Connecting the dots: Building social resilience to support sustainable food security policy in the Caribbean

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Abstract

Caribbean nations are grappling with a wide range of complex social and ecological challenges related to household food and nutrition insecurity, including high non-communicable disease rates, rapid environmental change and a steady decline in rural communities. Recognizing the significance and complexity of these challenges, this dissertation begins with a detailed review of the conditions that have served to undermine efforts to achieve sustainable food and nutrition security outcomes in the Caribbean, focusing on issues of history, economy and innovation. The concept of social resilience subsequently emerges as operating at the pivot of human-nature interactions in the region, cutting across three intersecting policy domains: 1) smallholder farming systems, 2) global environmental change, and 3) food security. Building on this conceptual framework, the remaining dissertation explores how various dimensions of social resilience influence sustainable smallholder agricultural system innovation in the nation of Saint Lucia, a typical small island developing state in the Caribbean Community.

First, focussing on the persistent challenge of low innovation and coordination among smallholder farmers in Saint Lucia, an adapted Institutional Analysis and Development (IAD) framework is used to analyze the various roles played by formal and informal institutions in the export and domestic agriculture and food systems (pre-1950 and post 1950). The results suggest a need for more 'bridging' institutions in Saint Lucia's food and agriculture sector that could help support shared rule-making, the decentralization of power, and reciprocal knowledge flows in support of smallholder innovation. A combined Stakeholder Analysis and Social Network Analysis is then used to explore the nature of the stakeholder interactions surrounding the development of Saint Lucia's 2009-2015 National Agricultural Policy and consider some of the implications for food and agriculture-related policy outcomes. Results reveal a potential role for

"boundary" organizations in the policy network, designed to facilitate a transition towards more flexible and adaptive institutions, enhanced knowledge exchange and learning, and greater trust among stakeholders. Turning to the challenge of supporting knowledge exchange and innovation among smallholder farmers at the community-level, Social Network Analysis is then used to assess the interactions between households producing fresh food for the domestic market in two rural communities. The results reveal how different forms of social capital can affect self-reported farmer innovation in different contexts, offering insights for policy that seeks to better support, coordinate and enhance smallholder innovation systems in Saint Lucia.

This dissertation provides important empirical evidence in support of creating and designing more sensitive, adaptive, locally-specific and culturally relevant agriculture and food system policies in the Caribbean.

Résumé

Les nations caribéennes font face à un grand nombre de défis sociaux et écologiques complexes liés à l'insécurité alimentaire et nutritionnelle des ménages, tels que d'importants taux de maladies non transmissibles, des changements environnementaux rapides, et le déclin des communautés rurales. Tenant compte de l'importance et de la complexité de ces défis, cette thèse débute par une revue détaillée des conditions ayant perturbé les efforts visant à atteindre une sécurité alimentaire et nutritionnelle durable dans les Caraïbes, en se concentrant sur les aspects liés à l'histoire, l'économie et l'innovation. Il en ressort que le concept de résilience sociale opère comme un pivot des interactions homme-nature dans la région, à la croisée de trois domaines d'action : 1) les systèmes agricoles de petits producteurs, 2) les changements environnementaux globaux, et 3) la sécurité alimentaire. En s'appuyant sur ce cadre conceptuel, la suite de la thèse explore comment les diverses dimensions de la résilience sociale peuvent influencer l'innovation durable dans les systèmes agricoles de petits producteurs à Sainte-Lucie, petit État insulaire en développement typique de la Communauté des Caraïbes.

Tout d'abord, en se concentrant sur le problème persistant des faibles niveaux d'innovation et de coordination entre les petits producteurs à Sainte-Lucie, un cadre adapté de celui de l'Analyse et du Développement Institutionnels (IAD framework) est utilisé pour analyser les différents rôles joués par les institutions formelles et informelles dans les systèmes alimentaires et agricoles domestiques et d'exportation (avant 1950 et de 1950 à 2010). Les résultats révèlent le besoin de davantage d'institutions « passerelles » dans le secteur de l'alimentation et de l'agriculture de Sainte-Lucie, qui pourraient aider à soutenir l'élaboration de règles partagées, la décentralisation du pouvoir, et les flux réciproques de connaissances en appui à l'innovation chez les petits producteurs. L'utilisation combinée de l'analyse des parties prenantes et de l'analyse des réseaux

sociaux permet ensuite d'explorer la nature des interactions entre parties prenantes impliquées dans le développement de la politique agricole nationale de Sainte-Lucie entre 2009 et 2015, et d'étudier certaines implications concernant les effets des politiques liées à l'agriculture et à l'alimentation. Les résultats mettent en évidence le rôle potentiel des organisations « passerelles » dans le réseau politique, conçues pour faciliter la transition vers des institutions plus flexibles et plus adaptables, l'augmentation des échanges de connaissances et de l'apprentissage, ainsi qu'une plus grande confiance entre parties prenantes. Afin d'aborder l'enjeu de soutenir les échanges de connaissances et l'innovation parmi les petits producteurs à l'échelle de la communauté, l'analyse des réseaux sociaux est ensuite utilisée pour évaluer dans deux communautés rurales les interactions entre les ménages de petits producteurs produisant des aliments frais pour le marché intérieur. Les résultats révèlent la façon dont les différentes formes de capital social peuvent affecter les innovations telles que décrites par les agriculteurs dans différents contextes, offrant des éléments de compréhension pour les politiques visant à mieux soutenir, coordonner et améliorer les systèmes d'innovation à Sainte-Lucie.

Cette thèse fournit des résultats empiriques importants permettant de créer, concevoir et ré-imaginer des politiques liées aux systèmes agricoles et alimentaires dans les Caraïbes, qui soient à la fois plus réceptives, adaptables, spécifiques localement et pertinentes au plan culturel.

Contributions to Knowledge

This dissertation provides novel empirical evidence in support of developing more coherent, locally-specific and culturally relevant agriculture and food system-related policies in the Caribbean region.

Chapter 2

- Using social-ecological systems (SES) and agricultural innovation systems (AIS) frameworks, I identify how different interactions informed the structural conditions underlying the development of a two-tiered agricultural innovation system (drawing on the history of the English-speaking Caribbean). I then present a framework that depicts social resilience operating at the pivot of human-nature interactions in small island developing states (SIDS) highlighting the need for more context-specific strategies to improve actor interactions with a view to facilitating innovation and improving the effectiveness and sustainability of policy interventions.

Chapter 3

- I identify how rule convergence in the domestic and export production systems resulted in the 'plantation' institution moving to a higher position in the hierarchy, displacing informal institutions and reducing interactions between community members. This rapid change likely had negative implications for social resilience and resulted in systemic barriers to smallholder innovation in Saint Lucia's domestic agriculture-food system.

Chapter 4

- Recognizing the limited empirical evidence available on how multi-stakeholder interactions affect Caribbean food and nutrition security policy development, I identify that national-level

stakeholders perceived supermarkets as being the most influential stakeholders in Saint Lucia's contemporary agriculture-food system and also the most salient (along with smallholder farmers) based on their legitimacy, power and urgency. These findings help explain how, without careful attention, inherent conflicts between different policy actors are likely to result in policy incoherence, and therefore the inability of public policy institutions to meaningfully respond to the ongoing challenges facing the domestic agri-food system.

Chapter 5

- For the first time in the Caribbean, I use social network analysis to explore how different dimensions of social capital affect knowledge exchange and innovation in Saint Lucia's smallholder farming system. Self-reported innovation was greater with increased direct and indirect links to other smallholder farming households in the community, providing empirical support to the potential importance of social networks for policy initiatives to better support, coordinate and enhance innovation among Caribbean smallholder farmers.

Contributions of co-authors and remarks on style

This thesis follows a manuscript-based format. As a result, there is some repetition in the text. I am the primary author of all the chapters of the thesis. Chapters 2, 3, and 4 are coauthored with Dr. Gordon M. Hickey, and Dr. Leroy E. Phillip. Chapter 5 is co-authored with Dr. Gordon M. Hickey, Dr. Uli Locher and Dr. Leroy E. Phillip. Chapter 2 has been published in *Regional Environmental Change* (2015) and Chapter 5 has been published in *Food Security* (2016). Chapter 4 has been published in *Food Policy* (2017). Chapter 3 has been submitted to *Journal of Rural Studies*.

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I dedicate this work to my late father, Ignatius B. Saint Ville, a humble giant of a man.

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List of Abbreviations

AKIS	Agricultural Knowledge and Innovation Systems
AIS	Agricultural Innovation Systems
a.s.l.	At Sea Level
CARICOM	Caribbean Community
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
GOSL	Government of Saint Lucia
ha	Hectare
IAD	Institutional Analysis and Development
IICA	Inter-American Institute for Cooperation on Agriculture
IFAD	International Fund for Agricultural Development
Kg	Kilograms
Km^2	Square Kilometres
M	Million
m	Metres
mm	Millimetres
NARS	National Agricultural Research Systems
NCDs	Non-communicable Diseases
NGO	Non-Governmental Organizations
No	Number
OAS	Organization of American States
OECS	Organisation of Eastern Caribbean States
SES	Social-Ecological Systems
SIDS	Small Island Developing States
UWI	University of the West Indies
VAT	Value-Added Tax
WTO	World Trade Organization

CHAPTER 1: GENERAL INTRODUCTION

1.1. Background

Smallholder farmers are often constrained by low levels of innovation and represent a vulnerable group of actors in the global agricultural food system[1] (Pretty et al. 2011). They also have the potential to significantly enhance food security through yield improvements with minimal ecological footprint (Foley et al. 2011). Various studies on smallholder farmers have highlighted their use of agro-ecological approaches that can help promote social and ecological sustainability (Pinstrup-Andersen and Herforth 2008; Pinstrup-Andersen and Hazell 1985; Conway 1987; Pinstrup-Andersen et al. 1999). Nevertheless, these often traditionally-based production systems are known to confront major challenges that include: low levels of technology adoption, low barriers to entry, difficulties in coordination, asymmetry in information flow, and high exposure to natural shocks (Dorward and Kydd 2004; Kydd and Dorward 2004; Birner and Resnick 2010).

