between groups. The communities of practice framework can accommodate practitioner and researcher constraints that may stem from funder or academic obligations, or political or cultural sensitivities (Denscombe, 2008), as well as help to incorporate multiple perspectives that make up heterogenous groups/communities.

Pragmatism is a philosophical framework rooted in practical application of research that honors the perspectives and knowledges of both researchers and participants (Creswell, 2013). PAR methodologies are a preferred set of tools for pragmatic researchers that work within inequitable power structures to uncover and address place-based problems (Hall, 1992). Both communities of practice and mixed-methods are well placed in pragmatic frameworks to incorporate multiple situated knowledges in order to select contextually appropriate methodologies that address power inequalities and work for social change.

Integration

When positioned within the communities of practice framework, mixed-methods research may provide opportunities to address power inequalities and improve community-based outcomes within research and development practices. By opening space to incorporate multiple situated knowledge systems, appropriately selected mixed-methods can help to address dynamic community gender, status, and/or class power structures. Communities of practice acknowledges that groups are not homogeneous entities and researchers must work to incorporate the voices of all members. The use of mixed-methods enhances inclusion and engagement practices for action research within local contexts. The variety of conceptual and functional tools provided within the mixed-methods template can also help researchers and practitioners select appropriate methods based on multiple outcomes and outputs. Outcomes may be related to community-based goals while outputs address funding, academic, or policy related agendas. Mixed-methods (specifically participatory methods) and communities of practice may also provide a process to deconstruct power inequalities and use complementary methods that work to acknowledge Western, feminist, indigenous, critical systems, and intersectional situated knowledge systems and science.

For example, the combined use of a quantitative survey and qualitative focus groups or interviews (i.e., a mixed-methods approach) may result in findings that account for funding agency, academic, and political outputs while simultaneously contributing to social action and community goals (i.e., outcomes). In this case, the results may provide statistically relevant and generalizable outputs, and also uncover rich, in-depth data to enhance the understanding of individual and

community needs (i.e. outcomes) through qualitative methods. Additionally, the communities of practice paradigm strives to utilize praxes that decrease power inequalities through methodological inclusivity, and participatory, process-oriented research.

While integrating disparate knowledge systems may not be appropriate, using pluralistic methods within a flexible paradigm structure (i.e. process) may allow for "two kinds of knowledge to be pursued separately but in parallel, enriching one another as needed" (Berkes, 2008, p. 270). The ability of researchers and development practitioners to develop processes that acknowledge and incorporate various situated knowledge systems becomes increasingly vital to transdisciplinary goals in cross-cultural settings. Power and gender play a vital underlying role in development. Communities of practice through a mixed-methods approach may improve development and research efforts to deconstruct historical power structures. The ability of transdisciplinary research processes to move toward community-based social change relies on a valued understanding of, possibly divergent but equally valuable, situated knowledge systems.

Part 3. Geography: Exploring pluralistic methodologies, power, and situated knowledges through a spatial lens

Part 3 incorporates geography by looking at the ways spatial analysis can serve as a bridge between academic research and social change. It also explores the opportunities and barriers for participatory geographic information systems to deconstruct historical systemic power structures toward social change and justice.

Spatial analysis and geographic information systems

Two disparate cholera outbreaks were mapped and spatially evaluated by Charles Picquet in France (1832) and John Snow in London (1854) that have been linked to the origins of spatial analysis application (Dempsey, 2012). Both Picquet and Snow used maps to display and disseminate their data, though Snow used an early form of point pattern spatial analysis to show the relationship between clustered cholera cases and the source of cholera (Darmofal, 2015; O'sullivan & Unwin, 2010). In addition to his map, Snow spoke with the local community to supplement his understanding of the cholera cases; Shuurman (2004) notes that local knowledge provided by these conversations helped Snow discern patterns and account for an additional water source used in the affected area. Presented in indigenous and decolonizing methodologies literature, the unique indigenous ways of experiencing connections between people, non-human beings, and space, would lead one to believe

that indigenous peoples have been considering the implications of spatial relationships much before the 1800s, albeit by different means and knowledge processes (Berkes, 2008; Engler, Scassa, & Taylor, 2013; Smith, 2013).

Spatial analysis is a unique set of analytic techniques and methods used to confirm or explore geographic patterns and relationships to address problems that require spatial data (Goodchild & Longley, 1999). Spatial analysis techniques compare data from one geographic location to similar data from another geographic location to uncover spatial patterns and relationships. GIS on the other hand is a computer system that assembles, stores, analyzes, and displays geographically referenced information (Dempsy, 2018). In combination, spatial analysis and GIS form a powerful tool for both visualization of comparative spatial analysis, and for rapid data crunching to make the analysis. In short – spatial analysis is a methodology (theory and method) – GIS is a tool that is particularly powerful for both the analysis and visualization of spatial data – but does not replace the theory.

Scientific assumptions about spatial relationships and interactions are foundational to the application of spatial analysis through techniques like spatial statistics, remote sensing, cartography, modeling, and GIS. Waldo Tobler's first law of geography that "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970) remains one of the most useful ideas for spatial analysis (Schuurum, 2004). Miller (2004) noted that Tobler's first law is at the root of spatial autocorrelation, or Galton's problem, that uses quantitative statistics to discern whether spatial relationships can be attributed to spatial or attributional dependence[6] (Schuurman, 2004; Darmofal, 2015). Miller also explained that Tobler's first law influenced further spatial analysis applications on the concepts of nearness, spatial heterogeneity, and work in complex systems (Miller, 2004). The increased complexity, widespread utilization, and diverse visualizations of spatial analysis would not have been possible without the progress of computerized technology that prompted automated cartography (i.e., digitized mapping) and GIS (Goodchild & Haining, 2004).

Researchers began exploring the use of more complex computational methods for spatial analysis in the late 1950s and early 1960s. In 1962, landscape architect Ian McHarg presented his overlay method that later became integral to spatial analysis and was integrated into early GIS (Schuurman, 2004). Toward more rapid analysis and diverse spatial data representation researchers in

[6] *Spatial dependence* occurs when geographically adjoining units are directly influenced by one another, for example, people talk to each other in adjacent communities and vote for the same candidate. *Attributional dependence* occurs when geographically adjoining units have independent adoption of similar behaviors, for example, people in adjacent communities don't talk but have similar political views and economic status and vote for the same person (Darmofal, 2015; Schuurman, 2004).

Canada, the United States (US), and the United Kingdom (UK) began exploring computerized cartography around the same time (Schuurman, 2004).

Roger Tomlinson and Lee Pratt created the Canada Geographical Information System in 1963 (Schuurman, 2004). Initially created for the Canadian government, it is one of the first computerized systems to digitally encode land use zones (Schuurman, 2004). Today, Tomlinson is known as the 'Father of GIS.' During the same time, scientists in the US (Harvard Laboratory for Computer Graphics and National Center for Geographic Information and Analysis) and UK (UK Ordnance Survey and Experimental Cartography Unit) were beginning to digitize spatial information, and build algorithms and code to solve spatial problems that led to the foundation of spatial analysis in GIS (as stated in Schuurman, 2004, N. Chrisman, 1998, personal interview). Early uses of GIS in the US are related to integration and exploration of population census data, such as, the Chicago Area Transportation Studies (Goodchild & Haining, 2004). The national mapping agency in the UK is called the Ordnance Survey and was initially established for military purposes after an uprising in Scotland in 1745 (Dempsy, 2012). Britain's Experimental Cartography Unit was established in 1967 and housed many of the initial GIS projects that included a Red Sea bathymetric chart, and soil and geographic surveys (Dempsy, 2012).

Goodchild and Haining (2004) note that advances in automated cartography and GIS in combination with the mixing of scientific visualization methods greatly influenced spatial analysis in the 1990s. They also suggest that while mapping is fundamental to the scientific visualization of spatial data, future efforts should focus on GIS and automated cartography integration within wider spatial analysis techniques and process, whereby shifting the perspective away from maps solely as result outputs (p. 374). Goodchild was behind the 1990s intellectual GIS revolution that called on researchers to move beyond simply thinking about GIS applications to questioning the underlying assumptions in GIS code and development (Goodchild & Longley, 1999; Schuurman, 2004). This questioning led to the theory behind GIS, known as geographic information science (Schuurman, 2004). GIS has technically and computationally expanded significantly over the past two decades including the incorporation of spatial analysis methods such as spatial statistics, simulation, and modeling within the GIS environment. Technological advancements and social norms have also influenced the widespread propagation of GIS through cell phones and automobile applications like Google Maps. Despite the increased integration of spatial analysis methods and ideas into GIS, they remain two distinct concepts.

Spatial analysis and GIS applications in PAR

PAR is an approach rooted in participatory methods and philosophical frameworks, local needs, and equitable partnerships (Hall, 1992; Kindon, Pain, & Kesby, 2007). PAR uses a grassroots approach toward local, sustainable social change where the researcher is ideally seen as a facilitator and participant rather than someone with 'power-over' community participants or process. Therefore, processes that use spatial analysis methods such as GIS must take appropriate caution when being used as part of any PAR approach. Craig, Harris, & Weiner (2002) noted that the results of GIS for spatial analysis have become a communication tool used to convert the results of scientific research into policy and decision making (Goodchild & Haining, 2004). The use of GIS for policy elucidates the concerns of power and knowledge production, representation, use, and data ownership that surface when conducting spatial analysis and using GIS as part of PAR (Cope & Elwood, 2009; Kindon et al., 2007).

Researchers should also be aware of power hierarchies within communities or on teams where they use PAR, as well as, the underlying governance structures that limit the opportunities for true democratic and participatory processes. Along these lines, Goodchild and Haining (2004) said that GIS tools are in the hands of millions of users, many of them unfamiliar with the theory behind spatial data analysis. Application without theoretical foundation has resulted in the misuse or misinterpretation of scientific principles and outputs. Partial or biased representation and visualization of spatial data is another concern that stems from the use of GIS under a PAR framework.

Indigenous, critical, and feminist scholars highlight concerns around the use of GIS and cartographic tools to represent multiple ways of knowing or standpoints that are dynamic and complex (Engler et al., 2013; Kindon et al., 2007; Kwan, 2002). Questions have also been raised about the quantitative, positivistic paradigm and political agendas the lie beneath spatial analysis and GIS that do not or cannot appropriately represent oppressed voices. The idea of partial knowledge representation discussed around situated knowledges (Haraway, 1988; Harding, 1991; Smith, 2013) must also be accounted for in relation to the partial and situated information collected, processed or manipulated, and represented through spatial analysis techniques. Despite the challenges, researchers have created innovative approaches to more equitably and effectively conduct spatial analysis within a PAR framework.

Participatory spatial analysis using GIS can be carried out as a process whereby map overlays are explored with the relevant community or individuals, which includes listening to local interpretations of the comparative differences as opposed to crunching the numbers with GIS (which could also be done to compare the results to local interpretation). Participatory methods do not

eliminate the biases that may be inherent in what was mapped/digitized but can eliminate some of the black box (input and output without knowledge of internal processing) aspect as well as provide a chance to identify what is missing from the local perspective. As opposed to an approach that focuses solely or primarily on spatial data analysis, mixed-methods approaches that combine GIS with qualitative social inquiry can provide an opportunity to gain complimentary cultural and social data. Additional prospects to incorporate spatial analysis into PAR lie in collaborating with local experts or organizations toward capacity development and empowerment at their request, or the use of GIS for spatial analysis post research process to further explore primary or secondary data. As highlighted by Kindon et al. (2007) PAR is not simple or superficial and researchers must be willing to think and act outside of the box throughout PAR practice. Best case scenario, using spatial analysis and/or GIS within a PAR framework may lead to unforeseen outcomes that deconstruct power structures at the roots of spatial analysis tools, processes, political agendas, and imbalanced partnerships.

Methodological pluralism

It cannot be denied, we are in an era where big data and social media is the new norm, and 'facts' are presented through partial, biased twitter feeds (for example) in an attempt to confuse and sway the masses. Where the 1990s saw a divide between qualitative and quantitative methodologies (i.e., philosophies, methods) within geography, DeLyser and Sui (2014) suggest 'engaged pluralism' can serve as a unified response, by scientists, to engage with the current open source and big data revolution. They go as far as labeling big data an explicit paradigm in the methodological revolution and advise that scientists join forces across subdisciplines and methodological divides in an effort to address the complex and dynamic problems. Bridging disciplinary and methodological divides may also provide strategies to overcome the inherent power hierarchies in knowledge production present in mapping and GIS.

Over the past two decades researchers have explored processes to address the early accusations that maps were (re)enforcing power inequalities (Monmonier, 2005) stemming from partial or limited inclusion and representation of diverse local knowledges. Maps and other spatial visualizations (i.e., GIS, graphics) and the processes to create them may expose power hierarchies between technical experts or researcher(s) and researched, within cultures, and based on political agendas (Cope and Elwood, 2009; Engler et al., 2013; Rambaldi, Kyem, McCall, & Weiner, 2006). Therefore, researchers must be cognizant that the research process can contribute to local empowerment and capacity development, or reproduce historical power inequalities, partial knowledges, and inaccurate visualizations of individual or community identity and relations to place. Akin to the connection between power and situated knowledges that Haraway (1988) and Smith (2013) highlight through

feminist and indigenous paradigms, Cope and Elwood (2009) present through numerous examples that attest to the effectiveness of combining (i.e., mixed-methods) geographic visualizations and qualitative methods to combat power and partial knowledge.

In 'Qualitative GIS: a mixed methods approach', Cope and Elwood (2009) explore GIS as a power and knowledge equalizer between researchers and the people living in communities where research and/or development takes place. While GIS technology is continuously being improved to more fluidly represent multiple situated knowledges within complex and dynamic systems, once locally constructed information is spatially displayed about a place that an individual or community knows very well – it is no longer a black box of academic or political speak; a potentially empowering opportunity. Process transparency is very important, because as Pavlovskaya (2009) noted, "as a representational tool and a socially embedded technology, GIS is indeed 'oozing with power'" (p.15). She goes on to say that the power is derived from its (i.e., GIS) ability to create visual images of previously hidden aspects of the natural and social world. Inequitable power structures also result from the agendas and beliefs of GIS researchers and practitioners that initiate their research processes and data outputs. The result is that maps and spatial analysis are only partial representations of reality and knowledge that are ripe for multiple interpretations. Feminist and indigenous theorists claim that knowledge is socially situated within a specific time and place (Haraway, 1988; Smith, 2013) and Goodchild (1991) noted that GIS was not designed as a substitute for knowledge, but rather to be used in combination with knowledge.

Further examples from Cope and Elwood (2009) highlight that qualitative methods such as ethnography or grounded theory can be used to ground truth GIS-based cartographic representations, re-envision human-space connections, empower local partners, and acknowledge multiple situated knowledges. Both Knigge and Cope's (2009) grounded visualization research in Buffalo, NY and Matthews, Detwiler, and Burton's (2005) geo-ethnography Welfare Project study provide examples of mixed-methods approaches that enhance GIS outputs with rich qualitative data. Knigge and Cope (2009) use multiple qualitative methods to gain rich data that they use to develop a situated (i.e., local and contextual), scalar understanding of a vacant lot used informally as a community garden space in Buffalo, NY. They found that the combination of data, process, and representation allowed them to construct a more holistic picture of the multiple realities of stakeholders leading to different interests and concerns for a single place. While geographic patterns and relationships often build on ethnographically developed contexts, Knigge and Cope (2009) conclude that it is also possible that "visualizations can also possibly provide context for ethnographic research" (p. 111). The in-depth interviews (i.e., ethnography) in the Matthews et al. (2005) study were used to develop a more

complete understanding of low-income welfare communities to compliment GIS. In their study, ethnography helps to shed light on community resource use and social networks within and between families and neighborhoods (Matthews et al., 2005).

Qualitative GIS approaches can foster knowledge sharing and the production and representation of spatially situated ways of knowing. While a variety of qualitative methods were addressed by Cope and Elwood (2009) to work in combination with GIS, participatory methodologies stand out. Participatory methodologies are rooted in action research that explicitly works to address issues of knowledge and power toward social change. The intersection of power and knowledge production and validity are especially evident through the use of participatory GIS within marginalized and indigenous communities (Berkes, 2008; Pavlovskaya, 2009; Engler et al., 2013; Kwan, 2002).

Participatory mapping and GIS

Participatory methodologies were born out of action research in the 1960s and 1970s (Hall, 1992). The early work was embedded in education and local activism that are credited to the likes of Prussian psychologist Kurt Lewin, Brazilian educator/philosopher Paulo Freire, and researchers Budd Hall and Robert Chambers (Hall, 1992; IDS, 2018a; Kindon et al., 2007). Participatory research is rooted in principles such as 'do no harm', develop community-based objectives, recognize multiple situated knowledges, address power inequalities, and guide research toward social change and justice (Hall, 1992; IDS, 2018a; Kindon et al., 2007). Participatory research continues to be guided by processes-based, inclusive, and community engagement practices. Mapping, through community-based participatory processes, specifically, counter-mapping (i.e., maps created and used to challenge official maps) (Newing, 2010; Engler et al., 2013), can act as "a vehicle of resistance, a language whereby rights to place may be asserted or through which non-dominatory representations might be cultivated" (Pickles 2004, p. 113). However, as one might expect, the participatory methodologies that lie at the core of participatory GIS are fraught with challenges, specifically in relation to process.

Despite the reality that indigenous peoples' have been drawing maps and interpreting their natural settings since time immemorial, it wasn't until the late 1980s that participatory mapping became more widely known and facilitated by development practitioners and academics (Chambers, 2006, Rambaldi et al., 2006). The range of tools and methods for participatory mapping can include *ephemeral* (i.e., ground maps, drawing maps with local resources such as rocks, soil, and sticks), *sketch mapping* (i.e., paper maps), *participatory GIS* (i.e., uses GIS technology to explore community driven questions, includes spatially referenced and non-spatial attribute data), and *participatory 3D modelling* (i.e., integrates evaluation data with local spatial knowledge depicted, by informants, on a physical model) (Rambaldi et al., 2006). Earlier participatory methods primarily reflect community-

based ground or paper mapping through frameworks such as the Participatory Rural Appraisal (Chambers, 2006; IDS, 2018a). Though the more basic techniques are still desirable in some contexts (e.g., rural, remote development settings), the advancement of spatial technologies has made GIS mapping more accessible and often preferred by academics and decision-makers.

The technical expertise, software base language, and relatively (e.g., people surviving on less than $2/day) expensive equipment required for GIS applications present increased barriers for participatory GIS practices. Engler et al. (2013) suggest that participatory GIS processes should address historically engrained power structures at the onset of projects. Approaches can include anticipating and mitigating for unintended consequences (e.g., potential misuse of mapped information, unequal participation), building and nurturing collaborative relationships early and often, and attempting to facilitate non-exploitive, equitable benefit-sharing processes (Engler et al., 2013). For example, academics have a history of 'parachute in, parachute out' research practices that exploit indigenous communities for knowledge. One key to overcoming these challenges is recognizing they exist and can become a problem. Ethical processes such as the university Institutional Review Board (IRB), and Tribal or community Memorandums of Understanding (MOU) are in place to mitigate these concerns of exploitation and harm to human or animal subjects. Chambers (2006), IDS (2018a), Narayanaswamy (2017), and Kwan (2002) call on critical self-reflection to help researchers and practitioners combat power inequalities. Kwan (2002) suggests that administering participatory GIS through a feminist (geography) lens will help bring women's spatial concerns to the fore. The applied context of much participatory GIS and mapping work requires context-driven selection of methodologies through an adaptive and locally driven research process.

Within the context of the author's research in Liberia and future cross-cultural collaborations, the use of participatory methods, such as participatory GIS, will require advanced planning that adheres to locally situated settings and agendas. Only through patience, empathy, humble positioning, and self-inquiry will transdisciplinary research practices (at its best) lead to social change and justice. There is no silver-bullet approach in participatory research, only continued efforts toward diverse and robust participatory practices (Elwood, 2006).

Integration: GIS, power, and praxes

Geographic (mis)representations of reality created through GIS (i.e., maps, graphs, visualizations), wield a significant amount of power, as do the processes and people that create them (Cope & Elwood, 2009; Monmonier, 2005; Schrruman, 2004). As the old adage goes 'a picture is worth a thousand words' and maps tell stories that have the ability to rapidly communicate information across diverse languages, agencies, and ways of knowing. Geographic images have the

power to (re)build bridges, give voice to marginalized communities, and deconstruct misconceptions that stem from historical power structures and positivist, partial knowledge construction; or they can reinforce the "white capitalist patriarchic" (Haraway, 1988; Maguire, 1987) propaganda that attempts to maintain an illusion of value-free, co-opted knowledge and objectivity (Berkes, 2008; Harding, 1991; Smith, 2013). The intersection between research process and appropriately selected pluralistic methodologies is where Cope and Elwood (2009) took us in 'Qualitative GIS a mixed methods approach' and DeLyser and Sui (2014) suggest we *ought* to be moving.

For example, Sarah Elwood (2009) worked on a transdisciplinary, grassroots GIS and qualitative methods project with two community-based organizations in northwest Chicago. The project set out to understand the practical, political, and social implications of the organizations' GIS practices in historically low income, ethnically diverse, minority communities. She found, that through their mixed-methods approach of combining census data and qualitative GIS methods, the two organizations have used maps to help draw attention to the local Puerto Rican place-based identity as part of an anti-gentrification agenda. Additionally, maps have been used to shift residents' (within and outside the focal communities) generalized assumptions about people who live in certain 'places' and to increase social services allocated to these communities by the city. These organizations have also used participatory processes to include and empower local citizens and have used maps to present local knowledge and concerns toward grant funding. Elwood (2009) highlights that maps can be used strategically for specific agendas or to advance discourse. She notes that "maps are productive not just in the representative moment of their creation, or in the discourses advanced through the visible text that appears on a map, but also in the spaces and meanings that are produced when maps are reinterpreted and reframed for specific agendas" (Elwood, 2009, p. 61).

While GIS may prove to hold pluralistic epistemologies, Harris (2016) and Aitken and Crain (2009) claim that GIS technology has limitations when it comes to representing the ranges of human experience, for example, emotion. In attempts to broaden the scope of GIS applications in relation to locally constructed knowledges and lived experiences, they present (participatory) deep mapping and affective geovisualization, respectively, that call on unique mixed-methods combinations that include science, technology, community-engagement, and art forms. Harris (2016) explains that deep maps represent a real move toward qualitative GIS and the hybrid mixed-methods approaches described by Cope and Elwood (2009). While promise may exist in conceptualizing new ways to engage through GIS, concerns around power inequality and knowledge representation remain salient.

GIS is not immune to the inherent political and power inequity present in research praxes. Efforts to address the critics, that cast GIS into the positivist paradigm up until the 1990s can be seen

through the progress to bridge divides between qualitative and quantitative 'camps' (Kwan, 2002; Schuurman, 2004). Progress is evident in mixed-methods research paradigms, qualitative GIS, participatory methodologies, and theories that welcome multiple situated knowledges, such as feminist, indigenous, critical systems, and post-modern constructivism (Cope & Elwood, 2009). However, the GIS and human geography debates that began in the 1990s remain relevant today. Maybe even more so, with the increased speed of information communication through technological advancements, social media, and globalization. Cope and Elwood (2009) emphasize that the utilization of qualitative GIS through a mixed-methods approach can help to address these complexities. Additionally, when used within a PAR approach GIS can help combat partial, biased geographic representations and the power inequalities rampant in quantitative research paradigms and methods. Research process and self-reflection are especially relevant in development practice when working with marginalized women and indigenous communities.

Part 4. Synthesis: For integration and application to the Liberia INGENAES project

Part 4 explains the common ground found between sociology, geography, and development literature that is relevant to the themes of gender, power, place, action research, and knowledge production. Further, it uses Phase 2 of Repko's (2012) interdisciplinary research process to identify research praxes that are best suited to bridge theory and practice for gender in development research. Resulting from Parts 1-3 common ground was found in the need to 1) be mindful of *connection* (i.e., spatial, social, complex systems thinking, methodological, intersections, interdisciplinary), 2) acknowledge both *context* and how something is *situated* within a given context (i.e., situated knowledge and standpoint, place, condition, history), to 3) conduct a pragmatic *research process* that includes the appropriate selection of methods and methodologies focused on participation, inclusion of difference, social and environmental justice, and pluralism when germane (mixed-methods, participatory, pragmatic), and in the 4) acknowledgement of the innerworkings of *power* in and through individual, social, and political perspectives and agendas, as well as the research process(es) and techniques (Appendix A). The following sections describe each key thematic common ground finding followed by a description of how and why FST was selected for the reflection conducted as part of Chapter 4.

Connection

Being that the prefix 'inter' means together, between, among, or mutually, it would lead one to believe that interdisciplinary research hinges on direct and indirect connection(s)[7], and the literature review in Parts 1-3 shows this to be true. The interdisciplinary research process itself calls for integration of disciplinary insights, experts (academic and non-academic), concepts, theories, and methodologies to construct common ground and more comprehensive understandings to address complex real-world problems (Repko, 2012; Mathews, Jones, Szostak, & Repko, 2008; Clark & Brennan, 1991). Other authors describe connections by way of research methodologies such as PAR, people and place connections as Kindon et al. (2007) describe, or mixing methods and philosophies (Cope & Elwood, 2009; DeLyser & Sui, 2014; Denscombe, 2008; Greene, 2007, Johnson et al., 2007; Midgley, 2000). The communities of practice concept set forth by Lave and Wenger (1991) provides a framework for connecting individuals with common interests. Their approach is particularly useful for community contexts because it enables differences and similarities to be simultaneously present within groups. When used within mixed-methods research, communities of practice can provide an avenue to embrace heterogeneity within community groups and on research teams.

Two critical connection findings that relate to the author's project in Liberia are connection between gender and power, as Koster (2015) notes "gender is fundamentally a question of power" and Haraway's (1988) situated knowledge link between women's standpoints, their lived reality, and knowledge production. Smith (2013) and Berkes (2008) likewise highlight the undisputable connections between indigenous knowledge, cultural practices, and place. Questions addressed through spatial analysis are fundamentally linked to connection vis-à-vis patterns and relations across landscapes (Darmofal, 2015; Schuurman, 2004). As shown through Tobler's first law of geography that "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236) we can see that one of the key facets to analyzing data geographically reflects connection through space (Darmofal, 2015; Schuurman, 2004).

Connections are also salient when addressing problems in complex systems that link social and environmental factors and account for system dependencies, feedbacks loops, and change. Critical systems thinking looks to address multifaceted real-world problems through innovative approaches that draw from an interdisciplinary research process and pluralistic and participatory methodologies (Midgley, 2000; Flood, 2010; Ulrich, 2003). The author's research in Liberia looks to address difficult questions in complex systems impacting gender equity and food security. For these reasons critical systems thinking was incorporated into the literature review, as was FST that connects

[7] The term *connection* refers to linkages between two or more entities, systems, ideas, or disciplines.

critical systems thinking and cultural ecofeminism (Stephens, Jacobson, & King, 2010; Stephens, 2012, 2013). Stephens (2013) highlights the two major contributions for FST from the cultural ecofeminism standpoint being that one "it rejects an essentialist position that women are biologically linked to nature" (p. 18), a position that reinforces dichotomies (i.e., man/woman, man/nature) and the role of women as inherently tied to nurturing behaviors and labor responsibilities. It also provides epistemological language that challenges Cartesian dualism[8] and incorporates situated knowledges.

In cross-cultural, transdisciplinary collaborations the acceptance of multiple situated knowledge systems, workable terminology definitions, flexible research processes, and power become even more integral to the interdisciplinary research process. The ability of researchers to assuage power inequalities, build trusting relationships, and connect seemingly disparate aspects of systems toward social chance is dependent on an appropriate selection of methodologies and the humble acceptance that local people are experts in their own right and place.

Context and situated knowledge(s)

All three disciplines share common ground in the importance of engaging in context specific research processes, specifically, in relation to situated experiences and knowledge production (Haraway, 1988; Kindon et al., 2007; MacDonald, 2012; Narayanaswamy, 2017; Smith, 2013). Dating back to 1944 when Kurt Lewin first coined the term action research, social research processes have been tailored to context specific problems and action. Paulo Freire, Budd Hall, and Robert Chambers firmly established participatory methodologies under the action research umbrella in the 1960s and 1970s (Hall, 1992; IDS, 2018a; Kindon et al., 2007; MacDonald, 2012). Hall (1992) contends that PAR is philosophically compatible with pragmatism because it is rooted in a local context, facilitates equitable participation, and welcomes multiple situated knowledges. Standpoint theorists and feminists such as Sandra Harding (1991) and Donna Haraway (1988) share the same sentiment that situated knowledge and the context specific struggles of women give them unique standpoints. Building on the standpoint theory that people's worldviews are shaped by their social and political experiences, feminist standpoint theorists highlight the unique awareness, positionality, and situated knowledges of marginalized populations, namely women (Bowel, n.d.; Haraway, 1988; Harding, 1991; Shiva & Mies, 2014; Tong, 2013). The ecofeminist movement acknowledges the dual-oppression of women and the environment; this intersection is also a central tenant to Stephen's (2012, 2013) FST approach. While feminist theorists have played a central role in characterizing the notion of context specific, partial, and situated knowledges, indigenous scholars and communities

[8] Division between human and nature

have also called attention to the detrimental impacts of the dominant white, patriarchic, partial knowledge paradigm.

Maori scholar and indigenous education professor Linda Tuhiwai Smith (2013) highlights that diverse ways of knowing are uniquely situated in indigenous communities throughout the world. Berkes (2008) has also emphasized the scientific validity and critical natural resource management contributions through traditional ecological and indigenous knowledges. Feminist theory and indigenous science literature share common threads in their call to acknowledge multiple ways of knowing that are temporally and geographically situated; they also describe knowledge as a living, dynamic system that is about communities, not isolated individuals (Berkes, 2008; Haraway, 1988, Smith, 2013).

Kindon et al. (2007) highlight the unique contextual intersection of people and place and highlight the importance of PAR that hinges on the use of pluralistic methodologies. Cope & Elwood (2009) use case studies to examine the integration of qualitative methods and GIS through mixed-methods research. They find that when coupled with qualitative methods, GIS projects are more likely to empower community participants, improve political and external stakeholder understandings of situated concerns, and help researchers engage in more reflective processes (Elwood, 2006; Cope and Elwood, 2009; Kwan, 2002). However, both Radil and Anderson (2018) and Narayanaswamy (2017) advise caution when examining the so called 'successes' of participatory or community-based research due to underlying political power and governance, superficial participatory processes, and a lack of critical data on community empowerment and accountable aid. Nonetheless, the role of context specific research and situated knowledge production remains common ground between disciplinary insights, and vital to the author's main goals around gender-sensitive, power-equitable, socially-relevant, and reflective research (processes).

Research process and pluralism

Due to the influence of power (visible and invisible) on social and political processes, researchers must be cognizant of their decisions when selecting research methods and methodologies. Because no method or technology is value-free it is vital to acknowledge and mitigate power to the extent possible by selecting appropriate methodologies based on local context and goals. The feminist, indigenous, systems, and critical theorists explored in the review express similar sentiments. The flexibility and adaptive capacity resulting from mixed-methods (Greene, 2007; Denscombe, 2008; Denzin, 1978; Johnson et al., 2007) or methodological pluralism (Flood, 2010; Midgley, 1996, 2000; Stephens, 2013; Ulrich, 2003) is most appropriate in community-based research contexts

because pluralism allows the purpose and process to define the tools used for research (Berkes, 2008; Greene, 2007; Kindon et al., 2007; Midgley, 2000; Stephens, 2013).

Participatory and mixed-methods were identified by all three disciplines as the primary approaches to deconstruct historical power structures toward social change. Pragmatism is described as the most compatible paradigm for action research and pluralistic methodologies. Cope & Elwood (2009) highlight unique examples of mixed-methods approaches to enhance inter and transdisciplinary[9] collaborations by combining visualization and qualitative methods (i.e., community mapping and GIS). They provide salient examples where GIS is used in combination with ethnography or grounded theory through participatory methods (Knigge & Cope, 2006; Matthews et al., 2005). The combination of participatory GIS and qualitative methods can shed light on place-based identity and discrimination, influence policy, represent situated knowledges, temper power inequalities, and build understanding between researchers and research participants (Cope & Elwood, 2009; Elwood, 2006; Matthews et al., 2005). Working in the field (i.e., in communities or with local partners) often requires unique combinations of qualitative and quantitative methods (based on multiple epistemologies) administered through participatory approaches (Cope & Elwood, 2009; Hall, 1992; IDS, 2018a).

The literature review shows a consensus that community-based projects are more likely to be useful and sustainable when local stakeholders are involved through participatory processes such as PAR or Participatory Learning and Action (Hall, 1992; IDS, 2018a; Kindon et al., 2007). However, cultural, political, academic, and funding constraints often make participatory approaches difficult or impossible for researchers to fully accomplish. Naraywanaswamy (2017) concluded that even with the best of intentions, knowledge for development projects in India that employ participatory approaches and hire local Southern-women intermediaries, often reinforce power inequalities and don't meet their development goals. Radil and Anderson (2018) also note that the local governance structures and failure to establish diverse locations for community engagement in Muncie, Indiana limited the Muncie Action Plan's ability to conduct inclusive and empowering public participatory and GIS processes.

[9] *Transdisciplinary research* Different academic disciplines working together with non-academic collaborators to integrate knowledge and methods, to develop and meet shared research goals achieving a real synthesis of approaches. Actively working toward social change. *Interdisciplinary research* Intentional collaboration between different academic disciplines working to integrate disciplinary knowledge and methods, to develop and meet shared research goals toward synthesis.

For researchers interested in bridging theory and practice to support local initiatives it is critical to question the effectiveness of methods in a given political, social, or cultural context. This literature synthesis highlights the importance for power inequalities and knowledge production and validation to be illuminated and called into question throughout the research process (Berkes, 2008; Engler et al., 2013; Haraway, 1988; Harding, 1991; Kwan, 2002; Narayanaswamy's, 2017; Pavlovskaya, 2009). Additionally, as Robert Chambers suggests in his focus on critical self-refection, researchers should iteratively ask themselves questions such as what the role of a researcher is and how one can contribute to social change and not do harm within the power laden, politically inequitable global society (IDS, 2018a; Narayanaswamy, 2017).

Power

In an effort to build bridges between academic theory and applied research, the previous sections explore the importance of contextually situated knowledge production and validity for research processes; the concept of power is also salient. Let us start by revisiting the definitions of power from Part 1. *Visible power* refers to decision-making and influence on research boundaries (i.e., where the study physically takes place, methods used, who is involved) and policies (information and formal) (Koester, 2015; Midgley, 2000). Cultural norms and patriarchic structures define what groups in a community or household have *power-over* others (Koester, 2015). *Invisible power* (i.e., to shape or influence others' beliefs and desires, thereby securing their compliance) was deemed as the most insidious and difficult type of power to identify and mitigate (Koester, 2015; Lukes, 2005; Nye, 2004). For example, Antonio Gramsci shows that the ability of the elite, capitalist class (i.e., bourgeoisie) to maintain power-over the lower, rural, peasant classes is often through hegemonic culture using ideology (i.e., invisible power), as opposed to violence, coercion, government policies, or economic force (Cox, 1983). When working toward common goals in interdisciplinary research, experts often have technical expertise to use *power-to* work toward common goals, or *power-with* community partners in participatory research (Koester, 2015). In community-based social science research the power that one has over participants or the processes must be acknowledged, monitored, and mitigated when possible.

Social research is inherently power laden and political because it is situated in the social realm. Therefore, this review suggests that researchers be cognizant of their positionality and influence on the research process, the power of different methods and techniques, and underlaying historical power structures (e.g., gender, class, culture, governance) that may influence community participation, research agendas, and the ability of participatory research to truly contribute to environmental and social change and justice.

The need for social researchers to acknowledge their own positionality, privilege, and influence on the research process has come into the fore of community-based research practices over the past two decades. For example, by participatory research methodologists such as Robert Chambers (IDS, 2018a) and Kindon et al. (2007), feminist theorists (Haraway, 1988; Harding, 1991), critical systems thinkers (Midgley, 2000; Ulrich, 2003), critical and feminist geographers (Kwan, 2002), and indigenous researchers (Smith, 2013). Standpoint Theory was coined by Sandra Harding (1991) to highlight the inadequate efforts of research methodologies to acknowledge the unique circumstances and beliefs of women due to their marginalized positions in society and earned standpoints. Feminist theorist Donna Haraway (1988) called on the use of 'situated knowledges' as one way to combat the dominant paradigm and create a more dynamic and truthful picture of the realities that underpin scientific assumptions. Haraway (1988) contends that honoring multiple viewpoints through situated knowledge systems will avoid disseminating partial knowledge and inaccuracy through a biased scientific lens and existent power structures. She also highlights that knowledge is an active entity, and similar to indigenous scholars suggests that it must not be treated as static or divorced from context and place. People are spatially situated, and one is shaped and influenced by the other. Indigenous scholar Linda Tuhiwai Smith (2013) contends that they (people and place) are inseparable and shape each other over time while Berkes (2008) notes that indigenous ways of knowing are expressed through spatially situated knowledge-practice-belief systems. Therefore, removing one from the other within a research process or representing place (people and space) through 2-dimentional mapping efforts, fundamentally puts research methods at odds with indigenous ways of knowing and being.

Methodological selection for community-based interdisciplinary research can either reinforce or mitigate existing power imbalances. Literature on visualization methods such as GIS, satellite imagery, cartography (i.e., maps), and story maps state that they and other technologies have a lot of power and potential (Cope & Elwood, 2009; Monmonier, 2005; Newell, 2000). When done in a participatory fashion, knowledge production, spatial analysis, and visual representation can identify and create space for minority voices to be heard, place-based identities seen, and multiple situated knowledges holistically represented (Cope & Elwood, 2009; Kindon et al., 2007; Pavlovskaya, 2009). Questions of power and appropriateness similarly arise between research processes that use, for example, quantitative survey methods vs qualitative interviews or focus groups (Greene, 2007; Newing, 2010). It then becomes important to question which methods support and contribute to community initiatives, and which use surficial, token participation with underlying political, academic, or economic agendas and no real intension or power to give back to a community.

When promoting the Participatory Rural Appraisal, Robert Chambers, identifies the right of local community members to evaluate their own reality, he uses ‘reversal of learning’ to encourage researchers and international development practitioners to learn from local people (IDS, 2018a). Hall (1992) corroborates with Chambers, Kurt Lewin, and Paulo Freire that participatory methods and action research provide a more appropriate template of methods and methodologies to mitigate power inequalities between the researcher(s) and research participants (Hall, 1992; IDS, 2018a). They also note that participatory research processes provide a more pragmatic path to equalize power towards social change and justice at the local level. However, if participatory research is done superficially and simply to fill quotas, or if researchers fail to acknowledge their own standpoint/positionality, power diffusion within participatory projects will fail. Further, the process, outcomes, and outputs of spatial analysis have unique potential to empower local partners when combined with qualitative and participatory methods, however, the efficacy of such approaches remain embedded in local power structures.

Narayanaswamy (2017) spent the better part of her book providing evidence that participatory knowledge for development approaches by northern, gender focused, NGOs in India are not working (i.e., are not decreasing poverty, food insecurity, or gender inequalities). While she places some of the blame on the type (long winded reports written in English) and dissemination (email, requiring internet or a printer) of information/knowledge, her greatest criticism fell on the unchecked promotion of local Southern women’s knowledge intermediaries that, she said, simply reinforced local hierarchal power structures and inequalities (Narayanaswamy, 2017). A similar sentiment was expressed in research on a well-intended, public participation process in Muncie, Indiana toward city revitalization (Radil & Anderson, 2018; Radil & Jiao, 2016). Despite its promotion as a ‘participatory’ planning project (specifically related to GIS) by Muncie Action Plan leaders, the authors found that grassroots organizations and participation were bypassed for more formal governance ‘civic engagement’ strategies initially carried out only in middle-class and higher income areas (Radil & Anderson, 2018; Radil & Jiao, 2016). Radil and Jiao (2016) also suggest that “the geographies of diversity within a particular place must be considered” for something closer to true citizen participation to occur. The project resulted in what authors note as an unsuccessful attempt to engage the full breadth of Muncie citizens toward local social and economic improvements. These two examples show that research methods and intensions cannot in and of themselves circumvent existing power structures to accomplish counter-hegemonic goals toward social change and justice.

What research praxes are best suited to bridge theory and practice for gender in development research?

The interdisciplinary research process highlights the need for more pluralistic, flexible, systems based, and context (situated) specific research praxes to effectively bridge theory and practice for gender in development research. While it is clear that no tool or method can overcome superficial, compulsory, or token participatory processes (Brown, 2012), there are integrated frameworks that emphasize researcher and research process accountability and reflectivity. Keeping in mind that the four common ground insights are connection, context, research process, and power, we will look at why the FST principles provide an appropriate framework to use in the author's case study on gender and agricultural extension services in Liberia, and for other gender and development research.

Feminist Standpoint Theory brings situated knowledge and marginalized women's voices (i.e., difference) to the fore (Haraway, 1988; Harding, 1991) and ecofeminism integrates the environmental and women's movements (Shiva & Mies, 2014; Tong, 2013) though neither explicitly address systems complexities. Where critical systems thinkers and theorists acknowledge the complexity and fluidity of interdisciplinary problems, they don't unequivocally acknowledge gender and gender intersections as influential to power nor systems. While mixed-methods and PAR work to dismantle traditional research power structures (DeLyser & Sui, 2014; Denscombe, 2008; Hall, 1992; IDS, 2018a; MacDonald, 2012), unfortunately, they often reinforce the underlying neoliberal hegemony or do little to tip the political power scale toward true social change and justice (Narayanaswamy, 2017; Radil & Anderson, 2018). In light of these findings, FST was chosen as an appropriate theoretical and practical framework because it bridges cultural ecofeminism and critical systems thinking (Stephens, Jacobson, & King, 2010; Stephens, 2012, 2013).

FST improves researcher and research process awareness, accountability, reflectivity, and reciprocity to bridge theory and practice for gender in development research. Developed through an in-depth grounded theory study on cultural ecofeminism and critical systems thinking, the five key FST principles are a) adopt a gender sensitive approach, b) value voices from the margins, c) incorporate the environment within research d) select appropriate methodologies and methods (methodological pluralism), and e) conduct research toward social change. While FST is missing an explicit link to spatial analysis, it can be incorporated through several of the principles or added through the adapted framework that is used in Chapter 4.

FST principles holistically and iteratively encompass power, context, process, and connection. The FST approach is simultaneously structured and fluid, without explicit ordering it

allows for feedbacks and exclusion of a principle depending on what the context calls for. *Power* is encompassed in all five principles. Specifically, in relation to power difference in gender, marginalized voices and non-human interests, within the research process itself, and the intended outcomes and process ownership. The underlying pragmatic approach means that FST is to be used *contextually* and towards social change. Methodological pluralism provides a pragmatic *research process* that has the potential to be more equitable, inclusive, participatory, and tailored to context/place. In best case scenarios, it may lead to locally relevant processes that facilitate situated knowledge production and representation. With a foundation in critical systems thinking, the FST is rooted in ideas of (inter)connection and feedbacks. *Connection* is apparent in selecting appropriate methodologies to bridge difference, minimizing dualism and incorporating marginalized voices, and being critical about inclusive boundary setting and stakeholder participation and ownership. The FST principles provide a unique framework to incorporate the common ground between reviewed development, sociology, and geography literature (i.e., power, context, process, and connection) while explicitly acknowledging gender. Due to its structured yet fluid approach, FST proved to be a beneficial framework for the author to reflect on her research case study in Liberia presented in Chapter 4. It is also a useful framework to develop and strengthen inter and transdisciplinary collaborations.

Literature Cited

Aitken, S.C., & Craine, J. (2009). Into the imagine and beyond: Affective visual geographies and GIScience. *Qualitative GIS: A mixed methods approach*, 139-155.

Berkes, F. (2008). *Sacred ecology*. Routledge.

Broome, M. E. (2000). Integrative literature reviews for the development of concepts. *Concept development in nursing: foundations, techniques and applications. Philadelphia: WB Saunders Company*, 231-50.

Brown, G. (2012). Public Participation GIS (PPGIS) for regional and environmental planning: Reflections on a decade of empirical research. *Journal of Urban and Regional Information Systems Association*, *25*(2), 7-18.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, *56*(2), 81.

Chambers, R. (2006). Participatory mapping and geographic information systems: whose map? Who is empowered and who disempowered? Who gains and who loses? *The Electronic Journal of Information Systems in Developing Countries*, *25*(1), 1-11.

Clark, H.H. (1996). *Using language*. Cambridge, MA: Cambridge University Press.

Clark, H.H., & Brennan, S. E. (1991). Grounding in communication. *Perspectives on socially shared cognition*, *13*(1991), 127-149.

Cook, T. D., & Reichardt, C. S. (1979). Qualitative and quantitative methods in evaluation.

Cope, M., & Elwood, S. (Eds.). (2009). *Qualitative GIS: a mixed methods approach*. Sage.

Cosens, B., Gunderson, L., & Chaffin, B. (2018). Introduction to the Special Feature Practicing Panarchy: Assessing legal flexibility, ecological resilience, and adaptive governance in regional water systems experiencing rapid environmental change. *Ecology and Society*, *23*(1).

Cox, R. W. (1983). Gramsci, hegemony and international relations: an essay in method. *Millennium*, *12*(2), 162-175.

Craig, W. J., Harris, T. M., & Weiner, D. (2002). Community participation and geographic information systems. In *Community Participation and Geographical Information Systems* (pp. 29-42). CRC Press.

Creswell, J.W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches. Third edition. Washington DC: Sage.

Darmofal, D. (2015). *Spatial analysis for the social sciences*. Cambridge University Press.

DeLyser, D., & Sui, D. (2014). Crossing the qualitative-quantitative chasm III: Enduring methods, open geography, participatory research, and the fourth paradigm. *Progress in Human Geography*, *38*(2), 294-307.

Dempsy, C. (2012). The History of GIS. *GIS Lounge*. Retrieved November 15, 2018, from https://www.gislounge.com/history-of-gis/

Dempsy, C. (2018). What is GIS? *GIS Lounge*. Retrieved November 15, 2018, from https://www.gislounge.com/whatisgis/

Denscombe, M. (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of mixed methods research*, *2*(3), 270-283.

Denzin, N. K. (1978). The research act: A theoretical orientation to sociological methods.

Elwood, S. (2009). Multiple representations, significations, and epistemologies in community-based GIS. *Qualitative GIS: A mixed methods approach*, 57-74.

Elwood, S. (2006). Negotiating knowledge production: The everyday inclusions, exclusions, and contradictions of participatory GIS research. *The Professional Geographer*, *58*(2), 197 208.

Engler, N. J., Scassa, T., & Taylor, D. F. (2013). Mapping traditional knowledge: Digital cartography in the Canadian north. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *48*(3), 189-199.

Flood, R. L. (2010). The relationship of 'systems thinking' to action research. *Systemic Practice and Action Research*, *23*(4), 269-284.

Freire, P. (1972). Pedagogy of the Oppressed. 1968. *Trans. Myra Bergman Ramos. New York: Herder*.

Goodchild, M. F. (1991). Issues of quality and uncertainty. *Unknown Journal*, 113-139.

Goodchild, M. F., & Haining, R. P. (2004). GIS and spatial data analysis: Converging perspectives. *Papers in Regional Science*, *83*(1), 363-385.

Goodchild, M. F., & Longley, P. A. (1999). The future of GIS and spatial analysis. *Geographical information systems*, *1*, 567-580.

Greene, J. C. (2007). *Mixed methods in social inquiry* (Vol. 9). John Wiley & Sons.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis*, *11*(3), 255-274.

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences.

Hall, B. L. (1992). From margins to center? The development and purpose of participatory research. *The American Sociologist*, *23*(4), 15-28.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist studies*, *14*(3), 575-599.

Harding, S. (1991). *Whose science? Whose knowledge?: Thinking from women's lives*. Cornell University Press.

Harris, T. M. (2016). From PGIS to Participatory Deep Mapping and Spatial Storytelling: An Evolving Trajectory in Community Knowledge Representation in GIS. *The Cartographic Journal*, *53*(4), 318-325.

Haugaard, M. (2010). Power: a 'family resemblance' concept. *European Journal of Cultural Studies*, *13*(4), 419-438.

Haugaard, M. (2017). Power-to, power-over, resistance and domination: an editorial Institute of Development Studies. (2018). Retrieved October 17, 2018, from http://www.participatorymethods.org

Hess, B. B., & Ferree, M. M. (1987). Analyzing gender A handbook of social science research.

Institute of Development Studies. (2018a). About Participatory Methods. Retrieved October 20, 2018 from http://www.participatorymethods.org/page/about-participatory-methods

Institute of Development Studies. (2018b). Accountable Aid. Retrieved October 20, 2018, from http://www.participatorymethods.org/method/accountable-aid

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research*, *1*(2), 112-133.

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and change*, *30*(3), 435-464.

Kindon, S., Pain, R., & Kesby, M. (Eds.). (2007). *Participatory action research approaches and methods: Connecting people, participation and place*. Routledge.

Knigge, L., & Cope, M. (2009). Grounded visualization and scale: A114 recursive analysis of community spaces. *Qualitative GIS: A mixed methods approach*, 95-74.

Koester, D. (2015). Developmental Leadership Program.

Kuhn, T. S. (1970). The structure of scientific revolutions, 2nd. Chicago: University of Chicago Press.

Kwan, M. P. (2002). Feminist visualization: Re-envisioning GIS as a method in feminist geographic research. *Annals of the association of American geographers*, *92*(4), 645-661.

Lave, J., & Wenger, E. (1991). Situated learning—Legitimate peripheral participation. Cambridge: Cambridge University Press.

Lukes, S. (2005). Power and the Battle for Hearts and Minds. *Millennium*, *33*(3), 477-493.

MacDonald, C. (2012). Understanding participatory action research: A qualitative research methodology option. *The Canadian Journal of Action Research*, *13*(2), 34-50.

Maguire, P. (1987). Doing participatory research: A feminist approach.

Maguire, P. (2006). Uneven ground: Feminisms and action research. *Handbook of action research*, 60-70.

Mathews, L.G., Jones, A., Szostak, R., & Repko, A. (2008). Using systems thinking to improve interdisciplinary learning outcomes: Reflections on a pilot study in land economics. *Issues in Interdisciplinary Studies*.

Matthews, S. A., Detwiler, J. E., & Burton, L. M. (2005). Geo-ethnography: Coupling geographic information analysis techniques with ethnographic methods in urban research. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *40*(4), 75-90.

Midgley, G. (2000). Systemic intervention. In *Systemic Intervention* (pp. 113-133). Springer, Boston, MA.

Midgley, G. (1996). What is this thing called CST? In *Critical systems thinking* (pp. 11-24). Springer, Boston, MA.

Miller, H. J. (2004). Tobler's first law and spatial analysis. *Annals of the Association of American Geographers*, *94*(2), 284-289.

Monmonier, M. (2005). Lying with maps. *Statistical science*, *20*(3), 215-222.

Morgan, K. (2007). The learning region: institutions, innovation and regional renewal. *Regional studies*, *41*(S1), S147-S159.

Morse, J. (1991). Approaches to qualitative-quantitative methodological triangulation. Nursing Research, 40, 120-123.

Narayanaswamy, L. (2017). *Gender, power and knowledge for development*. Routledge.

Newell, W. H. (2000). Transdisciplinarity reconsidered. *Transdisciplinarity: Recreating integrated knowledge—advances in sustainable development*, 42-48.

Newell, W.H., & Meek, J.W. (2003). Complexity an interdisciplinarity. Knowledge management, organizational intelligence and learning, and complexity, Encyclopedia of Life Support Systems. Available online at http://www.eolss.net. Oxford, UK: EOLSS Publishers.

Newing, H. (2010). *Conducting research in conservation: social science methods and practice*. Routledge.

Nye, J. S. (2004). *Soft power: The means to success in world politics*. Public affairs.

O'sullivan, D., & Unwin, D. (2010). *Geographic information analysis*. John Wiley & Sons.

Pavlovskaya, M. (2009). Non-quantitative GIS. *Qualitative GIS: A mixed methods approach*, 13-37.

Pickles, J. 2004. A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World. New York: Routledge.

Radil, S. M., & Anderson, M. B. (2019). Rethinking PGIS: Participatory or (post) political GIS? *Progress in Human Geography*, *43*(2), 195-213.

Radil, S. M., & Jiao, J. (2016). Public participatory GIS and the geography of inclusion. *The Professional Geographer*, *68*(2), 202-210.

Rambaldi, G., Kyem, P. A. K., McCall, M., & Weiner, D. (2006). Participatory spatial information management and communication in developing countries. *The electronic journal of information systems in developing countries*, *25*(1), 1-9.

Reeves, H., & Baden, S. (2000). *Gender and development: Concepts and definitions* (Vol. 55). Brighton: Institute of Development Studies.

Repko, A. F. (2012). *Interdisciplinary research: Process and theory*. Second Edition. Thousand Oaks, CA: Sage.

Rubin, D., & Manfre, C. (2015). A combined glossary of terms relating to gender and nutrition. Cultural Practice LLC and USAID-INGENAES Project. This work is licensed under a Creative Commons Attribution 3.0 Unported License. Retrieved April 10, 2018 from www.ingenaes.illinois.edu

Schuurman, N. (2004). GIS: A Short Introduction. Short Introductions to Geography. *Malden, MA: Blackwell*.Shiva, V., & Mies, M. (2014). *Ecofeminism*. Zed Books Ltd..

Shiva, V., & Mies, M. (2014). *Ecofeminism*. Zed Books Ltd..

Smith, L. T. (2013). *Decolonizing methodologies: Research and indigenous peoples*. Zed Books Ltd..

Stephens, A. (2013). *Ecofeminism and systems thinking*. Routledge.

Stephens, A. (2012). Feminist systems theory: Learning by praxis. *Systemic Practice and Action Research*, *25*(1), 1-14.

Stephens, A., Jacobson, C., & King, C. (2010). Describing a feminist-systems theory. *Systems Research and Behavioral Science*, *27*(5), 553-566.

Stephens, A., Lewis, E. D., & Reddy, S. (2018). Towards an Inclusive Systemic Evaluation for the SDGs: Gender equality, Environments and Marginalized voices (GEMs). *Evaluation*, *24*(2), 220-236.

Tobler, W. R. (1970). A computer movie simulating urban growth in the Detroit region. *Economic geography*, *46*(sup1), 234-240.

Tong, R. (2013). *Feminist thought: A comprehensive introduction*. Routledge.

Ulrich, W. (2003). Beyond methodology choice: critical systems thinking as critically systemic discourse. *Journal of the Operational Research Society, 54*(4), 325-342.

United States Agency for International Development, Bureau for Food Security. (n.d.). Retrieved April 1, 2018 from http://ingenaes.illinois.edu/

Webb, E. J., Campbell, D. T., Schwartz, R. D., & Sechrest, L. (1966). Unobtrusive measures: Nonreactive research in the social sciences. Oxford, England: Rand Mcnally.

Wenger, E. (2000). Communities of practice and social learning systems. *Organization, 7*(2), 225-246.

Wenger, E. (2011). Communities of practice: A brief introduction. Retrieved November 7, 2018, from http://wengertrayner.com/wp-content/uploads/2013/10/06-Brief-introduction-to communities-of practice.pdf

Chapter 2: Enhancement of rural-urban linkages and gender equity through agricultural extension services to Liberian smallholder farmers[10]

Rebecca Witinok-Huber and Caroline Nyaplue-Daywhea

Abstract

Following Liberia's 14 years of civil war that ended in 2003, an influx of resources and people flooded the country to aid in recovery. The Government of Liberia is now focused on rebuilding the economy, maintaining peace and security, and improving the livelihoods of its people. This effort is strongly supported by the international development partners. Reconstructing the agriculture sector has been one of the government's priorities for national recovery and development. The agricultural sector comprises 36.1% of the national gross domestic product and 70% of the workforce derives a portion of their income from agricultural activities. One approach used to rebuild the agricultural sector post-conflict was to implement strategies to improve the content, delivery, and efficacy of agricultural extension and advisory services (AEAS). AEAS are intended to provide a link between the Ministry of Agriculture and rural farmers. Successfully improving the delivery of AEAS to rural areas in Liberia requires overcoming several challenges. The war significantly decreased national infrastructure which hampered the mobility of people and hindered the flows of information, goods, and services. Additionally, 'brain drain' resulted from a mass out-migration of educated citizens during the conflict. Despite the initial influx of foreign aid, these challenges continue to have legacy implications for modern governance. Our Liberian case study findings provide further support for national and international directives related to agricultural sector development with attention to gender equity. Through 352 smallholder farmer surveys and 46 focus groups we discovered that implementation was not living up to the expectations and challenges of farmers, with particular focus on women farmers. The purpose of this paper is to describe research conducted with smallholder farmers in north-central Liberia to assess opportunities that may enhance rural-urban linkages, gender equity, and food security through improved provisioning of AEAS and international research partnerships.

Keywords: rural-urban linkages, extension and advisory services, Liberia, gender, systems

[10] Witinok-Huber, R., & Nyaplue-Daywhea, C. (2020). Enhancement of rural-urban linkages and gender equity through agricultural extension services to Liberian smallholder farmers. In L. Vasseur (Ed). *Relating urban-rural landscapes through ecosystem governance*. IUCN Publication, Gland, Switzerland (in press).

Introduction

Dynamic and complex socio-ecological agricultural systems (SEAS) play a vital role in the livelihoods, nutrition, and economies of rural and urban Liberian communities. Folke et al. (2010) defined a social-ecological system as an "integrated system of ecosystems and human society with reciprocal feedback and interdependence. The concept emphasizes the human-in-nature perspective." We have used SEAS to root this concept within an agricultural context. The productivity and sustainability of the SEAS that make up rural Liberian communities may be enhanced through better linkages with urban systems.

Social, economic, political, and environmental connections between rural and urban settlements are known as rural-urban linkages (Tacoli, 1998, 2004; Zewdu & Malek, 2010). Rural-urban linkages provide a useful framework for understanding how urban governance structures might generate decision-making processes that are more reflective of rural needs. Tacoli (2004) and Zewdu & Malek (2010) use a similar rural-urban linkages framework that categorizes linkages as flows of people, information, goods, and capital. People flow between rural and urban areas by way of commuting, or through migration (temporary or permanent). In developing countries, migration typically refers to urbanization, the movement of people from rural to urban areas (Zewdu & Malek, 2010). Flows of information can include market mechanisms such as consumer preferences, potential employment opportunities, and knowledge provisioning through agricultural extension services (Tacoli, 1998, 2004; Zewdu & Malek, 2010). Urban populations rely on flows of agricultural goods and other commodities from rural-based producers, and urban-based industries supply manufactured and imported goods to rural areas (Tacoli, 2004). Flows of capital include investments and credit from urban-based institutions and remittances from migrants to relatives or communities in rural settings (Tacoli, 2004). Capital is often concentrated in urban centers. Identifying and targeting flows related to the four rural-urban linkage categories is fundamental to developing policies and delivering AEAS that support rural smallholder farmers.

The case study highlights the difficulty and potential contributions of navigating novel projects in dynamic systems. Lofa, Bong, and Nimba counties in north-central Liberia were selected as the focal region (Appendix A) based on their agricultural productivity and generalized distinction as Liberia's breadbasket (Moore, 2017). Each county has at least one international border and all maintain diverse ethnic and religious traditions. The diversity and trans-boundary nature of these three counties increased their burden during the Liberian civil war (1989-2003) (Gbowee, 2011). The legacy impacts from that time continue to pose barriers to rural-urban flows of people, information, goods, and capital.

Researchers used a collective, multisite case study methodology (Creswell, 2013; Yin, 1994; Zainal, 2007) to help provide insights for understanding the delivery and adoption of AEAS, and the agricultural challenges faced by rural smallholder farmers, with a gender[11] focus. A case study methodology ensures data collection within the real-life context (Yin, 1994) and gives flexibility for research partners to contribute in defining relevant objectives and research questions (Chelimsky & Grosshans, 1990). A partnered approach was required to address the complex ecosystems and human actors involved in this unique Liberian case study setting. A primary goal of the research is to improve the provisioning of AEAS and increase gender equity[12]. Despite past efforts to increase the effectiveness and equity of extension service dissemination to rural smallholder farmers, women farmers remain underserved in Liberia (Talery-Wiles, 2012). The process to identify the specific needs and challenges faced by smallholder farmers can also inform projects in rural areas in which the natural and human altered landscapes are intimately entwined.

Using the framework outlined by Tacoli (2004) and Zewdu & Malek (2010), we incorporate literature and study results to identify the current rural-urban linkages that may impact AEAS provisioning within the present Liberian governance context (Appendix B). Specifically, how the flows of people and information can address the needs and challenges of rural smallholder farmers, particularly women, despite governance structures being centralized in urban areas. Understanding Liberia's historical context and its impact on the current social, economic, and political structures provides a backdrop to the difficulties of provisioning agricultural information and resources from urban to rural landscapes.

Background

Liberia is a West African country positioned on the North Atlantic coast with two seasons and a tropical climate. Typically, the dry season lasts from November to April and the rainy season from May to October (Bongers, Poorter, Rompaey, & Parren, 1999). In north-central Liberia, the focal region for this study, the average annual rainfall is 1300 mm and temperatures range from 27-32 °C during the day and from 21-24 °C at night (Bongers et al., 1999, Hamdan, 2010). Brush and grassland vegetation and lowland swamps cover a large portion of north-central Liberia with

[11] For this project *gender* is as a "concept referring to the social identity and roles associated with being a man or a woman that are usually learned through early socialization and reinforced by social norms. In some countries, additional gender categories are recognized [e.g. transgender]. The constellation of characteristics linked to men and/or women may change over time and place. The concept of gender includes the recognition that the social categories of man and woman are often defined in relationship to each other (Rubin and Manfre, 2015)

[12] *Gender equity* is a process that aspires to provide equal access of resources, benefits, representation, and agency to women and men without discrimination.

deciduous and evergreen forests toward the northern borders (Hamdan, 2010). Both lowland and upland landscapes contribute to agricultural production. Small scale (<2 ha) agriculture accounts for the majority of food production and produce is often grown for both household nutrition and income (Moore, 2017). Rural farming practices in this region are rooted in slash and burn agriculture, shifting cultivation, and bush-fallowing (Namubiru-Mwaura, Knox, & Hughes, 2012). Women and men farmers contribute differently to productive and reproductive labor. Liberia's fertile soils, abundant natural resources, biologically diverse rainforests, and diverse cultural traditions are often overshadowed by its violent history, a history that remains relevant today.

Fourteen-years of brutal civil conflict and political turmoil have led to major infrastructural damage, degraded social and cultural traditions, mass displacement, economic collapse, and significantly reduced governmental capacity (CIA, n.d.; Murphey, Erickson, & Tubman, 2016). The war ended with the Accra Peace Agreement in 2003, in large part due to the Women of Liberia Mass Action for Peace movement led by Leymah Gbowee (Gbowee, 2011); followed in 2005 by the Liberian presidential election of Ellen Johnson-Sirleaf, the first African female head of state (Murphey et al., 2016).

Recovery and development processes have been confronted with several challenges that vary from rising food prices, slow decentralization, limited revenue generation capacity and high food importation bills, to the recent deadly Ebola disease epidemic (2014-2015) (CIA, n.d.; Moore, 2017). The international development partners have contributed significant funding, human capacity, institutional development support, and other resources toward food and nutrition security in the post-war reconstruction of Liberia. However, international non-governmental organization (NGO) projects often have restricted timelines and specific goals that don't allow for adequate participatory processes. In the agricultural sector, field staff training, institutional strengthening, and long-term follow-up (i.e., monitoring, evaluation, and adaptation) often bypass the Ministry of Agriculture (MOA) altogether (Moore, 2017, Republic of Liberia, 2012). The Ministry faces additional challenges related to low extension officer to farmer ratio (1: 35,000) (MOA partners), insufficient resources, a non-diverse staff, and severe legacy impacts from the post-conflict 'brain drain' (Moore, 2017; Republic of Liberia, 2012). Brain drain is described as a gap in expertise due to mass emigration of talented, educated Africans to more developed nations (Eicher, 2006). The Ministry oversees policy formulation, planning, and coordination in the agricultural sector, while the Central Agricultural Research Institute manages basic and applied research in the principal commodities and value chains, and adaptive research (Republic of Liberia, 2008). Liberia's universities and agriculture colleges contribute to technical support and skill development training as well as other support

services to the farming communities. In recent years, efforts by the Ministry to decentralize AEAS delivery was a step towards a more bottom-up governance approach.

The agricultural sector accounts for 36.1% of Liberia's national gross domestic product and 70% of the workforce derive a portion of their annual income from agricultural activities (CIA, n.d.). Over the past decade, Liberia's government has prioritized the agricultural sector due to its close ties with the national economy, food security, poverty reduction, and advancement toward the Millennium Development Goals (Republic of Liberia, 2008, 2012). While national improvements include a 10.6% increase to Liberia's United Nations Development Program (UNDP) Human Development Index from 1990 to 2015, Liberia remains in the "low human development category" at 177 out of 188 counties. Further, as of 2013, the UNDP Multidimensional Poverty Index for developing countries stated that 63.3% of Liberian's have lived below the poverty line, earning less than $1.90 a day for over a decade (UNDP, 2016). A significant portion of the population also remains jobless (Mercy Corps, 2017; Rutherford, Burke, Cheung, & Field, 2016).

Liberia ranks 150th out of 188 countries on the UNDP Gender Inequality Index, a measure that attempts to quantify gender disparity by country through combined reproductive health, empowerment, and labor market production of women (UNDP, 2016). Despite showing strong gender equity relative to other counties in the region, as evidenced by the election of the first female head of state in Africa, within the agricultural sector women continue to face difficulties to access loans, tools, chemicals, and extension service information and resources (Moore, 2017). Legacy consequences of social gender roles can be witnessed in women's disproportionate contributions to domestic responsibilities. When combined with their reproductive biological characteristics, Glenn (1992) and Duffy (2007) recognize these responsibilities that women bear as reproductive labor[13]. In addition to women's reproductive labor roles, they have been globally recognized to provide over two-thirds of the productive labor for agriculture through gardens and small farm plots (Farnworth & Colverson, 2015).

While Liberia's history remains relevant to rural-urban linkage flows in both directions, the current progress and focus on the agricultural sector also provides opportunities as Liberia moves

[13] Pulling from the Marxist feminist philosophical paradigm that under recognized reproductive labor activities are central to women's oppression, Glenn (1992) deemed reproductive labor to include work that maintains daily life such as cooking, cleaning, purchasing foods, laundering clothes, maintaining social capital and emotional family support, and socializing children. Others have built on this through what Duffy (2007) called "nurturant" activities that include reproduction and childcare. This long-standing topic of debate in feminist literature is one of the underlying factors that necessitate sex/gender disaggregated research in the agricultural sector (Duffy, 2007).

from post-conflict aid and reconstruction into a new phase of development and growth (McNamara, Swanson, & Simpson, 2011; ROL, 2007, 2012). Christoplos (2010) refers to all of the activities required to provision information and resources that help farmers develop their own skills and improve their livelihoods as rural extension and advisory services. Despite efforts to increase the effectiveness and equity of extension service delivery to smallholder farmers, women farmers remain severely underserved, in Liberia, and across the globe (Talery-Wiles, 2012).

Though extension agents may be tasked with providing information related to women's reproductive labor roles such as household nutrition that involves small-scale/subsistence food production, caning, cooking, preparing food, and human health, they are rarely trained in such activities (Huyer, 2016; Halim, Ali, Swanson, Bentz, & Sofranko, 1998). Additionally, the male dominated extension field often fails to adequately understand and address the productive agricultural activities of women (Quisumbing & Pandolfelli, 2010). Yet, while providing women with gender-appropriate agricultural information and resources is vital, it must be done cautiously as gender-responsive approaches can also reinforce biased gender norms and inhibit gender transformation (ROL, 2012; Talery-Wiles, 2012). Overlooking the reproductive and productive labor of women has been traced to formal and informal governance structures that maintain or reinforce oppressive gender roles (Coulter, Witinok-Huber, Bruyere, & Nyingi, 2019; Figueiredo & Perkins, 2013; Quisumbing & Pandolfelli, 2010).

Liberian development policies and strategies have begun to acknowledge the role of gender equity within agricultural and rural development (Republic of Liberia, 2008, 2012). However, traditional gender stereotypes, the male dominated extension service field, and a lack of disaggregated data on Liberian smallholder farmers (e.g., access to services, tools and technology used, impact of agent gender) has resulted in providing AEAS that focus on cash-crop production and remain limited in information and opportunities related to the activities of women farmers (Kondylis, Mueller, Sheriff, & Zhu, 2016; Moore, 2017; Talery-Wiles, 2012). Recognizing that women farmers are a heterogeneous community, we posit that their societal roles (both productive and reproductive) in rural Liberia uniquely position women to influence multiple rural-urban linkages, and therefore should be prioritized in extension service development and delivery. Significant potential remains untapped for governance structures within extension services to capitalize on the social positionality of women. A more holistic, systematic approach to governance is required to improve rural-urban linkages that influence the way extension services are provisioned from urban actors to rural smallholder farmers.

Methods

Initial project partners spent the better part of 18-months building trust, defining project goals, navigating institutions and policy, applying for funding, and selecting a research fellow to lead the study. The fellow[14] and lead author was selected for the University of California Davis's Research and Innovation Fellowship for Agriculture, additional funding and support was provided from the United States Agency for International Development funded Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) project. The fellow worked closely with project partners to define research objectives and questions and throughout the data collection process. The project would not have been possible without these efforts.

The initially planned sample size of 384 farmers reflected a 95% significance with a 5% margin of error (Van Dessel, 2013) based on a total sample population of 28,350 farmers in the focal region. Numbers were based on District Agricultural Officer (DAO) self-reported values and provided the only baseline data available on farmers at the time of data collection (provided by MOA partners).

A collective, multisite case study methodology was used to frame this study (Creswell, 2013; Yin, 1994; Zainal, 2007). Three counties and 24 communities (Bong 7, Nimba 11, and Lofa 6) were selected through purposeful and proportional sampling techniques (Newing, 2010). Counties were pre-selected by in-country partners due to their productivity and distinction as Liberia's breadbasket (Appendix A). Communities were chosen based on specific criteria (Appendix F) provided by researchers through a participatory mapping exercise with DAOs and County Agricultural Coordinators that worked in the three focal counties. Selected communicates fell between the rural-urban delineations, with the majority being considered rural (<2000); this strategy was used due to a lack of census data. The large physical area covered during data collection helped to increase the diversity of farmer experiences with AEAS.

Eight Cuttington University senior students were selected through a rigorous writing and interview process and participated in a 10-day training, and four were selected to be on the field data collection team. All students freely chose to participate. Our field data collection team included four Cuttington University student enumerators, two researchers, and a hired driver.

One 200-question (open- and closed-ended) survey was administered to 352 randomly selected individuals (176 women and 176 men), 16 per community, and a 20-question focus group interview guide was used to complete 46 focus groups, one for women and one for men in each

[14] Rebecca Witinok-Huber, University of Idaho Ph.D. student and lead researcher

community, with all farmers present and consented. Four, one-hour, interviews were conducted daily per student. Instruments were developed, pre and pilot-tested, modified, and administered offline using SurveyCTO software and Samsung Galaxy tablets. In addition to pre and pilot testing, in-country partners and experts helped to improve survey reliability, validity, usefulness, and cultural appropriateness (Dillman, Smyth, and Melani, 2009).

In each community, the DAO, a local elder or farmer group representative, and farmers welcomed our team. The day always commenced with prayer and full introductions. Then, 16 farmers were randomly selected using what we called a paper game. This included farmers self-selecting by gender/sex[15] and then choosing a piece of paper brought around by the students; of the papers, 16 had an X written on it (8 for women and 8 for men) and farmers that selected these papers were individually surveyed. Two gender-disaggregated[16] focus groups were conducted separately in each community for a total of 46. Focus groups were conducted in 23 communities and surveys in 22. Survey and focus group respondents were over the age of 18 and self-identified as farmers based on their production of food, livestock, or their role as farm laborers. Daily, we gave a financial contribution for the community lunch and those present contributed rice and prepared the meal.

Initial descriptive data analysis and coding was carried out for 352 surveys using Excel and SPSS. Further quantitative analysis in R and qualitative coding will be completed. Coding will require extended time for capacity building and validation between researchers.

Limitations and possible biases we faced include language and culture, community entry and sensitization through the DAO, community elders, and farmer group leaders, and affiliation with the Ministry. Student enumerators conducted the surveys to decrease language and cultural barriers. The timing (day of week, time of day, season) and locations for research influenced the agricultural communities and individual farmers involved. The lead researcher also acknowledges her white, academic, economic, and woman's lenses.

Results

Urban to rural

Flows of people and information. In relation to the MOA field staff DAOs, NGOs, or researchers working with and visiting farmers on agriculture related activities and concerns.

[15] *Sex* refers to the biological characteristics that differentiate females from males.
[16] The collection of data based on community and/or self-identified gender division of participants.

Table 2.1. Farmers that had received AEAS visits from a DAO in the past three years, or from an NGO

	DAO Yes	NGO Yes
Overall	42% (148)	54% (189)
Women	47%	49%
Men	53%	51%

n=352 overall
Values for women and men correspond to the overall DAO or NGO yes values respectively
Cells represent percent of all farmers surveyed

The average amount of time farmers had worked with a DAO was 3.25 years with a frequency of two visits per month. One farmer asked "… for the ministry to empower us, and in fact assign more DAOs in the county."

Table 2.2. Overall farmer adoption rates and comfort contacting the DAO or NGO about agricultural information

AEAS delivered by the	Farmer adopted recommendations	Farmer is comfortable contacting the DAO or NGO
DAO[a]	96%	93%
NGO[b]	91%	80%

[a] n=148 (DAO)
[b] n=189 (NGO)
Cells represent percent of farmers that worked with a DAO or NGO

The most common methods for information provisioning by NGOs was through trainings and workshops (34%) and in-person one-on-one (20%), whereas farmers said DAOs work with them in a community group (21%), one-on-one (13%), and in a training or workshop (11%). In terms of information and communication technology (ICT) farmers receive agricultural information from their DAO through a radio (10%) or cellphone (5%), and from an NGO through a cell phone (15%) or radio (8%).

When asked how the Ministry via a DAO can better support the agricultural production of farmers, a pattern in the responses is shown by this farmer's quote that the Ministry "can better help me with knowledge by having a series of trainings in this community" and another alluded to accountability in that "the Ministry should always do a follow-up on the assigned DAO." Other farmers stated that NGO extension efforts also require more monitoring and intervention from the Ministry.

Flows of goods. The top five agricultural challenges for farmers are financial (82%), lack of tools (72%), lack of fertilizer, chemicals, and pesticides (68%), no access to credit/loans (64%), and a

lack of seeds or seed varieties (61%). Disaggregated by gender, the data shows that the top three challenges for women are a lack of (1) tools, (2) chemicals, and (3) money, and for men a lack of (1) money, (2) credit/loan access, and (3) tools. When asked to describe their greatest agricultural challenges, qualitatively coded questions show that infrastructure and market access are priorities for farmers and include farm-to-market roads, links to buyers, less dependence on middlemen and middlewomen, stable prices, and irrigation systems or dams.

Flows of capital. No farmer interviewed had access to bank loans. During the focus group interviews, farmers expressed interest in having access to an agricultural bank in addition to their current access to village savings and loan associations or other community groups for credit/loans; these loan mechanisms have high interest rates of around 20% and are typically paid back over three months. Out of 352 farmers, 59% (209) said they have received one or more community or family loans or use credit for agricultural purposes. One farmer stated that the Ministry "can better support my agricultural productivity by creating or establishing a bank where local farmers will be able to access loans. With this, we will be able to buy tools and other necessary things that can speed up our work and improve our productivity."

Rural to urban

Flows of people and information. Overall, 30% (107) of farmers also have non-farm jobs that they spend a daily average of 34 minutes (range of 0-300 min) comminuting to.

Table 2.3. Non-farm employment by gender

	Overall percent of non-farm jobs	Average travel time to job (min)	Jobs that require temporary migration	Percent of jobs that pay in cash	Jobs completed at all times of the year
Women	45%	43 min	51%	88%	98%
Men	55%	26 min	50%	86%	80%

n=110 non-farm jobs (107 farmers)
Cells represent percent of all non-farm jobs

Flows of goods**.** Refers to the transfer of products from rural to urban areas. The 85% of farmers that sell their products at market travel an average of 57 minutes to get to a market. Farmers said women were responsible for selling products at the market (67%), both adults (13%), men (6%), women and children (5%), female children (4%), and other (4%). Farmers also said that they may pay a middleman or middlewoman to sell their goods in Monrovia.

Out of six pre-defined production types 49% of farmers produce staple or field crops (such as, rice, cassava, maize, beans or peanut), 34% produce vegetables or a garden (vegetables, not

including rice, cassava, maize, beans or peanut), 13% cash crops, 3% raised livestock (such as, goat, pig, cow, sheep), and 1% raised poultry (such as, chickens or ducks).

Lateral or neutral

Flows of information. Happen between farmers through community or farmer-based organizations (FBO), and friends or family. One farmer said, "we need someone that will come in our community and put us in a cooperative…" Farmers had personal access to technology that includes radios (44%), cellphones (no data) (46%), smartphones (7%), and TVs (2%) (ICT provides bi-directional information flows).

Table 2.4. Farmer involvement and leadership in FBOs and Kuu[17] groups

	Involvement in an FBO	FBO leadership (past or present)	Involvement in a Kuu group [e]
Overall	77% [a]	71% [c]	95%
Women	54% [b]	48% [d]	50%
Men	46% [b]	52% [d]	50%

[a] n= percent of 352 survey respondents
[b] n= percent of 270 respondents involved in an FBO
[c] n= percent of 270 farmers that have been involved in an FBO
[d] n= percent of 191 farmers that have been involved in FBO leadership roles by gender
[e] n= percent of 334 farmers involved in a Kuu group
Cells represent percent of farmers respectively

Gender-focused

Agricultural involvement.

Table 2.5. Type of production that farmers carry out by gender

	Staple or Field (312)	Vegetables (214)	Cash Crops (84)	Livestock (13)	Poultry (8)
Women	50%	47%	26%	15%	38%
Men	50%	53%	74%	85%	63%

Cells represent the percent of responses for each production type by farmer gender

Household decision-making. In the following three categories farmers specify that women, men, or both adults in the household: 1) Usually pay the bills for family/household needs such as food and clothing; 2) Usually make family/household decisions; and 3) Has the most power over all members of the family/household (Figure 1).

[17] Informal farm labor group (Moore, 2017)

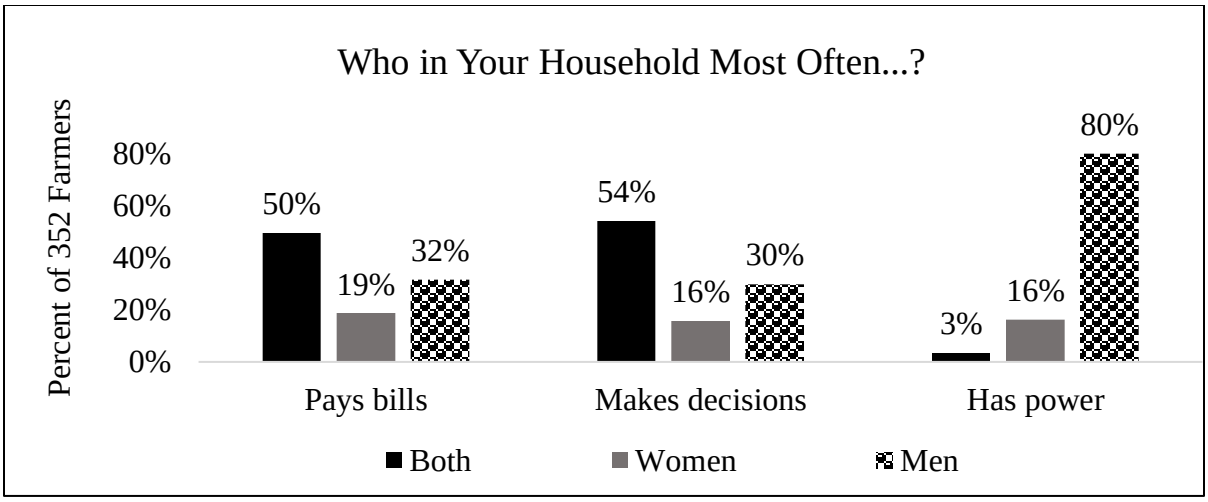


Figure 2.1. Household gender roles and agency

Empowerment.

Table 2.6. Self-identified empowerment to make agricultural decisions [a]

Response option	Women	Men
Always feel empowered	41 %	72 %
Usually feel empowered	28 %	20 %
Sometimes feel empowered	31 %	8 %
Never feel empowered	.6 %	.6 %

[a] n=352 respondents

Land tenure and purchasing power. When asked if women are able to purchase land in the community 95% of farmers said yes. When asked if women are able to own land in the community 81% of farmers said yes.

Discussion

People

Surveyed communities were selected through the participatory mapping exercise by their respective DAO with the primary criteria that the officer worked in the community and felt good about their work. The result that merely 42% of farmers had been visited by a DAO within the past 3-years was therefore a surprise and of concern. When extension officers are unable to maintain consistent connection with their farmers, flows of information and goods are severely impeded.

Thirty percent of farmers travel a daily average of 34 minutes to a non-farm job and they are paid in cash. Increasing flows of people to and from smaller urban centers will influence the development of rural Liberia, and the diversification of income may improve farmer stability.

However, temporary urban migration may also increase the work burden on rural farmers, specifically, women who are tasked with productive and domestic labor. The out-migration of skilled laborers, and consequently knowledge, should be addressed through extension services.

Women

While the study did not focus on household dynamics, the significant result that 80% of farmers believe men maintain power over[18] or authority in the household is important to acknowledge in AEAS development and delivery. Additionally, 92% of men self-identified as (usually or always) empowered compared to 69% of women. Men express being involved in high value cash crops (74%) and livestock (85%) more frequently and women in staple (50%) and vegetable (47%) crops. These divisions are characteristic of cultural labor roles that limit women's opportunities to participate in commercial agriculture and highlight their primary involvement in the production of lower-income crops for household nutrition. Consistent with this observation is the finding that women in sub-Saharan Africa tend to have better internal community networks whereas men have higher external networks critical in commercial agriculture (Perez et al., 2015). Results show that there is potential to improve on the current gender disparities in agriculture through basic language and education training, production diversification, technical skills, and self-confidence building for women farmers. With cultural sensitivity, the current women's farmer-based groups or the development of new groups may provide an opportunity to work with women on specific projects, knowledge, and skills. Additionally, the role of women in transporting agricultural goods to market(s) or a seller, increases their influence on flows of information and goods between rural and urban areas.

Information

The flow of information within this research primarily represents provisioning through AEAS. Therefore, information is directly linked to farmer access to extension services and became a clear theme based on our initial coding of open-ended survey questions and focus groups. The importance of information sharing through trainings was highlighted by one farmer that said the Ministry and their DOA "can better help me with knowledge by having a series of trainings in this community."

[18] *Power over* often has negative associations for people that include force, abuse, discrimination, or oppression. Reflected in the Liberian context, men are often considered to be the head of the household that can lead to disproportionate resource control and power over the other family members who may be excluded from participating in decision-making and from access to healthy food, healthcare, land, and decisions about the children (Henderson, 2016).

Information transfer can be directly linked to either the flow of people or the use of technology to enhance flows of information. Farmers had personal access to radios (44%), cellphones (no data) (46%), smartphones (7%), and TVs (2%). Farmers are already receiving agricultural information from a DAO using a radio (10%) or cellphone (5%), and from NGOs through a radio (8%) or cell phone (15%). There is untapped potential to improve agricultural information dissemination through ICT.

Lateral flows of information in remote, rural settlements are intertwined with flows of people in relation to social groupings. The majority of farmers stated that they are involved in a Kuu, an informal cooperative labor agreement whereby farmers arrange themselves into groups and rotate between farms to complete otherwise time-consuming and labor-intensive tasks (Moore, 2017). Women in particular have very strong community social ties and often raise children and carry out other domestic responsibilities collectively. Social structures should be utilized for information transfer and farmer training. Building human capacity and utilizing the social networks of rural farmers (i.e., FBOs and women's groups) will improve rural-urban linkages individually and the cohesion between flows of people, information, and goods.

Goods

Limited physical infrastructure (post-civil conflict) connecting rural and urban settlements is a major impediment for farmers to access markets and poses significant challenges for extension officers to reach their farming communities. Farmers struggle to transport their agricultural products from their farms to the market(s) and to access agricultural supplies from urban businesses. While infrastructural development has been at the forefront of national policies and strategies since the war ended, other solutions must be developed and utilized to address the current reality. Specifically, to identify and incentivize training local farmers and/or students as technicians. While urban relocation may be required for farmers to obtain education and training, the results could lead to a more integrated AEAS governance structure with decreased burdens to DAOs in the long run. Additionally, encouraging and training women farmers to become technicians may decrease AEAS gender gaps, and provide knowledge and instruction related to the productive and reproductive activities of women. It will be important to develop incentives for trained technicians to return to their rural villages with new knowledge to share, and to utilize ICT devices.

Capital

Financial limitations also pose significant challenges for farmers. Rural smallholder farmers are unable to access banking institutions and individually secure credit/loans. All 59% of the respondents that have access to loans or credit use local village savings and loan associations because

they don't have access to banks. Private investments, agri-business training, and the re-establishment of agricultural banks in rural areas may provide greater opportunities for farmers to build and secure their farms, particularly women.

Conclusion

The present ability of DAOs to effectively deliver targeted AEAS that address the diverse needs of smallholder farmers is reflected through the rural-urban linkages framework. While the legacy effects of civil conflict continue to hamper the flows of people, information, goods, and credit, there are also opportunities for improvement. The study highlights how extension services, specifically publicly delivered extension services in Liberia, can enhance rural-urban linkages to improve the lives of humans and the environment alike. Rural-urban linkages can be enhanced through human capacity development by way of consistent training and knowledge input, leveraging FBOs or social networks (specifically women's groups and connections), and improving the strength, cohesion, and accountability of the AEAS governance structure.

We recognize that rural-urban linkage flows do not occur in isolation and fundamentally influence one another. Study results through the rural-urban linkages framework allows us to discuss the current links and future prospects to improve connection. In fact, the ability of research and research processes to contribute to rural-urban linkages through extension provisioning may be enhanced by acknowledging the influence and power that different governance actors have. This study was accomplished because partners collectively developed the vision and remained invested in the outcomes. Future international research collaborations meant to delve into complex and dynamic systems can learn much from the novel approach of our project. The way forward demands that international researchers, and the aid and development community, reflect on our own positionality and contribution to solutions for complex global problems that include rural isolation. International and national actors must continue to build alliances and work together to improve farmer livelihoods, gender equity, and local capacity with long-term goals for Liberia's sustainable autonomy.

Literature Cited

Bongers, F., Poorter, L., Rompaey, R. S. A. R., & Parren, M. (1999). Distribution of twelve moist forest canopy tree species in Liberia and Cote d'Ivoire: response curves to a climatic gradient. *Journal of Vegetation Science*, *10*(3), 371-382.

Chelimsky, E., Grosshans, W. (1990). United States General Accounting Office Program evaluation and methodology division. GAO/PEMD-91-10.1.9 Case Study Evaluations. Retrieved April 20, 2018, from https://www.gao.gov/special.pubs/10_1_9.pdf

Christoplos, I. (2010). Mobilizing the potential of rural and agricultural extension.

CIA (n.d.) Liberia country profile. Central Intelligence Agency, Washington, DC. Retrieved April 1, 2018, from https://www.cia.gov/library/publications/the-world-factbook/geos/li.html

Coulter, J. E., Witinok-Huber, R. A., Bruyere, B. L., & Dorothy Nyingi, W. (2019). Giving women a voice on decision-making about water: barriers and opportunities in Laikipia, Kenya. *Gender, Place & Culture*, *26*(4), 489-509.

Creswell, J.W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches. Third edition. Washington DC: Sage.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stanford Law Review, 43(6), 1241–1299. https://doi.org/10.2307/1229039

Denscombe, M. (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of mixed methods research*, *2*(3), 270-283.

Dillman, D. A., Smyth, J. D., & Melani, L. (2009). Internet, mail, and mixed-mode surveys: The tailored design method.

Duffy, M. (2007). Doing the dirty work: Gender, race, and reproductive labor in historical perspective. Gender & Society, 21(3), 313-336.