Increasingly, there has been recognition that in order to bridge yield gaps faced by smallholder farmers in the developing world, institutional transformation and system-wide innovation will be required (Anthony and Ferroni 2011). Context-specific understandings will therefore be required to help identify supportive conditions for equitable institutional development capable of enhancing smallholder innovation to improve global food security outcomes. Such understandings may also highlight the limitations of conventional technological and institutional development interventions in agriculture. For example, in the Small Island Developing States (SIDS) of the Caribbean, smallholder farming systems dominate the agriculture-food system, a product of historical legacies, export-oriented institutions, limited land availability and large

[1] Estimates suggest there are 500 million smallholder farms worldwide; producing 80 per cent of the food consumed in Asia and sub-Saharan Africa [National Agricultural Research Systems (NARS), no date (n.d.)].

populations with limited education or limited alternative livelihood options. Following emancipation of slavery, large numbers of subsistence farmers produced food on marginal lands, further constrained by limited access to capital and low-levels of technology (Mintz 1985; Axline 1986; Watts 1990). In the post-colonial period, these farmers were absorbed into export-oriented production programs focused on cash crop production (Brierley 1974, 1988; Grossman 1998). While highly developed export institutions provided assorted services and formally integrated the majority of farmers into the export market structure (Andreatta 1999), a disaggregated minority whose farms were too small, or whose lands were ill-suited to export production (Timms 2008), produced food for weekly provision markets. While the institutional arrangements associated with export-oriented agriculture reported a measure of success with their focus on large-scale, monocrop production (Welch 1994; Leys 1996; Grossman 1998), these arrangements have generally been unable to reorganize production in domestic markets. Region-wide declines in access to export markets due to globalization and trade liberalization, combined with rapidly increasing rates of non-communicable diseases, particularly among women and children, have led many Caribbean governments to review their food and nutrition security-related policies and institutions.

1.2. Motivations for the research

Due to the small size of domestic markets in the Caribbean region, the existing food and agriculture policy agenda remains heavily focused on commodity production for export markets. However, opportunities for exploiting trade opportunities have become increasingly limited because of their small size-related high costs of production. One strategy adopted by the Caribbean Community (CARICOM) Secretariat to address these regional challenges has been to try and realign domestic agricultural production with a view to enhancing dietary diversity and

quality (Brathwaite and YongGong 2012; CARICOM 2010). However, realizing such a vision requires a fundamental departure from past institutional approaches (sectoral, state-led, or market-led) in order to better account for the complexity of the local agriculture-food systems and support the multi-level innovation processes required to ensure sustainable outcomes (Lowitt et al. 2015). Importantly, institutions are central in helping (or hindering) social actors in the food system to: 1) absorb change and maintain function (buffer capacity); 2) self-organize; and 3) enhance learning (Speranza 2013). Previous efforts to enhance innovation in the CARICOM have often suffered from a lack of interaction and interdependency between institutions and the actors that are needed to support learning; and an absence of enabling cultural environments (Lederman et al. 2013). It is therefore important to better understand how the interactions between actors and institutions (i.e. common rules and procedures) in Caribbean agriculture-food systems function in order to help foster systemic innovation, co-learning and collaboration (Bahadur et al. 2013; Dessie et al. 2013).

Despite the complexity and importance of this public policy challenge to the Caribbean, there is a relative dearth of empirical research evidence available on smallholder agricultural innovation systems in Caribbean island contexts. This thesis seeks to help address this knowledge gap by improving our understanding of how various dimensions of social resilience can be better incorporated into sustainable smallholder food and agriculture-related policy in the Caribbean. More specifically, I seek to provide new insights into the persistent challenges and opportunities facing Caribbean smallholder agriculture-food systems at different scales with a view to informing workable policy strategies (government, donor, private sector or community organizations).

1.3. Research objectives

The objective of this research was to better understand how social resilience influences food and nutrition security policy innovation in the Caribbean. More specifically, the research aimed to:

1. Provide a detailed literature review to better understand and frame the challenges and opportunities facing smallholder farming systems in support of resilient domestic food systems in the Caribbean Community (CARICOM);

2. Analyze how formal and informal institutional dynamics have affected the historic development of smallholder agricultural innovation systems and the social resilience of these domestic food systems, focusing on the case of Saint Lucia;

3. Identify and assess how stakeholder interactions affect contemporary food and agriculture policy innovation and the social resilience of domestic food systems, focusing on the case of Saint Lucia; and

4. Explore and assess how the social capital of individuals and communities influences smallholder farmer innovation and the social resilience of domestic food systems, focusing on the case of Saint Lucia.

1.4. Theoretical approach

This research explores the multidimensional challenge of sustainable food security policy, focusing on the central role of smallholder farmers, a group for whom agricultural innovation has been identified as being limited in the Caribbean setting. In order to approach these complex issues, I have adopted social-ecological systems (SES) thinking (Berkes and Folke 1998) which views human systems and ecosystems as coupled and emphasizes complexity, feedbacks, systemic interactions and adaptive capacity (Foran et al. 2014). I am particularly interested in

revealing novel and important insights to the relationship between institutions and resilience (Folke 2006).

Social-ecological systems can be thought of as "hybrids of the social and the physical" world (Buanes and Jentoft 2009 p. 447) and are challenging to study, requiring inter-disciplinary approaches (Wohl, 1955) tools and methods (Uiterkamp and Vlek 2007). For this reason, a constructivist paradigm was used to guide my research by looking at how diverse actors develop their understanding of the world from multiple realities. This assumes that these realities can be known through appropriately designed methods (Denzin and Lincoln 2005) covering varied disciplines (Ludwig et al. 2001).

1.5. General methodological approach

This research was designed using a mixed-method approach to help ensure the validity and reliability of the findings through recursive data triangulation (using qualitative and quantitative primary data, secondary data, literature review and policy review). More specifically, the research was structured to enable the corroboration of emergent themes and findings (Hancke 2009) from literature review (Chapter 2), institutional analysis (Chapter 3), stakeholder analysis (Chapter 4) and social network analysis (Chapter 5) (see Figure 1.1).

A combined grounded theory – case study research design (Glaser and Strauss 1967; Yin 1994) enabled the research questions to be explored and analyzed within their real life contexts following a structured process of data collection, analysis and interpretation (Babbie 2001; Yin 1994). Importantly, through my case study research I was able to observe and recognize how different relations were embedded into larger positions, networks, situations and relationships

(Charmaz 2006; Yin 1994). The specific research methods used are described further in each individual results chapter.

1.6. Organization of the thesis

This research was designed to progressively inform the research question from varying analytical scales (refer to Figure 1.1). The thesis follows a manuscript-based format and is written as a series of papers, each of which are at various stages of preparation, submission and publication in international peer-reviewed journals.

In Chapter 2, I present the results of a detailed literature review to understand the social-ecological complexity of food and nutrition security in the small island developing states (SIDS) of the Caribbean Community (CARICOM). I review the requirements for policy innovation, and the social issues associated with historical developments in the region. Then, I argue for a different approach to agricultural development that draws primarily on social-ecological systems (SES) and agricultural innovation systems (AIS) frameworks. Through the review, I propose that improving adaptive capacity in the domestic agriculture-food systems of CARICOM will require enhanced coordination, collaboration and innovation among actors at multiple levels.

In Chapter 3, I conduct an institutional analysis to assess the role played by institutions in the historical development of Saint Lucia's domestic agriculture-food system. Results suggest that a displacement of informal institutions to a lower position in the institutional hierarchy was driven by rule convergence in export and domestic agricultural production systems (pre-1950 to 2010). These rule changes served to reduce interactions between community members, with negative implications for horizontal knowledge flows (bridging and bonding social capital) at the community level despite apparent increases in vertical knowledge flows (linking social capital). In Chapter 4, I describe the ways in which national policy actors in Saint Lucia's agriculture and

food system interact and their perceived influence on contemporary agriculture-food policy development. The results provide novel insights to the national-level socio-political processes affecting policy outcomes and the potential implications for future public policy processes.

Building on these national-level analyses, Chapter 5 explores innovation among smallholder farmers producing fresh foods for domestic markets in two rural communities of Saint Lucia. Using a multi-level social network and statistical analysis of survey data, I sought to better understand the ways in which knowledge flows and innovation are affected by different dimensions of social capital at the local level.

In Chapter 6, I present a general discussion and conclusion to this dissertation, including future research directions.

References

Andreatta, S.L. (1999). The political ecology of bananas: Contract farming, peasants and agrarian change in the Eastern Caribbean. *Culture and Agriculture, 21* (2), 36-38.

Anthony, V.M., Ferroni, M. (2011). Agricultural biotechnology and smallholder farmers in developing countries. *Current Opinion in Biotechnology*, *23* (2), 278-285.

Axline, W.A. (1986). *Agricultural policy and collective self-reliance in the Caribbean*. Colorado: Westview Press.

Berkes, F., Folke C. (1998). *Linking social and ecological systems: Management practices and social mechanisms for building resilience*. Cambridge: Cambridge University Press.

Birner, R., Resnick, D. (2010). The political economy of policies for smallholder agriculture. *World Development, 38* (10), 1442-1452.

Brierley, J.S. (1974). *Small Farming in Grenada, West Indies*. Geographical Studies, 4. Winnipeg: University of Manitoba.

Brierley, J.S. (1988). A retrospective on West Indian small farming, with an update from Grenada. In J.S. Brierley and H. Rubenstein (Eds.) *Small farming and peasant resources in the Caribbean*. Winnipeg: University of Manitoba

Buanes, A., Jentoft, S. (2009). Building bridges: Institutional perspectives on interdisciplinarity. *Futures, 41* (7), 446-454.

CARICOM. (2010). *Regional food and nutrition security policy*. Guyana: Caribbean Community (CARICOM).

Conway, G.R. (1987). The properties of agroecosystems. *Agricultural Systems, 24* (2), 95-117.

Dorward, A., Kydd, J. (2004). The Malawi 2002 food crisis: The rural development challenge. *The Journal of Modern African Studies, 42* (3), 343-361.

Foley, J.A., Ramankutty, N., Brauman, K.A., Cassidy, E.S., Gerber, J.S., Johnston, M., Mueller, N.D., O'Connell, C., Ray, D.K., West, P.C. (2011). Solutions for a cultivated planet. *Nature, 478* (7369), 337-342.

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

Foran, T., Butler J.R., Williams L.J., Wanjura W.J., Hall A., Carter L., Carberry P.S. (2014). Taking complexity in food systems seriously: An interdisciplinary analysis. *World Development, 61*, 85-101

Grossman, L.S. (1998). *The political ecology of bananas: Contract farming, peasants, and agrarian change in the Eastern Caribbean*. Chapel Hill: University of North Carolina Press.

Kydd, J., Dorward, A. (2004). Implications of market and coordination failures for rural development in least developed countries. *Journal of International Development, 16* (7), 951-970.

Leys, C. (1996). *The rise and fall of development theory*. London: Indiana University Press.

Lowitt, K., Hickey, G.M., Ganpat, W., Phillip, L.E. (2015). Developing communities of practice in support of resilient value chains for sustainable food security. *World Development, 74*, 363-373.

Ludwig, D., Mangel, M., Haddad, B. (2001). Ecology, conservation, and public policy. *Annual Review of Ecology and Systematics*, 481-517.

Mintz, S.W. (1985). From plantations to peasantries in the Caribbean. In: S.W. Mintz, and S. Price, (Eds.), *Caribbean contours*. Baltimore: John Hopkins Press.