Eicher, C. (2006) The evolution of agricultural education and training: global insights of relevance or Africa. World Bank, Washington, DC. Retrieved April 1, 2018, from http://www.umb.no/statisk/noragric/World%20Bank%20workshop%20October%202011/global_aet_insights_eicher.pdf

Farnworth, C. R., & Colverson, K. E. (2015). Building a gender-transformative extension and advisory facilitation system in sub-Saharan Africa. *Journal of Gender, Agriculture and Food Security*, *1*(1), 20-39.

Figueiredo, P., and P.E. Perkins. 2013. "Women and water management in times of climate change: Participatory and inclusive processes." Journal of Cleaner Production, 60: 188-194.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and society*, *15*(4).

Gbowee, L. (2011). *Mighty be our powers: How sisterhood, prayer, and sex changed a nation at war*. Beast Books.

Glenn, E. N. (1992). From servitude to service work: Historical continuities in the racial division of paid reproductive labor. Signs: Journal of Women in Culture and Society, 18(1), 1-43.

Halim, A., Ali, M. M., Swanson, B. E., Bentz, R. P., & Sofranko, A. J. (1998). Improving Agricultural Extension. A reference manual.

Hamdan, W. (2010). *Environmental & social management framework. Government of Liberia energy & electric distribution.* World Bank. E2517V2.

Henderson, J. (2016). *Power over vs. power with.* USAID-INGENAES project. Retrieved May 1, 2018, from https://www.agrilinks.org/library/power-over-vs-power

Huyer, S. (2016). Closing the gender gap in agriculture. *Gender, Technology and Development*, *20*(2), 105-116.

Kondylis, F., Mueller, V., Sheriff, G., & Zhu, S. (2016). Do female instructors reduce gender bias in diffusion of sustainable land management techniques? Experimental evidence from Mozambique. *World Development*, *78*, 436-449.

McNamara, P., Swanson, B., & Simpson, B. (2011). Rebuilding and strengthening the pluralistic extension system in Liberia. *Report on the MEA Rapid Scoping Mission. Final Draft Submitted to USAID/Liberia*.

Mercy Corps. (2017) Growing a future: Liberian youth reflect on agriculture livelihoods. Funding from United States Agency for International Development and TOPS Small Grant.

Moore, A. (2017). Agricultural Extension in Post-Conflict Liberia: Progress Made and Lessons Learned.

Murphey, E., Erickson, K., and Tubman, M. (2016). *USAID Office of Food for Peace Food Security Desk Review for Liberia, 2016-2020*. Washington, DC: FHI 360/FANTA. Retrieved April 17, 2018, from https://www.usaid.gov/sites/default/files/documents/1866/FFP-Desk Review-Liberia Feb2016v2.pdf

Namubiru-Mwaura, E.L., Knox, A., and Hughes, A.K. (2012). *Land Policy and Institutional Support (LPIS) Project: Customary Land Tenure in Liberia: Findings and Implications Drawn from 11 Case Studies*. USAID Liberia EPP-I-00-06-00008- 00, Task 6.5. Retrieved May 15, 2018, from https://www.landlinks.org/wpcontent/uploads/2016/09/USAID_Land_Tenure_Liberia_LPIS Synthesis_Report.pdf

Newing, H. (2010). *Conducting research in conservation: Social science methods and practice*. Routledge.

Perez, C., Jones, E. M., Kristjanson, P., Cramer, L., Thornton, P. K., Förch, W., & Barahona, C. A. (2015). How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change*, *34*, 95-107.

Quisumbing, A. R., & Pandolfelli, L. (2010). Promising approaches to address the needs of poor female farmers: Resources, constraints, and interventions. *World Development*, *38*(4), 581 592.

Republic of Liberia Ministry of Agriculture. (2007). Comprehensive assessment of the agricultural sector in Liberia. Ministry of Agriculture of Liberia, Monrovia. Retrieved May 15, 2018, from http://www.fao.org/3/a-ai564e.pdf

Republic of Liberia Ministry of Agriculture. (2008). Liberia: poverty reduction strategy paper. *IMF Country Report No. 08/219.*

Republic of Liberia Ministry of Agriculture. (2012). National policy for agricultural extension and advisory services. *USAID- Modernizing Extension and Advisory Services project.*

Rubin, D., & Manfre, C. (2015). A combined glossary of terms relating to gender and nutrition. Cultural Practice LLC and USAID-INGENAES Project. This work is licensed under a Creative Commons Attribution 3.0 Unported License. Retrieved April 10, 2018 from www.ingenaes.illinois.edu

Rutherford, D. D., Burke, H. M., Cheung, K. K., & Field, S. H. (2016). Impact of an agricultural value chain project on smallholder farmers, households, and children in Liberia. *World Development*, *83*, 70-83.

Halim, A., Ali, M. M., Swanson, B. E., Bentz, R. P., & Sofranko, A. J. (1998). Improving Agricultural Extension. A reference manual.

Tacoli, C. (1998). Rural-urban interactions: a guide to the literature. *Environment and urbanization*, *10*(1), 147-166.

Tacoli, C. (2004). Rural-urban linkages and pro-poor agricultural growth: An overview. In *Prepared for OECD DAC POVNET Agriculture and Pro-Poor Growth Task Team Helsinki Workshop* (pp. 17-18).

Talery-Wiles, T.A. (2012). Republic of Liberia Ministry of Agriculture: Strategy for mainstreaming gender issues in agriculture programs and projects in Liberia. *Draft.*

Ulrich, W. (2003). Beyond methodology choice: critical systems thinking as critically systemic discourse. *Journal of the Operational Research Society*, *54*(4), 325-342.

United Nations Development Program. (2016). Human Development Reports. Retrieved April 3, 2018 from http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf

Van Dessel, G. (2013). How to determine population and survey sample size? *Checkmarket*. Retrieved April 1, 2018, from https://www.checkmarket.com/blog/how-to-estimate-your population-and survey-sample-size/

Yin, R., (1994). Case study research: Design and methods (2nd ed.). Beverly Hills, CA: Sage Publishing.

Zainal, Z. (2007). Case study as a research method. *Jurnal Kemanusiaan*, *5*(1).

Zewdu, G. A., & Malek, M. (2010). Implications of land policies for rural-urban linkages and rural transformation in Ethiopia. *Ethiopia Development Research Institute, Ethiopia*, *15*, 1-14.

Chapter 3: What's gender or place have to do with it: Building adaptive capacity through agricultural extension in post-conflict settings

Rebecca Witinok-Huber, Julia Piaskowski, Steven Radil, and Dilshani Sarathchandra

Abstract

From 1989-2003 Liberia was embroiled in civil conflict. Sixteen years later it remains in the process of reconstruction and capacity building. The rural, agricultural study setting of north-central Liberia and strong reliance on smallholder farmers, many of whom are women, means that extension may play an important role in this process and that gender and place may influence the efficacy of that effort. This is one of the first empirical studies of its kind conducted in Liberia, post-civil conflict. Women play a significant role in smallholder farms, thus understanding their ability to access agricultural resources that include extension information may have implications for food security and farmer adaptive capacity. A multidimensional index was developed to analyze survey results and used as a measure for adaptive capacity. The Liberian-Agricultural Potential Index (L-API) is comprised of four domains that include farmer access to agricultural resources and information, leadership opportunities, household power, and time allocation. Results highlight gender specific and place-based opportunities for improved extension practices and potential barriers to accomplishing them in the study area. A deeper understanding of the gendered and place-based intersections in agricultural production may lead to more effective extension service provisioning. Additionally, the paper provides evidence that bridging theoretical and disciplinary divides may shed light at the intersection of gender and place, allowing agricultural extension to build adaptive capacity through development research.

Keywords: gender, agricultural extension services, Liberia, adaptive capacity, post-conflict, rural-urban linkages

Introduction

Three bodies of research including local gender contracts, rural-urban linkages, and adaptive capacity come to bear on this study to build a case for agricultural extension service transformation in post-conflict settings with attention to gender and place. According to the United Nations Food and Agricultural Organization's 'World Agriculture: towards 2015-2023' report, an estimated 60% of the global population depends on agriculture for their livelihoods (Roser & Ritchie, 2019; Ritchie, 2017). Agricultural production utilizes 70% of the global freshwater supply (Schonberger & Trier, 2017) and

covers 50% of the world's 104 million km of habitable land (Roser & Ritchie, 2019). Farming is a social and environmental process, making it a social-ecological agricultural system (Witinok-Huber & Nyaplue-Daywhea, in press). Socially, agricultural production (mostly subsistence) in sub-Saharan Africa primarily rests on the shoulders of smallholder farmers[19] (Caretta & Börjeson, 2015; Rubin & Manfre, 2015; Ogunlela & Mukhtar, 2009). Up to 60% of productive agricultural labor in sub-Saharan Africa is reportedly conducted by women, this percentage is slightly higher in Asia and much lower in the global North (Agarwal, 2011; Ogunlela & Mukhtar 2009, Roser & Ritchie, 2019). Farmers play varied and vital social, economic, political, and environmental roles in their communities. Natural and human caused environmental processes such as climate change and deforestation impact environmental sustainability as well as social stability, pertinent in post-conflict African countries. These rural, primarily subsistence farming regions are often further encumbered by gaps in the ability of national institutions to build capacity as well as sustain and support local agricultural innovation (Farnworth & Colverson, 2015; Moore, 2017; Quisumbing & Pandolfelli, 2010).

To varying extents across the globe agricultural extension (and advisory) services have become a staple mechanism, for both government and non-governmental organizations, to distribute resources and information in support of agricultural productivity. At the core of extension are efforts by both developing and developed nations to improve agricultural production by closing the gap between science and technology innovation for agriculture and its application (Halim, Ali, Swanson, Bentz, & Sofranko, 1998). Over time, extension services have morphed from primarily top-down approaches to bottom-up information sharing, research and development, and sources of technological innovation for local problem solving (Rogers, 1993). The ability of national extension officers[20] to reach farmers with pertinent information depends on multiple factors, for example gas money, infrastructure, aptitudes, and knowledge of farmer needs. While rural isolation is exacerbated in post-conflict settings, extension officers may face additional service provisioning challenges to certain populations due to local social and cultural norms and household power dynamics. In relation to gender, it has been shown that while a high percentage of women are involved in food production, they rarely serve as extension officers; moreover, the specific productive needs of women farmers in Liberia are largely unknown and therefore unaccounted for (Moore, 2017; Peterson, 2016, Talery-Wiles, 2012).

[19] In the context of this project, *smallholder farm*er is characterized as someone that works, owns, or make decisions about up to 2 ha (5 acres) of land. Smallholder farmer will be used synonymously with farmer, though designation may vary by region and type of crop/livestock production.

[20] In Liberia, field-based *extension providers* are called District Agricultural Officers (DAO). While the terms agent (global south) and educator (global north) may be used synonymously with officer depending on the regional context, we refer to professionals providing extension services as *extension officer* throughout the manuscript.

However, the government led by President Ellen Johnson-Sirleaf (2005-2018) worked to change this by reconstructing the agricultural sector and improving national gender equality.

Moving forward, the year 2018 fashioned new beginnings in Liberia. In 2018, George Weah was sworn in after 12 years under President Johnson-Sirleaf, the first woman elected head of state in Africa. The United Nations Mission in Liberia also ended, leading to a decrease in in-county aid and development organizations and donor dollars. Liberia is currently in a national transition and development period; therefore, this study's efforts to fill place-based gender gaps is timely. The explicit allocation of limited resources and both Ministry extension officer and farmer training is vital for the future.

Gender systems and local gender contracts

The concept of gender can take on multiple meanings that have resulted in controversy and confusion. The terms sex and gender are distinct yet interconnected. Distinguished from 'sex', the biological characteristics that differentiate females from males (Reeves & Baden 2000), 'gender' denotes what it means to be a woman (feminine) or man (masculine) through social and cultural distinctions such as behavior, social roles, position, or identity (Reeves & Baden 2000; Maguire, 2006). Gender is a construct used to separate people into distinct categories, it is not a trait (Hess & Ferree, 1987). In their 'Glossary of Terms' for the USAID Integrating Gender and Nutrition within Agricultural Extension Systems (INGENAES) project Rubin and Manfre (2015) define gender as:

> A concept referring to the social identity and roles associated with being a man or a woman that are usually learned through early socialization and reinforced by social norms. In some countries, additional gender categories are recognized [e.g. transgender]. The constellation of characteristics linked to men and/or women may change over time and place. The concept of gender includes the recognition that the social categories of man and woman are often defined in relationship to each other. (p. 8)

Diverging from the sole biological characteristics referred to by the term sex, this paper relies on the stated definition of gender to understand the differences between women and men in relation to their abilities to gain access to resources and information and exert agency in their households.

The Swedish historian Yvonne Hirdman (1991) uses the gender systems theory to clarify that gender has historically implied difference, and "is a complicated process by which people are shaped to fit their gender, and the consequences this has in institutional, cultural and indeed even biological terms" (1991, p. 190). However, the INGENAES definition of gender doesn't explicitly acknowledge

the role of power hierarchies that work to mold the relations between women and men. Gender systems theory explicitly acknowledges power relationships that exist between the genders and the role of power in maintaining the subordination of women, and gender separation (Rantalaiho & Heiskanen, 1997; Hirdman, 1991); Hirdman (1991) refers to these as the two principles of "difference" and "hierarchy" explicit in gender systems. Framing the gender construct through a systems lens provides a more dynamic representation of the complex set of relations, ideas, and processes that shape how gender is interpreted and manifest (Rantalaiho & Heiskanen, 1997). Because gender is socially constructed it doesn't exist in isolation. Relevant to this work, early Black Feminists such as bell hooks (1952) called for intersections of gender and race to be acknowledged in the conversation on power and discrimination; Kimberle´ Crenshaw's (1991) Theory of Intersectionality further transformed feminist discussions when she called for the recognition of all intersections that influence and compound discrimination including disability, socio-economic status etc. The fact that the definition of gender varies with context (i.e., spatially and temporally) is captured by the concept of the gender contract.

Gender contracts are place-based, informally organized gender relations (Forsberg, 2001); they define a pervasive system or set of rules that describe the appropriate or accepted actions and interactions of women (feminine) and men (masculine) in a given place at a given time (Hirdman, 1991). Gender systems are operationalized through local gender contracts under specific circumstances, though the term contract rarely indicates equality as men and women are often not equals in the process, leading to unequal contracts (Duncan, 2000). Rantalaiho and Heiskanen (1997, p. 7) describe a gender contract as:

> a pattern of implicit rules on mutual roles and responsibilities, on rights and obligations, and it defines how the social relations between women and men, between the genders and generations, and also between the social production and reproduction are organized in our societies.

The concept of a gender contract is especially salient for this research because it takes on the issue of place (Duncan, 2000; Forsberg, 2001). While the policies, resources, and new information available to extension officers is disseminated by the national government through Ministries, extension officers work at the district level; it is also within this local context that gender contracts are formed and reinforced.

For example, Hirdman (1991) describes a transition from the 'housewife contract' to a 'contract of equality' in Sweden during the period of 1930-1975. The shift occurred following a

movement in 1971, spearheaded by the Social Democratic women's organization, promoting legislative efforts to decrease conflicts resulting from purported differences between the genders; this included promotion of day care centers so women could work more easily, encouragement of women to take male-dominated jobs, and legitimization of women's right to free abortion. Caretta and Börjeson (2015) provide further evidence that gender contracts can be renegotiated or transformed. The case study they present on a rural agrarian community called Sibou, Kenya, suggests that climate variability had an influence on the renegotiation of the two gender contracts they refer to as the 'local resource contract' and the 'household income contract.' The study shows that in order to build community adaptive capacity in the face climate variability, women and men adapt differently in relation to their specific gender roles for agriculture and irrigation. Changes such as increased cultivation of cash crops for men led to women taking up historically male roles such as fencing, herding, and intercropping (Caretta & Börjeson, 2015). In the face of change (physical or social), Caretta and Börjeson (2015) contend that more effective and gender sensitive climate change adaptation policies will rely on understanding the negotiation and transformation of local gender contracts. Other authors have also used the local gender contract as a framework to describe overlapping gendered and spatial relationships and power divides in the everyday lives of women and men; such as rubber tappers at the household level in Laos (Lindeborg, 2012), the daily experiences of Swedish citizens (Duncan, 2000; Forsberg & Stenbacka, 2013), and through the negotiation of gendered roles during a self-help housing project in Lobatse, Botswana (Kalabamu, 2005). Despite the persistent and hierarchical nature of the social relations formed and sustained through gender contracts, they are not static; this idea provides the prospect of renegotiation and transformation (Hirdman, 1991; Kalabamu, 2005).

The Latin root of the word contract come from "con" and "tractere" meaning "with, together" and "to draw," respectively (Hirdman, 2001; Lindeborg, 2012). Drawing from this, we describe the potential for collective action to transform gender contracts, as the case studies by Caretta and Börjeson (2015) and Hirdman (1991) exemplify. The vulnerable and to a certain extent malleable condition of post-conflict regions beset by natural disaster or disease epidemics, may present an opportunity for information systems, such as extension services, to be used as a catalyst to re-calibrate gender norms toward building equality and adaptive capacity.

We refer to place as more than just differentiated physical locations; they are unique, meaningful constructions that reflect and shape cultural and social habits and perceptions, including those pertaining to gender. Place has long been a central issue in feminist geography as something that impacts a person's identity and as the site of identity formation (McDowell, 1997). This is

particularly valuable to consider in post-conflict settings that are prone to human displacement, infrastructure and public service degradation, and possible adaptation of local gender contracts for the purpose of survival during conflict. For example, reflecting on the Liberian civil conflict Leymah Gbowee (2011) highlights that women in rural conflict zones were more likely to leave their homes in search of food and supplies during conflict episodes than they were pre-war. Looking at different farmer agricultural extension service needs, access to services, and household agency through a place-specific gender contract lens may also provide a more in-depth understanding of disaggregated survey results and the role of this study to inform extension provisioning. Thus, place as the setting of local gender contracts is important to consider when exploring farmer access and agency in rural Liberia, specifically, the opportunity to renegotiate gender contracts toward greater gender equality in the agricultural sector.

Extension service dissemination, marginalization, and rural isolation

Despite efforts to increase the effectiveness, involvement, and equity of extension service dissemination to disenfranchised communities worldwide, women remain severely underserved across the globe (Coulter, Witinok-Huber, Bruyere, & Nyingi, 2019; Figueiredo & Perkins, 2013; Farnworth & Colverson, 2015; Huyer, 2016; Moore, 2014; Quisumbing & Pandolfelli, 2010; Richelieu, Thomas-Slayter, & Wangari, 2013). An aspect of this gap are barriers for women resulting from local gender contracts. These contracts are often shaped and reinforced by the cultural and social systems rooted in patriarchy, male dominated religious undertones, and local acquiescence. This can, though not always, result in gender contracts were women are still cognitively and economically delegated to reproductive and men to productive labor. Albeit, women also contribute significantly to the day-to-day agricultural production in subsistence farming households (ČerniČ IsteniČ, 2015; Little, 2002; Mudege et al., 2017; Trauger et. al., 2008). Blind spots that result from the agricultural contributions of women being overlooked and undervalued, have been linked to formal and informal governance structures that reinforce or maintain gender contracts, consequently, preserving women's domestic functions in society (Ogunlela & Mukhtar 2009; Perez et al., 2015; Quisumbing & Pandolfelli, 2010). This is in no way an attempt to generalize women's experiences.

Gender cannot be removed from place and time and is always rooted in an individual human or collective social experience. For example, in Liberia women face additional challenges stemming from household power dynamics that may result in less agency due to male dominated decision-making, land ownership, involvement in cash crops, and the devaluation of women's education. Coupled with increases in environmental stress such as climate change, deforestation, and shifts in precipitation, means that social and environmental factors intersect to contribute to the complex

realities that rural women farmers face (Farnworth & Colverson, 2015; Mercy Corps, 2017; Rocheleau, Thomas-Slayter, & Wangari, 2013; Yerian et al., 2014).

In reference to post-conflict agricultural extension provisioning, Cristoplos (2017) suggests that the marginalization of women may occur when governments and donor organizations intentionally or haphazardly ignore the most vulnerable populations, in lieu of outcome-based objectives with timestamps. Huyer (2016) states that this neglect presents challenges to women farmers to access information, technology, and other farming support vital to household nutrition and prosperity. When it comes to information sharing through technological devices, women in rural developing nations report lower access to and aptitudes for cell phones and computers (Perez et al., 2015). Age, social status, education, and household-head gender are also important factors to understanding ICT access in post-conflict settings.

Rural isolation

A quarter of Liberia's population live in Monrovia proper combined with the outlaying peri-urban settlements. In the context of this study, extension funding and resources primarily originate from the Liberian MOA in Monrovia, the urban municipality. They are distributed or communicated by regional DAOs (i.e. extension officers). Therefore, understanding the connections within and between urban and rural areas including power hierarchies and decision making has an impact on the process of extension efficacy, and how that relates to building local productivity and adaptive capacity. We see the rural-urban linkages framework as a conceptual approach to help account for rural isolation through the incorporation of place; specifically, by considering how agricultural resource and information access, farming productivity, and agency vary across the study communities. To help distinguish rural vs urban Tacoli (2006, p. 4) references governmental designations by population size thresholds alone, or in combination with other criteria (e.g., local employment, access to electricity), through administrative or political boundaries, or national census data settlement lists (Tacoli, 1998, 2004; Zewdu & Malek, 2010). Despite such efforts, Satterthwaite and Tacoli (2006) conclude that while these designations remain pertinent to resource allocation, they have significant variation and global ambiguity. We have found the conceptual integration of the rural-urban linkages and local gender contracts frameworks useful in understanding gendered access and agency disparities across the study area. Further, an integrated gender systems and place-based lens can provide insights, and potential opportunities, into the capacity of Liberian social-ecological agricultural systems to adapt to change (Witinok-Huber & Nyaplue-Daywhea, in press).

Adaptive capacity

In this study, (farmer) adaptive capacity refers to the ability of rural Liberian farmers, farming households, and communities to build strategies using available resources and knowledge, in order to manage and change in the face of current and future social and environmental stress while maintaining livelihoods (Engle, 2011; Folke, 2006; Holling, 2001). Resilience as defined by Holling (1996) is the ability to resist and the capacity to adapt – thus adaptive capacity is a major aspect of resilience. Adaptive capacity is the key distinction between engineering and ecological resilience. Adaptive capacity has been used extensively in a number of disciplines with relevance to resilience and vulnerability, specifically, in relation to human behavior and climate change (Caretta & Börjeson 2015; Carr & Thompson, 2014; Engle, 2011; Perez et al., 2015). For the purposes of this study, resilience is the ability of a system to cope with and adapt to disruptions (Brooks, Adger, & Kelly, 2005; Folke et al., 2010). Brooks et al. (2005) frame adaptive capacity as an element of vulnerability, that when added to exposure and sensitivity to stress either build or degrade system resilience; according to Perez et al. (2015) improving resilience and building long-term adaptive capacity are analogous. Therefore, working in dynamic and complex social-ecological agricultural systems requires continued efforts toward maximizing adaptive capacity. Understanding adaptive capacity is highly relevant for extension processes to navigate the challenges and opportunities to most effectively and proactively support smallholder farmers in rural Liberia. Renegotiating local gender contracts to close detrimental gender gaps in agricultural resource and information access, and household agency, has the potential to increase equity and agricultural productivity; the result will be enhanced local adaptive capacity.

Liberia is still working to build adaptive capacity following the shocks of civil conflict and Ebola, and for future shocks such as climate stress and fluctuations in aid funding or government service allocations. Adaptive capacity is essential in the face of future complex and dynamic challenges like climate change, especially for the most vulnerable populations in rural agricultural communities (Engle, 2011; Stanturf et al., 2013). A key role of extension is (or should be) to build that capacity. While providing timely and useful agricultural information and resources is at the core of extension services, additional consideration and training for future changes (e.g., climate, fuel prices, out-migration, women's land rights) should become a role that extension officers negotiate. Such considerations may help move the government and agricultural development agencies away from stop-gap measures towards proactively evaluating and building adaptive capacity into extension practices.

Therefore, the ability to adapt while maintaining livelihoods is a core tenant for agricultural potential and social equity. To help build overall resilience in rural subsistence farming communities, the Ministry and NGOs working in the agricultural sector should work to enhance the adaptive capacity of farmers. We provide evidence that enhancements to household and community adaptive capacity is reliant on women's increased agency and access to educational training, leadership opportunities, and the associated agricultural resources (e.g., extension services, technology, land access, credit) that relate to their gender contracts (i.e., daily roles and responsibilities). However, gaps remain in the study area related to efficacy and reach of governmental (extension) services that address demographic and regional differences in farmer needs, specifically gender. These complex challenges are not static but change over time. Herein lies a word of caution. Local gender contracts and the national extension policies influenced by such gender norms and systemic power structures must be understood dynamically; a static representation is dangerous. When change occurs, local gender contracts must be flexible and adaptive, or women will become increasingly more vulnerable.

Methods

Research context

This study explores how gender and place impact farmer agricultural resource access, including extension services, and adaptive capacity in the study area. We used a collaborative, participatory research methodology that prioritized in-country partner project outcomes related to uncovering gender gaps. Analysis was conducted using survey and focus group data collected with 352 farmers in February of 2018. We hypothesize that extension access is higher for male farmers, and in locations closer to urban centers (>5000 people) and primary roads. Compared to women farmers, we further hypothesize that male farmers are more likely to have access to complementary agricultural resources including larger farmland acreage and have more leadership opportunities, more household agency, and lower domestic labor burden. To test our hypotheses, we developed a new multidimensional index to measure and understand adaptive capacity – the Liberian Agricultural Potential Index or L-API. We conduct statistical analysis using L-API to investigate how access to agricultural resources, including MOA extension services, and household agency impact smallholder farmer adaptive capacity with particular emphasis on farmers' gender and place. To accomplish this, we investigated the following research questions:

1) How does gender impact local smallholder farmer adaptive capacity?
2) How does place impact local smallholder farmer adaptive capacity?

Study site

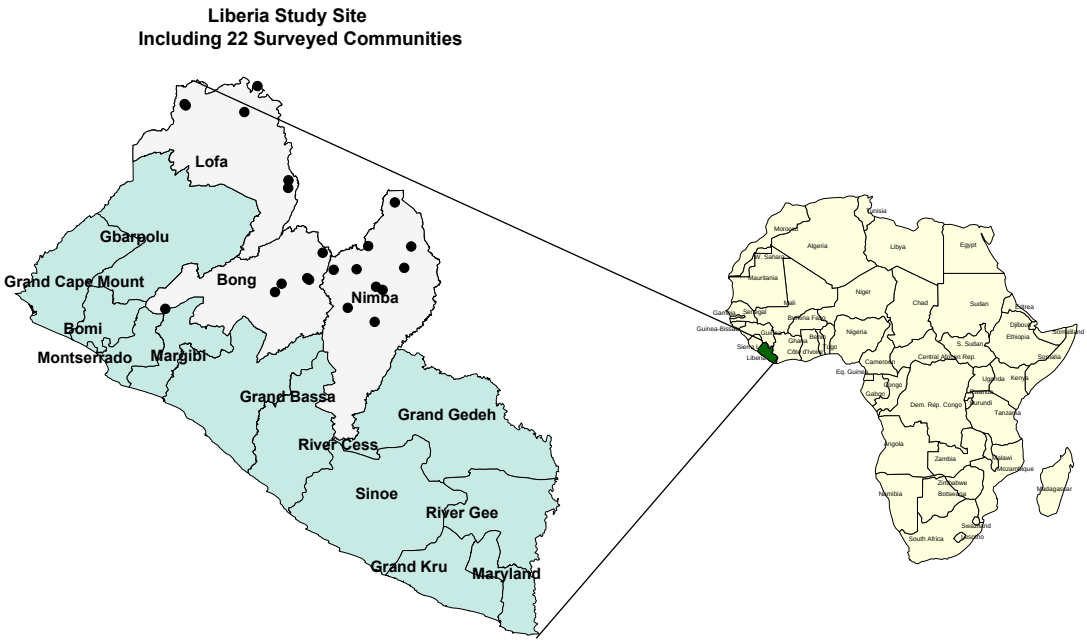


Figure 3.1. Liberia study area (Lofa, Bong, and Nimba counties) in grey and 22 surveyed communities (black dots).

Situated on the west coast of sub-Saharan, Africa, our study site in north-central Liberia encompasses three counties and 22 communities that are known for their agricultural productivity (primarily subsistence) (Peterson, 2016; Moore, 2017). The communities are ethnically, religiously, and economically diverse. Each county has at least one international border, and communities fall on the urban (>2000 people) to rural (<2000 people) gradient lying between 1 and 54 km from an urban city of greater than 5000 people along a defined road network (Table 3.7) (United Nations, n.d.). Communities lie at elevations ranging from 150m above sea level to 1,752m at Mount Nimba (UNESCO, n.d.), with 1300m of average annual rainfall and daily temperatures between 27-32°C (Hamdan, 2010). The study area was central to fighting during the Liberian civil wars (1989-2003) and provided an artery for transmission of the Ebola virus (2015) moving south from Guinea (Gbowee, 2011; Moore, 2017). Degradation of public services, infrastructure, economic instability, and ethnic tension remain visible today, along with enhanced aid and development projects/personnel such as the United Nations Mission in Liberia (UNMIL) that ended in 2018. Adding to the diverse social fabric, Liberia is a global, biological hotspot and has highly sought-after timber and precious stones and metals. Flora varies from lowland habitats of brush and grassland vegetation to evergreen forests in higher elevations on Liberia's northern borders; providing plentiful natural resources for timber harvest operations (Bongers et. al., 1999; Hamdan, 2010).

Data collection and descriptive analysis

Project partners from the Liberian MOA's Department of Regional Development, Research and Extension selected three counties known as Liberia's breadbasket (Bong, Lofa, and Nimba counties) for the focal study area. The lead researcher (also lead author) provided community selection criteria (Appendix F) to the Ministry field staff (extension officers and county coordinators) during a participatory mapping exercise conducted in Gbarnga, Liberia. The purposeful and proportional selection process was meant to provide a representative sample of farming communities (total farmer numbers were provided by MOA and the Liberian Institute of Statistics and Geo-Information Services).

Data collection took place in 22 communities between February 1st and 28th, 2018. An equal number of women and men participated in the 352 surveys administered by project trained Cuttington University student enumerators; forty-six, gender-disaggregated focus groups (two per community) were administered by the lead researchers (see Chapter 2 for full sampling details). When required, local translators were used. In March 2018, preliminary surveys and focus group results were reported to the MOA and USAID; a community brochure was also presented to partners to share with farming communities. The present paper further explores findings through triangulation of qualitative, quantitative, and spatial analysis methods including the development of L-API (Greene, 2007).

Focus groups and open-ended survey questions were coded and descriptively analyzed in the computer assisted qualitative and mixed-methods data analysis software called MAXQDA. It was chosen because it is designed to support mixed-methods data analysis across Apple and Microsoft products. L-API was developed by using emergent themes from the coding of farmer challenges, in combination with a review of International Food Policy Research Institute Women's Empowerment in Agriculture (WEAI) case studies based off of the Alkire-Foster method (Alkire, n.d.; Sen, 1976); this is useful here because the WEAI is used in similar agriculture and gender contexts to evaluate a different multifaceted concept, empowerment.

Multidimensional L-API

Preliminary survey and focus group findings show that smallholder Liberian women and men farmers face similar agricultural challenges such as financial limitations, lack of tools, seeds, training and markets, and pest control. Findings also show that primarily women deal with unique challenges related to securing land tenure and household agency. These findings led authors to consider additional controlling variables that may reflect different adaptive capacities, particularly related to the agricultural extension needs for women vs men. Multidimensional indices have been used to create more comprehensive representations of complex issues or phenomena such as poverty, well-

being, and empowerment (Sen, 1976; Kabeer, 1999). Multidimensional indices are also useful in determining latent variables at play and permit comparisons across place or other variables of interest (Alkire et al., 2013a,b, n.d.; IFPRI, 2012). For these three reasons, we chose to create a multidimensional index to further explore differences in agricultural production potential related to gender and place across the study area. Our local application of a multidimensional index shows that this analytical approach may be useful in understanding individual, household, and community adaptive capacity.

In addition to analyzing Liberian smallholder farmers' agricultural resource access and household agency, we use L-API as a measure for adaptive capacity. The practice of utilizing indices for overall measures such as well-being and empowerment in agriculture have been highlighted by the Oxford Poverty & Human Development Initiative, USAID, and International Food Policy Research Institute (IFPRI). We built and use L-API to encompass previous insights and locally relevant indicators for the Liberian context. Specifically, we looked at the WEAI methodology and case studies rooted in the Alkire-Foster method (Alkire et al., 2013a,b; IFPRI, 2012). The Alkire-Foster method measures complex constructs such as poverty, inequality, or empowerment by incorporating different measures in relation to deprivation cutoffs; for example, indicators of poverty could include lack of education, employment, or living conditions that are then used to construct a multidimensional index for comparison across categories (i.e., genders) or places (Alkire, n.d.). To determine empowerment for women (and men) in a given country the WEAI incorporates indicators for the five domains of production, resources, income, leadership, and time, measured at the individual or household level and aggregated (IFPRI, 2012). A pro-WEAI has recently been developed for project-level use. However, for individual farmer comparability, our methodology is based on a summed measure of 'access to' as opposed to the stated methods' use of deprivation domain cutoffs, aggregation, and matrix calculations (Alkire, n.d.). We will now explain exactly how we developed each domain.

L-API is made up of four domains that include 1) resources, 2) leadership, 3) household power, and 4) time allocation (workload) (Table 1). Overall, domains relate to agriculture and gender via farmer access to resources and information, and household agency. L-API is the summative score of resources, leadership, and household power, minus time allocation. Together, the four domains (Table 3.1) reflect overall farmer agricultural potential based on survey data. Comparative analysis is then conducted between individual farmers, or aggregated by place, gender, or additional variables of interest. Scores can be tallied for the overall L-API, each individual domain, or as composite domains

for access (resources plus leadership) or agency (household power minus time allocation). For triangulation, qualitative data is included through illustrative quotes from the focus group interviews.

Within the survey instrument, a gender matrix was used to delineate between the productive and reproductive responsibilities of all family members, by product type including staple or field, vegetables/garden, cash crop, livestock, or poultry. Ten possible responses include: men, women, both men and women, male children, female children, children, entire family, women and children, men and children, or not performed. To understand the daily time allocation and decision-making agency of women and men farmers, indicators were twice, ones as '1' for women, both men and women, entire family, and women and children, all other responses were '0', and a second round of coding gave the value of '1' to men, both, family, and men and children and '0' for all other responses. For the final L-API, women's scores included resource and leadership along with the women's time and power scores. Men's scores were the sum of resources, leadership, and men's time and power scores. A domain for information and communication transfer was removed from the final L-API based on significant overlap with access in an initial principal component analysis. Farmer access to Ministry extension services is analyzed separate to the L-API because it was a zero-inflated variable and skewed the results with only 148 positive responses out of 352 farmers.

Table 3.1. L-API and farmer access to Ministry extension services [a]

Domain (% of total L-API)	Indicator examples	Weight (pts)	Coding
Resources (38%) [b]	Access, use, and ownership of assets	17 of 21	Composed of 21 points and 15 indicators. Twelve are measured on a binary scale (no=0, yes=1) and three out of 2 points.
	Access to credit and non-farm work	2 of 21	
	Extension service access (Ministry and NGO)	2 of 21	
Leadership (12%) [b]	Group member, leadership role	2 of 7	Composed of 7 points and 5 indicators. Four binary indicators and education recoded as no formal (0), primary/Jr. high (1), high school or some university (2), university graduate (3)
	Literacy, education	5 of 7	
Household Power (25%) [cd]	Agricultural decisions	6 of 14	Composed of 14 points and 13 indicators. Ten gender-matrix and two land tenure questions were measured on a binary scale. Empowerment is measured using a Likert scale recoded as 0-3 points.
	Household decisions and power	6 of 14	
	Land tenure	2 of 14	
Time allocation (25%) [cde]	Workload (domestic)	7 of 14	Composed of 14 points and 13 indicators. Twelve gender-matrix questions were measured on a binary scale in addition to number of children recoded as '1' for 1-2 children and '2' from more than 2 children.
	Workload (productive)	7 of 14	
Ministry Access [fg]	Access to Liberian Ministry of Agriculture extension services	3 of 8	Composed of 8 points from 8 binary indicators. Respondents include 148 farmers that receive services from a MOA extension officer.
	Satisfaction and adoption	4 of 8	
	Yield improvement	1 of 8	

[a] n = 352 farmers (176 women, 176 men)
[b] Access (50%) is represented by resources plus leadership
[c] Agency (50%) is represented by household power minus time allocation
[d] Time allocation and household power gender matrix indicators were coded for women and men responses separately, then summed with the full L-API by participant gender.
[e] Time is subtracted for the total
[f] n=148 farmers
[g] Not included in L-API

Spatial and statistical analytical techniques

Analysis of variance was conducted to test the effect of participant gender, county of residence, and their interactions on L-API and other variables of interest. The Global Moran's I (Haining, 1993) (k-nearest neighbor of 3) was used to test for spatial autocorrelation or the influence of geography across the study area and the Local Indicators of Spatial Autocorrelation (Anselin, 1995) at the community scale. Additional exploratory spatial analysis was conducted through a Mantel test (Koenig, 1999) on dissimilarity matrices for L-API variation between communities with each of the following: proximity to a) major road, 2) city with over 5000 people, and 3) the Red-Light Market in Monrovia. Analyses were completed in R and GIS. The HOTOSM Liberia Roads dataset was used and can be accessed through United National Office of the Coordination of Humanitarian Affairs - Humanitarian Data Exchange, available under a Creative Commons Attribution 4.0 International license (United Nations, n.d.). The road network included trunk, trunk-link, primary, primary-link, secondary, and tertiary road designations. When possible, geolocations used in the Mantel test reflect important agriculture and movement sites such as gas stations (rare), key markets, and bus/taxi centers (Appendix C). Geographic Positioning Systems data points were collected in each community during 2018 field visits. To maintain the confidentiality specified during data collection, the 22 community points are represented as numbers in the results section and obscured throughout the manuscript and in publicly available data. To define the nearest cities for the Mantel test we use 2019 predictions by the World Population Review and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Humanitarian Data Exchange, were used to define nearest cities for the Mantel test (Appendix C); additional census data is from the Liberian Institute of Statistics and Geo-Information Services. The network analyst in ArcGIS (ESRI, 2019) is used to develop the road network for distance calculations between communities and places of interest. Distance matrices were calculated and tested for spatial autocorrelation against difference matrices for mean community L-API scores.

Study limitations

Study limitations and possible data collection biases include language and culture, and power and gender dynamics related to community entry and sensitization through Ministry field staff, community elders, and farmer group leaders (Newing, 2010). Additionally, having two women as the lead researchers may have shifted the typical local power-dynamics and influenced farmer responses. In order to decrease language and cultural barriers, survey administration was carried out by four Cuttington University student enumerators (1 woman, 3 men). While we attempted to conduct only same-gender interviews (e.g., woman enumerator interview women farmers and men enumerators interview men farmers) it wasn't always possible leading to potential study limitations. The age

difference between the enumerators and respondents may have also created limitations due to generation gaps (on average, the students were 15-20 years younger than the farmers they interviewed). The day of the week, time of day, season, and study locations biased the study to farmers that were available. Although the study areas were specifically chosen to represent different rural locations, the data collection tools used were not explicitly developed with spatial analysis in mind, spatial analysis techniques are exploratory and complimentary to other qualitative and quantitative analysis. The lead researcher acknowledges her white, academic, economic, and woman's lenses that may have impacted power dynamics or participant and team interactions.

Results

Farmer participants

The overall survey sample includes 352 farmers, 176 women and 176 men, from three Liberian counties and communities. The bulk of farmers identify with one of 6 ethnic groups, and two religions, and are primarily between the ages of 25 and 56 years old. Most are married or live with a partner and men primarily hold the position of household head. Over half of the participants report that they have no formal education or only elementary school. Women are more likely to have completed junior high school or below (43%, n=150) when compared to men (25%, n=89). Whereas, more men completed high school through university classes (24%, n=87) when compared to women (7%, n=26); only 16% of the 51% of literate participants are women (Table 3.2).

Table 3.2. Farmer participant demographics

		Descriptive results (n=352)	
Demographic variable	Response category	Count	Percent
County	Bong	96	27%
	Nimba	160	46%
	Lofa	96	27%
Sex/Gender	Women	176	50 %
	Men	176	50 %
Stated as household head	Women	70	20%
	Men	282	80%
Age group	18-24	16	4%
	25-34	63	18%
	35-44	104	30%
	45-54	74	21%
	55-64	71	20%
	65+	25	7%
Relationship status	Single, never married	24	7%
	Divorced/separated	14	4%
	Widowed	30	8%
	Living with a partner	150	43%
	Married	134	38%
Religion	Christian	321	91%
	Muslim	23	7%
	Other	8	2%
Ethnicity	Kpelle	96	27%
	Gio	85	24%
	Mano	75	21%
	Kissi	3	11%
	Loma	32	10%
	Mandingo	17	5%
	Other	8	2%
English literate (women/men)		178 (55/123)	51% (15%/35%)
Education	No formal	122	35%
	Elementary	60	17%
	Junior High school	57	16%
	High school	88	25%
	Some university or AA	20	6%
	University graduate	5	1%

Gender

The results of a chi-square contingency test indicate statistically significant ($p < .001$) relationships between education and gender ($X_2 = 62.5$, $p = 2.5e\text{-}14$) and relationship status and gender ($X_2 = 53.9$, $p = 5.7e\text{-}11$). Results do not indicate a relationship between participant age group and gender ($X_2 = 1.78$, $p = 0.41$).

Table 3.3. Gender disaggregated participant level of education, relationship status, and age

Demographic variable	Response category	Women (n=176)	Men (n=176)
Education	No formal	91	31
	Elementary and Junior high	59	58
	High school, college/AA, or university	26	87
Relationship status	Single, never married	17	7
	Divorce/separated	14	0
	Widowed	29	1
	Living with a partner	62	88
	Married	54	80
Age	Youth (18-34)	41	38
	Adult (35-54)	83	95
	Elder (55+)	52	43

Gendered ICT access. Results indicate that women are nearly 25% less likely to have access devices they use for to ICT gaining and sharing information about agriculture (Figure 3.2). As indicated in Figure 3.2, 352 farmers report personal or household access to one or more ICT devices; resulting in 352 farmers with access to 500 devices. Out of the 500 specified ICT devices, women respondents account for 38% (189 devices) and men for 62% (311 devices) of the 500 ICT devices. Satisfaction of device use is calculated as a percent of total access by farmer gender. Women respondents are satisfied with their use, i.e., time spent on the device, 87% of the time and men 95% (Figure 3.3).

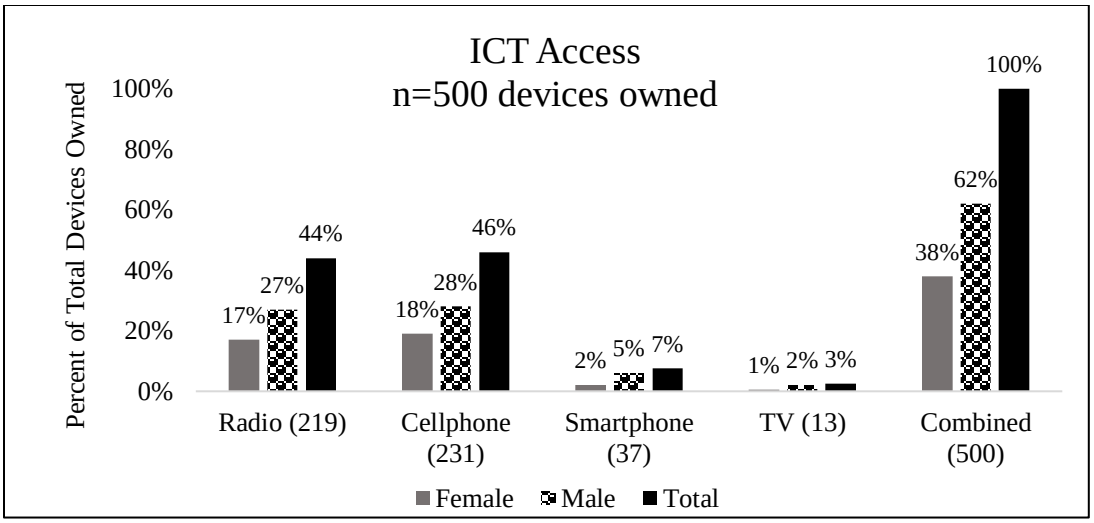


Figure 3.2. Access to ICT devices
Note. Cells represent the percent of total devices owned by 352 participants; multiple devices could be selected.

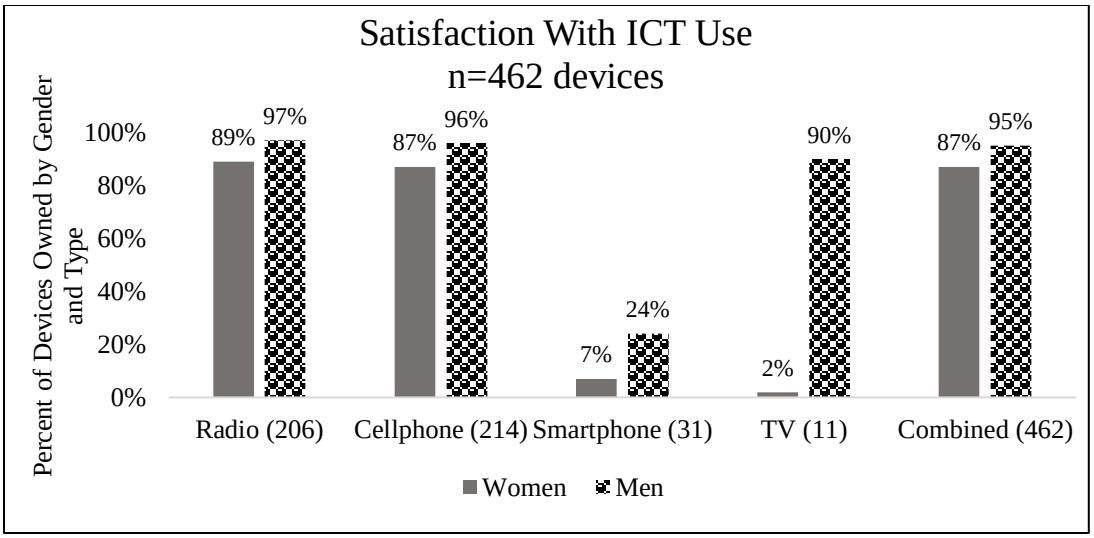


Figure 3.3. Satisfaction with the 'amount of use' for farmer owned ICT devices
Note. Cells represent the percent difference between a respondent's reported satisfaction to their access reported in Figure 3.2.

Qualitative quotes substantiate findings of gendered technology access and use. Difference in access relates to cultural views that 'gadgets' are for men and therefore women have difficulty gaining access to 'personal or private' devices and women more frequency report financial constricts as a barrier (Figure 3.4). Furthermore, limited technical skills for ICT use was only specified by women farmers (Figure 3.4). Our study corroborates previous literature that highlight multiple (productive and reproductive) challenges to women farmers' access and use of technical resources at the same level as their male counterparts (Huyer, 2016; Perez et al., 2015, Quisumbin & Pandolfelli, 2010).

ICT ACCESS/USE	ATTRIBUTE	ILLUSTRATIVE QUOTE
Ownership	Personal/ private use	*"… it is a phone and for private purposes. People in my household only use this when they are permitted." (Man, farmer 82)* *"It is for me and I keep it in my room." (Woman, farmer 50)*
	For the man, my husband	*"It [the radio] is for the man in the home." (Woman, farmer 36)* *"The gadgets are controlled by my husband." (Woman, farmer 238)*
	My child(ren) own it	*"The phone belongs to my daughter and the radio is controlled by my husband." (Woman, farmer 77)* *"… it is for my son and he has it for his personal use." (Woman, farmer 116)*
	Split household use	*"Everyone has his or her less basic time to listen to radio or use cellphone." (Man, farmer 14)* *"It [the phone] is for my personal use. But for the radio, everybody knows how to use it." (Woman, farmer 344)*
Maintenance	Care and protection	*"In my household, people below 18 are not allowed to use these technologies' because they need to be maintained." (Man, farmer 297)*
	Cost	*"… I use it to access information and I also spend money to purchase battery. Due to this if everyone use it the way I use it, means there are surplus batteries which is not possible." (Man, farmer 223)* *"I avoid damaging them because I bought them with my money." (Woman, farmer 170)*
Technical know-how	Limited technical skills	*"I don't know how to put it on." (Woman, farmer 277)* *"I can only receive calls and don't know how to make calls." (Woman, farmer 300)*

Figure 3.4. Farmer ICT access/use quotes

Gendered access to Ministry extension services. Results reflect limited extension service access across all three counties for both women and men farmers with a total of 42% (148 farmers)

reporting Ministry extension access via a DAO in the past three years. Lofa, the most geographically remote county in terms of paved road access to the capital city (Monrovia), report lower total extension service access when compared with Bong or Nimba (Figure 3.5).

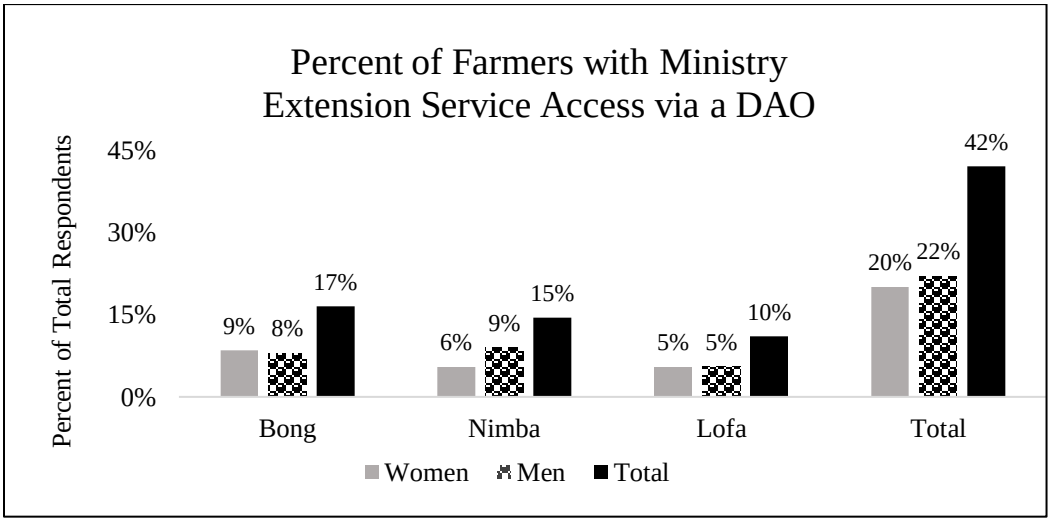


Figure 3.5. Percent of all respondents' (n=352) with access to Ministry extension services via a DAO in the past three years
Note. Total is the sum of women and men for each county and overall

Gendered access to NGO extension services. Overall, 189 (54%) farmers report to have worked with an NGO on agricultural related efforts in the past. When compared with the MOA, farmers are 12% more likely to have access to agricultural training, workshops, and resources through an NGO (e.g., USAID, ACDI-VOCA, DFID, BRAC) (Figure 3.6). There are 99 farmers that receive both Ministry and NGO extension services that include both women (45) and men (54); these 99 farmers reside in Bong (36), Nimba (40), and Lofa (23) counties.

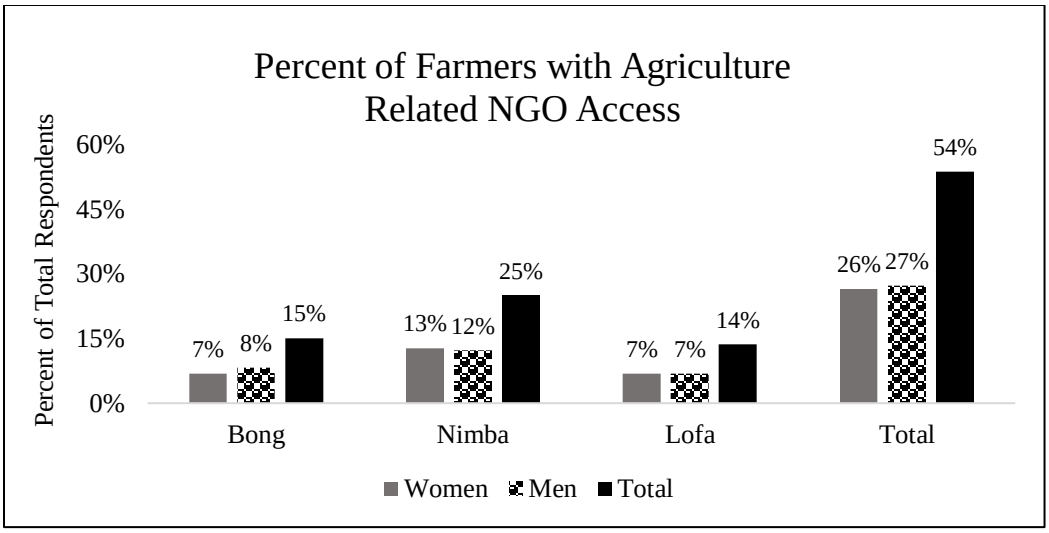


Figure 3.6. Percent of all respondents' (n=352) with access to agricultural resources and information via an NGO
Note. Total is the sum of women and men for each county and overall

Farmer preference for Ministry extension officer gender. Both women and men farmers said that women are capable and should be Liberian extension officers. Further, Figure 3.7 shows that farmers report an interest in having more women extension officers serve them and their communities.

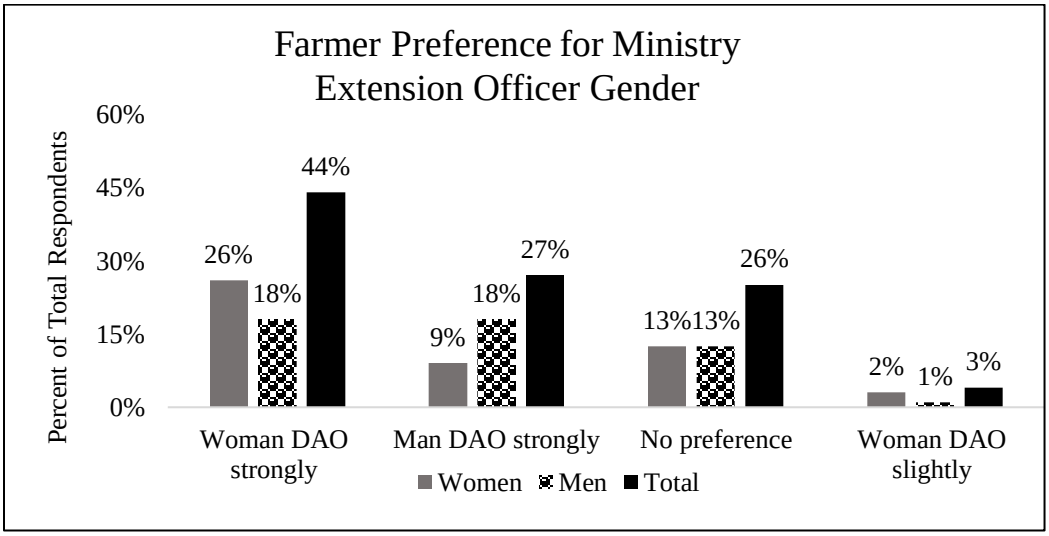


Figure 3.7. Respondent gender preference for Liberian extension officers
Note. Total is the sum of women and men for each response, n=352

The four main themes that account for farmer's (of both genders) preference to have more women as extension officers align with opinions that women are more 1) trustworthy and transparent, b) nurturing, patient, and sympathetic, c) a change from the current status quo, and d) easier for

women farmers to relate to. The reasons that farmers (of both genders) prefer having men officers are that men a) are physically strong, b) culturally known as the leaders, c) and more practical. There are many reasons that farmers don't have a preference for the gender of extension officers. Increased access to education for women was highlighted in addition to the capability and willingness of officers to work directly in the community and fields. Further, respondents of both genders said that gender equality is now a national policy they must abide by, and that there aren't enough officers or resources to go around; represented in the Nimba focus group quote that "One person can't cover this place, it would be a false face." Farmers discussed solutions such as increasing training for local technicians, collaboration between women and men extension officers, and more officers to cover the territory (Figure 3.8).

GENDER PREFERENCE	ATTRIBUTE	ILLUSTRATIVE QUOTE
Women	Identify with, similar roles	*"Women are aware of the challenges in the home and in the field." (Woman, farmer 283)* *"She will better understand my problems as a farmer and a woman like her, she will know what it means to be a woman farmer." (Woman, farmer 310).*
	Nurturing, patient, sympathetic	*"... because agriculture is like training a child or nurturing a child. This applies to growing crops." (Man, farmer 222)*
	Change	*"Donors have been sending materials, fertilizer, chemicals for us, but the men that are working in our county have not been reaching with them in our community. So I want to work along with women." (Woman, farmer 233)*
	Trust and transparency	*"I think women are not corrupt to sell fertilizers to farmers. Most women are transparent." (Man, farmer 102)* *"When some men are in the field they will never focus on their job, but on our women. And some men don't know good ways of talking to farmers, but women are different." (Man, farmer 157)*
Men	Physical strength, fieldwork	*"... I feel that they are strong and able to walk in the bush with us." (Man, farmer 16)* *"... they are strong and will be able to support local farmers when on the demonstration site." (Woman, farmer 347)*
	Culture, religion, patriarchy	*"... because I don't want woman control me. Because we superior than them, they are our ribs." (Man, farmer 55)*
	Practical, straight forward	*"...men don't compromise with issues, but always straight forward." (Man, farmer 22)* *"Women are sympathetic, but men stand by their words in achieving their goals." (Woman, farmer 342)*

GENDER PREFERENCE	ATTRIBUTE	ILLUSTRATIVE QUOTE
Either	Education	*"Women are now going to school so they can do the same men can do." (Woman, farmer 1)* *"She is going to school so she can also work as an extension agent." (Woman, farmer 106)*
	Work directly in our community	*"Anybody who is willing to work directly with us in our community. And put us into a cooperative for us to receive information about our farm." (Woman, farmer 69)*
	Qualifications	*"Man and woman who is qualified can equally serve." (Man, farmer 80)* *"…MOA is responsible to send extension agent who I think will be qualified." (Man, farmer 114)*
	Gender equality	*"We need gender difference. Why you send your child to school for?" (Woman, farmer 106)* *"…we have to give opportunity to people to prove themselves capable of what they know. I highly encourage gender balance." (Man, farmer 334)*
	Collaboration	*"I love for men and women to work together, feel they are all of society." (Men, focus group 39)* *"Because both play part of the home and play part in farming. They have equal opportunity." (Men, focus group 31)*
	Geographic limitations	*"One person can't cover this place, it would be a false face." (Men, focus group 45)*

Figure 3.8. Succeeding farmer explanations to the Likert survey question, "If you could choose, would you select to have a woman or man DAO visit you?"

L-API application. An analysis of variance model (Type II) limited to the main effects of gender and county provides the best fit in all cases to evaluate differences for L-API; the most parsimonious model doesn't include the gender-place interaction. Gender-only results indicate statistical differences ($p = 0.001$) for L-API and additional variables of interest except Ministry access

(Table 3.4 and Table 3.5). Analysis of variance also shows statistical difference between counties for L-API, access, and leadership at $p = 0.001$, and for resources and Ministry access at $p = 0.05$ (Table 3.5). Further, results show significant differences between women and men for the least squares means for all derived variables from the analysis of variance (Table 3.4). Results also show significant gender differences between smallholders' farm sizes, however, the average farm size for men is inflated by a handful of farmers with over 100 acres; the median farm size is two acres for women and three acres for men.

Table 3.4. Variations by gender for L-API and additional variables of interest

		Gender mean ± standard error		
Index	Domain	Women (n=176)	Men (n=176)	Significant [a]
L-API [b]		9.80 ± 0.35	19.5 ± 0.35	<.001
	Resources	8.7 ± 0.19	10.6 ± 0.19	<.001
	Leadership	2.50 ± 0.14	3.90 ± 0.14	<.001
	Power	9.43 ± 0.18	11.88 ± 0.18	<.001
	Time (-)	10.8 ± 0.16	6.90 ± 0.16	<.001
Additional variables of interest				
Access [c]		11.2 ± 0.28	14.0 ± 0.28	<.001
Agency [d]		-1.35 ± 0.20	4.97 ± 0.20	<.001
Ministry access		2.80 ± 0.26	3.30 ± 0.26	
Farm size (acres)		3.16 ± 2.64	13.7 ± 2.64	<.01
Monthly spending on agricultural information [e]		238 ± 65.9 (1.23)	632 ± 65.9 (3.26)	<.001

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. A confidence level of 0.95 with 348 degrees of freedom was used. Cells represent the mean values for respondents by gender.
[a] Statistic from Table 3.5
[b] Resources + Leadership + Power - Time
[c] Resources + Leadership
[d] Power – Time
[d] Spending in Liberian dollars (USD)

Table 3.5. Analysis of Variance main effects for L-API and variables of interest

		Anova Results (N=352)	
Dependent variable	Independent variable	F	*p*
L-API [a]	gender	395.1	2.2e-16***
	county	7.2	9e-10***
Resources	gender	55.6	7.0e-13***
	county	3.9	0.02 *
Leadership	gender	53.3	1.9e-12***
	county	14.6	8.1e-7***
Power	gender	98.5	2e-16***
	county	0.5	0.39
Time	gender	287.7	2e-16***
	county	0.1	0.44
Access [b]	gender	77.4	2.2e-16***
	county	10.5	3.9e-5***
Agency [c]	gender	504.2	2e-16***
	county	0.5	0.67
Ministry Access	gender	2.0	0.67
	county	3.9	5.6e-4***
Farm acreage	gender	8.2	0.004**
	county	1.4	0.24
Monthly spending on agricultural information	gender	18.4	2.4e-5***
	county	1.1	0.52

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. A confidence level of 0.95 was used with degrees of freedom for gender (1), county (2), and residuals (348).
[a] Resources + Leadership + Power - Time
[b] Resources + Leadership
[c] Power – Time

Place

L-API variations by county. Results show the least squares means for all derived variables from an analysis of variances for farmers across three surveyed counties (Table 3.6). Nimba farmers' scores are highest for the overall L-API, resources, access, household power, and farmers in Nimba spend the most money on agricultural information monthly. However, Nimba farmers report the least access to Ministry extension services. Bong and Lofa County farmers have similar L-API scores, yet Bong County is more deficient in resource access and Lofa in household agency. On average, Lofa farmers have smaller farms and spend less monthly on agricultural information. Despite having the

lowest overall agricultural resource access, Bong farmers have the highest access to resources from the MOA and the largest farms on average.

Table 3.6. Variations by county for L-API and additional variables of interest

		County (mean ± standard error)			
Index	Domain	Bong (n=96)	Nimba (n=160)	Lofa (n=96)	Significant [a]
L-API [b]		14.1 ± 0.47	15.9 ± 0.36	14.0 ± 0.47	<.001
	Resources	9.27 ± 0.25	10.1 ± 0.19	9.59 ± 0.25	<.05
	Leadership	2.88 ± 0.19	3.89 ± 0.14	2.79 ± 0.19	<.001
	Power	10.9 ± 0.24	10.7 ± 0.18	10.4 ± 0.24	
	Time (-)	8.95 ± 0.22	8.79 ± 0.17	8.80 ± 0.22	
Additional variables of interest					
Access [c]		12.1 ± 0.47	14.0 ± 0.29	12.4 ± 0.37	<.001
Agency [d]		1.93 ± 0.47	1.87 ± 0.21	1.61 ± 0.27	
Ministry access		3.95 ± 0.35	2.21 ± 0.27	2.90 ± 0.35	<.001
Farm size (acres)		11.1 ± 0.35	10.44 ± 0.27	3.74 ± 0.35	
Monthly spending on agricultural information [e]		468 ± 88.0 (2.41)	480 ± 68.1 (2.47)	357 ± 88.0 (1.84)	

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. A confidence level of 0.95 with 348 degrees of freedom was used. Cells represent the mean values for respondents by county.
[a] Statistic from Table 3.5
[b] Resources + Leadership + Power - Time
[c] Resources + Leadership
[d] Power – Time
[d] Spending in Liberian dollars (USD)

Place, access, and agency. The global Moran's *I*, a measure of spatial autocorrelation is used to determine the spatial distribution of L-API scores across the study area and make comparisons between the three counties, and 22 communities. A positive *I* indicates communities near each other have similar L-API scores and negative *I* indicates scores are dispersed in space; *I* near "0" mean random spatial distribution of L-API scores. Results show positive spatial clustering, at a k-nearest neighbor of three communities, for access ($I = 0.26$, $p = 0.04^{*}$), leadership (I=0.29, p = 0.02*), and the overall L-API ($I = 0.27$, $p = 0.02^{*}$). Further, for L-API, access, and agency, we found local spatial dependence for the three nearest communities to each other. Across the study area, the global results indicate that communities that are physically near each other were more likely to have similar L-API, access, and agency scores than should be expected at random. Local autocorrelation using a LISA test shows positive clustering for L-API in community 11 ($Ii = 2.86$, $p = 0.004^{**}$) and 19 ($Ii = 3.87$, p =

.0001***), for access in communities 1 (*Ii* = 2.16, p = 0.037*), 19 (*Ii* = 4.45, *p* = 7.96 * 10-16***), and 21 (*Ii* = 2.26, *p* = 0.024*), and agency in communities 6 (*Ii* = -2.03, *p* = 0.04*), 11 (*Ii* = 2.68, *p* = 0.007**), 16 (*Ii* = 2.21, *p* = 0.027*), and 17 (*Ii* = 2.26, *p* = 0.024*).

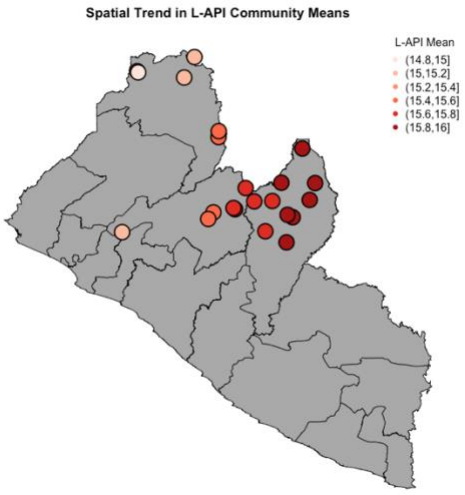


Figure 3.9. Spatial trend in mean L-API scores across 22 surveyed communities

Community geography and L-API. To further explore spatial aspects of L-API, we conduct a Mantel test to investigate pairwise comparisons between aggregated community L-API scores and road network distances to agriculturally relevant locations shown in Table 3.7 and Appendix C. While this analysis is exploratory, initial findings show a significant positive correlation between community aggregated L-API scores and distance to a city with over 5000 people (r = 0.16, *p* = 0.009**) and distance to Red Light Market in Monrovia (r = 0.1, *p* = 0.056+). Inversely, mean L-API scores increase as the distance from a community to major road decreases (r = -0.22, *p* = 1) (Table 3.7 and Appendix C).

Table 3.7. Mantel test for autocorrelation

Mantel test for Autocorrelation (Monte-Carlo results) [a]		
Location of interest [bc]	Correlation	*p*
Trunk or primary road	-0.22	1
Small city (>5000 people)	0.16	0.009**
Red-Light Market, Monrovia [d]	0.10	0.056+

Note. + = p < 0.1, ** = p < 0.01. Open source data layers are from the Humanitarian Data Exchange.
[a] Compares distance matrix of pair-wise comparisons across the 22 surveyed communities between L-API scores and the distance from each community to a location of interest.
[b] All distances are calculated from a survey data community collection point to a central point representing the location of interest (Appendix C).
[c] The road network was calculated using trunk, trunk-link, primary, primary-link, secondary, and tertiary roads specified in the data attribute table.
[d] Red-Light Market, Monrovia (6.29239, -10.69073)

Key farmer insights and recommendations for the Ministry

Qualitative findings reflect specific opportunities for the MOA and NGOs to improve extension program efficacy and farmer conditions, and to build adaptive capacity. Qualitative quotes corroborate quantitative findings that improving access to agricultural resources and training opportunities is vital for farmers to overcome stated challenges and increase productivity and food security. Farmers highlight specific limitations to the access of credit, stable markets, land, non-farm jobs, and the infrastructure required to increase mobility (i.e., roads, bridges). Specific to Ministry extension officer outreach (i.e., via a DAO), farmers highlight practical and technical place-based support, an increased focus on development of farmer cooperatives, and improved monitoring and evaluation of national and international projects. Improvements to monitoring, evaluation, and accountability will require spatial and scalar coordination between extension officers and county coordinators, as well as, county coordinators and Ministry officials in Monrovia. Men's focus group 44 noted that *"There is poor communication between DAO/Ministry and farmers and NGOs.* Further stating that there is a "*Lack of follow through. They come and look, say this and that and don't come back, don't see anyone, not Ministry, not NGOs"* (Table 3.10).

MOA SUPPORT	ATTRIBUTE	ILLUSTRATIVE QUOTE
Access	Credit/loan	*"Loan will enable us to help ourselves." (Women, focus group 8)*
	Markets	*"Government should provide buyer or market for the rice we grow." (Women, focus group 11)* *"Middlemen take advantage of farmers by buy from them at low price." (Men, focus group 24)*
	Land	*"Government should declare swamp (land) as government land so people who are willing to work there can work." (Women, focus group 8)* *"If I don't own (the land) then dependent on land owner." (Men, focus group 41)*
	Non-farm jobs and skill building	*"We would like for the government to provide us night school. Skill training on tie dye, sewing, hair dressing, or making soap." (Women, focus group 6)*
Extension	Place-based support	*"Know where specific crops grow and send technicians where they know best or what they know best." (Men, focus group 27)*
	Build and support farm cooperatives	*"Because they (government) won't leave Monrovia to help us, so help us through the cooperative." (Women, focus group 12)*
	Monitoring	*"The government is not monitoring if their work is creating impacts and getting to who is meant to get it." (Men, focus group 39)* *"There is poor communication between DAO/Ministry and farmers and NGOs. Lack of follow through, they come and look, say this and that and don't come back, don't see anyone, not Ministry, not NGOs." (Men, focus group 44)*
	Train local technicians	*"Colleges put out a lot of agriculture graduates, but they won't get out into the field. They want jobs in Ministry in Monrovia not out here in the soil. Agents should be willing to come into the field." (Men, focus group 36)* *"Train and utilize local technicians." (Men, focus group 45)*

Figure 3.10. Farmer advice for the Ministry of Agriculture on access and extension support

Insights about connection between food security and local community security came out in the focus groups; in addition, the acknowledgment of women's contributions around food preparation and money management in households and the farming community. Both women and men farmers stressed the need for more training and empowerment in their communities (Figure 3.11).

FARMER INSIGHTS	ATTRIBUTE	ILLUSTRATIVE QUOTE
Insights	Women's dual-burden	*"Sometime some man will leave the work on the woman. After doing the hard work, we are also responsible for the children." (Women, focus group 5)*
	Population growth and land access	*"We ask for the land, so we will like for government to get land for all the cooperative, before the population was not much but due to the increase, land issue is becoming the problem." (Women, focus group 8)*
	Gendered labor contributions	*"Women does 60% because they cater to the home and have work on farms. Nowadays, certain jobs are for women and others for men." (Men, focus group 31)* *"For farm plus domestic women do most, but for just farms its even." (Men, focus group 31)*
	Empowerment	*"If you give someone a fish, you feed them for a day. If you teach someone to fish, you feed them for a lifetime." (Men, focus group 34)*
	Security	*"No country will grow without food, without food security there is insecurity."* *"No hungry man will speak a good word to you." (Men, focus group 40)*
	Unity	*"When we are together, all is fine." (Men, focus group 45)*

Figure 3.11. Focus group interview insights related to adaptive capacity, community, and gender.

Discussion & Conclusions

Gender-specific and geographically targeted extension service practices are vital to Liberian smallholder farmers; unfortunately, the uncertainties of funding and aged and primarily male personnel are not currently meeting farmer's needs. Therefore, understanding what stands in the way of all farmers to accessing agricultural resources and making decisions, regardless of gender or geography, is critical for agricultural productivity. Study results show significant differences in household power dynamics and resource access of farmers based on place or gender, and sometimes both. In light of the Ministry's gender initiatives, study results show potential for extension services to be used as a catalyst for the transformation of local gender contracts toward greater gender equity. Taking into consideration previous use of access and agency as indicators for adaptive capacity (or resilience and vulnerability) we further discuss the links between gender, place, and L-API results toward ministry extension practices that build these aspects of adaptive capacity (Stanturf, 2015). Developing and delivering extension services that acknowledge future social and environmental shocks can contribute to knowledge, skills, and innovative farmer practices that build individual and collective adaptive capacity. Through bridging theoretical and disciplinary divides, we have shed light at the intersection of gender and place to form a case for the potential benefits of building adaptive capacity into agricultural extension practices in post-conflict settings. In the face of climate change and political tension this is more pertinent than ever.

Gender

An important discovery is that farmers collectively support increasing the number of women extension officers, in fact, respondents of both genders report that they prefer for women extension officers to serve them and their communities. At the root of these sentiments are women's increased access to education, farmer's frustration with their current male agents, and the recent promotion of and legal stance on gender equality in Liberia. However, cultural beliefs of women's lower ranking in society and stereotypes that men are more suited for extension work because of their physical strength remain possible deterrents to the acceptance of women extension officers by men farmers (Figure 3.8). Building place-based capacity by training local technicians and providing support for farmer-based organizations and other entrepreneurial opportunities that are women specific will require consistent knowledge sharing and may be further facilitated by increased technology access and training.

With urbanization leading to male outmigration (Tacoli, 1998, 2004; Zewdu & Malek, 2010) and other shifts in agricultural systems on the rise, it's becoming more important to prepare women for technology advancements related to agricultural productivity and knowledge sharing (Quisumbing &

Pandolfelli, 2010; Huyer, 2016). Quisumbing and Pandolfelli (2010) highlight the potential behind technology for women as both a tool for information sharing and to decrease women's labor burdens (i.e., time allocation) in developing countries. Increasing women's ICT capabilities may also enrich their external networks toward broader support systems, more diverse knowledge exchange and economic inputs, and enhancement of adaptive capacity (Perez et al., 2015). Engaging farmers with technology may also provide an avenue to engage the high number of unemployed youths. Barriers to the exercise of legal rights to land and education by women must also be addressed.

Some farmers stated that they were aware of women's legal rights to inherit and own land, however, in many communities' women still cannot effectively exert those rights due to cultural, religious, and social barriers. Such beliefs and informal laws reinforce an inequitable patrilineal 'land inheritance contract' that favors sons over daughters for land allocation. This is reflected in the data, in each L-API domain women are less likely to experience benefits and opportunities for critical agricultural resources, information, and skill development. Both formal and informal structures in the study area continue to limit women when compared to men. Increased farmer sensitization to the legal national rights of Liberian women and girls to own and inherit land and access education must be addressed. Focus groups and open-ended survey questions provide evidence that farmers are not satisfied with their access to agricultural resources or information. Farmers said they don't believe that the current Ministry steps to reach rural communities are providing adequate support to reach their full agricultural potential.

This study provides evidence that increasing women's opportunities in local and national leadership positions and hiring more women extension officers will help to address the identified gender gaps, however, alone they are not enough (Coulter, et al., 2019; Kondylis, Mueller, Sheriff, & Zhu, 2016). For example, in addition to promoting female extension officers, it is also important to address women's limited access to education and literacy, sensitize communities to women's legal rights to own and inherit land, improve extension officer accountability, and consider the compounding barriers for some women such as widows in single-parent households. Therefore, a siloed approach to understanding and improving gender equality through extension is unlikely to be effective.

Improving the capacity of extension agents to address women's agricultural needs and overall gender equity will require thoughtful, targeted, interdisciplinary, and long-term approaches. The Ministry must continue its efforts to more effectively train extension officers in gender equality by incorporating the challenges and needs of both women and men farmers in its curriculum. Moreover, the ability of extension officers to facilitate adaptive capacity, or not, requires that their knowledge

and resource dissemination be adapted through a gendered lens. Nevertheless, our findings do shed light on the potential for extension practices to play a key role in facilitating the transformation of local gender contracts in rural smallholder farming communities. Because gender doesn't exist in isolation extension efforts must also target place, and potentially other compounding challenges; place is the intersectional variable we explored in this study.

Place

L-API results show that understanding place, and place in relation to local gender contracts is relevant for addressing the overall challenges of farmers. It can be inferred from study results that the ability of extension officers to leverage local social capital is invaluable — making place even more germane due to the extremely disproportionate number of national extension officers to farmers combined with degraded infrastructure and varied farmer access to ICT.

Our results show that farmer needs, and extension capacity are hampered by geographic isolation; moreover, they corroborate other studies that show women's marginalization in agricultural extension services and delivery that remain evident in both developing (Huyer, 2016) and developed (Trauger et al., 2008) countries. Our findings confirm that the MOA field staff struggle to cover large territories under visibly difficult conditions with stated resources limitations (Talery-Wiles, 2012). Rural isolation also comes to bear in farmers' limited access to stable markets, local banks and therefore credit, employment opportunities, and vital agricultural information and resources. In fact, the lack of sufficient education and employment opportunities in many rural areas has led to an outmigration of able workers, especially young men. In focus groups, farmers across the study area suggest that two ways to combat these challenges are by training local extension technicians and providing resources for existing farmer-based organizations or supporting the development of new ones. These common findings between gender and place allude to the potential role of technology in extension education and corroborate studies that suggest ICT can help combat geographic isolation (Perez et al., 2015; Zewdu & Malek, 2010).

Financial strain and household power dynamics contribute to the insufficient access and use of ICT devices by both genders across the study area (Figure 3.2 and 3.3). However, women are less likely to be satisfied with their ICT access/use and are further constrained by higher illiteracy rates and less household power and free time. Technology infrastructure and literacy for agricultural information sharing with and between farmers would be a wise investment for the Ministry and NGOs alike. Moreover, it will be especially beneficial to target geographically isolated communities. ICT capacity building must be coupled with literacy, leadership, and business training for women.

The study also looks at the potential use of extension services to build adaptive capacity in the face of natural disasters and disease epidemics on the rise due to climate change.

Adaptive capacity

As discussed in the literature, adaptive capacity is critical to managing vulnerability and building social and environmental resilience (Adger, 2000; Barrett and Constas, 2014; Engle, 2011; Holling, 1996; Pasteur, 2011; Quinlan, Berbes-Blazquez, Haider, & Peterson, 2016). Across the globe people will be affected by climate change though those with low resilience and minimal capacity to adapt to changing conditions, often in poor and post-conflict countries, will be especially vulnerable; Perez et al. (2015) specifically notes that women farmers in sub-Saharan Africa will shoulder more than their fair share of the climate change burden. The uncertainty introduced by variations in precipitation, temperature, or natural disasters will only compound the uphill battle that Liberia faces in rebuilding. The 'Liberian Climate Change Assessment' conducted by Stanturf et al. (2013) shows that the three counties in this study, particularly Lofa and Bong, will face increased temperatures (between 1.5-2 deg C) and irregular precipitation patterns. Shifts that are known to cause lower rice yields, one of the main subsistence and productive crops in Liberia (Stanturf et al., 2013). The prospective consequences of women's unmet farming needs coupled with the low adaptive capacity present in rural, post-conflict farming communities must be addressed through strategies that close gaps in extension reach and efficacy for women farmers. Using L-API as a tool to measure gender and place-specific gaps in farmer's extension service access and household agency will help to achieve this goal toward achieving Liberia's agricultural production potential. Conceptually and in practice, applying L-API can contribute to a deeper understanding of gender and place limitations to extension access and household agency; opening the door — with suitable political will and collective action — for local gender contract transformation and increased adaptive capacity in the face of social and environmental change.

L-API

In this time and resource limited project, analyzing data with L-API allowed us to identify broad and targeted barriers to agricultural potential that would otherwise have been impossible to uncover. For example, Nimba, the eastern most county had a higher L-API than Bong or Lofa, but Nimba farmers show lower access to government Ministry extension services when compared to the other two counties (Table 3.6). Therefore, their access to other supportive resources such as NGO workshops, ICT, land tenure, and involvement in farmers associations or education opportunities were elevated. L-API also provides an avenue to uncover disparities resulting from difference in gender, county of residence, age, education, relationship status, and the intersectional barriers they

create. With reference to adaptive capacity, the ability of individuals and systems to resist or adapt to change is dependent on a multitude of factors. These factors are relevant and possible to identify in L-API analysis.

We envision that scholars, practitioners, and even community members can use L-API, or context specific adaptations of it as a tool to identify and address household and community access and agency limitations. As expressed, this is particularly valuable in post-conflict settings with limited resources, human capital and capacity, and movement due to degraded infrastructure. L-API indicators and domains were inductively selected based on survey and focus group findings as opposed to being pre-defined by global categories purported to be meaningful to gender equity, extension access, or agricultural potential in the Liberian context. Where other multidimensional indices report findings at the national and regional levels to make gender comparisons, L-API presents a locally functioning tool.

Farmers express that both Ministry extension officers and NGOs lack appropriate structures and processes for agricultural project monitoring and therefore accountability and follow through. L-API is one tool that can be used to help address farmer's concerns by tracking domains overtime, geographically, and demographically. This may also help the Ministry provide more targeted trainings and resources for their extension officers. The added benefit of using free, open-source software such as we did to create, disseminate, track, and analyze data collected for L-API is that it can be used in resource limited contexts. Both SurveyCTO and KoboCollect offer free online tutorials and membership in addition to secure servers and mobile android applications for offline data collection.

Moving forward

An interdisciplinary approach is required to address gender gaps in agricultural extension services in Liberia and other post-conflict countries. Additional attention to place-based needs and projected environmental change is also required to build local capacity for future stress. In the face of climate change and political tension this is more pertinent than ever. By bounding this study to gender and place we realize that other demographic variables were excluded. Further study using an intersectional framework such as the Theory of Intersectionality (Crenshaw, 1991) may uncover intersections of marginalization coming from cultural or demographic variables that influence farmer's access to resources, opportunities, and household agency. Chi-square results showing that relationship status and education are in some way related to gender provides an indication that further study would be fruitful.

Future research will benefit from incorporating spatial analysis into study methods from the beginning. As well, further spatial analysis has the potential to illuminate relationships between L-API, domains, and local or international places of interest. As many of the communities we surveyed are near international borders, it's possible that agricultural potential and adaptive capacity are reliant on international movement and networks. Perez et al. (2015) specified that men are more likely to have access to connections outside of a community while the opposite was true for women. Further study on internal and external networks may illuminate how social capital can be leveraged by extension officers to enhance farmer adaptive capacity or agricultural potential.

Our study process identifies opportunities for the improvement of long-term monitoring and evaluation for both Ministry and non-governmental organization agricultural extension programs. Such efforts can help to address farmers' stated discontent with the overall lack of accountability and transparency that have led to unsuccessful project outcomes and community buy-in in the past. Therefore, conducting formal developmental monitoring and evaluation studies on the long-term efficacy of agricultural programs is also recommended for further study.

Literature Cited

Adger, W. N. (2000). Social and ecological resilience: are they related?. *Progress in human geography*, *24*(3), 347-364.

Agarwal, B. (2011). *Food crises and gender inequality*. UN.

Alkire, S., Malapit, H., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013a). Instructional guide on the women's empowerment in agriculture index. *UF Initiative, Éd.*

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013b). The women's empowerment in agriculture index. *World Development*, *52*, 71-91.

Alkire, S. (n.d.). "Identification and aggregation in the Alkire Foster Method". Oxford Poverty & Human Development, University of Oxford. Retrieved September 20, 2019, from https://ophi.org.uk/alkire-foster-multidimensional-poverty-measure/

Anselin, L., 1995. Local indicators of spatial association—LISA. Geographical analysis, 27(2), pp.93 115.

Barrett, C. & Constas, M. (2014) Toward a theory of resilience for international development applications. Proceedings of the National Academy of Sciences, USA, 111, 14625–14630.

Bongers, F., Poorter, L., Van Rompaey, R. S. A. R., & Parren, M. (1999). Distribution of twelve moist forest canopy tree species in Liberia and Cote d'Ivoire: response curves to a climatic gradient. *Journal of Vegetation Science*, *10*(3), 371-382.

Brooks, N., Adger, W. N., & Kelly, P. M. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global environmental change*, *15*(2), 151-163.

Caretta, M. A., & Börjeson, L. (2015). Local gender contract and adaptive capacity in smallholder irrigation farming: a case study from the Kenyan drylands. *Gender, Place & Culture*, *22*(5), 644-661.

Carr, E. R., & Thompson, M. C. (2014). Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers. *Geography Compass*, *8*(3), 182-197. Retrieved September 7, 2019, from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.640.9080&rep=rep1&type=pdf

ČerniČ IsteniČ, M. (2015). Do rural development programmes promote gender equality on farms? The case of Slovenia. *Gender, Place & Culture*, *22*(5), 670-684.

Coulter, J. E., Witinok-Huber, R. A., Bruyere, B. L., & Dorothy Nyingi, W. (2019). Giving women a voice on decision-making about water: barriers and opportunities in Laikipia, Kenya. *Gender, Place & Culture*, *26*(4), 489-509.

Christoplos, I. (2017). Synthesis: The political economy of an extension service provider on the frontline of conflict In P. McNamara & A. Moore (Eds.), *Building agricultural extension capacity in post-conflict settings* (pp. 228-242). CABI.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stanford Law Review, 43(6), 1241–1299. https://doi.org/10.2307/1229039

Duncan, S. (2000). Theorising comparative gender inequality in Duncan S and Pfau-Effinger B eds Gender, economy and culture in the European Union Routledge. *London*, *1*, 24.

Engle, N. L. (2011). Adaptive capacity and its assessment. *Global environmental change*, *21*(2), 647 656.

Environmental Systems Research Institute (ESRI). (2019). Retrieved April 20, 2019 from https://desktop.arcgis.com/en/arcmap/

Farnworth, C. R., & Colverson, K. E. (2015). Building a gender-transformative extension and advisory facilitation system in sub-Saharan Africa. *Journal of Gender, Agriculture and Food Security*, *1*(1), 20-39.

Figueiredo, P., and P.E. Perkins. 2013. "Women and water management in times of climate change: Participatory and inclusive processes." Journal of Cleaner Production, 60: 188-194.

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global environmental change*, *16*(3), 253-267.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and society*, *15*(4).

Forsberg, G. (2001). The difference that space makes. A way to describe the construction of local and regional gender contracts. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, *55*(3), 161-165.

Forsberg, G., & Stenbacka, S. (2013). Mapping gendered ruralities. *European Countryside*, *5*(1), 1 20.

Gbowee, L. (2011). *Mighty be our powers: How sisterhood, prayer, and sex changed a nation at war*. Beast Books.

Greene, J. C. (2007). *Mixed methods in social inquiry* (Vol. 9). John Wiley & Sons.

Haining, R. (1993). *Spatial data analysis in the social and environmental sciences*. Cambridge University Press.

Halim, A., Ali, M. M., Swanson, B. E., Bentz, R. P., & Sofranko, A. J. (1998). Improving Agricultural Extension. A reference manual.

Hamdan, W. (2010). *Environmental & social management framework. Government of Liberia energy & electric distribution.* World Bank. E2517V2.

Haraway, D. (2006). A cyborg manifesto: Science, technology, and socialist-feminism in the late 20th century. In *The international handbook of virtual learning environments* (pp. 117-158). Springer, Dordrecht.

Harding, S. G. (Ed.). (2004). *The feminist standpoint theory reader: Intellectual and political controversies*. Psychology Press.

Hess, B. B., & Ferree, M. M. (1987). Analyzing gender A handbook of social science research.

Hirdman, Y. (1991). The gender system In T. Anderson (Ed.), *Moving on: New perspectives on the women's movement* (pp. 187-207). Aarhus University Press.

Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems*, *4*(5), 390-405.

Holling CS (1996) Engineering Resilience versus Ecological Resilience." National Academy of Engineering. *Engineering Within Ecological Constraints*. Washington, DC: The National Academies Press. doi: 10.17226/4919.

hooks, bell, 1952-. (2015). Ain't I a woman: Black women and feminism. *New York: Routledge, Taylor & Francis Group.*

Huyer, S. (2016). Closing the gender gap in agriculture.