Pinstrup-Andersen, P., Pandya-Lorch, R., Rosegrant, M.W. (1999). *World food prospects:*

Critical issues for the early twenty-first century. Washington DC: IFPRI.

Pinstrup-Andersen, P., Hazell, P.B.R. (1985). The impact of the Green Revolution and prospects for the future. *Food Reviews International, 1*(1), 1-25.

Pretty, J., Toulmin, C., Williams, S. (2011). Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability, 9* (1), 5-24.

Timms, B.F. (2008). Development theory and domestic agriculture in the Caribbean: Recurring crises and missed opportunities. *Caribbean Geography, 15* (2), 101.

Uiterkamp, A.J., Vlek, C. (2007). Practice and outcomes of multidisciplinary research for environmental sustainability. *Journal of Social issues, 63* (1), 175-197.

Watts, D. (1990). *The West Indies: Patterns of development, culture, and environmental change since 1492*. Cambridge: Cambridge University Press.

Welch, B. (1994). Banana dependency: Albatross or liferaft for the Windwards. *Social and Economic Studies*, 123-149.

Wohl, R.R. (1955). Some observations on the social organization of interdisciplinary social science research. *Social Forces, 33*, 374-383.

Yin, R. (1994). *Case study research: Design and methods*. Thousand Oaks, Chicago: Sage Publications.

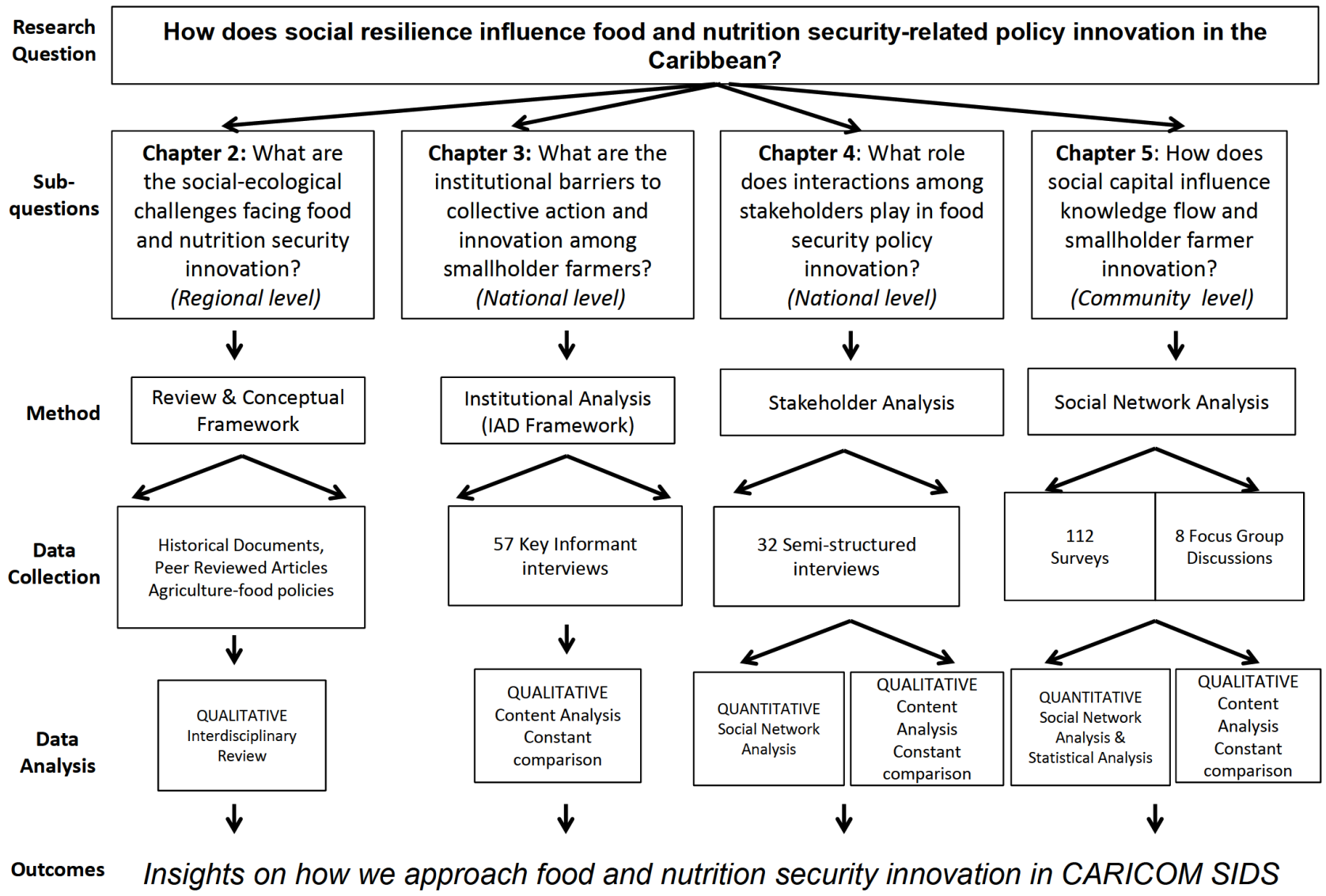

Figure 1.1 Conceptual design of the thesis

CHAPTER 2: LITERATURE REVIEW. ADDRESSING FOOD AND NUTRITION INSECURITY IN THE CARIBBEAN THROUGH DOMESTIC SMALLHOLDER FARMING SYSTEM INNOVATION: A REVIEW

Abstract

Smallholder farmers are key actors in addressing the food and nutrition insecurity challenges facing the Caribbean Community (CARICOM), while also minimizing the ecological footprint of food production systems. However, fostering innovation in the region's smallholder farming systems will require more decentralized, adaptive and heterogeneous institutional structures and approaches than presently exist. In this paper, we review the conditions that have been undermining sustainable food and nutrition security in the Caribbean, focusing on issues of history, economy and innovation. Building on this discussion, we then argue for a different approach to agricultural development in the Small Island Developing States of the CARICOM that draws primarily on social-ecological resilience and agricultural innovation systems (AIS) frameworks. Research needs are subsequently identified, including the need to better understand how social capital can facilitate adaptive capacity in diverse smallholder farming contexts; how formal and informal institutions interact in domestic agriculture and food systems to affect collaboration, co-learning and collective action; how social actors might better play bridging and linking roles that can support mutual learning, collaboration and reciprocal knowledge flows; and the reasons underlying past innovation failures and successes to facilitate organizational learning.

Keywords: Food security policy; Social capital; Resilience; Caribbean Community (CARICOM)

2.1 Introduction

Formally recognized at the Earth Summit in 1992, Small Island Developing States (SIDS) confront a range of context-specific challenges (Angelucci and Conforti 2010) while also sharing common challenges related to small size, insularity, remoteness, geographic isolation, and proneness to natural disasters (Briguglio 1995). Annual climatic variability and intensification of extreme weather events associated with global environmental change are adding additional layers of complexity to the sustainable development of many SIDS (Blancard and Hoarau 2013; Tompkins and Adger 2004).

The Caribbean Community (CARICOM) represents an economic grouping of fifteen nations, primarily SIDS (Figure 2.1). The SIDS of CARICOM have long been identified as being vulnerable to environmental change due to their small size, exposure to natural hazards, limited natural resources and ecological uniqueness (Blancard and Hoarau 2013; Méheux et al. 2007). Although these states face a wide range of social-ecological vulnerabilities, their unique characteristics have made them highly desirable tourist destinations (Armstrong and Read 2002; Read 2004). Beyond seasonal tourism, the natural resource sector also forms a significant component of many national economies in the CARICOM, with agriculture playing a particularly important role in supporting rural livelihoods. Smallholder farms, defined as farmers with limited resources operating on less than two hectares (World Bank 2003), comprise nearly 90% of the farms that operate in the CARICOM (Figure 2.2a) and account for approximately 55% of the total farm land (FAO 2012) (Figure 2.2b). These often informal farming systems face a wide range of systemic challenges to sustainable food production that include low levels of technology, the absence of barriers to market entry, difficulties in group coordination, asymmetry in the flow of knowledge and information, and high degrees of exposure to natural

shocks (Birner and Resnick 2010; Dorward and Kydd 2004; Kydd and Dorward 2004), limiting their ability to compete in domestic markets flooded with imported food (Clegg and Shaw 2002; FAO 2012; Gumbs 1981).

Historically, CARICOM countries based their economic development planning on the export of plantation cash crops to preferential markets in Europe (Axline 1986; Watts 1990). This agriculture-led economic development strategy resulted in agricultural institutions that were heavily directed towards export markets rather than the needs of domestic food markets. Both smallholder and larger-scale producers in the region were vertically integrated into value chains with coordination being managed through 'top-down' formal institutions (Thomas 1988). While cash-crop arrangements generated significant short-term economic benefits, the loss of protected markets with the advent of globalization and trade liberalization led to a dramatic decline in agricultural production across the region (Deep Ford et al. 2007). According to Andreatta (1998), the heavy focus on export markets fostered cyclical vulnerabilities in smallholder farming systems across the region, mainly due to an overexposure to exogenous shocks (Armstrong and Read 2002; Read 2004) driven by competition from low-cost producers benefitting from economies of scale, volatility in customary markets, and unsteady foreign exchange rates (Andreatta 1998). Over the period 1986 to 2006, dramatic changes occurred in the agriculture sectors across the region with CARICOM's share of global agricultural exports falling from 2% to 0.3% and the value of net agricultural exports changing from a surplus of US$ 2.9 billion to a deficit of US$2.2 billion over the same period (CARICOM 2007). In concert with the decline of export agriculture, CARICOM populations have been experiencing increasing rates of non-communicable diseases (NCDs), particularly obesity and overweight (CARICOM 2010) among women (Figure 2.3) and children, raising serious domestic and international public health

concerns (World Bank 2011). These health trends have been associated with an increasing dependence on the imported energy-dense foods, consumer food choices that have led to low consumption of fresh vegetables and fruits and sedentary lifestyles (Samuels et al. 2012).

One strategy adopted by the CARICOM Secretariat to address these regional challenges has been to try and realign domestic agricultural production with a view to enhancing dietary diversity and quality (Brathwaite and YongGong 2012; CARICOM 2010). However, realizing such a vision will require a fundamental departure from past institutional approaches (sectoral, state-led, or market-led) in order to better account for the complexity of the local agriculture-food systems and support the multi-level innovation processes required to ensure the resilience of domestic food systems. Recognizing the significance of the challenges that face the region, this paper reviews how institutional arrangements in Caribbean agriculture and food systems have been driving smallholder vulnerability in a cyclical manner. We first describe the conditions that have been undermining sustainable domestic food production in the region, focusing on issues of history, economy and innovation. Building on this discussion, we argue for a different approach to agricultural development in the SIDS of the CARICOM that draws primarily on social-ecological resilience and agricultural innovation systems (AIS) frameworks. Working within this approach, we then discuss potential policy options and identify research needs.