International Food Policy Research Institute (IFPRI). (2012). Women's empowerment in agriculture index. Retrieved October 10, 2019 from http://www.ifpri.org/publication/womensempowermentagriculture-index

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and change*, *30*(3), 435-464.

Kalabamu, F. (2005). Changing gender contracts in self-help housing construction in Botswana: the case of Lobatse. *Habitat International*, *29*(2), 245-268.

Koenig, W. D. (1999). Spatial autocorrelation of ecological phenomena. *Trends in Ecology & Evolution*, *14*(1), 22-26.

Kondylis, F., Mueller, V., Sheriff, G., & Zhu, S. (2016). Do female instructors reduce gender bias in diffusion of sustainable land management techniques? Experimental evidence from Mozambique. *World Development*, *78*, 436-449.

Lindeborg, A. K. (2012). *Where gendered spaces bend: the rubber phenomenon in northern Laos* (Doctoral dissertation, Kulturgeografiska institutionen, Uppsala universitet).

Little, J., & Panelli, R. (2003). Gender research in rural geography. *Gender, Place and Culture: A Journal of Feminist Geography*, *10*(3), 281-289.

Little, J. (2002). Rural geography: rural gender identity and the performance of masculinity and femininity in the countryside. *Progress in Human Geography*, *26*(5), 665-670. doi:10.1191/0309132502ph394pr.

McDowell, L. (1992). Doing gender: feminism, feminists and research methods in human geography. *Transactions of the institute of British Geographers*, 399-416.

McDowell, L. ed. (1997). *Undoing place?: A geographical reader*. London: Arnold.

McNamara, P., Swanson, B., & Simpson, B. (2011). Rebuilding and strengthening the pluralistic extension system in Liberia. *Report on the MEA Rapid Scoping Mission. Final Draft Submitted to USAID/Liberia*.

Mercy Corps. (2017) Growing a future: Liberian youth reflect on agriculture livelihoods. Funding from United States Agency for International Development and TOPS Small Grant.

Moore, A. (2017). Agricultural Extension in Post-Conflict Liberia: Progress Made and Lessons Learned In P. McNamara & A. Moore (Eds.), *Building agricultural extension in post-conflict settings* (pp. 1-22). CABI.

Mudege, N. N., Mdege, N., Abidin, P. E., & Bhatasara, S. (2017). The role of gender norms in access to agricultural training in Chikwawa and Phalombe, Malawi. *Gender, Place & Culture*, *24*(12),1689-1710.

Newing, H. (2010). *Conducting research in conservation: Social science methods and practice*. Routledge.

Ogunlela, Y. I., & Mukhtar, A. A. (2009). Gender issues in agriculture and rural development in Nigeria: The role of women. *Humanity & social sciences Journal*, *4*(1), 19-30.

Quinlan, A. E., Berbés-Blázquez, M., Haider, L. J., & Peterson, G. D. (2016). Measuring and assessing resilience: broadening understanding through multiple disciplinary perspectives. *Journal of Applied Ecology*, *53*(3), 677-687.

Pasteur, K. (2011) From Vulnerability to Resilience: A Framework for Analysis and Action to Build Community Resilience. Practical Action Publishing, Warwickshire, UK.

Pelling, M., High, C., Dearing, J., & Smith, D. (2008). Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. *Environment and Planning A*, *40*(4), 867-884.

Perez, C., Jones, E. M., Kristjanson, P., Cramer, L., Thornton, P. K., Förch, W., & Barahona, C. A. (2015). How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change*, *34*, 95-107.

Peterson, A.A. (2016). Liberia landscape analysis. USAID. Retrieved October 10, 2019, from http://ingenaes.illinois.edu/wp-content/uploads/ING-Liberia-Landscape-Analysis 2016_09_13.pdf

Quisumbing, A. R., & Pandolfelli, L. (2010). Promising approaches to address the needs of poor female farmers: Resources, constraints, and interventions. *World Development*, *38*(4), 581 592.

Rantalaiho, L., & Heiskanen, T. (1997). Gendered Practices in Working Life. *London: Macmillan.*

R Development Core Team. (2019). R: A language and environment for statistical computing. Retrieved January 15, 2019, from http://www.R-project.org/

Reeves, H., & Baden, S. (2000). *Gender and development: Concepts and definitions* (Vol. 55). = Brighton: Institute of Development Studies.

Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (2013). *Feminist political ecology: Global issues and local experience*. Routledge.

Rogers, A. (1993). Adult education and agricultural extension: some comparisons. *International Journal of lifelong education*, *12*(3), 165-176.

Roser, M. & Ritchie, H. (2019). Crop Yields. *Published online at OurWorldInData.org.* Retrieved September 23, 2019, from https://ourworldindata.org/crop-yields

Ritchie, H. (2017). How much of the world's land would we need in order to feed the global population with the average diet of a given country? *Published online at OurWorldInData.org.* Retrieved September 21, 2019, from https://ourworldindata.org/agricultural-land-by-global-diets

Rubin, D., & Manfre, C. (2015). A combined glossary of terms relating to gender and nutrition. Cultural Practice LLC and USAID-INGENAES Project. This work is licensed under a Creative Commons Attribution 3.0 Unported License. Retrieved April 10, 2018, from www.ingenaes.illinois.edu

Satterthwaite, D., & Tacoli, C. (2006). *The role of small and intermediate urban centres in regional and rural development: Assumptions and evidence*. na.

Schonberger, S., & Trier, R. (2017). Water in Agriculture. *The World Bank Group.* Retrieved September 21, 2019, from *https://www.worldbank.org/en/topic/water-in-agriculture*

Sen, A. (1976). Poverty: an ordinal approach to measurement. *Econometrica: Journal of the Econometric Society*, 219-231.

Stanturf, J., Goodrick, S., Warren, M., Stegall, C., & Williams, M. (2013). Liberia climate change assessment. USAID, USDA Forest Service. Retrieved August 10, 2019 from https://www.researchgate.net/publication/237102310_LIBERIA_CLIMATE_CHANGE_ASSESSMENT

Stanturf, J. A., Goodrick, S. L., Warren Jr, M. L., Charnley, S., & Stegall, C. M. (2015). Social vulnerability and Ebola virus disease in rural Liberia. *PLoS One*, *10*(9), e0137208. Retrieved October 5, 2019 from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0137208#sec001

Tacoli, C. (1998). Rural-urban interactions: a guide to the literature. *Environment and urbanization*, *10*(1), 147-166.

Tacoli, C. (2004). Rural-urban linkages and pro-poor agricultural growth: An overview. In *Prepared for OECD DAC POVNET Agriculture and Pro-Poor Growth Task Team Helsinki Workshop* (pp. 17-18).

Talery-Wiles, T.A. (2012). Republic of Liberia Ministry of Agriculture: Strategy for mainstreaming gender issues in agriculture programs and projects in Liberia. *Draft.*

Trauger, A., Sachs, C., Barbercheck, M., Kiernan, N. E., Brasier, K., & Findeis, J. (2008). Agricultural education: Gender identity and knowledge exchange. *Journal of Rural Studies*, *24*(4), 432-439.

United National Educational, Scientific and Cultural Organization (UNESCO). (n.d.). Mount Nimba Strict Nature Reserve. *United Nations Educational, scientific and cultural organization, world heritage convention.* Retrieved June 8, 2019, from https://whc.unesco.org/en/list/155

United Nations Office for the Coordination of Humanitarian Affairs Humanitarian Data Exchange. (n.d.) Retrieved May 3, 2019, from https://data.humdata.org/dataset/hotosm_liberia_roads

Witinok-Huber, R., & Nyaplue-Daywhea, C. (2020). Enhancement of rural-urban linkages and gender equity through agricultural extension services to Liberian smallholder farmers. In L. Vasseur (Ed). *Relating urban-rural landscapes through ecosystem governance*. IUCN Publication, Gland, Switzerland (in press).

Yerian, S., M. Hennink, L. E. Greene, D. Kiptugen, J. Buri, & M. C. Freeman. (2014). “The Role of Women in Water Management and Conflict Resolution in Marsabit, Kenya.” Environmental Management 54 (6): 1320–1330.

Zewdu, G. A., & Malek, M. (2010). Implications of land policies for rural-urban linkages and rural transformation in Ethiopia. *Ethiopia Development Research Institute, Ethiopia*, *15*, 1-14.

Chapter 4: Bridging divides in transdisciplinary research: The roles of introspection and process reflection

Abstract

Applied social science approaches may be improved if researchers invest in intentional introspection. The context-specific and dynamic nature of social research processes demand careful consideration of research methodologies, partner or disciplinarily collaboration, power navigation, and adaptability. I use an adapted version of five Feminist Systems Thinking principles to reflect on my personal journey and the research process to conduct a collaborative, cross-cultural study in Liberia in West Africa. Project development, relationship building, and in-country data collection took place between 2017 and 2018 in north-central Liberia as part of a USAID Feed the Future project on gender gaps in agricultural extension. The overall takeaways call for prioritization of self-care and safety, adaptability, attentiveness to accountability, inclusion and contribution, and to build on existing knowledge and structures. While monitoring, evaluation, and even reflection may be used in participatory research processes, they are rarely used by researchers to deeply understand their own personal experiences. In post-conflict settings it is vital to manage challenging situations and create healthier ones from the onset. Lessons learned via a customized Feminist Systems Thinking framework contribute one intentional approach to help guide introspection and process reflection in future cross-cultural scientific and development research collaborations.

Keywords: transdisciplinary, social science, Feminist Systems Thinking, introspection

Introspection — My journey

Awareness and presence

Traversing Monrovia, via a hired car in a northeast direction, I initially move through the hustle and bustle of city streets with traffic congestion, lively businesses, and people moving about their daily activities. Active construction offers shiny new storefronts and the odd posh hotel, an extreme contrast with tin roofed shacks just off the main drag (Tubman Blvd). I will come to know that my preference is to divert around Monrovia's Red-Light Market, a hub for national commerce and travel, when possible, to avoid the rough road thickly buffered by small shops that are protected from the elements only by small umbrellas. The thought of the Red-Light Market makes me feel somewhat claustrophobic, though time often eases such sensations. The road is an uneven combination of potholes, concrete, rock and dirt, accompanied by the uncertainty of cars, people, motorbikes, and carts weaving in and out of locally navigable ambiguity; it remains an experience to behold. Through my Western knowing it feels chaotic, nerve racking, and entirely uncertain. Approaching the outskirts of town, peri-urban development is evident by the seemingly unstable and random construction of huts near and far, including in the marshy areas typical for the tropical climate here that hug the road. As we cross the infamous Monteserrdo River Bridge that I've come to know through books and media coverage from the war the metropolis that is home to a quarter of Liberia's population and most of the commercial activity rapidly becomes a speck in the rearview mirror. The open and more rural expanse of a county with its cultural and ecological diversity and a history that I struggle to grapple with becomes my home for the next five months. During these five months I will experience a spectrum of emotions, from being robbed, bearing witness to the mob 'justice' of a rogue and feeling chronic insecurity, to seeing a baby come into the world and laughing and dancing with a women's farmer group in rural Nimba. I'll also face challenges with the differing expectations of collaborators, funders, and community partners, and constantly ask myself whether my work is doing "more harm than good." This chapter is a personal exploration of this experience to help others and I navigate transdisciplinary collaboration in the future. Before I dive deeper, I'd like to discuss the particular challenges of transdisciplinary research that relate to my experience.

In the cross-cultural setting that this research took place, I experienced the simultaneous and sometimes conflicting expectations of my Ph.D. program, two external funding agencies, numerous local communities, and my Liberian academic and governmental partners. Living up to the external expectations that each partner or project outcome required, in addition to my own goals, often left me feeling like I was dancing with two left feet. Moreover, the multitude of tasks layered on top of my cultural shock forced me to pay very close attention to the methodology and research process

selection. While concepts (Figure 4.1) related to research type continue to be a source of dialogue and discord between academics and non-academic collaborators, to better understand my experience it's helpful to know what transdisciplinary research tries to be.

Multi and interdisciplinary research are rooted in academia and carried out through disciplinary silos or with the intention of integration and finding common ground between different disciplines toward new theories (Repko, 2012). Transdisciplinary research differs in its attempt to build bridges that don't just span disciplines, but explicitly connect to the outside world, in effect, increasing the application of science and its potential to bring about social change. As seen in Figure 4.1, transdisciplinary research brings academic researchers from different disciplines together with non-academic collaborators to integrate knowledge and methods, develop and meet shared goals/outcomes, and achieve synthesis (Newell & Meek, 2003; Repko, 2012). This approach is often used in participatory action research to bring about social change. However, through experiences in the field and during the introspection process, I've learned when conducting transdisciplinary research there is a risk to negate the entire process if those involved don't ask themselves key questions, such as:

- *"Where does the power lie?",*
- *"Am I doing 'more harm than good' for humans and the environment?",*
- *"Am I asking and listening, or am I telling?",*
- *"Where is the accountability and transparency?",*
- *"How will the community or individual benefit?",*
- *"What is realistic within the project timeframe?",*
- *"What does my gut say?", and*
- *"Am I safe; How is the research process effecting me?"*

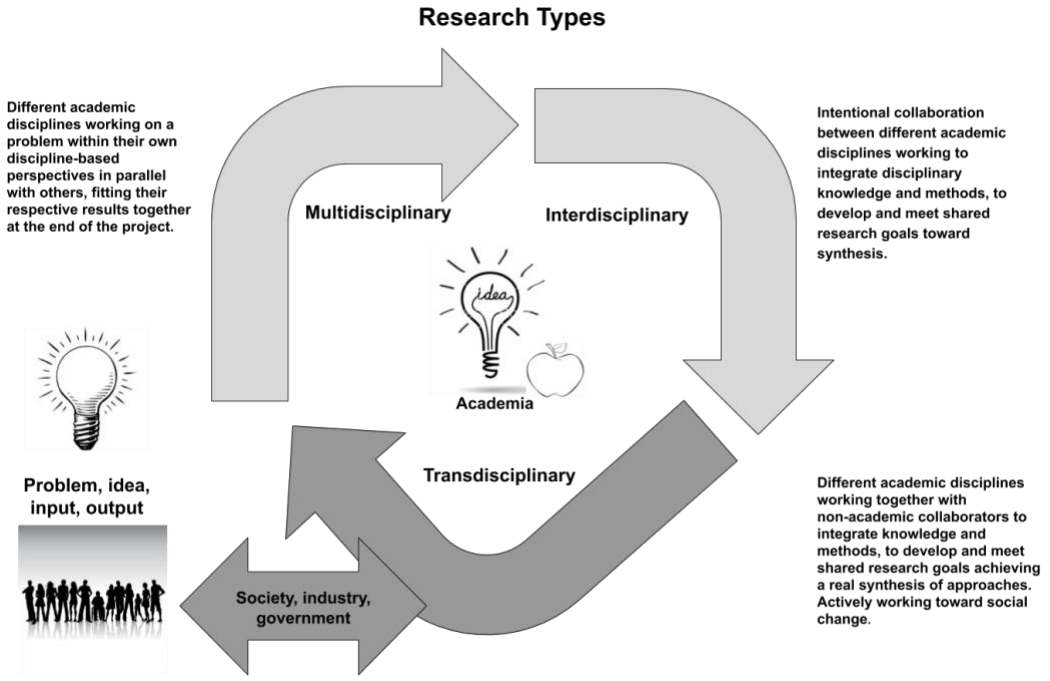


Figure 4.1. Definitions for multi, inter, and transdisciplinary research.

Research context

Historical context and project development overview. My passion to work at the intersection of social and environmental (i.e., socio-ecological) systems, specifically related to agriculture and gender in developing settings, had led me here to the small, coastal, West African country called Liberia. Liberia, "land of freedom," is home to nearly 4.5 million people. Founded in 1847, Liberia became a sovereign nation through a declaration of independence from the United States (US). The US first colonized the region via its American Colonization Society in 1822. The American Colonization Society was established by a group of white Americans seeking to reduce the number of free African Americans in the US by sending them, primarily, to the west coast of Africa to deal with the 'problem' of the growing number of free black Americans (United States Department of State, n.d). The American Colonization Society promoted and facilitated the Back-to-Africa or colonization movement to encourage Americans of African ancestry to return to Africa, anywhere in Africa, not specifically to people's countries of origin, and often against their will (United States Department of State, n.d.).

Post-independence, a complex relationship ensued between the ruling class of former African American freed slaves, known as Americo-Liberians and backed by US funding, and the multitude of indigenous peoples of Liberia (Murphey, Erickson, & Tubman, 2016). After 150 years of political, militaristic, religious, and economic domination, the Americo-Liberian ruling class was overthrown

in 1980 during a violent coup d'etat led by the indigenous sergeant Samuel Doe (Murphey et al., 2016; Peterson, 2016); followed by over two decades of civil conflict including two civil wars and the eventual imprisonment of Liberian President Charles Taylor for war crimes committed in Sierra Leone (Cooper, 2017; Gbowee, 2011). The conflict ended with the 2003 Accra Comprehensive Peace Agreement, followed by relative peace and stability (2003-2018) under the leadership of President Ellen Sirleaf-Johnson. However, power inequalities, corruption, extractive practices, and cultural differences continue to shape Liberia today (Gbowee, 2011).

The complex and disturbing history between Liberia and the US never strayed far from my mind, adding a dimension to the research experience that I had not previously faced. Not unlike the atrocities carried out on Native Americans at the hand of my European ancestors, the idea of (de)colonization added a layer of pause to my role as a social science researcher in a foreign land. Because I was recruited by the University of California Davis through their Research and Innovation for Agriculture fellowship in partnership with a USAID Liberia mission, I thought my research would assuredly have local legitimacy, specifically because the call for researchers had been conducted in partnership with the Liberian Ministry of Agriculture and Cuttington University, a national agricultural institution. Once in country, I quickly realized that the internal angst around my role, responsibility, and power to contribute was a consistent companion alongside the trauma and defiance of many people I met. Whether this gamut of emotions is requisite to be empathetic and effective in such settings or instead become a detriment, would only become clear to me as time passed allowing me to find the strength and willingness to reflect. For, only with deep internal reflection did healing, understanding, and growth eventually come. Along with many other lessons I wish I had reflected on during the in-country research process, my hope is that this adapted Feminist Systems Thinking (FST) framework provides a tool and valuable pre-lessons to others working in cross-cultural or post-conflict settings. Lessons to help other researchers and practitioners manage challenging situations, develop mutually beneficial research, and maintain personal well-being.

I came into this research tentatively, with only partial stories of the history from written word, news clippings, and videos from personal experiences or interpretations. In fact, I felt ashamed that I didn't know more at the onset due to my native country's role in Liberia's history, a twisted, destructive, and painful history that is in some ways analogous to the historical Cinderella tale that leaves the US akin to the ugly, enabling, and cruel stepsisters. I predicted that I would, likely, never fully grasp that history, and its legacy impact on people, in other words, the true complexity of the Republic of Liberia past and present. My interest was in understanding (as a researcher, activist, ally, accompanier) how to build connections and research protocols that would illuminate the roles of

gender and power structures to bring about social and environmental justice and build adaptive capacity; specifically, as they relate to agricultural extension services, food security, and gender. I was the lead academic researcher for a small project, housed under USAID's Feed the Future INGENAES program, a study that I had hoped would be more 'participatory' for rural farming communities, but instead suffered from limited financial, technical, and on-the-ground support resulting in significant personal and process adaptation. The result was a collaborative but less participatory process. In hindsight, the research process and my own personal journey can provide lessons and insights for future transdisciplinary and cross-cultural teams, specifically to bridge gaps between theory and practice, and possibly, avoid some miss-steps. I would also be remiss not to acknowledge challenges and share ideas on how I may personally do things differently the next time I conduct research in a post-conflict country or in a remote community.

My research lenses. Leading a transdisciplinary research project is not an easy undertaking to begin with, adding the elements of working cross-culturally in a post-conflict setting only increased the complexity and level of difficulty. During this research project, I came to see that building trust, transparency, and accountability with local partners would not only take time and involve some failures, but it would require significantly lowering my expectations. Additionally, that process flexibility and personal awareness stemming from introspection would be required for the role. I also experienced my own fallibility, so vividly, and with such painful vulnerability that I couldn't do anything but be present and let it all move through me. I also learned a new depth to my humanness, and in that space, I would only later discover that my human experience was broken and bent to the core, only later to be healed and reformed; even with gratitude for the experience. Maybe when our human experience is crushed, we are forced to search deeply in order to survive and transform. While many scientists "fight tooth and nail" to maintain or contort the idea of objectivity in the face of reality, I have come to find that our humanness is ever present. We are present in all we see, feel, and do; therefore, our projection is never truly without the overlay of our situated knowing and life experiences (Haraway, 1988; Harding, 1991). I am more effective at my work, both for myself and others' benefit, if I acknowledge my positionality and subjectivity from the onset of research instead of ignoring or resisting it.

As a (social science) researcher I believe my ethical responsibility is to acknowledge my worldviews and position(s) of power (i.e., white, middle class, U.S. citizen) in addition to the historical and context specific ways that power may influence the communities and settings in which I situate myself. Whether wearing my personal or professional hat, my moral compass consistently points toward a sense of ethical responsibility for human and environmental equality and justice. I see

equality and justice as integral to feminist and systems thought. I resonate with theories and methodologies that trend toward participatory, feminist, and action-oriented frameworks using qualitative and mixed-methods. In the academy, I work within pragmatic and feminist paradigms with the goal to serve as a facilitator to solve place-based and systemic problems that require systems approaches, honor multiple truths, and work to move beyond binary, positivist paradigms. In the primary spaces I work such as low- and lower-middle income countries, with women's groups, and in indigenous communities, positivist approaches tend to reinforce societal norms of power-over and invisible power exerted in relation to gender, development agendas, and indigenous oppression. I don't proport to be any different, but I do everything I can (in my power and understanding) to be aware and try to be/do better. As a result, participatory and mixed methodologies (appropriately selected based on context) provide the most effective template in my pragmatic, feminist systems research practice. My experience has also shown me the relevance of John Muir's sentiment that "when we try to pick out anything by itself, we find it hitched to everything else in the universe" (Muir, 2011). We are all part of a greater system. My tendency toward feminist, systems, and holistic approaches led me to Dr. Anne Stephens and the FST principles.

FST was originally presented by Stephens, Jacobson, & King (2010) and further developed by Stephens (2012, 2013). In four case studies, Stephens (2012) provides examples of how and when to use various sub-sets of the FST principles to demonstrate critical reflection of methodology, impact, and local accountability with specific attention to boundary setting. However, there is no mention of introspection or mechanisms to design and conduct research that also acknowledges the safety and well-being of the researcher(s), and the potential for improvement to research process/outcomes that may follow such an approach. I use an adapted version of the framework to evaluate the research process I was a part of in Liberia, and to deeply reflect on my own experiences; introspection can be useful in creating and conducting transdisciplinary research. Moreover, I found that applying the framework to my personal experience allowed me to create enough distance between myself and the experience to truly reflect, and in doing so, to ask the hard questions. Some examples are: how was power created and used in this project, how did I experience vulnerability, how was knowledge legitimated and produced, what viewpoints and voices were left out because of the project boundary, and what systemic barriers were present that limited social change.

Theoretical Underpinnings

To delve deeper into the principles that make up my adapted version of the FST approach, I will briefly describe the different integrated theoretical perspectives and their connections and

dissimilarities. The following section includes critical systems thinking that is a holistic framework to look at real world problems through an integrated lens focused on boundaries as they relate to inclusion and exclusion (Midgley, 2000); feminist thinking including feminist standpoint theory (Harding, 2004), situated knowledge (Haraway, 1988, 2006), and ecofeminism (Shiva & Mies, 2014; Tong, 2013) to draw in the specific standpoints of women and other groups historically marginalized from power and knowledge development. FST is a framework that was developed in 2010 to highlight the intersections of critical systems thinking and ecofeminism that results in FST. None of these approaches explicitly incorporate space or place prompting the inclusion of a section that looks at connections between feminist and rural geography (Little, 2002; Little & Panelli, 2003; McDowell, 1999), and place-based gender contracts (Forsberg & Stenbacka, 2013; Hirdman, 1991).

Critical systems thinking

It is a common view that the Buddha's teachings in the Lotus Sutra doctrine allude to the idea that 'all things appear and disappear because of the concurrence of causes and conditions. Nothing ever exists entirely alone, and everything is in relation to everything else' (The lotus sutra, 1993). The passage eloquently offers something akin the foundation of systems thinking, that to understand systems one must comprehend the unequivocal interrelation and interdependence between parts of human and natural systems (Midgley, 2000; The lotus sutra, 1993). Integral to critical systems thinking is the boundary concept. A starting point for the boundary concept, or judgement, is that of partial perspective, that no view of the world is ever complete (Midgley, 1996, 2000). Simply put, a decision must be made for what is considered inside and outside of a systems' boundary by the person or team evaluating the system or a complexity within it. When conducting transdisciplinary research this concept is relevant because it acknowledges exclusion and inclusion. As presented in critical systems thinking, boundary judgement is forthright about the partial story that results from research decisions, acknowledging that it is almost impossible to be truly objective, yet, presents philosophical approaches to combat the single, incomplete story (Midgley, 1996, 2000; Stephens, 2013). To understand historical social subordination, we must take this concept further: what is the role of power and social hierarchy in relation to boundary creation and how do these dynamics play out in society and social-ecological systems?

Connections are salient when addressing problems in complex systems that link social and environmental factors and account for system dependencies, feedbacks loops, change over time, and spatial relevance. Critical systems thinking looks to address wicked, real-world problems through novel lenses toward innovative solutions that draw from interdisciplinary research processes and pluralistic and participatory methodologies (Midgley, 2000; Flood, 2010; Ulrich, 2003). For these

reasons, this theoretical lens can be an effective approach to use when developing, conducting, and evaluating developmental research like the project I led in Liberia – to address difficult questions in complex systems impacting gender equity and food security. However, specific attention to the marginalized voices and realities of women has been more critically explored through feminist and standpoint theories.

Feminist thinking

Feminist theorists contribute that partial perspectives are composed of situated knowledge systems. For example, that women have a unique and often marginalized perspective because of their experience as women in patriarchal societies (Haraway, 1988; Harding, 2004; Hirdman, 1991). Here, the incorporation of feminist theories, such as the feminist standpoint theory, situated knowledge, ecofeminism, and feminist geography become even more relevant. Feminist standpoint theory brings situated knowledge and marginalized women's voices (i.e., difference) to the fore (Haraway, 1988; Harding, 1991, 2004) and ecofeminism integrates the environmental and women's movements (Shiva & Mies, 2013; Tong, 2013) though neither explicitly address the dynamic systems in the way critical systems thinking does. Critical systems thinking acknowledges the complexity and fluidity of inter and transdisciplinary questions and social problems, yet the focus is generally not on gender and thus they do not discuss gender intersections as influential (visibly or invisibly) to power and systems; feminist thinkers and theorists do. As does literature that calls on the inclusion of compounding or intersectional barriers to equality, power, and knowledge construction that add to systems judgement and the consequences of it, such as, race, class, and disability (Crenshaw, 1991; hooks, 1952; Valentine, 2007). One effort to incorporate these complimentary approaches, specifically, critical systems thinking and ecofeminism, towards a holistic, pluralistic, social change-oriented framework is presented by Stephens, Jacobson & King (2010) in what they term the FST principles. These principles have been expounded upon by Stephens (2012, 2013) in a series of applied case studies. I follow suit in this paper through a personal introspection and process-based reflection of my dissertation research project in Liberia using an adapted version that includes *place matters*.

The FST approach

Stephens (2012) developed the FST approach using grounded theory to identify key themes relevant in both critical systems thinking and ecofeminism. The result was five key principles that can be applied in any research approach or reflection. The principles are a) adopt a gender sensitive approach in an effort to acknowledge women's standpoints and mitigate systemic structures and language that may promote oppressive gender norms and conceal power hierarchies, b) value the voices from the margins such as non-experts and recognize harmful dualistic, patriarchal ideologies

often present in academia, c) center nature by identifying discounted non-human interests and looking at the entirety of a system, d) select appropriate methodologies and methods tailored to the needs of local partners that incorporate multiple ways of knowing and situated knowledges, use action and participatory research approaches if possible, and be reflective, and e) bring about social change by rooting research in the local context and co-developing bottom-up processes that work to diffuse engrained power hierarchies (Appendix D). The FST principles can add to the process of researcher and research process reflection, as well as equality and accountability to improve standards in transdisciplinary research. Further, this approach may help unite theory and practice for gender in development research.

However, one issue remains. While the FST principles calls on a context specific approach the principles do not use language explicit in geography, specifically, feminist and rural geography. This is particularly important to my dissertation research in Liberia and provides further applicability to the role of both geographic local and place-based identity that drive power structures and influence local gender contracts. To be inclusive of different ways of knowing and build safe, effective, and reflective transdisciplinary research processes we must also acknowledge the role of place and local context, including rural isolation (Witinok-Huber, Piaskowski, Radil, & Sarathchandra, *in preparation*).

Feminist and rural geography

Feminist geography explicitly adds a spatial element to the understanding of situated knowledge, power hierarchies, and social and cultural constructs relevant in the historical legacy of women's subordination (Carstensen-Egwuom, 2014; Caretta & Borjeson, 2015; ČerniČ IsteniČ, 2015; Little, 2002; Little & Panelli, 2003; McDowell, 1999; Mudege et al., 2017; Ogunlela & Mukhtar, 2009; Trauger et al; 2008). Some of the initial work on gender and space reflect the spatiality of women's lives through labor roles for productive vs reproductive activities and public vs private spheres of power. Kwan's (1999) work highlights that the uneven household divisions of labor present in her sample population in Columbus, Ohio that limit women's abilities to work fulltime, in turn, decreasing their income-earning potential. Further work investigates structural inequalities that result in unpaid domestic vs paid productive labor, and the function of place, culture, and policy to reinforce detrimental gender norms (Duncan & Pfau-Effinger, 2012; Forsberg & Stenbacka, 2013).

Linda McDowell's (1999) groundbreaking book, "Gender, Identity and Place: Understanding Feminist Geographies" thoroughly explores the intersections of gender and place in relation to power, knowledge creation, difference, and fluidity that can be identified in both gender and sex, as well as individual and collective identity in relation to place. Her work built a case for the need to understand

gender in relation to place, or the spatial, cultural, and historical context for gender and gender relations. She highlights that individual and group identity are theoretical constructs, and therefore stresses a relational as opposed to siloed approach for understanding gender; I assert the same is true for place. Or, as Judith Butler (1988) contends, "being female is not a 'natural fact' but 'a cultural performance…" lending to the understanding that gender constructs are culturally and historically positioned. This is similar to the holistic and situated approaches we see developed through critical systems and feminist thinking. However, McDowell's (1999) work is rooted in urban and global north settings and she acknowledges that it doesn't adequately address rural locations or the global south.

Differences between urban and rural become particularly relevant in the context of agrarian livelihoods. Jo Little (2002) draws links between geography and gender in the global south, where subsistence farming is a common way of life and women are known to play a vital role in productive and domestic labor (Little & Panelli, 2003). Little explores the power-laden gender-place stereotypes that emphasize divisions between paid and unpaid labor, productive vs unproductive (domestic) labor, and strong (rural-productive-male) vs weak (reproductive-women). Little (2002) highlights that the same power structures and collective ideas about the divisions between urban and rural also shape beliefs about gender that reinforce the subordination of women. While this is particularly valuable to consider in the search to understand gender gaps in agricultural extension in Liberia, it also adds value to the conversation about farming in the global south as dirty or poor-people's work. Therefore, I add the sixth principle that urges researchers to consider that place matters. In this dissertation, place refers to more than just differentiated physical locations; places are unique, meaningful constructions that reflect and shape cultural and social habits and perceptions, including those pertaining to gender. Place has long been a central issue in feminist and rural geography as something that impacts a person's identity and as the site of identity formation (Little, 2002; McDowell, 1997). The place matters principle reflects the often neglected yet vital inclusion of (questions of) place in social research; not simply as an add on or afterthought, but as integral to the entire process.

Introspection and Process Reflection Using an Adapted FST Framework

I use a flower shaped conceptual diagram to present my adapted version of the FST framework in a palpable manner (Figure 4.2). Self-introspection is at the core of the flower bordered by process-reflection, the principles are each represented by a different color petal. The circular presentation shows that there is no hierarchy or preferred order; instead, with relevance to a project or process the petals can change size reflecting varying levels of importance or inclusion.

Underlying themes between the discussed theoretical frameworks are incorporated for use through the adapted FST principles. The principles incorporate technical aspects of methodological selection, social and cultural inclusion of vulnerable population, and work that is locally relevant and applied through systems and feminist lenses. I found this approach useful to understand the complexities of the Liberia project; moreover, the principles also contribute value to more deeply reflect on my personal journey. I feel that this process, my candid reflections, and the specific principles may prove beneficial to others working on transdisciplinary teams.

Figure 4.2. Adapted FST principles including place matters, self-introspection, and research-process

Reflection for the Liberia case study primarily encompasses three of the five FST principles and place matters: be sensitive to gender, value the voices from the margins, and select appropriate methodologies. While the environment was considered in relation to land use and agricultural productivity, the voice of nature was not central to the project and will not be discussed. Further, while bringing about social change is integral to the long-term goals of the project and my personal research intensions, it was recognized more through local capacity building and partnerships as opposed to visible changes in the structure or function of extension services in relation to women's agricultural needs. Therefore, the social change petal is smaller. While the study areas were specifically chosen to represent different rural locations, the data collection tools were not explicitly developed with spatial or place-based analysis in mind and therefore spatial analysis techniques are exploratory and complimentary to other qualitative and quantitative analysis. Thus, while I

acknowledge that place does matter, and is valuable for understanding gender extension gaps, the place matters petal is smaller. It is important to remember that the petals come in no particular order and are dynamic throughout the research process; additionally, they must be constantly monitored, evaluated, and when necessary adapted in reflection of the local context and actors involved. At the core will always be the human element, who the researcher(s) is, her or his subjective and partial lens and personal journey within the process. So, how did I see the struggles of the women farmers reflected in my own struggles, and mine in theirs?

Be sensitive to gender

As a white, woman researcher my attentiveness to gender marginalization is intrinsic and experienced both inside and outside of academia. Additionally, working primarily in the social sciences often comes with a side glance and scoff about the legitimacy of my science as soft and subjective. To take this one step further, while it is unfortunate that we are still combatting the same issues in academia and industry my mother contended with as a geologist in the 1970s and 80s, women continue to face different barriers to men. In personal settings I often hear my women colleagues contemplate how to balance progressing their careers in tandem with building a family, not unlike what I've heard from smallholder women farmers about balancing agricultural production and domestic duties. While I'm more likely to face the overt barriers such as tenure-track faculty positions and minimal maternity leave that produce common hurdles for women in academia, the local gender contracts and religious norms rooted in patriarchal beliefs have solidified systemic formal and informal barriers for women farmers in Liberia.

Building on the idea that gender inequality is a systemic issue shaped and exerted through invisible power, I will briefly describe my experience as a non-Liberian woman researcher with a Caucasian male colleague. During my time in Liberia, I became acutely aware that this male colleague, with extensive experience as part of on-the-ground multinational teams was very unaware of the vulnerability that I experienced as a white woman living in rural Liberia. Likely to no fault of his own, to me he presented as unacquainted to the invisible and visible power dynamics that I would face. I attempted to negate my own fears and insecurities that eventually bubbled to the surface when my home was broken into. Listening to the stories of both women and men helped me better understand that our human experiences are gendered. Specifically, I heard the enduring challenges and witnessed behaviors of rural women in Liberia that exemplified their added labor burdens, expectations, and vulnerabilities that men simply couldn't grasp.

We strived for gender sensitivity throughout the project to understand the local challenges of women farmers. To do this we (myself and in-country partners) promoted the involvement of women

at every level of the project, from the Ministry and research team through to the participants, I use theories and methodologies that explicitly work toward gender inclusion and acknowledge and mitigate for power inequalities, and both my Cuttington University counterpart and I are women. Despite working for equal gender representation among the students on our research team, to my dismay, we ended up with three men and one woman; this was due to the lack of women applicants and because one woman didn't accept our position offer.

The Liberia project was meant to understand gender-specific smallholder farmer challenges that include resource access, household agency, and extension support. The gender sensitivity principle was highlighted throughout the process. For example, the intentional inclusion of women on the research team, gaining input from women Ministry officials, and interviewing an equal number of women and men in the field. I also gleaned ideas from feminist theories such as ecofeminism, feminist political ecology, FST, and PAR to address issues of unequal power division between the genders, and multiple standpoints. Additionally, the survey and focus group questions were written through the lens of a woman and designed to purposefully target the concerns, labor roles, and inequalities that women farmers face. The two co-lead field researchers (one Liberian and one American) were women and did their best to use gender specific language and administer surveys and gender-segregated focus groups in local languages and private spaces to create gender sensitivity within the cultural context. To me, the principle of gender sensitivity is intrinsically linked with valuing the voices from the margins.

Value the voices from the margins

Within the project context, valuing the voices from the margins was closely linked to being gender sensitive, however, likely more difficult to accomplish. In addition to focusing on ways to involve women, and marginalized women in the project and on the research team, the team traveled to rural, remote villages to gain the perspectives and experiences of 352 smallholder farmers (176 women, 176 men). I tried to be inclusive within the practical and cultural constraints of language, village leadership, resources, security, and traveling conditions. I used a random selection process to create an equal opportunity for all farmers to be involved in survey interviews. After pilot testing, I developed a focus group tool and protocol for increased inclusion; all farmers available on the day of community data collection were invited to participate in focus groups and share their voices. Additionally, research objectives, questions, and survey tools were developed through an iterative process between in-country collaborators.

The value the voices from the margins principle calls for inclusion of non-human voices[21], however, the research did not attempt to engage or include this category of marginalized interests. Our effort to include marginalized voices focused on inclusion of a diverse subset of farmers. These included women and men with diverse demographics from across three counties in rural and urban settings. Challenges specific to this principle were evident when working in communities or households that stated their religion or cultural belief holds that men dominate women, or that specific subsets of the population shouldn't have a voice. Another barrier to including those voices from the margins was the reality that all men had more access to education resulting in higher rates of English literacy. In remote villages where farmers spoke tribal languages different to our research team, we were dependent on local (most often male) translators, adding an additional challenge to including the voices of women, un-educated, and/or low-income farmers. Similar to my own sense of isolation when traveling to and between remote areas of Liberia, I can imagine the sense of isolation felt by marginalized farmers that can't communicate with outsiders or struggle to gain vital access to resources, power, or make decisions that impact them.

Select appropriate methodologies

My personal journey with project development and methodological selection was both challenging and enlightening. It was one of those rare occasions in life that I was placed in a position of leadership that forced me to "sink or swim." I was looked to for guidance and expertise far beyond my believed capacity and I often felt unsure, at time incapable of success, yet, I succeeded, we (my team and the project) did it. Part of this challenge reflects my interest in using participatory methods that would be inclusive of the participating farmers, not simply the project's in-country governmental and academic partners. However, these approaches take time and resources and often require downsizing project expectations and geographic reach, neither seemed possible. This was not possible due to the interest of partners to generalize findings to the entire country. In addition to the implicit pressure from funders to maintain congruency with initial protocols that called on large-scale survey data collection in three counties that would result in, at least some, quantitative results. Though I recommended that such broad generalization would be inappropriate and not statistically feasible or ethically responsible beyond our study area, even with the 352 interviews and 46 focus groups, it is not within my power to decide how the information/findings are eventually applied.

Last but certainly not least, I was lacking both a local counterpart and mentor. In no way am I saying that I showed up in Liberia with no one, no local partners or relationships that were painstakingly built, including a memorandum of understanding for the overarching USAID project.

[21] Nature and animals

However, the proposed project and similar efforts require more, much more than I knew, or my funders or partners were prepared for. There is a reason that Peace Corps volunteers initially undergo 2-3 months of cultural orientation in their host countries, or that Médecins Sans Frontières staff pay fulltime logisticians, or that USAID staff live in capital cities in compounds often paying more in monthly rent than locals make in a year. My felt experience was that the overarching support required for a researcher to conduct a project such as this in a participatory fashion was not available to me. Nor was appropriate background investigation into the local capacity and resources for someone in my position. While I saw some of the "writing on the wall" leading up to my time in Liberia, I'm an idealist and had hoped for the best. In fact, I laugh when reflecting on a comment in a pre-trop conversation from someone affiliated with the USAID program in other countries: "they are throwing you to the wolves" the person said, "without appropriate support or resources." They advised that I take care and set up my own support system to fall back on when I inevitably run into road blocks. While I regularly felt alone and isolated, because I had heeded this advice, I had enough support and mentorship at my home university to have confidence in my decisions, lower my expectations, care for myself, and stay the course.

I found that getting involved in the community wherever and whenever possible was extremely helpful. While I didn't have the professional support required for this project, the combination of my Liberian university partner involving me in family events and spending time with other expatriates provided just enough respite to make it through each day. Efforts to be gender sensitive and value the voices from the margins culminated in the selection of appropriate and feasible methodologies. Collaborative, feminist, decolonizing, and participatory research methodologies were all used. Pluralistic (multiple complementary) methods include participatory mapping, a mixed-methods survey tool, and focus groups. For example, the study area (Bong, Lofa, and Nimba counties) was purposefully selected by in-country partners, and participatory mapping was used in a workshop with Ministry field staff to select the 23 surveyed communities. Qualitative focus groups and mixed-methods surveys were used in a simultaneous fashion (Morse, 1991). The mixed-methods protocol allowed for the inclusion of individuals from diverse demographics and geographies. Additionally, data collection instruments were developed in partnership with in-county collaborators and the field research team.

Conduct research toward social change

There are different ways to look at the principle of conducting research toward social change. Change can be immediate and visible or latent for days or even years. In the Liberian project context, possible latent change includes the future use of project data or findings, capacity building, or

knowledge sharing resulting from the process. The extent of latent social change for farmers, extension officers, and university student enumerators involved in the project will remain unknown. What is clear is that the project involved eight university students and one lecturer in project development, knowledge sharing, and data collection. It also included 16 extension officers, Ministry staff, and over 600 farmers in 23 communities. The collaborative and transboundary nature of our process also provided relationship building and knowledge sharing throughout the development and data collection phases. Additionally, each community visit ended with information sharing and a question and answer session that may have brought some social change. A community brochure was also created to share preliminary findings with partners and community members; however, I'm not sure the brochure was shared with the intended audiences.

Thinking about this principle and my ability to affect social change is something that "keeps me up at night." My desire to affect social change is one of the reasons I went back to school for a Ph.D., and undoubtedly the reason I accepted my role in this research project. My interests in working on real-world problems to create societal value and justice also guide me in the selection of theoretical and methodological research approaches that seek to diffuse power, collaborate with local partners, and work toward innovative and meaningful local outcomes. To my dismay, I realized during the project that bringing about social change is not always in my power as a researcher due to existing systemic, legal, funding, and cultural barriers much more complex, powerful, or significant than me. Regardless, I will strive to work at the community level, envisioning partnerships that work toward meaningful change and justice for society and the environment; as an international community-based researcher, I accept that I may rarely see immediate or tangible change. However, next time I will question and negotiate for a more participatory process.

During the project I felt time, resource, and outcome constraints from funding and policy partners that led to a more quantitative selection of methods; in hindsight, I may have pushed to scale down the number of farmers and communities involved and opted for a smaller, more participatory, farmer-centered process. Decreasing the number of communities and using a community-based participatory research approach may have increased the potential for social change. Despite being the lead researcher and project manager for the Liberian case study presented, I was constrained by a broadly predefined project and the requirements of the funding agency and academia, all barriers that limited my ability to make autonomous, locally relevant decisions. Project decisions were also inhibited by time, resources, and cultural understanding. Albeit, I'm white, so being a woman in a male dominated (patriarchal) society put me at a power deficit. Additionally, not speaking the local dialect or having shared history, created an instantaneous knowledge barrier. As a researcher,

specifically a junior one or graduate student, it is challenging to attempt to account for the combination of scientific rigor, community or partner interests, and funding agency demands.

Place matters

Using the rural-urban linkages framework in this dissertation (Chapters 2 and 3), I tackle the constraints of rural isolation that many Liberian farming communities face in relation to extension services; however, that process didn't account for how rural isolation affected me, the researcher. While in Liberia, I lived in a small community three hours from the capital, also three hours from grocery and department stores, reliable banks, and all other familiar amenities. I was very happy having my own small apartment on a rural Liberian university campus, for three months until it was broken into and I moved, my roommates consisted of cockroaches, possibly malaria carrying mosquitos (I had a bed net), and the not so odd ceiling rat. I say this "tongue and cheek" because I'm not a fancy person, nor do I have qualms with living in local communities different to my own and with less amenities. However, many of my experiences in this place heightened my awareness that place really does matter; that rural and urban populations experience different challenges and varying resource limitations and degrees of geographic isolation.

For example, with each passing day our campus electricity was cut until I had only 6 hours per day, and there were no internet cafes. As theft and burglary are common, especially when you are from out of town, and diverse food is difficult to get but you can't use your refrigerator, isolation becomes more palpable as does vulnerability. Meaning, I had many sleepless nights feeling alone and insecure. Unlike those living in Monrovia in gated and guarded compounds, in my first home I had neither, though I did have bars on my windows. I also lived with the shock of hearing a mob 'rogue' beating, in my neighbor's yard, about a week after my arrival. All of these factors and experiences created my understanding of this place. Another example of why place mattered to me relates to field data collection. Many of the communities we surveyed were remote and difficult to access. This meant that preparation and risk management were vital; moreover, emergency services are also limited in rural, post-conflict Liberia. I did find that the kindness and generosity of rural Liberian farmers put me at ease despite the uncertainty resulting from geographic isolation. Understanding place through my own experiences, helped me appreciate the vast challenges of rural smallholder farmers and extension officers alike, especially women. Specifically in relation to accessing vital resources and information. During my time in Liberia I also learned about the role of place in trauma.

After my first home was burglarized, I experienced a visceral reaction to the area I had lived; it became difficult to be near the house, especially alone, and I never spent another night there. I didn't sleep at all the two nights I stayed with a neighbor. In my second home, I lived with a

roommate on a hospital compound. Despite the initial fear and sleepless nights when my roommate was away, I had a completely different experience in the new place. While it was only 10 minutes up the road, it was both gated and guarded 24-hours a day. Further, we typically had electricity including a refrigerator and lived in a larger community within walking distance from a big market. This experience increased my appreciation for the role of place in both the research process and my personal experience, and the importance of community and social networks.

Both at my second home in Liberia and in the field, it was the connection to other people via phone or in-person that fashioned my network of support. Whether it was going out for a Savanna Dry Cider after work, cooking dinner with my roommate, or calling a Peace Corps volunteer about a place to stay during field work, that human connection made life bearable. I would be hard pressed to come up with 10 farmers that I met who are not part of a Kuu, an informal labor group, or a farmer-based organization. Especially women, they are very involved in such groups for both domestic and productive activities, including community savings and loan groups. This type of labor sharing, comradery, and connection is much different to the insular lives of many Americans. While I saw some difference in the human behaviors and beliefs throughout the region we surveyed, and I'm sure there is variance across the whole of Liberia with 16 different ethnic groups, the realities of a place shape human behavior and vice versa. Meaning, I saw many similarities in the way people cope with stress and isolation, often through family and community networks. People rarely spoke about the war, but they did mention the consequences and further isolation that have resulted from degraded infrastructure and public services. They asked for the Ministry to help support their farmer groups and prided themselves on community unity. Place builds social capital, and in the face of social and environmental trauma or change, community is often what we lean on to survive and adapt; I know that I did throughout my time in Liberia. Had I lived in Monrovia or another community in Liberia my experience would have been different, as it would have been shaped and reflected in relation to that place.

Transdisciplinary research requires sustained partnerships between the academy and non-academic collaborators in an effort to integrate knowledge and methods and to develop and meet shared goals. Therefore, part of any transdisciplinary research approach requires a sustainable situation for everyone involved. For any other researcher or I, working in a remote, rural, and/or post-conflict place requires a support system, strategies to cope with isolation and insecurity, and time spent cultivating local relationships. Preemptively discussing or addressing assumed challenges with local partners and funding organizations may help researchers minimize, or altogether bypass,

challenges related to certain places. The acknowledgement that place matters in social research is a valuable principle to add to any framework for personal or research process reflection.

Key Takeaways

Process reflection refers to the retrospective analysis of facts in order to learn and improve; introspection refers to a deeper and more personal (philosophical) process of observing or examining one's own mental and emotional state, essentially "soul searching" (Kumar, 2009). As an applied social science researcher using participatory approaches, I found it interesting and illuminating to turn one of the methodologies I use back on myself for the purposes of introspection and process reflection. In doing so, my four key takeaways are a) practice self-care and safety, b) be adaptable, c) be accountable, inclusive, and positively contribute, and d) build from existing and place-specific knowledge and structures. Reflectively applying this framework to the Liberia case study provides new ideas for researchers who work in especially difficult regions without proper support. The table below includes personal introspection and research process takeaways including a column of overlap (Figure 4.3)

Takeaways	Introspection	Both	Process reflection
Practice self-care & safety	* Pre-establish and use a support system/network * Make time for introspection, including keeping a personal journal and recording 3 things that went well each day and 3 things to be grateful for * Make time to do things that bring joy, meditation and yoga can be helpful to quiet the mind * Have self compassion and patience * Take breaks/time off * Personal safety: know your insurance plan and funding agency contingency plans, have all national documents in place, have contact numbers in case of emergency * Cultivate an attitude of gratitude	* Set and maintain boundaries (work and personal) * Develop a personal and team risk management plan * Learn how and when to say 'no' * Set appropriate expectations and timelines * Establish and maintain balance as much as possible * Never be afraid to speak up when you feel uncomfortable or unsafe * Build a peer network of international researchers and practitioners	* Ask questions for clarification * Open and frequency communication is critical * When appropriate challenge power structures * Delegate tasks and build local capacity * Establish and work with research mentors * Plan for safety and security of research team, know your surroundings, have contingency plans * Take time to build trust, nourish local collaboration, and learn with local researchers and communities
Be adaptable	* Humor * Keep a journal * Have self compassion and use daily affirmations * Have a holistic perspective	* Cultivate patience and display calm * Set appropriate expectations and manage them accordingly * Allocate (a lot) more time for everything * Learn and improve from mistakes * Be flexible and culturally sensitive	* Plan for uncertainty and change (i.e., back-up plans) * Carry out reflection, monitoring and evaluation, and project/process adaptation * Learn how to delegate work in an empowering way
Be accountable, inclusive, & contribute	* Engage in the community outside of work/research * Find ways to provide mentorship and build local capacity * Have personal follow-through, actions must reflect words	* Do no harm * Reflexivity * Power diffusion, identify and counteract inequality * Always look to include marginalized voices * Understand what equity and mutual benefits means in the local context, try and adhere to it * Do you research to know	* Acknowledge the validity of local knowledge * Acknowledge the validity of local knowledge * Use systems and feminist thinking to incorporation multiple ways of knowing and being * Use participatory methods/methodologies when possible * Share project results and facilitate next-steps planning * Allocate extra time to get things done * Incorporate ways to share information and resources throughout the research process * Find ways to equitably work with local researchers, professors, students, and communities members to build partnerships and capacity
Build from existing and place-specific knowledge & structures	* Allocate time at the beginning of the project to get to know people, culture, and local norms * Be respectful and open to new and different ways of thinking and doing * Engage in the community outside of work/research	* Work to build and maintain professional relationships * Use active and transformational listening * Don't reinvent any wheels you don't have to, keep a research log to share so others don't have to reinvent the wheel either * Listen and learn for and from different ways of knowing * Do your homework on other organizations or research that has been conducted or currently is in the community/region	* Build local capacity and improve opportunities * Incorporate local and indigenous knowledge, value voices from the margins. * Try not to reinforce any bad stereotypes that previous organizations or individuals have created * Select methodologies that explicitly call for equity, sharing of knowledge and resources, and finding

Figure 4.3. Introspection, process reflection, and overlap takeaways

Practice self-care & safety

When I applied to work as the lead researcher for this project, I understood the basic prerequisites such as patience and adaptability because I had prior experience working abroad in

developing contexts. What I couldn't and didn't fully comprehend was the personal/emotional toll of living and working in a post-conflict country and in a rural community, while also trying to balance a multitude of expectations, many of were my own creation. Experience and reflection on this project has taught me the value of practicing self-care and safety preparations. Some organizations have built-in networks that provide logistics and emotional support, train staff/volunteers in cultural sensitivity, or financially compensate their employees when working in challenging contexts; I was not afforded such privileges. Based on further dialogues and investigation, I have come to understand that other researchers (in Liberia or elsewhere) may also be "falling through the cracks." Having technical, emotional, and project specific support is especially pertinent for graduate students or others working under umbrella organizations without direct supervisors or support. I would also contend that women may encounter context specific challenges and vulnerabilities that must be addressed, such as added gender discrimination, safety risks, and the cultural appropriateness of clothing or activities.

Be adaptable

The concept of adaptability is also integrated throughout the FST principles. Findings from this process in relation to adaptability highlight the importance of setting appropriate expectations and timelines that can be managed adaptively as things arise. This is especially vital for researchers that are perfectionists (I know one), and those rooted in positivist paradigms. Working in post-conflict countries and in remote areas requires the willingness to think differently and adapt one's methods and personal behaviors (cultural sensitivity) to align more with local customs and expectations. I found out that preparing back-up plans is critical to maintaining safety and sanity. As well, research activities seemed to take three times as long as I anticipated, so I would suggest allocating excess time for everything, and adapting accordingly when things still don't go as planned. In my opinion, two of the most important aspects of being flexible and adaptive are to show self-compassion and have humor throughout the process; reflecting regularly and maintaining a journal can be useful. Learning how to gracefully adapt can keep researchers and practitioners from rapid burnout.

Be accountable, inclusive, & positively contribute

I can see that my sense of isolation, lack of project mentorship and on-the-ground technical and emotional support, in addition to the existing political and project complexities thwarted my efforts to be fully accountable, inclusive, and contributive. If I'd been more aware and empowered in the process I could have experimented with participatory methodologies; though this would have required more qualitative methods and fewer communities with possibly less generalizable and statistically relevant results. A more holistic approach including semi-structured interviews, farmer

inclusion in project development, and monitoring could have increased project accountability, inclusion, and contribution. Building stronger local partnerships, accountability, and capacity often bodes well for long-term project sustainability. In reflection, to improve on accountability and transparency I could have asked more questions to understand how and in what timeframe the findings and recommendations would be used to support community initiatives and policy development.

One of the main goals in action research is to acknowledge and diffuse power. Communities of practice is a collective framework for knowledge sharing and creation (Wenger, 2011). As a development research approach, it calls on researchers and practitioners to see themselves more as facilitators or conveners to promote inclusion, local knowledge production, and recognition of non-academic experts (Wenger, 2011). With this in mind, I may have selected interview, participant observation, and field notes methods that build on and enhance existing social capital (i.e., farmer and community-based organizations) as opposed to surveying individual farmers. By focusing on engagement and inclusion within fewer communities the project may have more effectively mitigated cultural, gender, status, and economic power inequalities toward place-based social change.

Build from existing and place-specific knowledge and structures

In reflection, to build on existing knowledge and structure (locally and nationally) I could have prioritized building relationships and learning with/from other in-country organizations such as BRAC, CARE, or DFID. Time spent on the front end of the project getting to know local groups and other international organizations with similar goals or projects would likely have paid dividends. Organizations, like researchers, are often hesitant to share data; in a perfect world such collaboration with projects, organizations, and community partners can lead to information and results sharing toward social change. Additionally, developing a better understanding of the current and past (postwar 2003) policies around gender and agriculture may have allowed our team to understand and navigate the systemic barriers that prevent recommendations and implementation from being useful.

Moving forward

Gender and power are interwoven through the entire introspection and research reflection process using the FST framework. Not solely as an evaluation process, but by using the framework as Stephens (2013) recommends through the entirety of a project, including conception, can help mitigate inequities for both researcher(s) and participants. Further, in already marginalized populations there is a need for research to openly acknowledge and work to deconstruct historical power structures toward social change and justice. Transdisciplinary research is centered around communication and developing common ground. The role of personal accountability, transparency,

and introspection can assist in building a process where communication leads to common ground and change. It also provides space for a researcher to heal and set healthy boundaries. Boundaries also enhance local inclusion, contribution, and knowledge production. Using an intentional approach to guide introspection and process reflection can cultivate healthier, more equitable, and sustainable transdisciplinary processes for researchers, non-academic collaborators and participants alike.

Literature Cited

Butler, J. (1988). Performative Acts and Gender Constitution: An Essay in Phenomenology and Feminist Criticism. *Theatre Journal,* 40(4), 519–31.

Caretta, M. A., & Börjeson, L. (2015). Local gender contract and adaptive capacity in smallholder irrigation farming: a case study from the Kenyan drylands. *Gender, Place & Culture*, *22*(5), 644-661.

Carstensen-Egwuom, I. (2014). Connecting intersectionality and reflexivity: Methodological approaches to social positionalities. *Erdkunde*, 265-276.

ČerniČ IsteniČ, M. (2015). Do rural development programmes promote gender equality on farms? The case of Slovenia. *Gender, Place & Culture*, *22*(5), 670-684.

Cooper, H. (2017). *Madame President: The Extraordinary Journey of Ellen Johnson Sirleaf*. Simon and Schuster.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stanford Law Review, 43(6), 1241–1299. doi: 10.2307/1229039

Duncan, S., & Pfau-Effinger, B. (2012). *Gender, economy and culture in the European Union*. Routledge.

Flood, R. L. (2010). The relationship of 'systems thinking' to action research. *Systemic Practice and Action Research*, *23*(4), 269-284.

Forsberg, G., & Stenbacka, S. (2013). Mapping gendered ruralities. *European Countryside*, *5*(1), 1 20.

Gbowee, L. (2011). *Mighty be our powers: How sisterhood, prayer, and sex changed a nation at war*. Beast Books.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist studies*, *14*(3), 575-599.

Haraway, D. (2006). A cyborg manifesto: Science, technology, and socialist-feminism in the late 20th century. In *The international handbook of virtual learning environments* (pp. 117-158). Springer, Dordrecht.

Harding, S. (1991). *Whose science? Whose knowledge?: Thinking from women's lives*. Cornell University Press.

Harding, S. G. (Ed.). (2004). *The feminist standpoint theory reader: Intellectual and political controversies*. Psychology Press.

Hirdman, Y. (1991). The gender system In T. Anderson (Ed.), *Moving on: New perspectives on the women's movement* (pp. 187-207). Aarhus University Press.

hooks, bell, 1952-. (2015). Ain't I a woman: Black women and feminism. *New York: Routledge, Taylor & Francis Group.*

Kumar, M. (2009). "Difference between reflection and introspection." Retrieved October 4, 2019, from http://www.differencebetween.net/miscellaneous/difference-between-reflection-and introspection/

Kwan, M. P. (1999). Gender and individual access to urban opportunities: a study using space–time measures. *The Professional Geographer*, *51*(2), 210-227.

Little, J. (2002). Rural geography: rural gender identity and the performance of masculinity and femininity in the countryside. *Progress in Human Geography*, *26*(5), 665-670. doi: 10.1191/0309132502ph394pr.

Little, J., & Panelli, R. (2003). Gender research in rural geography. *Gender, Place and Culture: A Journal of Feminist Geography*, *10*(3), 281-289.

McDowell, L. (1992). Doing gender: feminism, feminists and research methods in human geography. *Transactions of the institute of British Geographers*, 399-416.

McDowell, L. (1999). Gender, identity and place: Understanding feminist geographies. John Wiley & Sons.

McDowell, L. ed. (1997). *Undoing place?: A geographical reader*. London: Arnold.

Midgley, G. (1996). What is this thing called CST?. In *Critical systems thinking* (pp. 11-24). Springer, Boston, MA.

Midgley, G. (2000). Systemic intervention. In *Systemic Intervention* (pp. 113-133). Springer, Boston, MA.

Morse, J. (1991). Approaches to qualitative-quantitative methodological triangulation. Nursing Research, 40, 120-123.

Mudege, N. N., Mdege, N., Abidin, P. E., & Bhatasara, S. (2017). The role of gender norms in access to agricultural training in Chikwawa and Phalombe, Malawi. *Gender, Place & Culture*, *24*(12), 1689-1710.

Muir, J. (2011). *My first summer in the Sierra*. Houghton Mifflin Harcourt.

Murphey, E., Erickson, K., and Tubman, M. (2016). *USAID Office of Food for Peace Food Security Desk Review for Liberia, 2016-2020*. Washington, DC: FHI 360/FANTA. Retrieved April 17, 2018, from https://www.usaid.gov/sites/default/files/documents/1866/FFP-Desk Review-Liberia Feb2016v2.pdf

Newell, W.H., & Meek, J.W. (2003). Complexity an interdisciplinarity. Knowledge management, organizational intelligence and learning, and complexity, Encyclopedia of

Life Support Systems. Available online at http://www.eolss.net. Oxford, UK: EOLSS Publishers.

Ogunlela, Y. I., & Mukhtar, A. A. (2009). Gender issues in agriculture and rural development in Nigeria: The role of women. *Humanity & social sciences Journal*, *4*(1), 19-30.

Peterson, A.A. (2016). Liberia landscape analysis. USAID. Retrieved October 10, 2019, from http://ingenaes.illinois.edu/wp-content/uploads/ING-Liberia-Landscape Analysis%202016_09_13.pdf

Repko, A. F. (2012). *Interdisciplinary research: Process and theory*. Second Edition. Thousand Oaks, CA: Sage.

Shiva, V., & Mies, M. (2014). *Ecofeminism*. Zed Books Ltd..

Smith, L. T. (2013). *Decolonizing methodologies: Research and indigenous peoples*. Zed Books Ltd..

Stephens, A. (2012). Feminist systems theory: Learning by praxis. *Systemic Practice and Action Research*, *25*(1), 1-14.

Stephens, A. (2013). *Ecofeminism and systems thinking*. Routledge.

Stephens, A., Jacobson, C., & King, C. (2010). Describing a feminist-systems theory. *Systems Research and Behavioral Science*, *27*(5), 553-566.

The lotus sutra. Columbia University Press, 1993.

Tong, R. (2013). *Feminist thought: A comprehensive introduction*. Routledge.

Trauger, A., Sachs, C., Barbercheck, M., Kiernan, N. E., Brasier, K., & Findeis, J. (2008). Agricultural education: Gender identity and knowledge exchange. *Journal of Rural Studies*, *24*(4), 432-439.

United States Department of State, Office of the Historian, Foreign Service Institute, USA. Retrieved August 5, 2019, from https://history.state.gov/milestones/1830-1860/liberia

Ulrich, W. (2003). Beyond methodology choice: critical systems thinking as critically systemic discourse. *Journal of the Operational Research Society*, *54*(4), 325-342.

Valentine, G. (2007). Theorizing and researching intersectionality: A challenge for feminist geography. *The professional geographer*, *59*(1), 10-21.

Wenger, E. (2011). Communities of practice: A brief introduction. Retrieved November 7, 2018, from http://wengertrayner.com/wp-content/uploads/2013/10/06-Brief-introduction-to communities-of practice.pdf

Witinok-Huber, R., J., Piaskowski, S., Radil, & D., Sarathchandra. (2019). *What's gender or place have to do with it: Building adaptive capacity through agricultural extension in post-conflict settings*. Manuscript in preparation.

Appendix A: Additional Materials for Chapter 1

Key disciplinary and methodological abbreviations include development (DEV), sociology (SOC), geography (GEO), interdisciplinary (INT), systems thinking (SYS), governance (GOV), indigenous (IND), feminist (fem), mixed-methods research (mmr), participatory action research (par), geographic information systems (gis), and subject or sub-heading (sub).

Table A.1. Literature synthesis

Insights into the influence of qualitative, participatory, and mixed-methods research on power inequities				
Disc/ sub	Disc/Author	Insight	Key concept(s)/theory	CG
DEV	Koester, 2015	Gender and power are interconnected. Development work must acknowledge the intersection and look for what is not easily seen.	Interconnection of gender and power for development.	Power Situated Connection Gender
DEV	Lukes, 2005	Power influences the way people see themselves and their worldview without them knowing.	Power dimensions, invisible power (i.e., third dimension of power)	Power
DEV	Narayanaswamy, 2017	Inclusive knowledge societies must be rooted in communities marginalized by dominant knowledge systems. K4D is currently reinforcing power hierarchies even through PAR.	K4D, Southern-based women's NGO, knowledge intermediary	Power Systems: knowledge PAR Context Gender Knowledge Participatory Inequality
DEV par	IDS, 2018 Institute for development studies: 'Participatory Methods' website	Education and activism require participatory practices and the researcher/practitioner must be self-aware and reflective.	Participatory methodologies, Participatory Rural Appraisal, Participatory learning and education, accountable aid, self-inquiry	Participatory Reflective Knowledge Power Plural methods
DEV par	MacDonald, 2012; Hall, 1992	PAR is a subset of action research used to describe and understand phenomena toward social change. PAR is empowering, and capacity building, rooted in local questions. PAR can equalize power and is linked to pragmatism	Participatory action research, *pragmatism*	Participatory Pragmatic Power Social change Equality Knowledge Plural methods

SOC fem	Harding, 1991	Our worldview is driven by our experiences. Women's standpoint is fundamentally different to men, and marginalized perspectives are more holistic and objective as outsiders.	Standpoint theory, multiple knowledges, feminism	Context/situated Feminism Gender Power Knowledge Inequality Difference
	Bowel, n.d. https://www.iep.utm.edu/fem-stan/#H5	(1) Knowledge is socially situated. (2) Marginalized groups are socially situated in ways that make it more possible for them to be aware of things and ask questions than it is for the non-marginalized. (3) Research, particularly that focused on power relations, should begin with the lives of the marginalized.	Feminist standpoint theory, double-vision.	
SOC fem	Haraway, 1988	Worldviews are driven by experiences that are situated in social reality (culture, history, place, policy, racism). Honoring multiple situated knowledge systems will avoid partial and inaccuracy knowledge dissemination.	Situated knowledges, dominant knowledge (white capitalist patriarchy)	Context/situated Pluralism Feminism Knowledge Power
SOC mmr	Greene, 2007	Methodology is ever the servant of purpose, never the master. MM is much more than a method. Used under pragmatism.	Mixed-methods for social inquiry, MM typology	Pragmatic Social change Mixed-methods Context/situated Participatory Power
SOC mmr	Denscombe, 2008 (mmr and CoP); Lave & Wenger, 1991 (CoP); Wenger, 2000, 2011 (CoP)	MMR is strongly linked to pragmatism. Pragmatism provides a fusion of approaches not an anything goes. CoP inherently provides opportunities for individuals with common areas of interest to coalesce. Embraces difference.	Mixed-mixed research, communities of practice, mixed-methods is the third research paradigm, pragmatism	Pragmatic Mixed-methods Connection (i.e. community) Difference embraced Philosophy Context/situated Participatory Power
SOC mmr	Johnson, Onwuegbuzie & Turner, 2007	Like Greene (2007), Johnson et al expressed the philosophical foundations and fluidity of MMR. That it is most effectively used pragmatically.	Mixed-methods research	Pragmatism Mixed-methods Philosophy Power

GEO par	Kindon, Pain, Kesby, 2007	Participation is itself a form of power, and PAR can be used to link theory to practice toward social chance and local empowerment or the opposite. Researchers are not the owners of the process they are a participant and facilitator. PAR is fluid and pluralistic, and it can be used as a transformative process to empower and connect, or represent the connections between, people and place, and address power.	PAR & GIS, (P)PGIS	Participatory Mixed-methods Knowledge Context Connection Place/space Pragmatic Equality Difference Power
GEO par	DeLyser & Sui, 2014	Times call for geographer's (scientists) to unite and support each other regardless of discipline or methodological beliefs.	Engaged pluralism (4th paradigm), open data and PAR integration	Pluralism Participatory Difference Knowledge Power
GEO mmr gis	Cope & Elwood, 2009; Pavlovskaya, 2009; Elwood, 2009	MMR can enhance the application and efficacy of GIS in a local context.	Qualitative GIS, mixed-methods GIS, PGIS	Mixed-methods
		Visualization techniques inherently have power to represent the unseen and unknown. Power imbalances also reflect secondary data analysis.		Participatory (em)Power
		GIS should be used in combination with locally situated knowledges and can foster knowledge production and sharing. MMR-GIS best achieved through participatory methodologies.		Spatial
	Matthews, Detwiler & Burton, 2005	More complete story told by combining ethnography and geography. Can include community voices and power.	Geo-ethnography	Visual Reflexivity Difference
	Kwan, 2002	GIS methods: help researcher/user identify complex relationships across geographic scales and multiple axes of difference (gender, class, race, ethnicity, place).	GIS methods within feminist geography research	Context/situated Feminism Knowledge Equality
GEO gis	Schuurman, 2004	Spatial analysis uses tools and scientific approaches such as GIS to generate information and knowledge about space, and spatial patterns and relationships. While GI Systems is a software that requires numbers (quantitative), since the 1990's participatory and qualitative methods have been used in combination (mixed-methods) with GIS to develop context, and incorporate multiple ways of knowing through rich social data.	GIS, spatial analysis	Spatial Technology Power Philosophy Difference Connection Context Space/Place Participatory
GEO	Darmofal, 2015	Spatial analysis. Tobler's first law "everything is related to everything else, but near things are more related than distant things" (p. 21). How are things (physical and social) related and how do they differ across 2D space. In what ways do space and scale matter for processes and social relationships for dependence and independence (autocorrelation, spatial dependence, clustering).	Tobler's first law, Galton's problem (spatial or attributional dependence), spatial analysis, spatial autocorrelation, spatial dependence	Spatial Technology Connection/relations Boundary Difference Space/place

INT	Repko, 2011 (56-57, 321-381)	Disciplinary perspectives are partial and biased. Creating or discovering common ground as a step in interdisciplinarity that makes integration possible (Clark, 1996; Broome, 2000). Interdisciplinary are proactive. Integration is used for cognitive advancement (Mansilla, 2005) a more comprehensive understanding for complex systems/problems.	Interdisciplinary research process, common ground, disciplinary perspective, cognitive decentering,	Complex Systems Interdisciplinary Connection
INT	Clark and Brennan, 1991; Clark 1996	Language use is a joint action. CGT grounds communication between two or more people in mutual knowledge, beliefs, and assumptions. Coordination of content, process, and self-reflexivity. Also used in machine-mediated and other communication mediums (letter, phone etc.).	Common ground theory	Communication Understanding Connection Interdisciplinary Reflexivity
INT	Broome, 2000	Different perspectives can both impede understanding between individuals or disciplines, but also help in interdisciplinary communication. Implications for interdisciplinary research and learning. Boundary between disciplinary and interdisciplinary is flexible dependent on knowledge systems.	Theory of cognitive interdisciplinarity	Difference Connection Boundary Interdisciplinary System
INT	Mathews & Jones, 2008	Systems thinking is pragmatic and through boundary judgement/creation can be used for interdisciplinary research as it is both structured and fluid. Disciplinary strength and situated knowledge are equally valid in systems thinking. Promotes thought awareness, reflexivity, and connection.	Perspective talking, holistic thinking (non-linear, holistic, critical), belief-testing (situated knowledge). Land-people-place systems	Systems Context/situated Pragmatic Interdisciplinary Connection Reflexivity
INT	Newell & Meek, 2003	Interdisciplinary research and education/learning	Two phase 13-step IRP	Process
			1. draws on disciplinary perspectives (6 steps).	Plural
	Newell, 2000	Pluralistic, dynamic. Common ground. Interdisciplinary research integrates disciplinary	2. integrates insights to construction a comprehensive perspective (7 steps).	System
			Transdisciplinary attempts to integrate disciplines and insights.	Connection
			Interdisciplinary moves uses IRP (problem, insights, integration, understanding).	Interdisciplinary

IND	Smith, 2013	Ngugi wa Thiong'o (colonization of the mind).	Decolonizing methodologies, indigenous science	Power Control Indigenous Sovereignty Knowledge/relations Participatory Context
IND	Berkes, 2008	Two kinds of knowledge to be pursued separately but in parallel, enriching one another as needed	Traditional ecological knowledge (TEK), pluralistic methodologies	Difference Power Connection Indigenous Mixed-methods Knowledge Context
IND par mmr	Engler, Scassa, & Taylor, 2013	Combining GIS and traditional knowledge through PAR processes can empower indigenous communities and support more equitable knowledge production and representation. Combined methods also have political power (i.e., counter-mapping) and allow images to take on fluid and dynamic attributes such as situated knowledge and stories).	GIS and TK, counter-mapping (Pickles 2004, p. 113)	Power Process Participatory indigenous mixed-methods Knowledge Connection Context
GOV	Cosens, Gunderson, Chaffin, 2018	Collective action and choice are influenced by both formal (government) and informal (nongovernmental) participation through governance. Therefore, adaptive governance (or adaptive capacity) must be simultaneously structured and flexible. Adaptation, a component of resilience, is required to address complex systems problems.	Adaptive capacity, adaptive governance	Adaptation Governance Context Interdisciplinary Systems Connection
SYS	Midgley, 1996, 2000	Knowledge is a partial representation of reality. Research boundaries (i.e., research questions, what matters, who is in or out) reflect decisions made through partial lenses and can be improved through pluralistic, pragmatic, and participatory processes that stretch the idea of what/who is inside or outside the boundary for research.	Critical systems thinking, systemic intervention, critical boundary judgement, pluralistic methodologies	Systems Pluralistic Pragmatic Boundary Context Connection Participatory Inclusion Equality Knowledge Power
SYS	Stephens, 2010, 2012, 2013	Feminism has not been recognized in systems thinking, therefore situated knowledges are not fully represented	Feminist Systems Theory	Gender System Participatory Connection Context Inclusion Pragmatic Pluralistic Equality Difference Boundary Power

Figure A.1. Figure A.1. MAXQDA word cloud of overall word frequency.

Figure A.2. MAXQDA word cloud by document count.

Appendix B: Additional Materials for Chapter 2

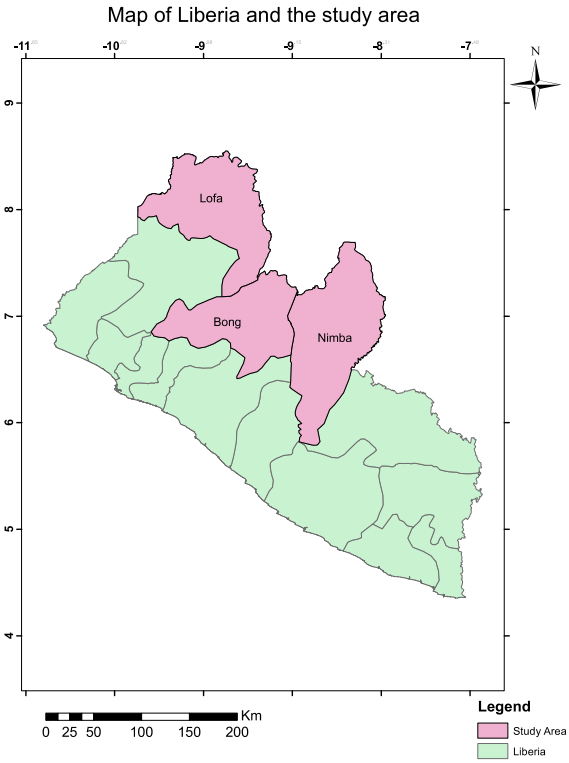


Figure B.1. Map of the study area that includes Lofa, Bong, Nimba counties in north-central Liberia

Note. Created by Dr. Abraham Mahari, Cuttington University lecturer and GIS specialist.

DAOs were asked to use the following 8 criteria in order to select one community they had served, for our team to visit during data collection. The DAOs worked together with their CAC to develop our travel logistics based on selected communities.

- You have worked in this community and feel good about the work you've done.
- There are women and men farmers in this community.
- Farmers in this community are diverse ages. (18 to …)
- Farmers in this community have different income levels or livelihoods and have different farm sizes (in acres).
- Farmers within this community are engaged in a number of agricultural activities (e.g., crops, livestock and fishery etc.)
- You would feel comfortable having this community host our research team.

- You would like to know how to better serve this community.
- This community may have farmer-based organizations (FBOs)

Conceptual diagram of the governance structure and actors related to this project. Defined on an urban (Monrovia) and urban centers outside of Monrovia (2000), to rural (<2000) scale using directional arrows to represent flow of the stated resources, information, and responsibilities. Dark green represents urban actors housed in Monrovia, light green are urban areas (>2000) outside of Monrovia that may or may not provide amenities and social services for citizens, and gray represents rural (<2000) areas where the majority of field data for this study was collected. Blue represents international actors at various scales both governmental and non-governmental, public and private, and purple is research through a variety of organizations at various scales with different levels of funding and power.

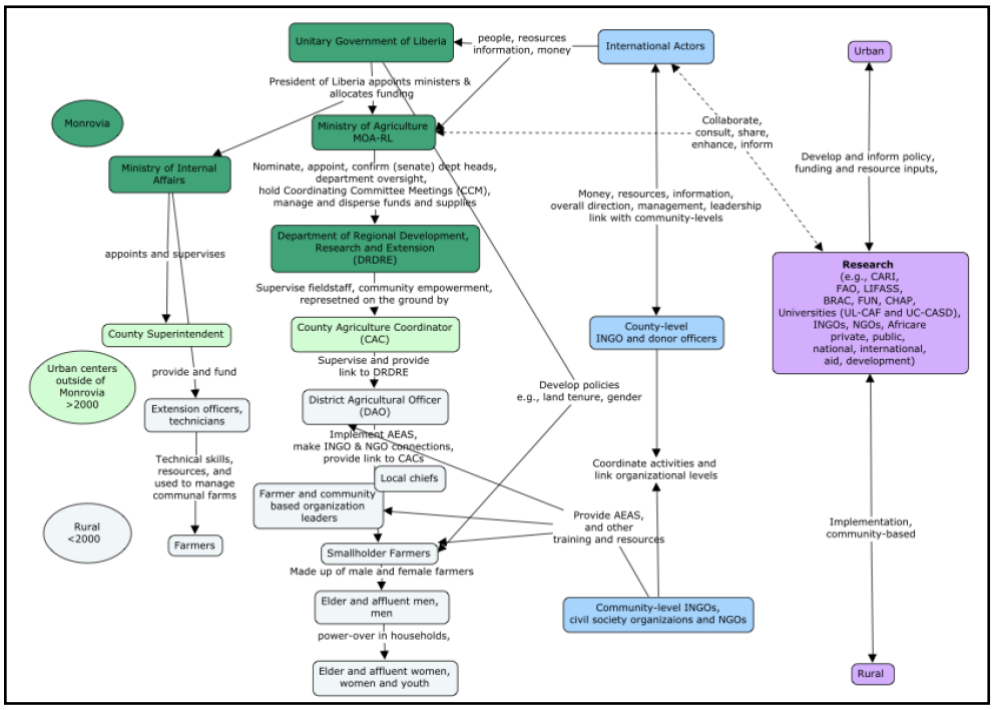


Figure B.2. Conceptual diagram of the governance structure and actors related to this project

Appendix C: Additional Materials for Chapter 3

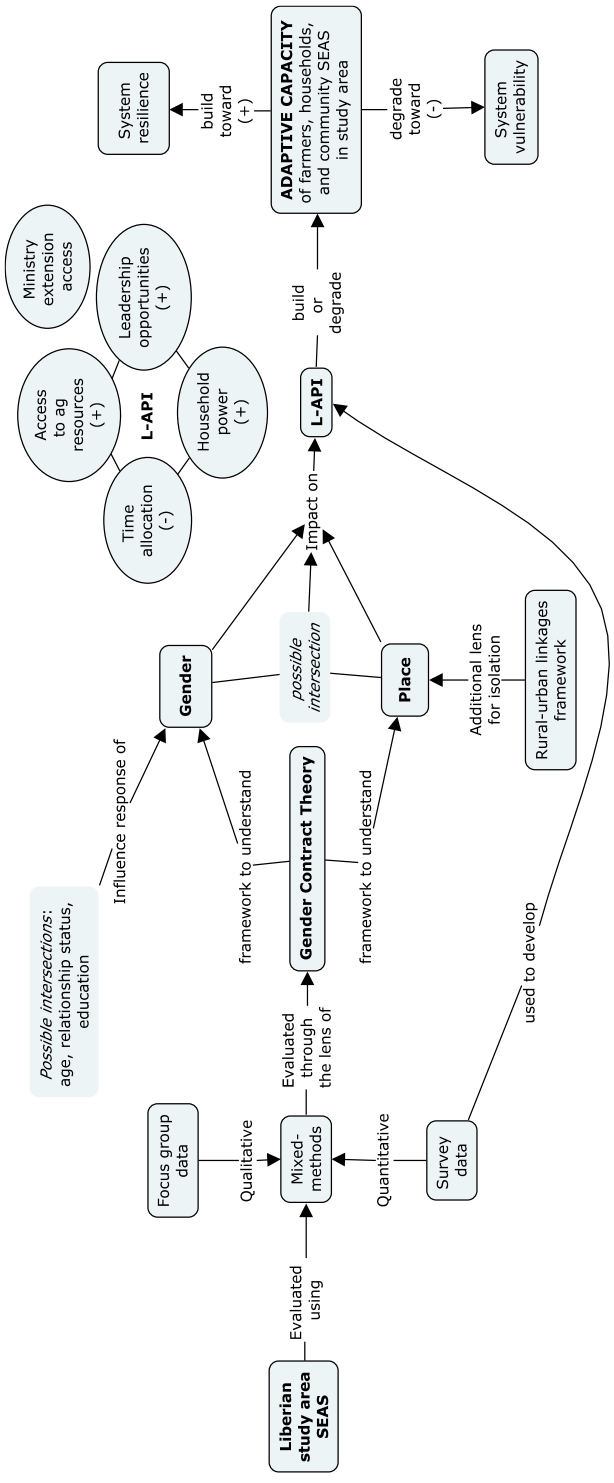


Figure C.1. Conceptual diagram of study concepts, linked phrases, and (directional) connections.

Quantile-quantile plots and scatterplots of residuals versus fitted values were used to evaluate that the error terms were independently and identically distributed as normal random variables (Figure 1).

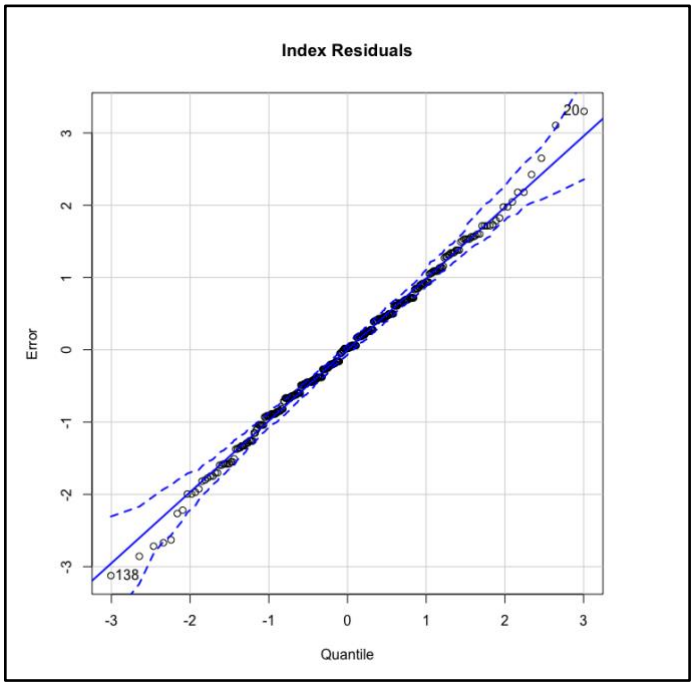


Figure C.2. Linear regression for an ANOVA Type II model of L-API residuals.

Figures C.3, C.4, and C.5 present correlations using a 95% confidence interval between L-API and specific places of interest. Though not a significant finding, as expected we see that the mean L-API community scores increase as the distance from a community to a major road decreases ($r = -0.22$, $p = 1$) (Figure C.3). While we expected that L-API would increase with decreased proximity to major cities, results indicate that the inverse is true. Findings show a significant positive correlation between community aggregated L-API scores and distance to Red Light Market in Monrovia (Figure C.4; $r = 0.1$, $p = 0.056_{+}$) and cities with over 5000 people (Figure C.5; $r = 0.16$, $p = 0.009_{**}$); this means that L-API scores increased as the distance from a city also increased. While it is out of the scope of this study, many of the surveyed communities have an international border. Further investigation on role of regional networks may provide additional explanations to what we saw in this study related to place-based access and agency.

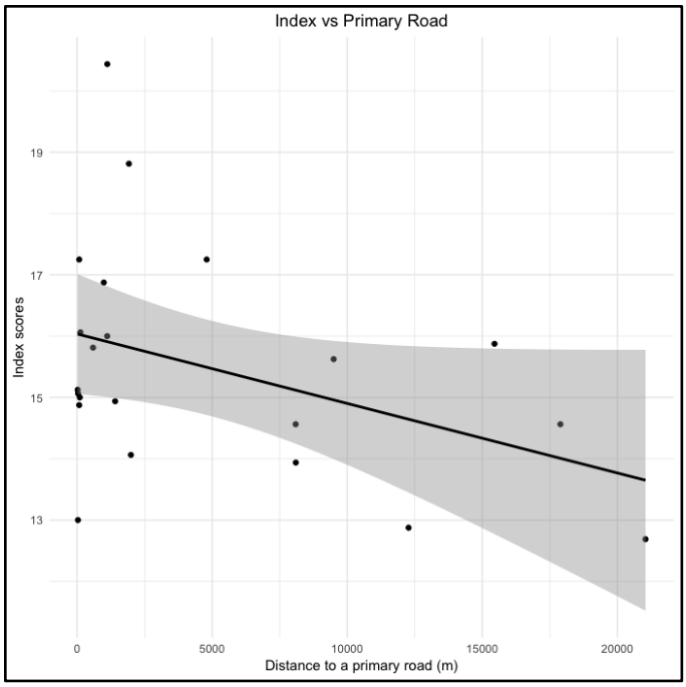


Figure C.3. Mantel test for L-API differences compared to community distance (m) from a primary road.

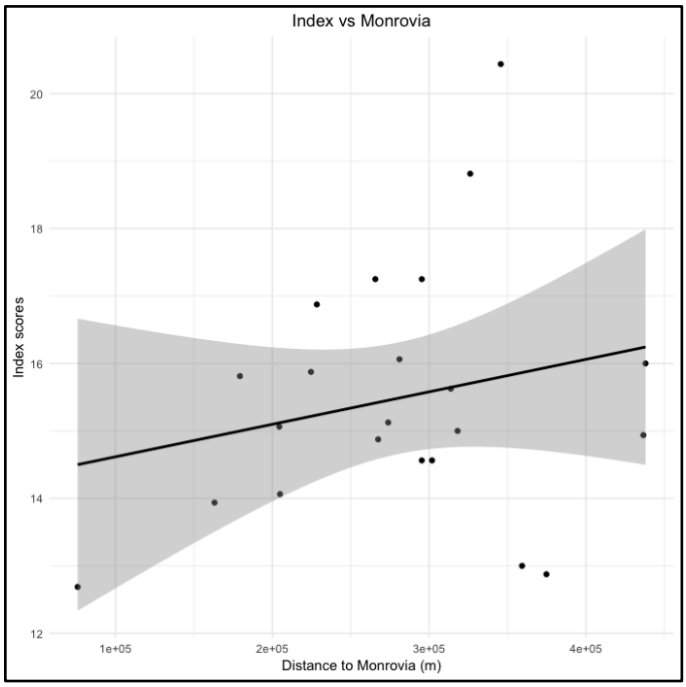


Figure C.4. Mantel test for L-API differences compared to community distance (m) from Monrovia.