2.2 Conditions undermining domestic agriculture and food systems in CARICOM SIDS

2.2.1 History: Plantation institutions and the legacies of colonization

The legacies of colonization in the Caribbean have been the subject of much study, influenced by Gunder Frank's (1969) analyses of economic development and external structural arrangements (Beckford 1999; Cooper 1993; Lewis 1968; O'Loughlin 1968; Richardson 1992a; Thomas 1988).

Increasingly, however, it is being recognized that domestic institutions in ex-colonies have the potential to play a significant role in sustainable and equitable economic development (Acemoglu et al. 2002; Favaro 2006; Mendola 2007; Olson 1996; Rodrik et al. 2004; Seligson and Passé-Smith 2008). In the context of agricultural development, understanding how colonial institutional legacies have fostered export production in the SIDS of the CARICOM region requires examination of the role played by domestic policy and institutions (Rodrik et al. 2004; Seligson and Passé-Smith 2008). Recognizing this, Timms (2008) traced agricultural policy development in the Caribbean from the colonial mercantilist interests (1500-1900) to the most recent 2008 food price hikes and offered three factors driving CARICOM's export-oriented focus: 1) in-country resistance to changing the status quo by the planter class and political elites; 2) lack of resources to support institutional change, first by colonial and then ex-colonial powers who have been concerned primarily with their own positive balance of trade, and utilizing aid to sustain such terms of trade; and 3) most recently, neo-liberal trade policies that have disadvantaged small local producers through market flooding with cheaper food produced in industrial agricultural systems (see also Elliott and Palmer 2008).

Across the Caribbean, the 'plantation' as an institution of political colonization was both a powerful economic and social unit, surviving for over 450 years with minimal structural change (Beckford 1999; Beckles and Shepherd 1996), and influencing social norms, interactions and relations concerning agriculture. Caribbean plantation agriculture was a system informed by an exploitation and domination ethic that used land and labour for the maximum extraction of profit. More specifically, Richardson (1992a) identified six characteristics of the Caribbean plantation institution: 1) viewing land as a commodity, 2) complete control of resources and their use centralized by the owner or representative, 3) significant investment in equipment and

technology for monocrop agriculture, 4) introduced workforce controlled by coercion and/or force (slavery), 5) production-oriented toward foreign mass markets, and 6) supporting policies devised by foreign capital interests. Other linked norms associated with the plantation institution include racist and exploitative ideologies that have affected human relations in the Caribbean agricultural system (Beckles and Shepherd 1996). For example, Thomas (1988) described plantation relations during slavery as authoritarian, based on force, terror, fear and fraud (see also Richardson 1992a). In order to supplement imported food rations, each slave was allowed one day a week to tend to their garden and exchange surplus produce. As a result, producing food for subsistence was one of the few areas where slaves were able to enjoy the fruits of their labour and subsistence farming became the focal point of family and community life (Thomasson 1994). According to Mintz and Price (1976), these interactions form the basis of the contemporary informal institutions that support domestic production and weekly farmer markets in the Caribbean (Richardson 1992a).

After emancipation of slavery in 1838, slaves were freed and their legal status changed however their economic domination by planters remained a societal norm (Thomas 1988). For sugar, the major export crop at that time, prices fell and the region experienced economic depression, leading ex-slaves to riot against oppression and causing widespread social unrest (Watts 1990). The British colonial administration responded to the situation with the West India Royal Commission of 1897, hailed as the "Magna Carta of the West Indian peasant" (Shephard 1947 p.63), designed to deal with concerns of declining revenue from sugar production, lowering of wages, and the abandonment of plantations by freed slaves. The Commission made five major recommendations: 1) settlement of peasants on small plots of land; 2) establishment of small-scale agricultural industries; 3) improvements in regional communications; 4) development of a

fruit trade; and 5) establishment of cane-milling factories (Richardson 1992a; Richardson 1992b). Recognizing the highly charged conditions in the colonies, the administration moved to implement non-revolutionary changes. Land settlements were initiated to pacify landless peasants, and the development of the fruit trade was initiated, transitioning much of the region from sugar to banana production (Axline 1986; Clegg and Shaw 2002). Initially, plantation owners often blocked land settlement schemes assuming that they would increase labour shortages and negatively impact their production (Thomas 1988). As a result, the ownership of land and the exchange of labour in the CARICOM region became subject to societal class divisions that still pervade the society, particularly in the agricultural sector (Thomas 1988), and would serve to limit the proper functioning of market or economic forces. George Lamming (1981) described how these tensions impact labour availability in the region:

> *"[A]t the deepest levels of a man's being it cannot make sense that he should … labour for those whose style of thinking discloses them to be his enemies" (Louis 1981 p. 222).*

Eventually, under pressure from ex-slaves, land settlement schemes were implemented but they did not generate the desired outcomes. Five factors can be seen as undermining these settlement plans: 1) political expediency - lands were carved into farms of less than two hectares to increase land ownership levels among many peasants rather than into more economically viable units; 2) low access to financial and physical capital and technology which kept production levels low; 3) low levels of human and social capital with many farmers lacking the knowledge to design and sustain commercial operations; 4) lack of natural capital - since plantations were already located on the fertile lands and plains, smallholders were often allocated inappropriate and marginal lands which limited production and increased land degradation; and 5) local elites, with

conflicting economic interests in the wholesale business of food imports, actively undermined agricultural investments directed toward domestic production and local markets (Axline 1986; Timms 2008).

> *"[T]he peasants of the Caribbean have been embattled since their beginnings …. agricultural or infrastructural improvement - in roadways, marketing facilities, agricultural extension and credit, crop varieties...went to the plantation sector…. Perhaps the most unusual thing about Caribbean peasantries is that any of them survived at all" (Mintz 1985 p.132).*

Beyond the formal land settlement schemes, land tenure across the CARICOM region also became subject to a diverse range of informal, unclear and complex (multiple ownership) arrangements. For example, communal, indigenous and generational land ownership is still found in Suriname, Belize, Jamaica, Bahamas, Tobago, Dominica and Saint Lucia (FAO 2013). In Saint Lucia, 45% of all land parcels fall under the generational "family land" title, defined as lands owned across generations of a family that can be accessed and used by a multiplicity of heirs without title by virtue of shared bloodline (OAS 1986). These socio-historical influences on land and labour continue to pervade agriculture in the region. Further, the relative ease of access (not ownership) to small, sub-economic farm units serves to limit the operation of the more conventional microeconomic principles needed to support conventional commercial agricultural investment and development.

2.2.2 Economy: Small size of domestic markets

The small size of domestic markets and the absence of economies of scale present a particular challenge to sustainable domestic agricultural sector development and regional food security for the SIDS of CARICOM. According to Blancard and Hoarau (2013), small domestic markets,

absence of economies of scale, limited economic diversification, high costs of imports, and limited private sector development are significant challenges to innovation in most sectors. In the agricultural sector, these challenges are compounded by limited natural resources, remoteness and insularity and vulnerability to natural disasters, which further undermine the resilience of domestic food systems. According to Briguglio (2003), the factors affecting development capacity and innovation in the small market economies of CARICOM include: 1) loss of high skilled human capital ("brain drain') with 70% of the regional labour force migrating to developed economies (Mishra 2006; Stubbs and Reyes 2004); 2) high social cohesion among policymakers and social elites which stifles growth (Briguglio 1995); and 3) revenue shortfalls from the small population and taxation base resulting in public service limitations (Briguglio 1995; Favaro 2006). These are significant size- related challenges which limit the options and resources available to decision makers tasked with developing and reviewing the effectiveness of existing institutional arrangements (Tonurist 2010).

Notwithstanding historical legacies, institutional 'lock-in', and size-related limitations, the governments of CARICOM have recognized the urgent need to foster innovation across their domestic agriculture-food systems to help build the adaptive capacity of rural communities and address the growing public health crises of NCDs resulting from low dietary and nutritional diversity (CARICOM 2010). The complex challenges of food insecurity became further highlighted during the 2007-2008 food price hikes (Grote 2014), which revealed that while there had been extensive investments in agricultural science and technological developments, there had not been matching policy innovation around the institutional arrangements that support smallholder farmer systems (FAO 2013; Gamble et al. 2010; von Braun 2009). According to Maetz et al. (2011), many governments have returned to previously neglected areas of food

security-related public policy since the 2007-2008 food price hikes due to a lack of confidence in the market, unwillingness of policymakers to continue dependence on the private sector to provide signals for food security decision-making, and attempts to make policy more context-driven. Their analysis of the policy options implemented by CARICOM SIDS revealed that 42% had initiated producer-oriented measures (e.g. input subsidies, seed improvement, input price control), 17% trade policy measures (e.g. food imports/exports imposed or lifted) and 25% consumer oriented measures (e.g. school feeding, price control, removal of VAT) (Maetz et al. 2011). As the CARICOM searches for new, context-driven food and nutrition security policy options, the region will require a better understanding of how existing (often informal) domestic institutions function, and how they can and do inform formal agricultural sector reform policy and process.

2.2.3 Institutions, interactions and innovation: Lack of formal learning and low levels of adaptive capacity

Another significant challenge facing the agriculture and food sectors in the CARICOM is the malfunctioning of institutions, namely: (1) a lack of interaction and interdependency between institutions that support learning; and (2) the absence of enabling cultural environments (Lederman et al. 2013). It is therefore important to understand how interactions between actors and institutions (i.e. common rules and procedures) in the agriculture-food system function in order to promote resilience and adaptive capacity through innovation, co-learning and collaboration (Bahadur et al. 2013; Dessie et al. 2013). Importantly, institutions are central in helping (or hindering) social actors in the food system to: 1) absorb change and maintain function (buffer capacity); 2) self-organize; and 3) enhance learning (Speranza 2013). In order to better understand how institutions have affected the agricultural production systems operating in

the CARICOM, we depict the interactions between networks of organizations and actors, together with the dominant institutions and policies (Figure 2.4) to show how interactions between agriculture and food-related institutions have helped and hampered smallholder farmers absorb change, self-organize and learn through time. Figure 2.4 shows that, since the 1900s, minimal institutional change has occurred in the functioning of the region's two-tiered agriculture-food system, with human, social, economic and institutional resources directed primarily towards commodity-oriented production. When comparing how the commodity-oriented export production and domestic-oriented subsistence production have helped social actors absorb changes, organize and learn, we can distill three main differences. First, they have different worldviews and approaches to change. In the CARICOM a command and control paradigm (evolving from the plantation institution) has informed the formal agriculture and food institutions of government (Pant 2013). This production paradigm is based on assumptions that include a stable environment where resource flows can be controlled and nature will return to equilibrium (Wilby and Dessai 2010). In contrast, the informal agriculture-food institutions supporting production for the domestic market evolved largely organically, as diverse producers met weekly, exchanged (bartered) and later sold excess production (small volumes) of a wide variety of crops. Second, each production system fostered different social relations, levels of farmer organization and learning. Social relations from slavery to present created and maintained division between races and classes with low knowledge flows across the class divide. After the emancipation of slaves and later as part of national independence activities, land settlement schemes enabled first ex-slaves, and later smallholder farmers to become vertically integrated into export-oriented commodity production programs (Brierley 1974, 1988; Grossman 1998). These smallholder farmers received significant economic benefits from this approach until the

late 1990's, ending with changes to global trading agreements. Over the same period, a smaller group of smallholder farmers oriented towards domestic markets were squeezed into a small niche initially limited to ad-hoc production for weekly provision markets (Levitt and Best 1975). While export-producers were vertically integrated with linear exchanges of codified knowledge, contrastingly, weekly provision markets developed and organized in a decentralized manner, through what Hart (2005) characterized as "the self-organized energies of people excluded by the exigencies of state rule" (p.10). In this case, knowledge exchange was more multifunctional and needs-based, with social learning and relationships guiding tacit knowledge exchange.