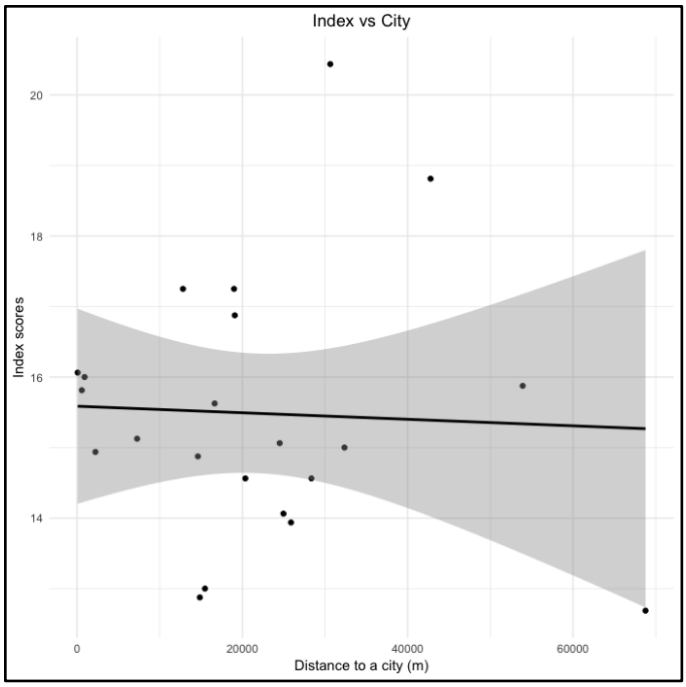


Figure C.5. Mantel test for L-API differences compared to community distance (m) from a city with over 5000 people.

Place or City, County	Address	Latitude	Longitude	Population	Source (2019 projections)	Link
Red Light Market, Monrovia	Light Market, Somalia Drive, Nizohn, Greater Monrovia, Montserrado County, 00231, Liberia	6.29239	-10.69073	939,524	World Population Review	http://worldpopulationreview.com/countries/liberia-population/
Gbarnga, Bong	Total, Broad Street, Gbandi Quarter, Kortu Quarter, Zone 3, Jorquelleh, Bong County, Liberia	6.9981	-9.472243	45, 853	World Population Review	http://worldpopulationreview.com/countries/liberia-population/
Kakata, Margibi	Monrovia-Kakata Hwy, Kakata, Liberia	6.53142	-10.35033	33,945	World Population Review	http://worldpopulationreview.com/countries/liberia-population/
Ganta, Nimba	Total Filing Station, Nya Kullah Street, Gbalagbein, Zone 2, Garr-Bain, Nimba County, Liberia	7.233	-8.9871	41,106	Humanitarian Data Exchange, OCHA	https://data.humdata.org/dataset/liberia-population-statistics
Saclepea, Nimba	Vivian Building, Ganta - Tapita, Kpaytuo, Wee-Gbehyi-Mahn, Nimba County, Liberia	6.96371	-8.84197	12,117	Humanitarian Data Exchange, OCHA	https://data.humdata.org/dataset/liberia-population-statistics
Sanniquellie, Nimba	Ganta - Sanniquellie, Red Cross Village, Nyan Dahn Village, Mr. Kona Town, Sanniquellie Mahn, Nimba County, Liberia	7.35456	-8.72237	11,415	World Population Review	http://worldpopulationreview.com/countries/liberia-population/
New Yekepa, Nimba	Arcelormittal Hospital, Area 'C' Road, Yekepa, Yarmein, Nimba County, Liberia	7.5756	-8.5391	26,695	World Population Review	http://worldpopulationreview.com/countries/liberia-population/
Zorzor, Lofa	Total Gas, Balozu, Beawoma Vilage, Zorzor, Lofa County, Liberia	7.7772	-9.4295	51,662	Humanitarian Data Exchange, OCHA	https://data.humdata.org/dataset/liberia-population-statistics
Voinjama, Lofa	Total Gas, Mr. W. M. K. Bazzie's Village, Guworma, Voinjama, Lofa County, Liberia	8.42163	-9.75279	54,311	Humanitarian Data Exchange, OCHA	https://data.humdata.org/dataset/liberia-population-statistics
Foya, Lofa	National Petty Trader Union and Credit Union, Kornduma, Bornordu, Foya Kamala Number One, Foya, Lofa County, Liberia	8.35933	-10.20787	93,048	Humanitarian Data Exchange, OCHA	https://data.humdata.org/dataset/liberia-population-statistics

Figure C.6. Mantel Test place points.

Appendix D: IRB Approval

University of Idaho
Office of Research Assurances Institutional Review Board
875 Perimeter Drive, MS 3010, Moscow ID 83844-3010
Phone: 208-885-6162
Fax: 208-885-5752

To: Leontina Hormel

Cc: Rebecca Witinok-Huber

From: Jennifer Walker, IRB Coordinator

Approval Date: October 09, 2017

Title: Gender specific extension service needs for smallholder farmers: A Liberian case study

Project: 17-205

Certified: Certified as exempt under category 2,4 at 45 CFR 46.101(b)(2,4).

On behalf of the Institutional Review Board at the University of Idaho, I am pleased to inform you that the protocol for the research project “Science and environmental management in a changing climate-- salmon habitat restoration in the Columbia River Basin” has been certified as exempt under the category and reference number listed above.

This certification is valid only for the study protocol as it was submitted. Studies certified as Exempt are not subject to continuing review and this certification does not expire. However, if changes are made to the study protocol, you must submit the changes through VERAS for review before implementing the changes. Amendments may include but are not limited to, changes in study population, study personnel, study instruments, consent documents, recruitment materials, sites of research, etc. If you have any additional questions, please contact me through the VERAS messaging system by clicking the ‘Reply’ button.

As Principal Investigator, you are responsible for ensuring compliance with all applicable FERPA regulations, University of Idaho policies, state and federal regulations. Every effort should be made to ensure that the project is conducted in a manner consistent with the three fundamental principles identified in the Belmont Report: respect for persons; beneficence; and justice. The Principal Investigator is responsible for ensuring that all study personnel have completed the online human subjects training requirement.

You are required to timely notify the IRB if any unanticipated or adverse events occur during the study, if you experience and increased risk to the participants, or if you have participants withdraw or register complaints about the study.

Appendix E: Participatory Mapping Workshop

Workshop agenda

Community Smallholder Farmer Research – Lofa, Nimba, and Bong, Liberia

CAC/DAO Meeting – December 13-14, 2017

Wednesday, December 13th

Evening Session: (3:30-5pm)

I. Welcome/Introductions/Logistics (30minutes)
II. Activity 1: Community selection (60 minutes)
    a. Criteria

Thursday, December 14th

Morning Session: (10am-12:30pm)

I. Activity 1: Community selection (Continued) (60 minutes)
    1. Group selection and mapping
II. Debrief and turn-in community names, map, answers to questions, and suggested route for team to take. Questions and suggestions. (30minutes)
III. Activity 2: Individual participant selection (12M/12F) (60minutes)
    1. Criteria and recommendations for added criteria.
    2. Individual activity (participant selection, question responses)
    3. Collect participant lists and answer any questions during lunch.

IV. Break (12:30-1:30pm)

Afternoon Session: (1:30-3pm)

V. Community logistics (60 minutes)
    1. Pre-interview
    2. Day of -- Logistics
        a. Introduction to community head (elder or political leader)
        b. Community introduction
        c. Central location
        d. Participant time slots
        e. Accommodation
        f. Project resources
    3. DAO support requests and research resources

VI. Questions and closing remarks (30 minutes)

Community selection process

Directions for Activity 1: Community Selection

Selection Criteria

__ You have worked in this community and feel good about the work you've done.

_ There are women and men farmers in this community.

_ Farmers in this community are diverse ages. (18 to …)

_ Farmers in this community have different income levels or livelihoods and have different farm sizes (in acres).

_ Farmers are engaged in a number of agricultural activities (i.e. crops, livestock and fishery etc.)

_ You would feel comfortable having this community host my team.

_ You would like to know how to better serve this community.

_ This community may have CBOs, FBOs or other farming groups.

Community mapping process

DAO mapping Activity

This will be a group activity that all of the DAOs in your county work together to complete. Please use the large sheet of paper provided to create a visual representation of your county that includes:

1. Within the blue boundary of your county, please place a **RED star** on the approximate **locations of the communities that you have each selected**. They don't need to be perfect.
2. Write the **community names in BLACK** letters next to each star.
3. Just below each community name, write the **name of the DAO** that serves that community in **GREEN** letters**.**
4. You will need to discuss this task with the DAOs that work in districts that border your own. Please provide an estimate of how long it takes to travel, by car, between the communities that are on either side of the one you have each selected. On the **left edge** of the map, in **BLUE**, write the **names of all communities** you have selected and already placed on your map. Please start with the northern most community at the top and list the names in the order that they are geographically situated on a map.
5. Next to each blue community name, in **RED**, write the **time (in hours) it takes by VEHICLE** to get to the community directly north or the one you selected.

Community visit and prior sensitization

Community logistics and team needs during our time in your community

_ Central interview location

_ Overnight accommodation and meals for 5 people (students have per-diem)

_ When are people available for interview time blocks (morning, afternoon, evening)? Please provide specific times, for example 8-12, 12-3, 5-8 etc.

_ We would like to interview one community in each county on a Sunday, is this appropriate and what barrier may we face?

☐ Prior to our arrival, we need you to help us establish community interest and buy-in.

☐ Prior to our arrival, we need you to help us communicate with and gain support from a local leader and/or elder.

☐ Prior to our arrival, we need the CACs to help us communicate with and seek a letter or approval from the county superintendent.

Requested DAO support for community visits:

☐ DAOs should create awareness in the community that we will be coming, when, and for what purpose. Only basic information should be provided. It's important for the research, and the ability of the information to best support you all, that the community doesn't try to prepare for the surveys. Say something like, "this community has been selected as part of a collaborative study between Cuttington University and a University in the USA for community research with smallholder farmers to better understand their extension needs and the challenges they face. Your participation in this study will help the MOA provide more relevant agriculture information based on your needs and challenges. The regional CACs and the MOA, DAO, and I will not see your responses and the research team will not record your name or any other information to identify you."

☐ Create a list of what time participants will come to be interviewed. The list should include participant names, contacts, and time of scheduled interview. We can set up time slots that best suit the participant's schedules.

☐ We would like the DAOs to introduce the research team to the community elder/leader when we arrive.

☐ We would like the community leader/elder and DAO to do a community introduction when we arrive.

☐ We expect that the DAOs will be in the community with us for the entire workday. This is important for three specific reasons: 1) You all know these communities best and we want this project to serve you and your community 2) Each DAO and community leader(s) will provide initial community introductions to help build trust, support, security, and buy-in on the day of fieldwork 3) Finally, this project does not have the resources to pay DAOs for their time in the field during this project. We are working with the MOA and humbly request your presence for the day(s) we are in your district. DAOs don't need to spend the entire day in the central location where interviews are taking place, but in the community would be very much appreciated.

Appendix F: Enumerator Training Materials

Students selection process: RFP for Cuttington University enumerators

Identifying Barriers to Best Practice Adoption of Agricultural Extension and Advisory Services among Liberian Smallholder Farming Communities: A Gendered Approach

Project Description

This project intends to collect data around best practice adoption within agricultural communities that receive Ministry of Agriculture (MOA) extension services (ES), disaggregated across gender, age, and socio-economic status. The MOA and Cuttington University (CU) intend to use this data to assess the barriers to best practice adoption and access, to inform strategies for making extension services more gender equitable, and to guide the next phase of research regarding agricultural extension to rural smallholder farmers.

We are seeking four to sixteen Cuttington University senior students to assist in the data collection within rural farming communities. Applicants must be in good standing with the University and their respective Departments and committed to collaborative teamwork in the fulfillment of their duties. All students who are selected to participate in this project will have all of their travel, lodging, and meal expenses paid for by the research project.

At the completion of student involvement with this project, participating students will be required to create a presentation to demonstrate what they learned throughout the project. Requirements for CASD students will also include using their participation in this project to help develop their senior thesis.

Student Enumerator Duties

The selected student researchers will assist the project by performing the following duties:

- Participate in a 10-day pre-research training, in December, prior to fieldwork.
- Be active and engaged in the research process.
- Travel to agricultural communities as part of the research team.
- Administer surveys to community members in the area of agricultural extension activities and gender, using tablets.
- Organize and analyze data with guidance from principal investigator.

Requirements to Apply

- Must be a senior student from the College of Agriculture and Sustainable Development or the Sociology Department.
- Minimum 3.0 GPA.

Personal Information

Name: _____.

Email: _____.

Phone Number(s): _____.

Major: _____.

Minor: _____.

Cumulative Credits: _____.

Local languages spoken: _____.

Research interests: _____
_____
_____
_____.

Additional Information

Please attach a copy of the following to your application:

- Your latest course guide
- Your last grade sheet
- A copy of chapters 1 through 3 from your research paper

Please answer BOTH of the following questions using 150-200 words for EACH QUESTION:

1) State the reason you would like to participate in this research?

2) Tell us about a time you met challenges in your academic work and how you overcame them?

Student selection process: Interview questions

Integrating Gender and Nutrition into Agricultural Extension Systems (INGENAES)

Research Assistant Interview Questions/Responses– Liberia 2017

November 27, 2017

Evaluators:
Time:
Applicant:
Code:

Questions:

1) Please tell us about your skills in qualitative social science research including any field-based research experience that may set you apart from your peers?
2) Please describe any experience you have using tablets, computers, and/or smartphones.
3) We read your research project submission chapters 1-3. In your own words, please describe your research project objectives, methodology, and its broader significance. (What are the Key things you are interested in and doing when you are carrying out this work as a social researcher?)
4) With the remaining number of credits you have to complete your degree, how are you going to manage your time between this project that includes training and fieldwork to be carried out between December 27th through February 27th, and your remaining school requirements? Additionally, please tell us if the courses you remaining are in CASD or another college?
5) Please tell us about a time you worked as part of a team. What are your strengths and weakness when doing teamwork?
6) How will this project assist you in accomplishing your final senior thesis?

Do you have any questions for us?

Student training course: Syllabus

INGENAES Community Research

Course Syllabus: CU Student Enumerator Training and Pilot Studies

December 27-February 10, 2017

INGENAES Team Contacts: Rebecca Witinok-Huber and Caroline Nyaplue-Deawhea

Week One: December 27-30, 2017			
	Breakfast	**8-8:45 AM**	
	Morning Session	**9-12 PM**	
	Lunch	**12-1 PM**	
	Afternoon Session	**1-4 PM**	
Training Day	**Objectives**	**Activities**	**Outcomes**
Wednesday December 27th: personal introductions, describe project, expectations, social science lecture	Ice Breaker, personal intros, and project introduction	Name game using a ball. Pair up and introduce your partner. Describe project and the fact that we can only bring 4 students into the field.	Get to know each other and project
	What is science? What is research?	Mini-lecture on science, social science research, and qual/quant methodologies.	Social science research and how it applies to this project.
	Cultural awareness/sensitivity	Group activity with Caroline about cultural considerations while in the field.	Understanding of cultural considerations while in the field
	Ground Rules	Collectively develop a team list of expectation and rules of respect and conductivity (e.g. don't talk when others are, raise your had, what does on time mean, turn off cell phone during training, no question is bad, etc..)	Record and post team "ground rules" to abide by for the next 2-weeks
Thursday December 28th: Assumptions, beliefs, values. Learning how to become aware and drop them at the door. Active listening and power-over vs. power-with.	Assumptions and personal beliefs	Group drawing activity (Cristina Manfre suggestion)	Drop your assumptions at the door
	Active Listening	Listening activity. Partner up and tell the story of you NAME.	Critical thinking, active listening, probing questions
	Power (over and with)	Discussing the role of power from the previous day and in the world of academics and research. Address our role as objective researcher's. In addition to the value and validity of community/non-academic knowledge. How can we truly understand the if we don't actively listen because we are so biased and clouded by our own assumptions and beliefs?	As researcher's, our opinions don't matter. How to record to our best ability the responses/reality of the participant.

Friday December 29th: Teamwork, sample selection and methodology. Group grant writing.	Learn about sample selection methodology and how we used it in this project.	Mini-lecture on (CI, CL, MoE, Sampling, coverage, measurement, and non-response error; interviewer and between-interviewer bias).	Understand our sample selection process and why. Begin to know how to select samples from parent or total population. Navigate differences between qualitative and quantitative methodology and sample selection.
	Carry out rapid group grant proposal writing and presentation	Group grant writing activity.	Gain experience with teamwork and rapid proposal writing. Be able to support and present ideas.
	Learn about survey errors and bias, and ways to overcome them.	Mini-lecture and discussion.	Understand survey errors and interviewer bias. Know how to overcome them and why it matters.
Saturday December 30th: Instrument familiarization with peers. Tablet introduction.	Introduce paper survey through online preview in SurveyCTO.	Project and go over entire survey as a group.	Survey familiarization. Gain group feedback on survey language etc..
	Tablet and SurveyCTO introduction.	Introduce SurveyCTO and tablets. Go over basics and get some hands on	Begin to get comfortable with tablet, SurveyCTO intro.
December 31st - January 1st	**HAPPY NEW YEAR see you on Tuesday January 2nd at 9am**		
Week 2: January 2-6, 2018			
	Objectives	**Activities**	**Outcomes**
Tuesday January 2nd: Instrument familiarization. SurveyCTO and Tablet practice.	SurveyCTO experience	In-pairs: interview each other using tablets. Practice, practice, practice	Be critical of survey, how to ask questions, what people are
	Go over 1 peer-test exercise for everyone.	Reflect in pairs and then as a group. Will do little presentations on key takeaways and feedback.	Comfort with instrument, and interviewing non-classmates.
	Register for an account and navigate SurveyCTO setup and builder.	Register for an account and maneuver around in SurveyCT.	Understanding of how to use this tool post project.
Wednesday January 3rd: Instrument practice	More SurveyCTO familiarization. Interview other faculty, staff, friends.	In-pairs: interview non-trainees with tablets. At least 1 interview per person.	Familiarity with our survey and administering the survey. Get feedback, be critical of survey, how to ask questions, what people are responding. Observe and take notes.
	Adapt survey and process	Student questions, feedback, confusion.	Survey improvement. Increased student familiarity and confidence.
	Discuss what students need tomorrow in order to feel fully prepared for Friday.	Make a list of needs and questions.	Expectations for last-day prior to pilot.
Thursday January 4th: SurveyCTO instrument practice and Pilot #1 prep	Reflect on Survey practice and clear-up any questions on community farmer administration.	Discuss key takeaways and feedback.	Comfort with instrument, and interviewing non-classmates.
	Pilot #1 Prep	Discussion, timeline, lists (supplies), expectations	Ready for tomorrow, timetable and supplies needed
	Partner up	Determine who you will work with in the field for Pilot #1 and who will survey first and who will take notes firs.	Clarity and organization.
Friday January 5th: Pilot #1 in Bong County	**Community Pilot #1**: This is an opportunity for students to get hands on experience in the field. And for the team to get survey and process feedback. Students will pair up and one person with interview and the other will observe and take notes. Then vice versa.		

Saturday January 6th: Pilot #1 reflection, discuss entire training and next steps.	De-brief, reflection, feedback on Pilot #1.	Get student feedback to adapt survey and protocol. Hear student experiences, the good the bad, what to improve upon.	Spend the morning and early afternoon going over feedback from the students and evaluating possible confusion for them and participants. How and where should we adjust the survey and the protocol?
	Celebration	Provide certificates for everyone that competed the training!	Have fun and celebrate hard work and learning.
	Reflect on the entire course so far and what students learned, how they can use it in their futures, and answer any burning questions. Let 4 people (either here or with a phone call in the evening)	Do a reflection exercise. Short tablet survey, should do the same one first day of class too. Compare for learning. Tell students that we will call everyone that evening to tell the final 4 who should be prepared to come to the pilot on Monday. Request that the 4 people not selected be prepared if we need their support in the field. (Jan 22-Feb 22)	Everyone leaves happy and clear on their roles. Everyone has learned new skills and had positive experiences. I have a pre-post survey through SurveyCTO.
Sunday January 7th	OFF		
Monday January 8th: Pilot #2 in Bong County	**Community Pilot #2:** This will only be done with the final 4 students and provide another opportunity for the students to test out the survey process, familiarize themselves with fieldwork and the tablet. Provide feedback and questions. This will help to solidify the survey/interview final draft and fieldwork protocol.		
Tuesday January 9th: pilot reflection, feedback,	De-brief, reflection, feedback	Get feedback to adapt survey and protocol. Hear students experiences, the good the bad. How they can learn from the experience and do better the next time around. Help students process through experiences.	Spend the morning and early afternoon going over feedback from the students and evaluating possible confusion for them and participants. How and where should we adjust the survey and the protocol?
	Reflection: On training and how this will help us in the field. What we need to remember and think about. How their learning will be applied.	Come up with questions, concerns, reflection	Apply classroom and pilot work to fieldwork
	Start to prepare for fieldwork with dialogue and familiarity.	Discuss experience in the bush. What to expect, flexibility, and patience. Discuss student fears, needs, expectations. Di treat each other, community, etc..	Plan of attack.
Wednesday January 10th: preparation for fieldwork January 22-February 22nd and data analysis February 26-March 7.	Continue from tomorrow. Overview	Fill out prescription and medication list. Packing list (food, clothing, notepad, pens, sheet/pillow etc..) For entire time with focus on Loaf.	Individual and group packing lists, medication sheets filled out by each student (allergies, current prescriptions, need to bring), plan to have what they need with them.
	Talk about Lofa County culture, ethnic groups, language, field work and potential issues that may arise in the field.	Role play and dialogue. Halala and DAO comments.	Flexibility, Lofa background (from students and maybe Halala?)
	Go over expectations (work, no being on cell phones, no illegal behavior, team effort etc..)	Conversation	Know expectations and have a plan of attack

Figure G.1 Syllabus: Cuttington University community research student training course

Student Training Course: Student centered outcomes

CU-CASD campus December 27th through January 6th

Day #1 (Dec 27th)
Trainer Objectives

1. Facilitate an ice breaker/introductions activity (60)
2. Explain the purpose of the research study: student value, final selection process, certificate for full participation and training completion (30)
3. Develop team ground rules (30)
4. Deliver a mini-lecture on: What is science? Looking at knowledge and truth through the lens of scientific research (30)
5. Deliver a mini-lecture on the types of research: qualitative, quantitative, and mixed-methods (30)
6. Facilitate an activity to promote cultural awareness/sensitivity (60)
7. Facilitate a re-cap of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (60)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. Describe, in 25 words or less, the basic intent of the INGENAES-sponsored research study: "*Identifying the Extension/Adoption Gap for Liberian Smallholder Farmers - A Gender Approach*.
2. List the rules and expectations for conducting the study and for respecting all team members.
3. Define the following scientific terms: ontology, epistemology, axiology, and methodology.
4. Explain the differences and similarities among qualitative, quantitative, and mixed-methods research approaches.
5. Identify three cultural norms that influence and shape our perceptions and behaviors.

Day #2 (Dec 28th)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions. (30)
2. Deliver mini-lecture on the qualitative researcher's role. Tie in active listening, power, assumptions, objectivity/subjectivity, and the value of local knowledge. (30)
3. Facilitate group-drawing activity "What you see is what you get" (activity described below) to address assumptions and personal beliefs. Subjectivity versus objectivity. (60)
4. Facilitate active listening activity. Tell the story of your name (where it comes from, why your parents gave it to you, etc.) (45)
5. Facilitate power activity. (60)
6. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (30)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. Describe, in 25-words or less, your role in this research project.
2. List what you want to get out of this experience.
3. Define the following terms: subjectivity, objectivity, local knowledge, active listening (listener to fully concentrate, understand, respond and remember what is being said).

4. Explain how the presentation (the way someone carries themselves) and assumed power of a researcher may influence participant responses.
5. Identify three key responsibilities of a social science researcher administering surveys or interviews in rural communities.

Activity: ***What you see is what you get?***

- Get into groups of 3-4 people and select one person to be the Artist.
- The Artist will be facing away from the screen/picture, the rest of the group or the see-ers will face the picture.
- Each group will be asked to draw one of two images following these rules:

  Rule 1. The Artist is only allowed to draw and is not allowed to speak.

  Rule 2. The Artist cannot turn around to look at the screen/picture.

  Rule 3. The rest of the group cannot look at what the Artist is drawing.
- The groups have 5 minutes to describe and draw what they see.
- After 5 minutes we will have a class discussion.

Day #3 (Dec 29th)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions.30
2. Deliver mini-lecture on sample selection, basic statistics, survey error, interviewer bias, and ways to overcome them (May only focus on 3). (CI, CL, MoE, Sampling, coverage, measurement, and non-response error; interviewer and between-interviewer bias). (45) (Becky) (Completed but need to work on)
3. Facilitate a hands-on activity related to sampling methods at CU. (60) (till lunch)
4. *Team building portrait drawing activity (30): (Not completed)*
   - *In-pairs, each person takes a piece of paper and a writing utensil*
   - *One at a time look at the other person and draw their portrait.*
   - *The artist must draw <u>without</u> looking down at their paper and <u>without</u> lifting the utensil.*

5. Explain and discuss survey as a group. If time, facilitate practice with peers. (120) (Moved to Dec. 30th)
6. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (30)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. List 5 ways to overcome errors and bias during survey development and data collection.
2. Define three types of survey errors or biases, our sample selection methods (purposive, proportional, convenience), interviewer and between-interviewer bias.
3. Illustrate, in 25 words or less, our sample selection process, size, and reasoning behind it.
4. Apply sampling methodology, as a team, to a real world example.
5. Demonstrate critical thinking skills.

Day #4 (Dec 30th)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions.
2. Explain and discuss survey as a group using projected SurveyCTO preview. (180)
3. Develop a list of survey adaptations to make based on student feedback.
4. Discuss the benefits and cons of mobile data collection.
5. Explain how to use tablets/SurveyCTO.
6. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions.

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. Describe when it's necessary to probe further or re-explain a question in order to address respondent uncertainty, questions, or challenges. Describe, briefly, how to probe and navigate such challenges when you are in the field.
2. List 3 benefits of using mobile data collection over paper surveys.
3. Explain how to navigate to the "Liberia Team" folder on a tablet, open SCTO, and pull up a form to fill out.
4. Discuss the importance of pre-testing and getting local and cultural survey feedback prior to research data collection.

Day #5 (January 2nd)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions.
2. Practice survey administration through peer interviews using SurveyCTO on tablets (120).
3. Discuss practice and reflect on challenges. Provide feedback. (60)
4. Learn how to set up a SurveyCTO community account (free). (60)
5. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (30)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. Describe challenges to administering a survey using a tablet.
2. List 3 things you would like to have changed on the survey or in the administration protocol.
3. Explain how to navigate to the "Liberia Team" folder on a tablet, open SurveyCTO, pull up a form to fill out, and how to save your work.
4. Discuss how to provide team-lead(s) with appropriate and constructive feedback on survey or survey administration challenges.

Day #6 (January 3rd)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions.
2. Practice survey administration through non-peer interviews using SurveyCTO on tablets (120).
3. Discuss practice and reflect on challenges. Provide feedback. (60)
4. Determine student and team needs for last day prior to Pilot #1. (60)
5. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (30)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. Describe survey administration challenge with non-peers.
2. List 3 ways to overcome in-the-field survey administration challenges.
3. As a group, breakdown the best ways to probe and explain questions further while in the field.
4. Explore ways to provide critical feedback required to learn and evolve process while in the field.

Day #7 (January 4th)

Trainer Objectives

1. Facilitate a re-cap discussion on yesterday and answer any burning questions. (60)
2. Prepare for Pilot #1. Discuss expectations, timeline, list of supplies. (120)
3. Facilitate a re-cap discussion of the day's objectives and outcomes. Include daily reflection activity where students record and hand-in, 1-3 takeaways and 1-3 questions. (30)

Student-Centered Outcomes – At the end of today's session, the students will be able to:

1. List everything you are required to bring tomorrow, where we are going, and what time you need to be at the CU cafeteria in the morning.
2. Explain your role in this research.
3. Discuss what to do in the field if you have any issues or questions.
4. Express your partner and the order of who will survey and note take first.

Day #8 (January 5th): Pilot #1 in Deansville with DAO Marshall Moses.

Day #9 (January 6th): Pilot feedback and student certificate ceremony.

Student Training Pre/post-test: December 27, 2017 (pre)

1. What is science? A. it can be physically or empirically based B. inter-disciplinary and collaborative C. include education and science communication D. traditional and indigenous E. all of the above g. A, C, & D
2. What methodologies can be used in social science research? A. Qualitative B. Quantitative C. Mixed-methods D. All of the above
3. Qualitative research is considered exploratory research that helps to gain a better understanding of people and their experiences. A. True B. False
4. Qualitative research has how many basic steps. A.6 B.5 C.10 D.11
5. Ontology is a philosophical study of the nature of being, of reality, of belief systems through social constructs. A. True B. False
6. It is important to be subjective in qualitative research. A. True B. False

7. Can the biases and assumptions of the researchers influence data findings/results? A. Agree B. Disagree
   - Please back your response with an argument if you agree or disagree.
8. What is the difference between sex and gender? Please explain in short.
9. The three ways to overcome data errors or interviewer biases. A. Practice, pilot test, active listening, use close-ended questions B. Practice, use open-ended questions, teamwork C. Participants opinion doesn't matter, Practice, closed-ended questions D. Only active listening
10. Methods of survey administration, subjective language, distracted interviewer, trust, power, culture/language, gender. A. Can cause sampling error B. Can cause interviewer bias C. Can cause coverage error
11. We will be using mobile data collection through SurveyCTO software for this project? A. True B. False
12. INGENAES stands for?

Appendix G: Fieldwork

Fieldwork: Daily evaluation form for enumerators

Enumerator name _____.

Date _____.

County name _____.

Community name _____.

Research day in this County (Bong 1-7; Nimba 1-11; Lofa 1-6) _____.

Was a focus group carried out today? Yes No

- Were women and men (divided or together or I don't know)? Circle one.
- If yes, by who? _____.
- If no, why not? _____.

Number of participants YOU interviewed today:

Women _____.

Men _____.

Total _____.

Number of participant refusals (the number of people that didn't want to take the survey or didn't complete the entire survey today) _____.

Number of question refusals (number of times someone refused to respond to a survey question today) _____.

Average length of time it took you to complete a full survey today _____ (minutes).

How was the participant selection carried out? Please be specific.
How many Men were involved? _____. How many Women were involved? _____. What was the process?

Comments, questions, and concerns about the day? Please respond below.

Fieldwork: Participation consent form

INGENAES Community Research Consent Form
Cuttington University contact: 077 654 4002

Thank you for the opportunity to speak with you about agriculture extension and advisory services today. I'm a fourth year Cuttington University student working on a community research project that's funded by USAID. It is a partnership between the Ministry of Agriculture Republic of Liberia (MOA-RL), Cuttington University, and the INGENAES project that is supported by several Universities in the United States.

During this project our team will be completing surveys and focus groups with smallholder farmers like you in Bong, Nimba, and Lofa counties. I will be asking you questions about the agriculture extension and advisory services that you currently get or that you would like to, what types of products your household produces and who works on different activities related to each product, and your access to technology, credit, and other resources. I will also ask you about the best time and methods for the MOA-RL District Agriculture Officers (DAOs) to use, to get you the agriculture information you need.

Please be aware that I will NOT record your name, contact, or any other personal information, and that your responses will be combined with nearly 380 other farmers. No one but our research team will have access to this data, and it will be stored very securely. The DAO you currently work with, CACs, the MOA-RL or any of the local or international NGOs providing agricultural services will NOT know what you say today. Also, know that there are no right or wrong answers, we are trying to better understand your experiences and needs.

This survey and interview will take about 60-90 minutes of your time. Your participation is entirely voluntary. Do you have any questions about the study or what I have said?

If questions or concerns about this survey or the study come up in the future, you are welcome to contact Cuttington University 077 654 4002. We will leave a copy of this form with your DAO so that you have our contact information.

Fieldwork: Example of daily schedule

7:30-8:30AM meet for breakfast

9AM Leave for community

By 10AM Community introduction (By DAO and community leader)

a. Prayers and introductions
b. Survey selection
c. Focus groups being (sex/gender disaggregated)
d. Students find quiet space to conduct interviews and commence

10:30-12:30PM (Interviews)

12:30-1:30PM Lunch (Community and research team)

1:30-3:30PM (Interviews)

4-5PM Community farmer focus group and closing remarks

Travel home and do group de-brief

Prepare DAOs

1) We'll be in the community for most of the day (food?) Prepare for a long day
2) Let the community know that of all of the farmers that come only 16 (8M/8F) will be selected for survey participation, but we'll also do a large focus group (beginning or after?)
3) We'll do a random selection on the day or and don't want anyone to get upset.
4) Introduction by DAO and community leader/elder.
5) DAOs shouldn't be around the survey/interview space (potentially uncomfortable for farmers and may create bias), but around in the community or a short distance for support.

TO DO:

Get journals and writing utensils for each student

Caroline's tasks:

- Group introduction
- Survey participants (if needed)
- Help facilitate focus group
- Take notes

Student tasks:

- Survey participants
- Take quick notes after each interview
- At the end of each
- Reflect

My tasks:

- Take copious methodological notes (how did the protocols change and stay the same, what happened, why, what is my reasoning)
- (Field journal): Everything, non-scientific, observations, feeling, etc. (Should I combine methodological notes and basic observations/feelings etc.?) Lessons learned
- Observe
- Facilitate

Fieldwork: ORID team reflection

An ORID Reflection

What – happened? **(Objective Questions)**

- *What one image or interaction during data collection is most memorable?*

Gut – how do you feel about what happened? **(Reflective Questions)**

- *What was a high point for you during data collection?*
- *What was most difficult or challenging for you during data collection?*

So What – difference does this make? **(Interpretive Questions)**

- *What came through to you as very important when you were in the field collecting data?*
- *What did you learn about your own feelings and abilities as a researcher/data collector?*

Now What – do we do? **(Decisional Questions)**

- *What will you do differently in your educational pursuits because of participating in this research project?*
- *What is a first step you can take in applying what you learned in the field during data collection?*

Appendix H: Community Deliverable of Preliminary Results

Integrating Gender and Nutrition within Agricultural Extension Services

Project Objectives

1. **Collect data** on the current Ministry of Agriculture (MOA) Extension and Advisory Services (AEAS) provided in Bong, Nimba, and Lofa Counties.
2. **Identify farmer challenges to accessing AEAS** provided by District Agriculture Officers (DAO), and adoption of new practices and technology.
3. **Identify agricultural challenges that women face**, such as: access to resources, gender responsibilities and beliefs about women's roles, and household decision-making power.
4. **Provide recommendations** to improve the efficacy of MOA administered AEAS to smallholder farmers with emphasis on gender-equitable approaches.

What's Next: **MOA utilization** of project results and **community voices** to **improve** the **AEAS** provided.

We are grateful for your time!

MOA field staff (CACs and DAOs), Cuttington University, and research team: Caroline Nyaplue-Daywhea, Rebecca Witinok-Huber, and students.

Nimba produce

"If you give someone a fish, you feed them for a day. If you teach someone to fish, you feed them for a lifetime."

Additional Agricultural Information & Contacts

County Agriculture Coordinators
(Bong) Roland Varkpeh 0770279009
(Nimba) N. Samuel Kehleay 088648192 7/0776143458
(Lofa) Halala W. Kokulo 0886556858/0776282026
CARI
MOA
Cuttington University 088/0776544002
INGENAES Library *ingenaes.illinois.edu/library*

Liberian Smallholder Farmer Community Research Project

To understand the challenges, responsibilities, and needs of smallholder farmers. Results from a collaborative approach towards gender equitable Liberian extension services.

Community cassava farming, Lofa

CUTTINGTON UNIVERSITY · SANCTE ET SAPIENTE · FEBRUARY 22, 1999

MINISTRY OF AGRICULTURE · LIBERIA · Integrity – Service – Inclusion

INGENAES
Integrating Gender and Nutrition within Agricultural Extension Services

Project Highlights

Farmers that Participated

600 individuals participated in focus groups.

352 surveys: 176 women and 176 men

3 Counties: Bong, Nimba and Lofa

23 communities

Focus Group Quotes

"An empty bag cannot stand."

"The woman can make money to carry home, you yourself (the man) can make money to carry out of the home."

"No man is bad under the sun, but man makes a man to be bad."

More Survey Results

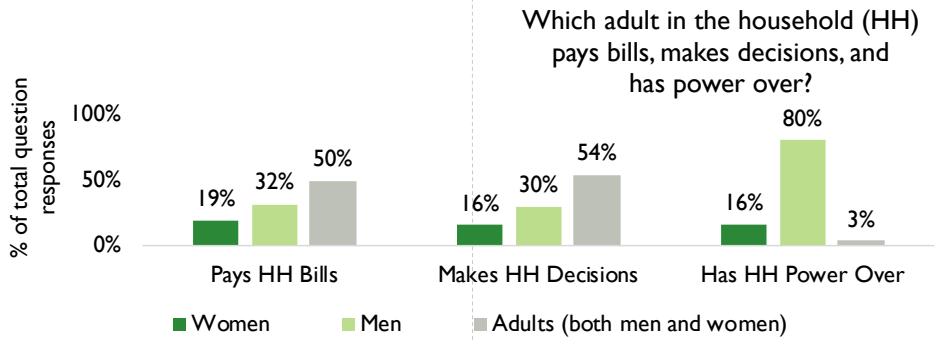
90% of the total 352 farmers surveyed said that **women are capable of and should be DAOs**

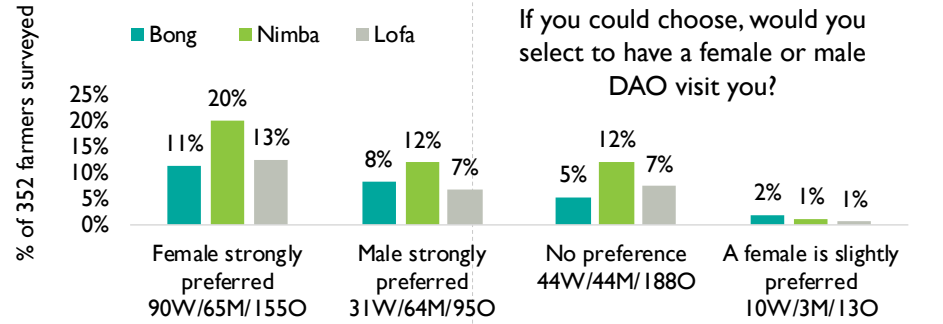
80% of respondents identified the **head of the household as male**

77% of farmers are **involved in FBOs**

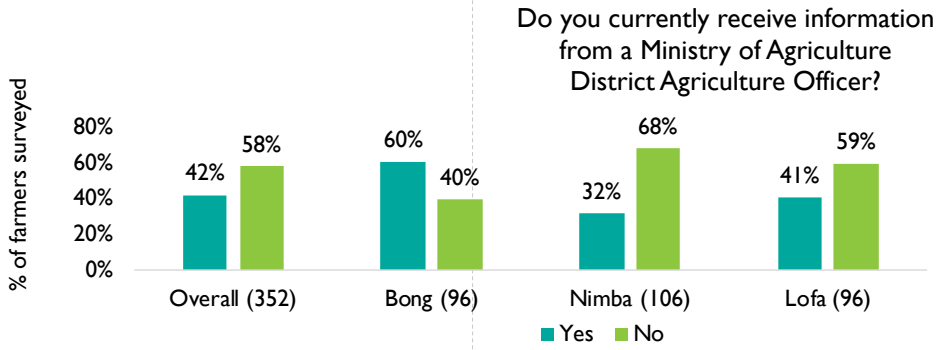
60% of women and **56% of men** said they **do not currently (within past 3 years) receive information/resources** from a DAO

The **main agricultural resource challenges** for **women** are a lack of (1) tools, (2) chemicals, and (3) money. For **men** a lack of (1) money, (2) credit and loan access, and (3) tools





Numbers above: frequency of survey responses for Women (W), Men (M), and Overall (O) to each option



Appendix I: Liberia Smallholder Farmer Research Project Findings and Summary Report

In June 2018 this report was developed and shared with in-country partners that include the Liberian Ministry of Agriculture's Department of Regional Development, Research and Extension (DRDRE), Cuttington University, and USAID-INGENAES. It presents preliminary findings and discusses the research process. It also provides lessons learned and recommendations for future international research collaboration, and recommendations to DRDRE for extension service practices in relation to gender and county. The full report is available as a supplementary file.

Appendix J: Survey and Focus Group Instruments

Both the survey and focus group instruments were developed in partnership with in-country collaborators, through pre-testing and discussions with Cuttington University students and local community members, and during a pilot study. SurveyCTO software and Samsung Galaxy tablets were used to develop and conduct the survey and focus groups in each community. The SurveyCTO output presents the survey and focus group instruments that were used in the study.