The evolution of a two-tiered agriculture-food system in the CARICOM has resulted in institutional mismatch that likely drives smallholder vulnerabilities, supports institutional inertia in Caribbean agriculture, but also provides an entry point for future interventions to enhance innovation outcomes and overall food and nutrition security in the region. Major differences between the tiers include: knowledge types (tacit vs. codified), ethics (subsistence vs. exploitation), knowledge exchange/learning pathways (social learning vs. top-down), production principles (agro-ecological vs. monoculture), management type (self-emergent vs. authoritarian) institutional forms (informal/flexible vs. formal/command and control), major resource used (social capital vs. financial capital), coordination mechanism (heterogeneous vs. homogenous), governance (decentralized/multi-level vs. centralized/bureaucratic). Interestingly, both production tiers appear to have followed parallel processes, with the formal agriculture-related institutions likely undermining the adaptive capacities of smallholder farmers. Rahman et al. (2014) described this phenomenon of dual resource management systems with conflicting objectives as resulting in an "inter-institutional pitfall" which undermines reciprocity, knowledge exchange, learning, and development of common interests across institutions. Policy can bridge

these gaps, foster trust and shared vision by acknowledging informal institutions, and enhancing cooperation through inter-institutional processes (such as multi-stakeholder groups) supported by mediating agents (Rahman et al. 2014).

2.3 Promoting innovation in the domestic agriculture and food systems of CARICOM

Recognizing the complex challenges that face the CARICOM as it seeks to sustainably develop domestic agriculture-food systems there is an urgent need for more systems-based approaches to policy, practice and research. More specifically, the historical, economic and institutional challenges facing smallholder agriculture will require a greater focus on building agricultural innovation systems (AIS), defined by (Hall et al. 2006) as "networks of organizations or actors, together with the institutions and policies" that influence innovation processes and outcomes through interactive learning that results in "new products, new processes and new forms of organization" (p. 12). AIS thinking goes beyond previous approaches in the region, such as the National Agricultural Research Systems (NARS) and the Agricultural Knowledge and Information Systems (AKIS), to focus explicitly on interactions between actors and their institutional and policy contexts with a view to creating enabling environments for innovation (Klerkx et al. 2012). Understanding how such interactions, interdependencies and cultural environments developed within CARICOM's agricultural innovation systems offers a potentially fruitful avenue to address the institutional mismatches that likely drive smallholder vulnerabilities and institutional inertia in Caribbean agriculture with a view to enhancing innovation outcomes and overall food and nutrition security in the CARICOM (see Maat (2007) on AIS application in the Dutch Caribbean Island dependencies and Chave et al. (2012) on the French Caribbean Island dependencies). Adopting an AIS perspective also has implications for the ways in which donor agencies, governments, non-governmental organizations, scientists and

communities might best approach resiliency-focused food security policy and research in the region (Bernard and Spielman 2009; Hounkonnou et al. 2012; Schut et al. 2015; Totin et al. 2012).

Another important approach to understanding the complexity of the interactions occurring between the human and natural systems supporting agriculture and food systems in the CARICOM is socio-ecological systems (SES) thinking (Berkes and Folke 1998). SES thinking views human systems and ecosystems as coupled and emphasizes complexity, feedbacks, systemic interactions and adaptive capacity (Foran et al. 2014). Efforts to better understand the dynamics of SESs, including how they adapt, absorb shock, and maintain key functions, have revealed important insights to the relationship between institutions and resilience (Folke 2006). More specifically, the concept of social resilience, defined by Adger (2000) as the capacity of groups or communities to adapt in the face of external social, political, or environmental stresses and disturbances, represents an often untapped resource for facilitating social-ecological resilience through adaptation and innovation (Folke et al. 2003; Folke et al. 2005; Pretty 2003; Pretty and Ward 2001). Recently, however, Fabinyi et al. (2014) identified the need to focus further on how social diversity, power relations, and agency affect SESs. For example, Westley et al. (2013) reviewed agency in social-ecological transformation and matched social innovation strategies with SES adaptive cycle phases, suggesting that innovation within a SES depends upon the ease with which organizations can promote joint action and the extent to which institutional structures foster the type of innovation required in that system phase.

Drawing on the literature covering the theory and application of AIS and SES frameworks in diverse contexts, Figure 2.5 presents a conceptual diagram of how CARICOM policy institutions might better approach the problem of low adaptive capacity in the domestic agriculture-food

systems of SIDS. This diagram is based on a recognition that responding to environmental change and shocks (social, political, economic and environmental) to domestic agriculture and food systems will need to build upon and expand existing social system agency in order to foster social transformation and innovation. According to Westley et al. (2013), this will involve questioning of arrangements, undermining of existing rules and authority, and the need for increased interaction to foster new collaboration toward common goals. In particular, fostering innovation in the region's smallholder farming systems will require more decentralized social systems where mutually supporting relationships among diverse social actors are mediated through connections with the natural environment (Anderies et al. 2004). In our diagram (Figure 2.5), social resilience is shown as the pivot of human-nature interactions in SIDS, cutting across the three intersecting policy domains of domestic smallholder farmers, global environmental change and regional food and nutrition security, each of which suffer from low levels of innovation and adaptive capacity. This is because any efforts to build adaptive capacity, or lessen vulnerability, will be dependent on the capacity of new institutions and social actors to buffer against disturbance, self-organize, learn and adapt across scales (Carpenter et al. 2001; Obrist et al. 2010; Tompkins and Adger 2004). The diagram also depicts the intersection of numerous complex and "wicked" policy challenges (Norton 2005) which support the need for more decentralized and systems-based approaches.

Previous research by Butler et al. (2014) has combined AIS and SES resilience thinking to examine adaptation pathways in Indonesian islands and provides some general guidance on how an integrated AIS and SES approach might be operationalized, including: multi-scale analysis of livelihoods within the SES; development of multi-stakeholder processes (e.g., innovation platforms); and emphasis on governance through adaptive co-management. Our review of the

literature supports the potential utility of these steps in the context of the domestic agriculture and food systems operating in CARICOM's SIDS, and points to the following opportunities to foster innovation: 1) facilitating institutional diversity that fosters local knowledge and governance; 2) creating conditions that support interaction for collaboration, co-learning and adaptation at multiple scales; and 3) supporting agro-ecological approaches to local food production systems (Bahadur et al. 2013), each of which is further discussed below.

2.3.1 Facilitating institutional diversity that fosters local knowledge and governance

Institutional diversity can facilitate improved local knowledge from varied sources, enhance governance structures and provide the basis for community-based development approaches (Bodin and Prell 2011; Pelling and High 2005; Tompkins and Adger 2004). The formal institutions operating in the agriculture and food systems of the CARICOM are generally characterized by a state-led focus on managing food exports with markets directing imports (Armstrong and Read 2002). In the context of British ex-colonies, Lange (2009) observed that rather than promoting broad-based development following independence, state institutions have remained relatively static, reinforcing previous colonial hierarchies and centralized power. A good example of this situation is the Windward Islands Banana Growers' Association, co-owned by the four Windward Islands (Dominica, Grenada, Saint Lucia, and Saint Vincent and the Grenadines), which when commercialized into the Windward Islands Banana Development and Exporting Company Limited in 1994 witnessed minimal institutional change. The importance of focussing on the issue of adaptive capacity in these relatively young institutions is supported by a recognition that promoting innovation through enhanced interactions, supportive rules and two-way knowledge flows (Berkes and Folke 1998) will require more decentralized, adaptive and heterogeneous institutional structures. These structures will be considerably different from the

often authoritarian, top-down, technocratic, state-led agricultural production institutions enacted by parliament that dominate the Caribbean (Adger et al. 2005; Allison and Hobbs 2004; Folke 2006; Tompkins and Adger 2004), such as the Guyana Rice Development Board (3/1998) and the Coffee Industry Board of Jamaica (146/1999). Further studies into different institutional forms and how they can influence social actors in Caribbean SIDS contexts are needed in order to provide a better understanding of how domestic agriculture and food system innovation might be enhanced in the region.

Studies by Osbahr et al. (2010), Aligica and Tarko (2014) and Ostrom (1999) have shown that more context-specific, multi-layered and polycentric institutional structures can foster more equitable governance arrangements and have the potential to counter historical social hierarchies, power differences and class divisions. These structures have also been shown to be more suitable for enhancing the transfer of knowledge and interaction between diverse social actors (Bahadur et al. 2013; Kilelu et al. 2013). The development and maintenance of technocratic institutions in the agriculture and food systems of CARICOM have had the effect of stifling system innovation and creativity by sustaining hierarchical power differentials and limiting the evolution of more locally-appropriate institutional designs (Lam 2011). This is supported by the FAO (2013) who identified the need for policy reform in the region to develop institutions better tailored to small-scale agriculture. Such reforms would benefit from clear institutional diagnoses (see Amankwah et al. 2012; Hounkonnou et al. 2012; Totin et al. 2012) to detect constraints, highlight openings for intervention, the key intermediaries functioning and the development of multi-stakeholder groups (Struik et al. 2014b). While innovative multi-stakeholder governance pathways in AIS are conceptualized as iterative and adaptive, capable of fostering learning and conflict resolution (Amankwah et al. 2012), existing deficiencies in collaboration and innovation systems may serve

to limit institutional evolution and maintain the 'status quo'. In these situations, more flexible policy structures and facilitation mechanisms may help to enhance decision-making to better meet conflicting and multi-faceted objectives (Kilelu et al. 2013; Klerkx et al. 2010; Swaans et al. 2013). In the context of Sub-Saharan Africa, innovation platforms, which comprised of multi-stakeholder support networks operating within a geographic area, have been shown to enhance agricultural innovation by bridging critical social, economic, technical, and institutional gaps (Kilelu et al. 2013; Klerkx et al. 2013). While innovation platforms identify problems, seek opportunities and develop solutions (Adekunle and Fatunbi 2012), change agents or innovation entrepreneurs are also needed to galvanize change in complex systems (Klerkx et al. 2013; Westley et al. 2013) which can be derailed by power dynamics and limit effectiveness of participatory processes (Foran et al. 2014). The adaptive co-management model, which supports power and knowledge-sharing amongst stakeholders from multiple levels through reflective learning and innovation, is another approach that has already been applied in other natural resource sectors in the region (notably in fisheries, coastal zone and watershed management) (Tompkins and Adger 2004) and may offer valuable insights for domestic agriculture and food systems governance. According to Sandersen and Koester (2000), these may include how to get commitment to the devolution of state power, how to develop dynamic mechanisms to resolve conflicts, how to manage social diversity and power asymmetries, and how to enforce rules based on agreed-upon social norms.