Survey Instrument

Field	Question	Answer
Location	1.Location *GPS coordinates can only be collected when outside.*	
Enumerator_code *(required)*	2.Enumerator research code as (Letter; #; Letter; #). The first letter is either B for Bong, N for Nimba or L for Lofa; the first number is DAY we are in the specific county so 1-7 for Bong, 1-11 for Nimba, 1-6 for Lofa, the second letter is your first initial [redacted] the second number is number for the amount of participants you have interviewed for the day so 1-4.	
Enumerator_code_verify	3.You entered [Enumerator_code] as the enumerator code. (Letter; #; Letter; #) *If not correct, swipe back and correct.*	
Date *(required)*	4.Date	
County *(required)*	5.County Name	1 Lofa 2 Bong 3 Nimba
Community *(required)*	6.Community Name	[redacted]
Community_other	7.Other please specify *Question relevant when: selected(${Community} , '99')*	
consent *(required)*	9.Enumerator: Thank you for the opportunity to speak with you about agriculture extension and advisory services today. I'm a fourth year Cuttington University student working on a community research project that's funded by USAID. During this project our team will be completing surveys with smallholder farmers like you in Bong, Nimba, and Lofa counties. I will be asking you questions about the extension services that you currently get or that you would like to, what types of products your household produces and who works on different activities related to each product, your access to technology, credit, and other resources. I will also ask you about the best time and methods for the Ministry of Agriculture District Agriculture Officers to use to get you the agriculture information you need. Please be aware that I will NOT record your name, contact, or any other personal information, and that your responses will be combined with nearly 380 other farmers. No one but our research team will have access to this data and it will be stored very securely. The DAO you currently work with, CACs, the MOA or any of the local or international NGOs providing agricultural services will NOT know what you say today. Also, know that there are no right or wrong answers, we are trying to better understand your experiences and needs. This survey and interview will take about 60-90 minutes of your time. Your participation is entirely voluntary. Do you have any questions about the study or what I have said? If questions or concerns about this survey or the study come up in the future, you are welcome to contact Cuttington University [redacted]. We will leave a copy of this form with your DAO so that you have our contact information.	1 Yes 2 No

Field	Question	Answer
	Do you voluntarily accept to participate in this survey? If yes, I thank you for your participation and we will get started.	
Questions *Group relevant when: selected(${consent} , '1')*		
Questions > Introduction and Household Information		
hh_members *(required)*	10.How many people live in your household? Please include children and adults that live in your home and share resources.	
hh_adults *(required)*	11.Of the people in your household, how many are adults? For this survey we define adults as people over the age of 18. *Response constrained to: . < ${hh_members} or . = ${hh_members}*	
hh_farmers *(required)*	12.Of the people in your household, how many are farmers? Please count adults or children. *Response constrained to: . < ${hh_members} or . = ${hh_members}*	
hh_head_sex *(required)*	13.Is the head of your household a male or female?	1 Male 2 Female
Enumerator_2	14.Enumerator: We would like to learn more about your farm, what you produce, who owns the land you farm, and what your agriculture needs are. Let us get started.	
Questions > Section 2: Landownership and Production		
landtenure *(required)*	15.From the list provided, please tell me who owns the land you farm?	1 You do 2 Your family 3 You rent the land 4 You share crop (you don't pay cash for the land, you give some of your crop to the landowner or pay in another way) 5 You use community or Tribal lands and farm with other community members 99 Other 77 don't know 88 no response
landtenure_other *(required)*	16.Other please specify *Question relevant when: selected(${landtenure} , '99')*	

Field	Question	Answer
landtenure_size *(required)*	17.How much land do you farm? (Enumerator: please specify the amount with a unit such as acres or hectares).	
landtenure_uplow *(required)*	18.Do you practice upland or lowland farming?	1 Upland farming 2 Lowland farming 3 Both upland and lowland farming 77 don't know 88 no response
landuse *(required)*	19.Broadly, what type of agriculture production are you involved with? Please select all that apply.	1 You grow crops only to sell. 2 You grow crops just to feed you and your family, but do NOT sell any. 3 You eat some of the crops you grow and sell some of the crops you grow. 77 don't know 88 no response
landuse_other *(required)*	20.Other, please specify *Question relevant when: selected(${landuse} , '99')*	
landtenure_women_yn *(required)*	21.In this family, are women allowed to own land?	1 Yes 0 No 77 don't know 88 no response
landtenure_women_purchase_yn *(required)*	22.In this family, are women allowed to purchase land?	1 Yes 0 No 77 don't know 88 no response
type_tools *(required)*	23.What kind of farming tools do you use?	1 Mechanized tools 2 Non-mechanized hand tools/traditional farming tools 3 Both mechanized and non-mechanized 77 don't know 88 no response
tools_hand *(required)*	24.Please specify the non-mechanized hand or traditional farming tools you use. (Enumerator: check everything they say that they use) *Question relevant when: not(selected(${type_tools} , '1'))*	1 Cutlass 2 Hoe 3 Rake 4 Digger 5 Grass slasher 6 Furrow opener 7 Mango harvester 10 Hand fork

Field	Question	Answer
		11 Wheelbarrow 12 Hand glove 13 Rain boots 14 Axe 99 Other 77 don't know 88 no response
tools_hand_other *(required)*	25.Please specify what other hand or traditional tools do you use? (Enumerator: check everything they say that they use) *Question relevant when: selected(${tools_hand} , '99')*	
tools_mechanized *(required)*	26.Please specify what mechanized tools you use. (Enumerator: check everything they say that they use) *Question relevant when: not(selected(${type_tools} , '2'))*	1 Tractor 2 Plow 3 Weeder 4 Harrow 5 Planter 6 Harvester 7 Thrasher 8 Broadcaster 9 Rotovator 10 Cultivator 11 Transplanter 12 Sickle 13 Mower 14 Sprayer 15 Farm truck 16 Wagon 99 Other 77 don't know 88 no response
tools_mechanized_other *(required)*	27.What other type of mechanized tools do you use? *Question relevant when: selected(${tools_mechanized} , '99')*	
Enumerator_3	28.Enumerator: In the next section, I will be asking you about the agriculture extension and advisory services that you get from the District Agriculture Officers (DAOs). This will include questions about how often the DAO comes to visit your farm/community and what information they share, how these visits impact your production, the sex of the agent, and how these visits could be more useful for you.	
DAO_yn *(required)*	8.Do you currently get information from a Ministry of Agriculture District Agriculture Officer (DAO)? (Enumerator: please confirm that the farmer you are surveying HAS RECEIVED services from the DAO)	1 Yes 2 No
Questions > Section 3: Ministry District Agriculture Officers *Group relevant when: selected(${DAO_yn} , '1')*		

Field	Question	Answer
DAO_equal_explain *(required)*	29.In short, please explain how the DAO spends his/her time while working in this community. Who does he/she work with, on what crops, and on what projects, and anything else you'd like to add about how the DAO spends his/her time here?	
DAO_benefits *(required)*	30.In short, please explain the overall benefits you get from DAO visits?	
DAO_method *(required)*	31.HOW do you get agricultre information? Please state all of the ways you get agriculture information, for example from your DAO or other people, through technology such as a cell phone, and/or trainings and woklshops, or community groups. (Enumerator: Please select all of the ways they get information and DO NOT suggest something they don't directly say.)	1 Head of Household 2 Family Member 3 Neighbor or friend 14 Village chief or elder 4 One-on-one with the DAO 5 Community group with DAO 6 Training/workshop with DAO 7 NGO or other outside organization 8 Cell/local phone (without a data plan) 9 Smart phone (cell phone with a data plan) 10 Radio 11 TV 12 Farmer based organization (FBO) 13 News paper 99 Other 77 don't know 88 no response
DAO_method_other *(required)*	32.You stated other, please specify HOW you get information from your DAO.	
DAO_services *(required)*	33.What agriculture information do you get from your DAO? Please tell me what information and resources the DAO provides you with.	
DAO_services_list *(required)*	34.In addition to what you have already mentioned, do you also get any of the following information from you DAO? (Enumerator: Please select all of the information they mentioned for the previous question and ask if they do any of the following. If they state any additional information, please check that AS WELL. If they say Other, please return to the previous question and add Other information there).	1 Market Information 3 Weather Information 4 Pest Management 5 Crop Management 6 Animal Husbandry 7 Land management or natural resource management. 8 Gender Information 9 Emercency Preparation 10 Financial Training (how to manage money) 11 Seeds 12 Gardening 13 Climate Change Resilience (flooding, drought) 14 Fertilizer 16 Pesticide 15 Post harvest information 99 Other

Field	Question	Answer
		77 don't know 88 no response
DAO_monthlycommunication *(required)*	35.How many times per MONTH do you speak with a DAO? (Enumerator: please specify a number of times per month, if they say they don't know or can't respond write that)	
DAO_needsmet_personal *(required)*	36.Are these visits from the DAO meeting YOUR PERSONAL needs?	1 Yes 0 No 77 don't know 88 no response
DAO_needsmet_resources *(required)*	38.What resources and information would you like to get from the DAO that you don't currently? *Question relevant when: selected(${DAO_needsmet_personal} , '0')*	
DAO_needsmet_hh *(required)*	39.Are the visits from the DAO meeting the needs of others in your HOUSEHOLD?	1 Yes 0 No 77 don't know 88 no response
DAO_needsmet_hh_explain *(required)*	40.Please specify why? *Question relevant when: selected(${DAO_needsmet_hh} , '0')*	

Field	Question	Answer
needsgap_interact_equal_yn *(required)*	41.Do you feel that your DAO interacts with all of the farmers in your community equally?	1 Yes 0 No 77 don't know 88 no response
needsgap_interact_equal_no *(required)*	42.Please explain why? *Question relevant when: selected(${needsgap_interact_equal_yn} , '0')*	
needsgap_timeknown *(required)*	43.How long have you known your DAO? (Enumerator: please specify a unit of time such as: days, weeks, months, years)	
DAO_comfort_yn *(required)*	44.Do you feel comfortable reaching out to your DAO with questions about agriculture?	1 Yes 0 No 77 don't know 88 no response
DAO_comfort_explain *(required)*	45.Please explain why.	

Field	Question	Answer
DAO_yield_record *(required)*	46.Do you collect yield data for any of your crops?	1 Yes 2 No 3 For some crops but not others 77 don't know 88 no response
DAO_yield_record_crops *(required)*	47.For which crops do you record your yields? *Question relevant when: selected(${DAO_yield_record} , '1') or selected(${DAO_yield_record} , '3')*	
DAO_yield_imp *(required)*	48.Did the information and resources you got from the DAO improve your farming yield? *Question relevant when: selected(${DAO_yield_record} , '1') or selected(${DAO_yield_record} , '3')*	1 Yes 0 No 77 don't know 88 no response
DAO_yield_improve_before *(required)*	49.What was your yield before the DAO helped you? *Question relevant when: ${DAO_yield_imp} = '1' or ${DAO_yield_imp} = '0'*	

Field	Question	Answer
DAO_yield_improve_after *(required)*	50.What is your yield now? *Question relevant when: ${DAO_yield_imp} = '1'*	
enumerator_DAO_adopt	51.Enumerator: I will now ask about the agriculture practices that you decided to use based on DAO information and recommendations.	
DAO_adopt_yn	52.Do you currently practice any of the DAO's agriculture recommendations?	1 Yes 0 No 77 don't know 88 no response
DAO_adopt_nowhy	53.Why not? *Question relevant when: selected(${DAO_adopt_yn} , '0')*	
DAO_adopt_specify *(required)*	54.What information or farming practices have you adopted that the DAO suggested? Specify what agriculture practices, techniques, technology, or ideas you adopted because the DAO suggested them? *Question relevant when: selected(${DAO_adopt_yn} , '1')*	
DAO_adopt_priorities *(required)*	55.When you choose to adopt new technology or practices, what is your most important consideration?	1 Money/profit 2 Labor time (+-) 3 Difficulty of labor involved 4 Yield increase 5 Cost of labor 99 Other 77 don't know 88 no response
DAO_adopt_priorities_other *(required)*	56.Other, please specify *Question relevant when: ${DAO_adopt_priorities} = '99'*	
DAO_ag_challenges *(required)*	57.What are the greatest challenges you face to getting the resources and information you need to be a successful farmer? Please select all that apply from the provided list or anything additional that we didn't list.	0 No electricity 1 Lack of reliable electricity 2 Lack of tools 3 Lack of quality seeds 4 Lack of fertilizer and pesticides 5 No access to credit or loans 6 Lack of access to agriculture information 7 Lack of access to markets 8 Bird attacks 9 Grass cutter attacks

Field	Question	Answer
		10 Lack of money 11 Lack of labor 12 I'm not in charge of agriculture decision making in my household 13 Lack of access to tools and equipment 14 Lack of opportunities to attend workshops and training 15 My household is engaged in other activities 16 My gender 17 Lack of land 18 The DAO doesn't know very much about the activities I do or products I produce. 20 Theft from other members of my community 19 I don't have any constraints 99 other 77 don't know 88 no response
DAO_ag_challenges_other *(required)*	58.You stated other, please specify the other challenges you face. *Question relevant when: selected(${DAO_ag_challenges} , '99')*	
Enumerator_DAOsex	59.Enumerator: The rest of the questions in this section will help us understand how a female DAO may serve your community.	
DAO_female_yn	60.Have you ever worked with a female DAO?	1 Yes 0 No 77 don't know 88 no response
DAO_sex *(required)*	61.Is the DAO you normally speak with a male or female? *Question relevant when: selected(${DAO_female_yn} , '1')*	1 Male 2 Female
DAO_female_info *(required)*	62.Did she provide you with any different information than the male DAO you have worked with? *Question relevant when: selected(${DAO_female_yn} , '1')*	1 Yes 0 No 77 don't know 88 no response
DAO_female_explain *(required)*	63.Please explain how the information was different. *Question relevant when: selected(${DAO_female_yn} , '1') and selected(${DAO_female_info} , '1')*	

Field	Question	Answer
Questions > Gender_and_Extension		
DAO_sex_capable *(required)*	64.Do you feel that females are capable to provide you the farming information you need?	1 Yes 2 No 77 don't know 88 no response
DAO_sex_women_yn *(required)*	65.Should women be extension agents?	1 Yes 2 No 77 don't know 88 no response
DAO_sex_pref *(required)*	66.If you could choose, would you select to have a female or male DAO agent visit you?	1 A male is strongly preferred 2 A male is slightly preferred 5 I don't have a preference 3 A female is slightly preferred 4 A female is strongly preferred 77 don't know 88 no response
DAO_sex_pref_explain *(required)*	67.Please explain why.	
Enumerator_4	68.Enumerator: We would like to find out if you get agriculture information and resources from anyone in addition to DAOs. For example NGOs, local groups, religious groups, or government groups other than the	

Field	Question	Answer
	MOA.	
Questions > Section 4: Agriculture Extension and Advisory Services from other organizations		
eoo_yn *(required)*	69.Do you currently receive agriculture information, resources, or support from any other government, non-government, aid, or local organization in addition to DAOs?	1 Yes 0 No 77 don't know 88 no response
eoo_name *(required)*	70.Please specify the name of this organization. *Question relevant when: selected(${eoo_yn} , '1')*	
eoo_freq *(required)*	71.How often do you get agriculture information from an organization other than your DAO? (Enumerator: please specify with a time unit such as week, month, or year). *Question relevant when: selected(${eoo_yn} , '1')*	
eoo_method *(required)*	72.HOW did/do you get information from the organization? Please state all of the ways you get agriculture information. For Example: from your DAO or other people, through technology such as a cell phone, and/or trainings and worlshops. (Enumerator: Please select all of the ways they get information and DO NOT suggest something they don't directly say.) Please circle all that apply. *Question relevant when: selected(${eoo_yn} , '1')*	1 In-person (one on one) 5 In-person (at a training or workshop) 10 Your spouse tells you the information 11 Friends, neighbors, or other community members tell you the information 7 By cell phone 8 Radio 9 Television 99 Other 77 don't know 88 no response
eoo_method_other *(required)*	73.Please specify the other method the organization used to provide you agriculture information or resources. *Question relevant when: selected(${eoo_yn} , '1') and selected(${eoo_method} , '99')*	
eoo_services *(required)*	74.What type of information or training do you get from the organization(s) you stated? Please select all that apply. *Question relevant when: selected(${eoo_yn} , '1')*	1 Market Information 3 Weather Information 4 Pest Management 5 Crop Management 6 Animal Husbandry

Field	Question	Answer
		7 Land management or natural resource management. 8 Gender Information 9 Emercency Preparation 10 Financial Training (how to manage money) 11 Seeds 12 Gardening 13 Climate Change Resilience (flooding, drought) 14 Fertilizer 16 Pesticide 15 Post harvest information 99 Other 77 don't know 88 no response
eoo_services_other *(required)*	75.Please specify what other agriculture information you get from other organizations. *Question relevant when: selected(${eoo_services} , '99')*	
eoo_adopt *(required)*	76.Do you currently practice any of the organizations agriculture recommendations? *Question relevant when: selected(${eoo_yn} , '1')*	1 Yes 2 No 77 don't know 88 no response
eoo_adopt_explain *(required)*	77.What information or farming practices have you adopted that the DAO suggested? Specify what agriculture practices, techniques, technology, or ideas you adopted because this organziation suggested them? *Question relevant when: selected(${eoo_yn} , '1') and selected(${eoo_adopt} , '1')*	
eoo_comfort *(required)*	78.Do you feel comfortable reaching out to this organization with your questions regarding agriculture information? *Question relevant when: selected(${eoo_yn} , '1')*	1 Yes 2 No 77 don't know 88 no response
ooo_comfort_explain *(required)*	79.Please explain. *Question relevant when: selected(${eoo_yn} , '1')*	
eoo_sex *(required)*	80.Is the person you speak with from this organization a male, female, or you speak with both? *Question relevant when: selected(${eoo_yn} , '1')*	1 Male 2 Female 3 Both
eoo_benefits *(required)*	81.Please describe the overall benefits you get from this organization. *Question relevant when: selected(${eoo_yn} , '1')*	

Field	Question	Answer
Enumerator_5	82.Enumerator: In the next section, I will ask you questions about your access to information technology, markets and loans for agriculture, and additional jobs you have. First, I'd like to learn more about what type of technology you and your household use.	
Questions > Household and Personal Technology used for Communication		
labels	83.Do you or your household currently own a ..?	1 Yes 0 No 77 don't know 88 no response
hh_has_radio *(required)*	Radio?	1 Yes 0 No 77 don't know 88 no response
hh_has_cellphone *(required)*	Cell or local phone? (without a data plan)	1 Yes 0 No 77 don't know 88 no response
hh_has_smartphone *(required)*	Smart Phone? (with a data plan)	1 Yes 0 No 77 don't know 88 no response
hh_has_tv *(required)*	TV?	1 Yes 0 No 77 don't know 88 no response

Field	Question	Answer
hh_has_computer *(required)*	Computer?	1 Yes 0 No 77 don't know 88 no response
Questions > Family/household technology use? *Group relevant when: selected(${hh_has_radio} , '1') or selected(${hh_has_tv} , '1') or selected(${hh_has_cellphone} , '1') or selected(${hh_has_smartphone} , '1') or selected(${hh_has_computer} , '1')*		
labels_use	84.Does everyone in your household currently spend the same amount of time using the ..?	1 Yes 0 No 77 don't know 88 no response
hh_has_radio_use *(required)*	Radio? *Question relevant when: selected(${hh_has_radio} , '1')*	1 Yes 0 No 77 don't know 88 no response
hh_has_cellphone_use *(required)*	Cell or local phone? (without a data plan) *Question relevant when: selected(${hh_has_cellphone} , '1')*	1 Yes 0 No 77 don't know 88 no response
hh_has_smartphone_use *(required)*	Smart Phone? (with a data plan) *Question relevant when: selected(${hh_has_smartphone} , '1')*	1 Yes 0 No 77 don't know 88 no response

Field	Question	Answer
hh_has_tv_use *(required)*	TV? *Question relevant when: selected(${hh_has_tv} , '1')*	1 Yes 0 No 77 don't know 88 no response
hh_has_computer_use *(required)*	Computer? *Question relevant when: selected(${hh_has_computer} , '1')*	1 Yes 0 No 77 don't know 88 no response
hh_ict_use_explain *(required)*	85.Please explain why everyone in your household does NOT use the technology equally? *Question relevant when: selected(${hh_has_radio_use} , '0') or selected(${hh_has_tv_use} , '0') or selected(${hh_has_cellphone_use} , '0') or selected(${hh_has_smartphone_use} , '0') or selected(${hh_has_computer_use} , '0')*	
Questions > Personal technology use		
label_use	86.Currently do you personally use the technology you selected as much as you would like? *Question relevant when: selected(${hh_has_radio} , '1') or selected(${hh_has_tv} , '1') or selected(${hh_has_cellphone} , '1') or selected(${hh_has_smartphone} , '1') or selected(${hh_has_computer} , '1')*	1 Yes 0 No 77 don't know 88 no response
radio_use *(required)*	Radio? *Question relevant when: selected(${hh_has_radio} , '1')*	1 Yes 0 No 77 don't know 88 no response
cellphone_use *(required)*	Cell or local phone? (without a data plan) *Question relevant when: selected(${hh_has_cellphone} , '1')*	1 Yes 0 No 77 don't know 88 no response
smartphone_use *(required)*	Smart Phone? (with a data plan) *Question relevant when: selected(${hh_has_smartphone} , '1')*	1 Yes 0 No 77 don't know 88 no response
tv_use *(required)*	TV? *Question relevant when: selected(${hh_has_tv} , '1')*	1 Yes 0 No 77 don't know 88 no response
computer_use *(required)*	Computer? *Question relevant when: selected(${hh_has_computer} , '1')*	1 Yes 0 No 77 don't know 88 no response
ict_use_explain *(required)*	87.Please explain why you don't use the technology as much as you would like? *Question relevant when: selected(${radio_use} , '0') or selected(${tv_use} , '0') or selected(${cellphone_use} , '0') or selected(${smartphone_use} , '0') or selected(${computer_use} , '0')*	
access_ict_spend *(required)*	88.How much do you spend on agriculture information each MONTH? (in LD)	

Field	Question	Answer
Enumerator_access_loan	89.Enumerator: Now I'll ask a few questions about the loans or credit you have used for agriculture, in the PAST 5 YEARS?	
access_loan_yn *(required)*	90.In the PAST 5 YEARS, have you used a loan or credit for agriculture?	1 Yes 0 No 77 don't know 88 no response
access_loan_number *(required)*	91.In the PAST 5 YEARS, how many loans have you used for agriculture purposes? *Question relevant when: selected(${access_loan_yn} , '1')*	
Questions > Access to Loans and Credit (1) *Group relevant when: selected(${access_loan_yn} , '1')*		(Repeated group)
access_loan_source *(required)*	92.I would like to learn more about the [access_loan_number] loan(s) you have used for agriculture. Please specify where you got loan number 1 of [access_loan_number] loans you said you have used for agriculture? *Question relevant when: selected(${access_loan_yn} , '1')*	1 Bank 2 Family member 3 Certified micro lender 4 Community member 5 VSLA (Village and savings loan) 6 Government 7 A friend or neighbor 8 Non-governmental organization 9 Church 10 SUSU 99 Other 77 don't know 88 no response
access_loan_source_other *(required)*	93.Other loan source. *Question relevant when: selected(${access_loan_source} , '99')*	
access_loan_farmuse *(required)*	94.What did you use the agriculture loan from the [loan_name] for? *Question relevant when: selected(${access_loan_yn} , '1')*	
access_loan_type *(required)*	95.Was the loan from the [loan_name] paid to you in cash or was it an in-kind/materials loan? *Question relevant when: selected(${access_loan_yn} , '1')*	1 Cash 2 In-kind or materials 3 Both 77 don't know 88 no response
access_loan_inkind *(required)*	96.How are you asked to repay the in-kind or materials loan you got from the [loan_name]? *Question relevant when: selected(${access_loan_type} , '2') and selected(${access_loan_yn} , '1')*	
access_loan_inkind_time *(required)*	97.How long will it take you to settle the in-kind or materials loan you got from the [loan_name]? (Enumerator: please specify a value and amount of time in weeks, months, or years) *Question relevant when: selected(${access_loan_type} , '2') and selected(${access_loan_yn} , '1')*	
access_loan_amount *(required)*	98.How much was the loan from [loan_name] for? (in LD) *Question relevant when: selected(${access_loan_yn} , '1') and selected(${access_loan_type} , '1') or selected(${access_loan_type} , '3')*	
access_loan_payment *(required)*	99.How much do you pay MONTHLY for the [access_loan_amount] dollar loan you got from the [loan_name]? (in LD) *Question relevant when: selected(${access_loan_yn} , '1') and selected(${access_loan_type} , '1') or selected(${access_loan_type} , '3')*	
access_loan_time *(required)*	100.How much time do you have to pay off the entire loan from the [loan_name]? (Enumerator: please specify a unit of time, either weeks, months, or years) *Question relevant when: selected(${access_loan_yn} , '1') and selected(${access_loan_type} , '1') or selected(${access_loan_type} , '3')*	
access_loan_paid_yn *(required)*	101.Is the loan you got from the [loan_name] completely paid off or settled? (Enumerator: we want to know if they have fully paid off the loan (cash or inkind/material) yet or if there is still a balance they are paying?) *Question relevant when: selected(${access_loan_yn} , '1')*	1 Yes 0 No 77 don't know 88 no response
access_loan_future_amount *(required)*	102.If you were able to get a cash or in-kind loan for farming, how much would you get? (in LD) *Question relevant when: selected(${access_loan_yn} , '0')*	
access_loan_future_activity *(required)*	103.If you were able to get a cash or in-kind loan for farming, what would you use it for? *Question relevant when: selected(${access_loan_yn} , '0')*	
Enumerator_access_jobs	104.Enumerator: Next, I would like to learn more about the work you do inside and outside of your home in addition to agriculture. This may be work that you get paid cash for, that you get compensated through trade, that you volunteer for, or that is a part of your household responsibilities.	

Field	Question	Answer
outside_jobs_yn *(required)*	105.Do you have any jobs or work, in addition to agriculture, that you get paid cash or in-kind for?	1 Yes 0 No 77 don't know 88 no response
outside_job_number *(required)*	106.How many paid (cash or in-kind) jobs do you have in addition to agriculture? *Question relevant when: selected(${outside_jobs_yn} , '1')*	
Questions > Outside Job Details (1) *Group relevant when: selected(${outside_jobs_yn} , '1')*		(Repeated group)
outside_job_name *(required)*	107.Name or describe job number 1 of [outside_job_number]:	
outside_job_compensation *(required)*	108.How are you compensated for working as a [outside_job_name]?	1 Cash 2 Trade or in-kind 3 Household or family responsibility. 99 Other 77 don't know 88 no response
outside_job_compensation_other *(required)*	109.Please specify how you are compensated for working as a [outside_job_name]? *Question relevant when: selected(${outside_job_compensation} , '99')*	
jobs_outside_migrate *(required)*	110.Do you need to leave your home for long periods of time to work as a [outside_job_name]?	1 Yes 0 No 77 don't know 88 no response
jobs_outside_migrate_town *(required)*	111.Where do you go to carry out work as a [outside_job_name]? *Question relevant when: selected(${jobs_outside_migrate} , '1')*	
outside_job_travel_distance *(required)*	112.How many MINUTES does it take you to travel to work as a [outside_job_name]?	
outside_job_season *(required)*	113.During what season(s) do you carry out work as a [outside_job_name]?	1 Rainy 2 Dry 3 All times of the year 77 don't know 88 no response
Enumerator_6	114.Enumerator: We would like to know when and how you prefer someone from the Ministry of Agricultre come to share information with you and your family?	
Questions > DAO_info_dissemination_prefereences		
pref_months *(required)*	115.What months of the year would be best for the DAO to visit your household?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 13 All year round 77 don't know 88 no response
pref_day *(required)*	116.What days of the week would be best for the DAO to visit your household to speak with you?	1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday 99 don't know 88 no response
pref_daytime *(required)*	117.What time of day would be best for the DAO to come to your household/farm?	1 Morning 2 Noon 3 Early afternoon 4 Late afternoon

Field	Question	Answer	
		5	Evening
		77	don't know
		88	no response
pref_freq *(required)*	118.How often would you like the DAO to visit your farm?	1	Weekly
		2	Twice a month
		3	Once a month
		4	Several times a year
		5	I'm happy with the frequency of DAO visits I get.
		99	Other
		77	don't know
		88	no response
pref_freq_other *(required)*	119.Please specify other. *Question relevant when: selected(${pref_freq} , '99')*		
pref_sex *(required)*	120.Would a male or female DAO be better able to provide you with the agriculture information you need?	1	Male
		2	Female
		3	I don't have a preference
		77	don't know
		88	no response
Enumerator_7	121.Enumerator: We would like to learn a bit more about the farming groups or organizations in this area. For example CBOs or FBOs, or any other groups that share farming information or help community members with labor or training etc..		
Questions > Farm_Associations			
farmasso_yn	122.Are you a part of any farming/agriculture groups or organizations in this community? For example: a community based agriculture or farmer based organization.	1	Yes
		0	No
		77	don't know
		88	no response
farmasso_name *(required)*	123.What organization? (Enumerator: record the name of the group/organization) *Question relevant when: selected(${farmasso_yn} , '1')*		
farmasso_spread_aginfo *(required)*	124.Does [farmasso_name] help to spread agriculture information in the community? *Question relevant when: selected(${farmasso_yn} , '1')*	1	Yes
		0	No
		77	don't know
		88	no response
farmasso_sex_contribute *(required)*	125.What agriculture activities does [farmasso_name] carry out in this community? Please be specific. *Question relevant when: selected(${farmasso_yn} , '1')*		
farmasso_lead_yn *(required)*	126.Have you ever been a leader? It could be in this group or another. *Question relevant when: selected(${farmasso_yn} , '1')*	1	Yes
		0	No
		77	don't know
		88	no response
farmasso_kuu *(required)*	127.Are there Kuu groups in this community that provide agriculture support?	1	Yes
		0	No
		77	don't know
		88	no response
farmasso_kuu_support	128.What type of agriculture support do the Kuu groups provide to you? *Question relevant when: selected(${farmasso_kuu} , '1')*		
Enumerator_8	129.Enumerator: In this section, we will talk about the different products you and your family produce on your farm. We would also like to gain a better understanding of what activities men, women, and children do, and who gets to select what tools, seeds, fertilizer and other products are used.		
Questions > Gender_Division_of_Labor			
selected_products *(required)*	130.Please specify the types of products you produce on your farm? (Enumerator:Please READ THEM THE LIST)	1	Staple or Field Crop (such as, rice, cassava, maize, beans or peanut)
		2	Vegetables or Garden (vegetables, not including rice, cassava, maize, beans or peanut)
		3	Livestock (such as, goat, pig, cow, sheep)
		4	Cash Crops
		5	Fish pond
		6	Poultry (such as, chickens or ducks)

Field	Question	Answer	
		7	Traditional (such as, rabbits or snails etc..)
		99	Other
		77	don't know
		88	no response
selected_products_other *(required)*	131.Please specify other *Question relevant when: selected(${selected_products} , '99')*		
Questions > Gender_Division_of_Labor > Gender Division of Production Labor (1)		(Repeated group)	
product_specific *(required)*	132.Please list all of the products you produce that you would consider to be [product_name]?		
genmatrix_DAOsupport	133.Does the DAO provide you information and resources for the production of [product_name]?	1	Yes
		0	No
		77	don't know
		88	no response
genmatrix_adopt *(required)*	134.Who in your household purchases new products such as fertilizer, seeds, livestock food or medicine related to the production of [product_name]?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genmatrix_newtech *(required)*	135.Who makes the household decisions to purchases new technology, equipment, and farming tools related to the production of [product_name]?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
tools_clean *(required)*	136.Who in your household cleans and takes care of the tools and equipment used to produce [product_name]?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
tools_gender_repair *(required)*	137.Who in your household repairs tools for the [product_name]?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children

Field	Question	Answer	
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genmatrix_plant *(required)*	138.Who plants the [product_name]? *Question relevant when: selected(${selected_products} , '1') or selected(${selected_products} , '2') or selected(${selected_products} , '4') or selected(${selected_products} , '99')*	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genmatrix_harvest *(required)*	139.Who harvests the [product_name]? *Question relevant when: selected(${selected_products} , '1') or selected(${selected_products} , '2') or selected(${selected_products} , '4') or selected(${selected_products} , '99')*	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
decision_women_likert *(required)*	140.In your household, how often do women make decisions related to the production of [product_name]? Please use the following scale.	1	Never
		2	Sometimes
		3	Often
		4	Always
		77	don't know
		88	no response
genmatrix_market_yn *(required)*	141.Do you sell [product_name] at a market?	1	Yes
		0	No
		77	don't know
		88	no response
genmatrix_market_sell_freq *(required)*	142.How often does your family sell [product_name] at the market? *Question relevant when: selected(${genmatrix_market_yn} , '1')*	1	Daily
		2	Weekly
		99	Other
		77	don't know
		88	no response
genmatrix_market_sell_freq_other	143.Other *Question relevant when: selected(${genmatrix_market_sell_freq} , '99')*		
genmatrix_market_who *(required)*	144.Who from your family goes to the market to sell [product_name]? *Question relevant when: selected(${genmatrix_market_yn} , '1')*	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family

Field	Question	Answer
		8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
genmatrix_market_travel *(required)*	145.How does the person get to the market to sell [product_name]? *Question relevant when: selected(${genmatrix_market_yn} , '1')*	1 Walk (by foot) 2 Moto 3 Car 99 Other 77 don't know 88 no response
genmatrix_market_travel_other *(required)*	146.Other *Question relevant when: selected(${genmatrix_market_yn} , '1') and selected(${genmatrix_market_travel} , '99')*	
genmatrix_market_distance *(required)*	147.From your house, many MINUTES does it take to get the the market to sell [product_name]? *Question relevant when: selected(${genmatrix_market_yn} , '1')*	
genmatrix_market_opportunity *(required)*	148.If you had access to a market, would you like to sell your products? *Question relevant when: selected(${genmatrix_market_yn} , '0')*	1 Yes 0 No 77 don't know 88 no response
genmatrix_market_money *(required)*	149.Who controls the money from the sale of [product_name]? *Question relevant when: selected(${genmatrix_market_yn} , '1')*	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
decision_moneysat_likert *(required)*	150.In your household, are you satisfied with the way money is spent on [product_name]? Please use the following scale.	1 You are never satisfied with the way money is spent in your household 2 You are sometimes not satisfied with the way money is spent in your household 3 You are usually satisfied with the way money is spent in your household 4 You are always satisfied with the way money is spent in your household 77 don't know 88 no response
Enumerator_genfarm_hh	151.Enumerator: Based on the people you consider to be a part of your household, we would now like to better understand if men, women, boys or girls complete the following household activities.	
Questions > Gender_Division_of_Labor > genfarm_hh_labor		
genfarm_hh_kids_school *(required)*	152.In your household, who usually gets the children ready for school?	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children

Field	Question	Answer
		10 Not performed 77 don't know 88 no response
genfarm_hh_school *(required)*	153.In this household do both boys and girls go to school?	1 Yes 0 No 77 don't know 88 no response
genfarm_hh_matrix_cook *(required)*	154.In your household, who usually prepares food?	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
genfarm_hh_washclothes *(required)*	155.In your household, who usually washes clothes?	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
genfarm_hh_water *(required)*	156.In your household, where do you get water?	1 Well 2 Pump 3 River or stream 99 Other 77 don't know 88 no response
genfarm_hh_water_other *(required)*	157.Please specify where you get water. *Question relevant when: selected(${genfarm_hh_water} , '99')*	
genfarm_hh_water_collect *(required)*	158.Who gets water for this household?	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
genfarm_hh_water_collect_time *(required)*	159.How many MINUTES does it take, the person you specified, to collect water each day?	
genfarm_hh_eat *(required)*	160.In your household, who usually eats first?	1 Men 2 Women 3 Adults (both men and women)

Field	Question	Answer	
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genfarm_hh_careyoung *(required)*	161.In your household, who usually takes care of young children?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genfarm_hh_schoolfees *(required)*	162.In your household, who usually pays for children's school fees?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genfarm_hh_paybills *(required)*	163.In your household, who usually pays the bills for household needs such as food and clothing?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children
		9	Men and children
		10	Not performed
		77	don't know
		88	no response
genfarm_hh_decisions *(required)*	164.In your household, who usually makes family/household decisions?	1	Men
		2	Women
		3	Adults (both men and women)
		4	Male children
		5	Female children
		6	Children (both male and female)
		7	Entire family
		8	Women and children

Field	Question	Answer
		9 Men and children 10 Not performed 77 don't know 88 no response
genfarm_hh_power *(required)*	165.In your household, who do you believe has the most power-over all members of the family/household?	1 Men 2 Women 3 Adults (both men and women) 4 Male children 5 Female children 6 Children (both male and female) 7 Entire family 8 Women and children 9 Men and children 10 Not performed 77 don't know 88 no response
decision_empower_likert6 *(required)*	166.How empowered are you? Empowerment means that you feel confident, respected, and able to make decisions that impact your farm and your family.	1 You never feel empowered 2 You sometimes feel empowered 3 You usually feel empowered 4 You always feel empowered 77 don't know 88 no response
decision_empower_likert6_explain *(required)*	167.What do you think would improve your empowerment, confidence, household respect, and ability to make decisions that impact you and your family? (Enumerator: PROBE, try to get them to be specific) *Question relevant when: not(selected(${decision_empower_likert6} , '4'))*	
Enumerator_semistructured_interview	168.Enumerator: We are almost done with the survey. In this second to last section, I will ask you questions about your perspective and opinions. Please feel free to answer in-depth if you would like. At the end, you can add anything that you want to share but haven't been able to.	
Questions > Perception of Access: Barriers and opportunities related to access of Ministry of Agriculture extension services.		
perception_1 *(required)*	169.Please describe your greatest agriculture challenges? (These could be anything from information, physical resources, decision-making challenges, or anything else that is a barrier to your farming production goals and your family needs).	
perception_2 *(required)*	170.When you have agriculture challenges on your farm, what creative ways have you used to solve them? (Enumerator: we are looking for innovative and create solutions that this person, their household, and community have come up with to overcome agriculture challenges). PROBE	
perception_3	190.In short, how are agricultre decisions made in your household?	
perception_4 *(required)*	171.If there was one thing you could change about your farm to improve your productivity, what would that be? (Enumerator: For the farmer's perspective, What is the single most important thing they would like to change to help them be more successful?) PROBE	
perception_5 *(required)*	172.Please describe how the Ministry of Agriculture and your DAO can better support your agriculture production? This may be specific information, resources, the frequency of DAO visits, certain activities, tools, or expertise, or any additional ways that you would like to see the DAO support your agriculture needs in the future.	
Enumerator_dem	173.Enumerator: This is the last section of the survey and we should be done in about 5 minutes. Because we surveying many farmers of different ages, that are male and female, and produce different crops, we would like to get a bit more information about you so that we can compare your answers with the other farmers we survey.	
Questions > Demographics		
Participant_sex *(required)*	174.Enumerator should select the appropriate option. I am interviewing a male or female?	1 Male 2 Female
dem_age *(required)*	175.What is your age?	1 18-24 2 25-34 3 35-44 4 45-54 5 55-64 6 65 and older 77 don't know 88 no response
dem_ed *(required)*	176.What is the highest level of education you have completed?	1 No Formal Education 2 Elementary

Field	Question	Answer
		3 Junior High School 4 High School 6 Some University courses 5 University graduate 99 Other 77 don't know 88 no response
dem_ed_other *(required)*	177.Please specify *Question relevant when: selected(${dem_ed} , '99')*	
dem_religion *(required)*	178.What is your religion?	1 Christianity 2 Islam 3 Traditional 4 No Religion 99 Other 77 don't know 88 no response
dem_religion_other *(required)*	179.You selected other, please specify your religion. *Question relevant when: selected(${dem_religion} , '99')*	
dem_ethnic *(required)*	180.What ethnic group do you consider yourself a part of?	2 Bassa 3 Belle 5 Gbandi 19 Gbee 6 Gio 7 Gola 8 Grebo 9 Kpelle 10 Kissi 11 Krahn 12 Kru 13 Loma 14 Mandingo 17 Mano 18 Mendi 15 Sapo 16 Vai 99 Other 77 don't know 88 no response
dem_ethnic_other *(required)*	181.Please specify the ethnic group you identify with. *Question relevant when: selected(${dem_ethnic} , '99')*	
dem_language *(required)*	182.What language(s) do you speak?	
dem_read *(required)*	183.Can you read in English?	1 Yes 0 No 77 don't know 88 no response
dem_write *(required)*	184.Can you write in English?	1 Yes 0 No 77 don't know 88 no response
dem_relationship *(required)*	185.What is your relationship status?	1 Single and never married 2 Married 3 Living together 4 Divorced/separated 5 Widowed (male or female) 99 Other 77 don't know 88 no response
dem_relationship_other *(required)*	186.Other, please specify your relationship status. *Question relevant when: selected(${dem_relationship} , '99')*	
dem_kids *(required)*	187.How many children do you currently or have you financially supported and/or raised? They may or may not be your biological children?	
perception_final	188.Is there anything else you would like to share with me today?	

Field	Question	Answer
image	189.Enumerator: You can take a picture that represents this interview if you'd like. Please don't take a picture of the participants face.	

Focus Group Instrument

Field	Question	Answer
Date *(required)*	i.Date	
Recorder_name *(required)*	ii.Recorder name	
County *(required)*	iii.County Name	1 Lofa 2 Bong 3 Nimba
Community *(required)*	iv.Community Name	[redacted]
Community_other	v.Other community *Question relevant when: selected(${Community} , '99')*	
participants	vi.Number of participants in group	
challenges	1.What are the greatest agriculture challenges for farmers in this community?	1 Disease 2 Insects/pests 3 Seeds 4 Tools/equipment/materials 5 Machines 6 Chemicals 7 Pesticide 8 Low yield or low productivity 9 Training/Education 10 Climate Change 11 Soil 12 Market Systems 13 Loans and Credit 14 Transparency 15 Lack of support 16 Financial challenges 17 No food 18 Labor support 19 Birds 20 Weeds 21 Transportation 22 Storage 23 Irrigation 24 Rats 25 Mills 26 Fertilizer 27 Middle-man (in market sales)

Field	Question	Answer
		28 Market prices 29 Accountability 30 Pay workers/laborers 31 Timing (for planting and access of seeds) 32 Land 99 Other
challenges_other	2.Other challenges and additional notes about the challenges listed. *Question relevant when: selected(${challenges} , '99')*	
DAO_yn	3.Has a Ministry of Agriculture representative visited and worked in this community over the last two years? You would likely know them as a District Agriculture Officer (DAO)?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
DAO_benefits	4.What benefits does this community get from the Ministry of Agriculture DAO representative? *Question relevant when: selected(${DAO_yn} , '1') or selected(${DAO_yn} , '3')*	
eoo_yn	5.Are there any other organizations, such as NGOs, technicians, private companies, or academics , that have given agriculture information or resources to this community in the last 2 years?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
eoo_list	6.Please list the names of these organizations? *Question relevant when: selected(${eoo_yn} , '1') or selected(${eoo_yn} , '3')*	
eoo_benefits	7.Please describe the benefits you, your farming group, and/or this community has received from these organizations? *Question relevant when: selected(${eoo_yn} , '1') or selected(${eoo_yn} , '3')*	
info_needs	8.For Male participants: What agriculture INFORMATION do MEN need from the Ministry to increase their agriculture production in this community? For Female participants: What agriculture INFORMATION do WOMEN need from the Ministry to increase their agriculture productivity in this community?	1 Training/Education 2 Storage 3 Tools/equipment/materials 4 Machines 5 Market Systems 6 Innovative solutions 99 Other 77 Don't know 88 No response
info_needs_add	9.Additonal notes for information needs including other information not listed.	
landtenure	10.How do farmers get their farming land in this community? (RECORDER: DON'T say these unless they struggle: do you typically own, rent, inherit, or use family or community land to farm?)	1 Rent 2 Own 3 Inherit 4 Farm on community land 5 Government land 99 Other 77 Don't know 88 No response
landtenure_other	11.Please list the other ways farmers get land. *Question relevant when: selected(${landtenure} , '99')*	
landtenure_payment	12.How do farmers pay for the land? In cash or in-kind? How do farmers negotiate price or trade with the land owner?	
landtenure_women_yn	13.Can women in this community own land?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
landtenure_women_explain	14.Please describe how this works? Is it through purchase, when they are married they own land with their husband, or through family inheritance? *Question relevant when: selected(${landtenure_women_yn} , '1') or selected(${landtenure_women_yn} , '1')*	
decisions_hh	15.Are women empowered to make decisions in their households in this community? Please explain how agriculture decisions are made in households in this community?	
farmwork_mostwork	16.Who does most of the work on farms? (including farm and domestic work)	1 Men 2 Women

Field	Question	Answer	
		3	Some people say women and some people say men
		4	Work is divided equal (50/50)
		77	Don't know
		88	No response
farmwork_explain	17.Please explain? (Additional notes on who does most of the work in this community)		
women_work	18.What do women do? Let's first list the agricultre activities women are responsible for, then the household or domestic activities.	1	Brush/slash
		2	Scratch
		3	Weed
		4	Hoe
		5	Harvest
		6	Fell trees and clear
		7	Clean farm
		8	Thrash
		9	Fence
		10	Storage preparation
		11	Make a garden
		12	Sell products at the market
		13	Layout farm/crops
		14	Plant
		15	Plow
		16	Pound rice
		17	Lay out gutter
		18	Pack rice
		19	Apply chemicals and fertilizer
		20	Manages the money made from selling products
		21	Makes decisions about agriculture
		22	Controls money made from agriculture
		23	Find food
		24	Collect water
		25	Collect wood
		26	Care for children
		27	Cook
		28	Clean
		29	Wash
		30	Drink alcohol
		99	Other
women_work_other	19.Other work WOMEN do? *Question relevant when: selected(${women_work} , '99')*		
men_work	20.What do men do? Let's first list the agricultre activities men are responsible for, then the household or domestic activities.	1	Brush/slash
		2	Scratch
		3	Weed
		4	Hoe
		5	Harvest
		6	Fell trees and clear
		7	Clean farm
		8	Thrash
		9	Fence
		10	Storage preparation
		11	Make a garden
		12	Sell products at the market
		13	Layout farm/crops
		14	Plant
		15	Plow
		16	Pound rice
		17	Lay out gutter
		18	Pack rice
		19	Apply chemicals and fertilizer

Field	Question	Answer
		20 Manages the money made from selling products 21 Makes decisions about agriculture 22 Controls money made from agriculture 23 Find food 24 Collect water 25 Collect wood 26 Care for children 27 Cook 28 Clean 29 Wash 30 Drink alcohol 99 Other
men_work_other	21.Other work MEN do? *Question relevant when: selected(${men_work} , '99')*	
farmgroups_yn	22.Are there farming groups or organizations in this community?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
farmgroups_explain	23.Please list all of the groups? *Question relevant when: selected(${farmgroups_yn} , '1') or selected(${farmgroups_yn} , '3')*	
farmgroups_benefits	24.Describe how these farming groups benefit you and this community? *Question relevant when: selected(${farmgroups_yn} , '1') or selected(${farmgroups_yn} , '3')*	
loan_yn	25.Have any of you ever received a loan or used credit? This could be from a Susu in the community, family member or friend, or from outside the community like a bank?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
loan_list	26.From what organizations or who can farmers in this community get loans or credit? (RECORDER: if they don't say, make sure to ask if they have Do you have Susu's, VSLA, or Kuu's here? *Question relevant when: selected(${loan_yn} , '1') or selected(${loan_yn} , '3')*	
loan_benefit	27.How have the loans/credit benefitted you, your farming gorup, or the community? (RECORDER: if they can get a cash loan Please specify the amount of interest and how long they have to pay it off)? *Question relevant when: selected(${loan_yn} , '1') or selected(${loan_yn} , '3')*	
sexpref	28.If a Ministry of Agriculture officer comes to this community, would you prefer a male or female?	1 Male 2 Female 3 Either/both/don't have a preference 4 Some people say male and some people say female 77 Don't know 88 No Response
sexpref_why	29.Please explain why?	
strength	30.What is the greatest strength of your community/community farming group?	
climatechange_yn	31.Has anyone here heard of climate change?	1 Yes 0 No 3 Some people say yes and some people say no 77 Don't know 88 No response
climatechange_describe	32.Please describe what climate change means to you? *Question relevant when: selected(${climatechange_yn} , '1') or selected(${climatechange_yn} , '3')*	
finalquesion	33.Are there any questions, recommendations to the Ministry of Agricultre, or things anyone would like to add?	