2.3.2 Creating conditions that support interaction and adaptation at multiple scales

The absence of an enabling cultural environment needed to support innovation (Lederman et al. 2013) particularly within the region's historically two-tiered food production system hampers learning and knowledge exchange. More specifically, procedures are needed to govern behavior

and facilitate collaboration, co-learning and collective action for adaptation (see Dessie et al. 2013), while there is also a need to create environments that are conducive to realizing two-way communication flow (formal and informal), consensus and change (Struik et al. 2014a; Struik et al. 2014b; Temby et al. 2015). These changes often require a systemic reassignment of the collective resources that created the division, or what Hart in Guha-Khasnobis et al. (2007 p.33) described as "a massive cultural effort" directed toward support for learning and adaptation at multiple scales.

Both SES and AIS approaches require a high degree of interaction between social actors and organizations in order to support institutional and cultural change and foster innovation in attitudes, values and norms from the farm to the community, private and public sectors, NGOs and wider society (Hounkonnou et al. 2012; Olsson et al. 2014; Westley et al. 2013). One way that this can be accomplished is by mobilizing and building social capital in the form of trust, reciprocity and social networks (Folke et al. 2005) across the domestic agriculture-food systems operating in CARICOM SIDS. Social capital comprises three dimensions: bonding (horizontal within group ties), bridging (horizontal ties bridging distinct groups) and linking social capital (vertical ties to power, finance through shared tasks toward the common good) (Grootaert et al. 2003; Sabatini 2009). Importantly, not all social capital is equal, with different dimensions playing different roles in the innovation process. While van Rijn et al. (2012) in their study on smallholder farming systems in seven Sub-Saharan African countries identified social capital and innovation as complementary, they suggested that while structural social capital (bridging) enhanced innovation adoption, cognitive social capital (bonding) among homogenous groups, served to limit innovation by maintaining the status quo. Studies in the Caribbean have suggested that an enhanced understanding of social capital dynamics within communities could improve

policy and practice (Adger 2003; Pelling and High 2005), by encouraging social actors to co-learn and collaborate (Pretty and Ward 2001). Perhaps most importantly, the capacity of policy processes and institutions to build bridging and linking social capital across actors in the agriculture-food system will likely be directly related to their ability to overcome historical legacies of inequity and marginalization, which dominate the social memory. Social memory involves widely accepted practices based on experiences activated by a collective in response to various shocks (Folke et al. 2003). High levels of distrust between actors in the domestic agriculture-food systems of the CARICOM (Lowitt et al. 2015) are likely embedded in the social memory that has resulted from coercion and authoritarian exploitation and may foster bonding social capital between marginalized smallholder farmers, and undermine efforts to develop bridging and linking social capital in support of innovation and collective action. Existing linking and bridging social capital between organized actors in the agriculture-food system, such as policymakers, international donors and scientists, may offer an important entry point for developing the smallholder agricultural innovation system (Fischer and Qaim 2014) through more participatory and decentralized processes of research, deliberation and decision-making that can foster trust and the "cross-fertilization of ideas, methods and expertise" (Brooks and Loevinsohn 2011 p.195; Real and Hickey 2013).

Despite the recognized need for more flexible policy frameworks and decentralized innovation processes to support the development of social capital in the domestic agriculture-food systems of the CARICOM, a significant gap remains between potential and actual practices in most countries, with negative implications for smallholder farming systems. Informed by Rogers' (1983) diffusion theory, most agricultural extension practices in the CARICOM have followed a conventional linear approach to knowledge flow, where knowledge is developed by scientific

researchers and delivered through government agricultural extension officers to individual farmers (Ganpat et al. 2010). According to Ganpat et al. (2010) the large gap between agricultural extension theory and practice in the region stems from: 1) weak linkages between agricultural research and education; 2) limited coordination of limited resources; and 3) inadequate adaptation of the institutional structures to meet existing needs and resource limitations. As the region confronts the challenges of developing resilient smallholder farming systems, dynamic and organic learning systems will be needed to allow farmers to critically assess and adopt new practices or technologies (Zilberman et al. 2012). Mobilizing disconnected policy actors (e.g., farmers, consumers, health practitioners, and importers), institutions and sectors operating within the CARICOM agriculture-food systems (for example through innovation platforms) can help support adaptive capacity by building trust, social capital, and widening knowledge networks, but will require redeployment of human, financial and social capital (Lowitt et al. 2015). This task will also involve creating opportunities for diverse social actors to work together, develop joint visions, meet varied knowledge needs, and identify and respond to change (Klerkx et al. 2013); which may be supported by innovation platforms that seek to orchestrate change agents (Kilelu et al. 2013; Swaans et al. 2013) and connect them at different scales (Westley et al. 2013).

2.3.3 Supporting agro-ecological approaches to local food production

Despite institutional similarities, the high degree of diversity in both the population sizes (e.g., 2.7 million in Jamaica compared to 70,000 in Dominica (World Bank 2014)) and natural resource bases (e.g., Guyana has an area of 216,970 km^2 compared to Montserrat with 103 km^2), of CARICOM nations results in varied opportunities for agricultural development (CARICOM n.d.). As a result, complex systems approaches are needed that can go beyond "overly simplified

institutional prescriptions" or the "panacea problem" (Ostrom and Cox 2010 p.1) that often serve to limit the capacity of the domestic agriculture and food sectors to respond to change (Thompson and Scoones 2009). Agro-ecological approaches offer an alternative approach to research and policy that contrasts with the monoculture plantation approaches that have unsustainably used natural resources in the CARICOM region and left domestic food systems vulnerable to shocks (Simpson 2010). More specifically, intensive commodity-oriented production in the CARICOM has resulted in high levels of deforestation and loss of wildlife (Bramwell 2011; Crichlow 2005; Watts 1990), spiraling soil erosion (Cox and Madramootoo 1998), coral reef destruction (Pandolfi and Jackson 2006), and subsequent economic vulnerability of food systems and national economies (Andreatta 1999; Deep Ford et al. 2007). Previous research has demonstrated that agro-ecological approaches have the potential to be successfully applied in the region (Brierley 1988), however further research and supporting policies are needed to encourage more ecologically-based agricultural production (Simpson 2010). For example, building upon proven low-input traditional agronomic practices would support livelihoods, especially pro-poor. Additionally, it would likely help support sustainability in these communities (Blay-Palmer 2010; Buttel 2006).

Key principles of taking an agro-ecological approach include: supporting diversity and redundancy, building connectivity, managing slow variables and feedbacks, improving understanding of social-ecological systems as complex adaptive systems, enhancing learning and experimentation, increasing participation and encouraging polycentric governance systems (Biggs et al. 2012; Mercer et al. 2007; Tomich et al. 2011) all of which offer important insights for how institutions and actors might foster innovation in the domestic smallholder farming systems of the CARICOM. In the context of West Africa, Struik et al. (2014a) posed four

questions that may also help guide CARICOM member states to better approach agro-ecological approaches to local food production: 1) How can context-driven change be sustained in dynamic agro-ecological settings? 2) How can practice build on best practice in institutional innovation to build resilient agro-ecosystems? 3) How can dual goals of sustainable intensification and improved pro-poor rural livelihoods be aligned?; and 4) How can policies be designed to protect smallholder farmers against global market shocks?

Science has an important role to play in this thinking by: 1) developing new tools that integrate mixed data sources to inform decision-making; 2) conducting assessments based on multiple criteria that can be used to prioritize, evaluate and predict impacts and trade-offs at different scales and; 3) enhancing knowledge development on local species and traditional practice to assess their contribution to developing sustainable food systems (Caron et al. 2014). However, as noted by Tittonell and Giller (2013) researchers and policy makers also need to be careful not to romanticize traditional practices which may limit smallholder farming systems in realizing their potential, resulting in 'poverty traps' that can prevent the adoption of good agronomic practices and sustain low soil fertility.

2.4 Conclusion

Fifty years since their independence, CARIOM SIDS continue to grapple with their unique food and nutrition security challenges that have resulted from historical plantation legacies that support cyclic vulnerability within a two-tiered agriculture-food system. These challenges range from degrading natural resources, declining exports and rural livelihoods, high production costs, small populations and domestic market size, increasing food imports, growing rates of obesity and non-communicable diseases, and disaster proneness with production difficulties arising from environmental change. Improving adaptive capacity in the domestic agriculture-food systems of

CARICOM will require enhanced coordination, collaboration and innovation. However, export policy 'lock-in', limited investment in agricultural development, structural openness with associated susceptibility to economic, environmental and political change and inattention to the unique social-historical context of the region have limited attempts to revitalize national and regional policies and practices.

By combining AIS and SES frameworks in the context of CARICOM smallholder farming system innovation, this paper identifies social resilience as the pivot point for improving human-nature interactions and points to the following opportunities to foster innovation: 1) facilitating institutional diversity that fosters local knowledge and governance; 2) creating conditions that support collaboration, co-learning and adaptation at multiple scales; and 3) supporting agro-ecological approaches to local food production systems (Bahadur et al. 2013). More specifically, we highlight how resilience and innovation in the smallholder farming systems of the CARICOM could be enhanced through greater interaction among social actors and institutions, allowing them to better navigate the ill-defined issues, power hierarchies, and limited collective learning processes that generally exist in the region. Research gaps are subsequently identified, including the need to better understand how social capital and cohesion can facilitate resilience in diverse smallholder farming contexts; how formal and informal institutions interact in domestic agriculture and food systems to constrain or provide opportunities for collaboration and collective action; how social actors might better perform bridging and linking roles (e.g. innovation champions, knowledge brokers) to support mutual learning, collaboration, reciprocal knowledge flows; and the reasons for past innovation failures and successes in the region to facilitate organizational learning. Ultimately, there is a need to increase the interactions, knowledge flows and interconnections between the formal and informal institutions and diverse

social actors who drive domestic agriculture-food systems in the CARICOM.

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References

Acemoglu D., Johnson S., Robinson J.A. (2002). Reversal of fortune: Geography and institutions in the making of the modern world income distribution. *The Quarterly Journal of Economics, 117* (4), 1231-1294.

Adekunle A., Fatunbi A. (2012). Approaches for setting-up multi-stakeholder platforms for agricultural research and development. *World Applied Sciences Journal, 16* (7), 981-988.

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

Adger, W.N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography, 79*, 387-404.

Adger, W.N., Brown, K., Tompkins, E.L. (2005). The political economy of cross-scale networks in resource co-management. *Ecology and Society, 10* (2).

Aligica, P.D., Tarko, V. (2014). Institutional resilience and economic systems: Lessons from Elinor Ostrom's work. *Comparative Economic Studies, 56* (1), 52-76.

Allison, H.E., Hobbs, R.J. (2004). Resilience, adaptive capacity, and the lock-in trap of the Western Australian agricultural region. *Ecology and Society,* 9 (1).

Amankwah, K., Klerkx, L., Oosting, S., Sakyi-Dawson, O., van der Zijpp, A., Millar, D. (2012). Diagnosing constraints to market participation of small ruminant producers in northern Ghana: An innovation systems analysis. *NJAS-Wageningen Journal of Life Sciences, 60*, 37-47.

Anderies, J.M., Janssen, M.A., Ostrom, E. (2004). A framework to analyze the robustness of social-ecological systems from an institutional perspective. *Ecology and Society,* 9 (1).

Andreatta, S. (1998). Transformation of the Agro-food Sector: Lessons from the Caribbean. *Human Organization, 57*, 414-429.

Andreatta, S.L. (1999). The political ecology of bananas: Contract farming, peasants and agrarian change in the Eastern Caribbean. *Culture and Agriculture, 21* (2), 36-38.

Angelucci, F., Conforti, P. (2010). Risk management and finance along value chains of Small Island Developing States. Evidence from the Caribbean and the Pacific. *Food Policy, 35* (6), 565-575.

Armstrong, H.W., Read, R. (2002). The phantom of liberty? Economic growth and the vulnerability of small states. *Journal of International Development, 14* (4), 435-458.

Axline, W.A. (1986). *Agricultural policy and collective self-reliance in the Caribbean. Westview special studies on Latin America and the Caribbean*. Colorado: Westview Press.

Bahadur, A.V., Ibrahim, M., Tanner, T. (2013). Characterizing resilience: Unpacking the concept for tackling climate change and development. *Climate and Development, 5*, 55-65.

Beckford, G.L. (1999). *Persistent poverty: Underdevelopment in plantation economies of the third world* (2nd ed.). Jamaica: University of West Indies Press.

Beckles, H., Shepherd, V. (1996). *Caribbean freedom: Economy and society from emancipation to the present: A Student Reader*. Jamaica: Ian Randle Publisher.

Berkes, F., Folke, C. (1998). *Linking social and ecological systems: Management practices and social mechanisms for building resilience.* Cambridge: Cambridge University Press.

Bernard, T., Spielman, D.J. (2009). Reaching the rural poor through rural producer organizations? A study of agricultural marketing cooperatives in Ethiopia. *Food Policy, 34* (1), 60-69.

Biggs, R., Schlüter, M., Biggs, D., Bohensky, E. L., BurnSilver, S., Cundill, G., ... & Leitch, A. M. (2012). Toward principles for enhancing the resilience of ecosystem services. *Annual Review of Environment and Resources, 37*, 421-448.

Birner, R., Resnick, D. (2010). The political economy of policies for smallholder agriculture. *World Development, 38*, 1442-1452.

Blancard, S., Hoarau, J.F. (2013). A new sustainable human development indicator for small island developing states: A reappraisal from data envelopment analysis. *Economic Modelling, 30*, 623-635.

Blay-Palmer, A. (2010). *Imagining sustainable food systems: Theory and practice.* Vermont: Ashgate Publishing.

Bodin, Ö., Prell, C. (2011). *Social networks and natural resource management: Uncovering the social fabric of environmental governance*. Cambridge: Cambridge University Press.

Bramwell, D. (2011). *The biology of island floras*. Cambridge: Cambridge University Press.

Brathwaite, R., YongGong, L. (2012) Agricultural policy evolution in Barbados and its impacts (1960-2010). *Journal of Agriculture, Biotechnology and Ecology, 5* (3), 1-18.

Brierley, J.S. (1974). *Small Farming in Grenada, West Indies*. Winnipeg: University of Manitoba.

Brierley JS (1988). A retrospective on West Indian small farming, with an update from Grenada.

In J. S. Brierley, and H. Rubenstein (Eds.) *Small farming and peasant resources in the Caribbean*. Winnipeg: University of Manitoba.

Briguglio, L. (1995). Small island developing states and their economic vulnerabilities. *World Development, 23*, 1615-1632.

Briguglio, L. (2003). *The vulnerability index and small island developing states: A review of conceptual and methodological issues.* Meeting of the ten year review of the Barbados Plan of Action. http://www.um.edu.mt/__data/assets/pdf_file/0019/44137/vulnerability_paper_sep03.pdf. Accessed 22 January 2015.

Brooks, S., Loevinsohn, M. (2011). Shaping agricultural innovation systems responsive to food insecurity and climate change. *Natural Resources Forum, 35* (3), 185-200.

Butler, J. R. A., Suadnya, W., Puspadi, K., Sutaryono, Y., Wise, R. M., Skewes, T. D., ... & Kisman, M. (2014). Framing the application of adaptation pathways for rural livelihoods and global change in Eastern Indonesian Islands. *Global Environmental Change, 28*, 368-382.

Buttel, F.H. (2006). Sustaining the unsustainable: Agro-food systems and environment in the modern world. In P. Cloke, T. Marsden, and P. Mooney (Eds.) *Handbook of Rural Studies (*pp. 213-229). London: Sage.

CARICOM. (2007). *Strategic approach to realising the agriculture contribution to CARICOM development*. Paper presented at the Caribbean Community Agriculture Donor Conference, Crowne Plaza Trinidad Hotel, Port of Spain, Trinidad and Tobago, 2 June 2007.

CARICOM. (2010). *Regional food and nutrition security policy*. Caribbean Community

(CARICOM). http://www.caricom.org/jsp/community_organs/regional_food_nutrition_security_policy_oct2010.pdf. Accessed 20 January 2015.

CARICOM (n.d.) Caribbean community members. Caribbean Community. http://www.caricom.org/jsp/community/member_states.jsp?menu=community. Accessed 15 January 2015.

Caron, P., Biénabe, E., Hainzelin, E. (2014). Making transition towards ecological intensification of agriculture a reality: The gaps in and the role of scientific knowledge. *Current Opinion in Environmental Sustainability, 8*, 44-52.

Carpenter, S., Walker, B., Anderies, J.M., Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems 4* (8), 765-781.

Chave, M., Ozier-Lafontaine, H., Noel, Y. (2012). Towards agricultural innovation systems: Designing an operational interface. *Outlook Agriculture, 41* (2), 81-86.

Clegg, P., Shaw, T.M. (2002). *The Caribbean banana trade: From colonialism to globalisation.* USA: Palgrave Macmillian.

Cooper, F., Mallon, F.E., Isaacman, A.F., Stern, S.J., Roseberry, W. (1993). *Confronting historical paradigms: peasants, labor, and the capitalist world system in Africa and Latin America*. Madison: University of Wisconsin Press.

Cox, C., Madramootoo, C. (1998). Application of geographic information systems in watershed management planning in St. Lucia. *Computers and Electronics in Agriculture, 20*, 229-250.

Crichlow, M.A. (2005). *Negotiating Caribbean freedom: Peasants and the state in development.* Maryland: Lexington Books.

Deep Ford, J.R. (2013). *Hunger: More than a bread and butter issue*. http://www.slideshare.net/FAONoticias/deep-ford-hongermorethanabreadandbutterissue. Accessed 15 January 2015.

Deep Ford, J.R., Dell'Aquila, C., Conforti, P. (2007). *Agricultural trade policy and food security in the Caribbean: Structural issues, multilateral negotiations and competitiveness.* Rome: FAO Trade and Markets Division.

Dessie, Y., Schubert, U., Wurzinger, M., Hauser, M. (2013). The role of institutions and social learning in soil conservation innovations: Implications for policy and practice. *Environmental Science and Policy, 27*, 21-31.

Dorward, A., Kydd, J. (2004). The Malawi 2002 food crisis: The rural development challenge. *The Journal of Modern African Studies, 42* (3), 343-361.

Elliott, D.R., Palmer, R.W. (2008). Institutions and Caribbean economic performance: Insights from Jamaica. *Studies in Comparative International Development, 43* (2), 181-205.

Fabinyi, M., Evans, L., Foale, S.J. (2014). Social-ecological systems, social diversity, and power: Insights from anthropology and political ecology. *Ecology and Society, 19* (4).

FAO. (2012). *Report on workshop of small scale farming in the Caribbean*. FAO. http://www.rlc.fao.org/fileadmin/templates/iniciativa/content/pdf/eventos/agric-fam-caribe-2012/report-workshop-small-scale-farming-caribbean.pdf. Accessed 10 June 2013.

FAO. (2013). *The outlook for agriculture and rural development in the Americas: A perspective on Latin America and the Caribbean*. Chile: FAO.

Favaro, E. (2006). *Trade in institutions and the integration of small states to the world economy*. The World Bank.

http://depot.gdnet.org/gdnshare/pdf2/gdn_library/annual_conferences/seventh_annual_co

nference/Favaro_parallel_4_3.pdf. Accessed 12 March 2013.

Fischer, E., Qaim, M. (2014). Smallholder farmers and collective action: What determines the intensity of participation? *Journal of Agricultural Economics, 65* (3).

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

Folke, C., Colding, J., Berkes, F. (2003). *Synthesis: building resilience and adaptive capacity in social-ecological systems*. Cambridge: Cambridge University Press.

Folke, C., Hahn, T., Olsson, P., Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources, 30* (1), 441-473.

Foran, T., Butler, J.R., Williams, L.J., Wanjura, W.J., Hall, A., Carter, L., Carberry, P.S. (2014). Taking complexity in food systems seriously: An interdisciplinary analysis. *World Development, 61*, 85-101.

Frank, A.G. (1969). *Latin America: Underdevelopment or revolution: Essays on the development of underdevelopment and the immediate enemy*. New York: Monthly Review Press.

Gamble, D.W., Campbell, D., Allen, T.L., Barker, D., Curtis, S., McGregor, D., Popke, J. (2010). Climate change, drought, and Jamaican agriculture: Local knowledge and the climate record. *Annals of the Association of American Geographers, 100* (4), 880-893.

Ganpat, W.G., Ragbir, S., de Freitas, C., Badrie, N. (2010). The use of information and communication technologies in the modernization of Caribbean agriculture: Focus on agricultural extension. In: *2009 West Indies Agricultural Economics Conference, Barbados, 2010 (Vol 122663)*. Trinidad and Tobago: Caribbean Agro-Economic Society.

Grootaert, C., Narayan, D., Woolcock, M., Nyhan-Jones, V. (2003). *Integrated questionnaire for the measurement of social capital (SC-IQ)*. Washington DC: The World Bank Social

Capital Thematic Group.

Grossman, L.S. (1998). *The political ecology of bananas: Contract farming, peasants, and agrarian change in the Eastern Caribbean*. Chapel Hill: The University of North Carolina Press.

Grote, U. (2014). Can we improve global food security? A socio-economic and political perspective. *Food Security, 6* (2), 187-200.

Guha-Khasnobis, B., Kanbur, R., Ostrom, E. (2007). *Linking the formal and informal economy: Concepts and policies*. Oxford: Oxford University Press.

Gumbs, F. (1981). Agriculture in the Wider Caribbean. *Ambio, 10*, 335-339.

Hall, A., Janssen, M., Pehu, E., Rajalahti, R. (2006). *Enhancing agricultural innovation: How to go beyond the strengthening of research systems*. Washington DC: The World Bank.

Hart, K. (2005). *Formal bureaucracy and the emergent forms of the informal economy*. UNU-WIDER, United Nations University. http://www.econstor.eu/bitstream/10419/63313/1/488093279.pdf. Accessed 18 January 2015.

Hounkonnou, D., Kossou, D., Kuyper, T. W., Leeuwis, C., Nederlof, E. S., Röling, N., ... & van Huis, A. (2012). An innovation systems approach to institutional change: Smallholder development in West Africa. *Agricultural Systems, 108*, 74-83.

Kilelu, C.W., Klerkx, L., Leeuwis, C. (2013). Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme. *Agricultural Systems, 118*, 65-77.

Klerkx, L., Aarts, N., Leeuwis, C. (2010). Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment.

Agricultural Systems, 103, 390-400.

Klerkx, L., van Mierlo, B., Leeuwis, C. (2012). Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions. In: I. Darnhofer I, D.P. Gibbon, and B. Dedieu (Eds.) *Farming systems research into the 21st century: The new dynamic (*pp. 457-483). New York: Springer.

Klerkx, L., Adjei-Nsiah, S., Adu-Acheampong, R., Saïdou, A., Zannou, E., Soumano, L., ... & Nederlof, S. (2013). Looking at agricultural innovation platforms through an innovation champion lens: An analysis of three cases in West Africa. *Outlook on Agriculture, 42* (3), 185-192.

Kydd, J., Dorward, A. (2004). Implications of market and coordination failures for rural development in least developed countries. *Journal of International Development, 16*, 951-970.

Lam, E. (2011). Sharing best practices in Barbados and Trinidad and Tobago: Patterns of policy implementation and resistance. *Compare, 41*, 25-41.

Lange, M. (2009). *Lineages of despotism and development: British colonialism and state power*. Chicago: University of Chicago Press.

Lederman, D., Messina, J., Pienknagura, S., Rigolini, J. (2013). *Latin American entrepreneurs: Many firms but little innovation*. Washington DC: World Bank Publications.

Levitt, K., Best, L. (1975). Character of Caribbean economy. In: G. Beckford (Ed.) *Caribbean Economy* (pp 34-60). Jamaica: Institute of Social and Economic Research, University of the West Indies.

Lewis, G.K. (1968). An introductory note to the study of the Virgin Islands. *Caribbean Studies, 8* (2), 5-21.

Louis, M. (1981). *An equal right to the soil: The rise of peasantry in St. Lucia; 1838-1900 (*unpublished doctoral dissertation). John Hopkins University, Baltimore.

Lowitt, K., Hickey, G.M., Laszlo, S., Saint Ville, A., Raeburn, K., Phillip, L.E. (2015). Exploring the factors influencing agricultural innovation and adaptive capacity among smallholder farmers in the Caribbean. *Regional Environmental Change, 15* (7), 1367-1377.

Maat, H. (2007). Is participation rooted in colonialism? Agricultural innovation systems and participation in the Netherlands Indies. *IDS Bulletin, 38*, 50-60.

Maetz, M., Aguirre, M., Kim, S., Matinroshan, Y., Pangrazio, G., Pernechele, V. (2011). *Food and agricultural policy trends after the 2008 food security crisis: Renewed attention to agricultural development*. Rome: FAO.

Méheux, K., Dominey-Howes, D., Lloyd, K. (2007). Natural hazard impacts in small island developing states: A review of current knowledge and future research needs. *Natural Hazards, 40* (2), 429-446.

Mendola, M. (2007). Farm household production theories: A review of "Institutional" and "Behavioral" responses. *Asian Development Review, 24* (1), 49-68.

Mercer, J., Dominey-Howes, D., Kelman, I., Lloyd, K. (2007). The potential for combining indigenous and western knowledge in reducing vulnerability to environmental hazards in small island developing states. *Environmental Hazards, 7* (4), 245-256.

Mintz, S.W. (1985). From plantations to peasantries in the Caribbean. In: S. W. Mintz, and S. Price (Eds.) *Caribbean contours*. Baltimore: John Hopkins Press.

Mintz, S.W., Price, R. (1976). *An anthropological approach to the Afro-American past: A Caribbean perspective*. Philadelphia: University of Virginia Press.

Mishra, P. (2006). *Emigration and brain drain: Evidence from the Caribbean*. Washington DC: International Monetary Fund.

Norton, B.G. (2005). Rebirth of environmentalism as pragmatic, adaptive management. Virginia *Environmental Law Journal, 24*, 353-376.

O'Loughlin, C. (1968). *Economic and political change in the Leeward and Windward Islands*. Connecticut: Yale University Press.

OAS. (1986). *Saint Lucia Natural Resources and Agricultural Development Project-Studies and Proposals for the Implementation of a Land Registration Programme*. Department for Regional Development Executive Secretariat for Economic and Social Affairs, Organisation of American States. http://www.oas.org/dsd/publications/Unit/oea36e/oea36e.pdf. Accessed 20 January 2015.

Obrist, B., Pfeiffer, C., Henley, R. (2010). Multi−layered social resilience a new approach in mitigation research. *Progress in Development Studies, 10* (4), 283-293.

Olson, M. (1996). Distinguished lecture on economics in government: Big bills left on the sidewalk: Why some nations are rich, and others poor. *Journal of Economic Perspectives, 10* (2), 3-24.

Olsson, P., Galaz, V., Boonstra, W.J. (2014). Sustainability transformations: A resilience perspective. *Ecology and Society, 19* (4).

Osbahr, H., Twyman, C., Adger, W.N., Thomas, D.S. (2010). Evaluating successful livelihood adaptation to climate variability and change in southern Africa. *Ecology and Society, 15* (2).

Ostrom, E. (1999). Polycentricity, complexity, and the commons. *The Good Society, 9* (2), 36-40.

Ostrom, E., Cox, M. (2010). Moving beyond panaceas: A multi-tiered diagnostic approach for social-ecological analysis. *Environmental Conservation, 37* (4), 451-463.

Pandolfi, J.M., Jackson, J.B.C. (2006). Ecological persistence interrupted in Caribbean coral reefs. *Ecology Letters, 9* (7), 818-826.

Pant, L.P. (2013). Critical systems of learning and innovation competence for addressing complexity in transformations to agricultural sustainability. *Agroecology and Sustainable Food Systems, 38* (3), 336-365.

Pelling, M. High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change, 15*, 308-319.

Pretty, J. (2003). Social capital and the collective management of resources. *Science, 302* (5652), 1912-1914.

Pretty, J., Ward, H. (2001) Social capital and the environment. *World Development, 29*, 209-227.

Rahman, H.T., Sarker, S.K., Hickey, G.M., Haque, M.M., Das, N. (2014). Informal institutional responses to government interventions: Lessons from Madhupur National Park, Bangladesh. *Environmental Management, 54* (5), 1175-1189.

Read, R. (2004). The implications of increasing globalization and regionalism for the economic growth of small island states. *World Development, 32*, 365-378.

Real, A., Hickey, G.M. (2013). Publicly funded research: A participative experience from the Chilean Native Forest Research Fund. *Forest Policy and Economics, 37*, 37-43.

Richardson, B.C. (1992a). *The Caribbean in the wider world, 1492-1992: A regional geography.* Cambridge: Cambridge University Press.

Richardson, B.C. (1992b). Depression riots and the calling of the 1897 West India Royal Commission. *New West Indian Guide/Nieuwe West-Indische Gids, 66*, 169-191.

Rodrik, D., Subramanian, A., Trebbi, F. (2004). Institutions rule: The primacy of institutions over geography and integration in economic development. *Journal of Economic Growth, 9* (2), 131-165.

Rogers, E.M. (1983). *Diffusion of innovations* (3rd ed.). New York: Macmillan Publishers.

Sabatini, F. (2009). Social capital as social networks: A new framework for measurement and an empirical analysis of its determinants and consequences. *Journal of Socio-Economics, 38* (3), 429-442.

Samuels, T.A., Guell, C., Legetic, B., Unwin, N. (2012). Policy initiatives, culture and the prevention and control of chronic non-communicable diseases (NCDs) in the Caribbean. *Ethnicity and Health, 17* (6), 631-649.

Sandersen, H.T., Koester, S. (2000). Co-management of tropical coastal zones: The case of the Soufriere Marine Management Area, St. Lucia, WI. *Coastal Management, 28* (1), 87-97.

Schut, M., Klerkx, L., Rodenburg, J., Kayeke, J., Hinnou, L. C., Raboanarielina, C. M., ... & Bastiaans, L. (2015). RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity. *Agricultural Systems, 132*, 1-11.

Seligson, M.A., Passé-Smith, J.T. (2008). *Development and underdevelopment: The political economy of global inequality* (2nd ed.). Colorado: Lynne Rienner Publishers.

Shephard, C.Y. (1947). Peasant agriculture in the Leeward and Windward Islands. *Tropical Agriculture, 24*, 61-71.

Simpson, L.A. (2010). *Climate change and agriculture in the Caribbean: Approaches and opportunities for sustainable development in the 21st Century.* Review:20 CARDI. http://www.cardi.org/wp-content/uploads/2011/09/CARDI-Review-Issue-

10.pdf#page=22. Accessed 22 January 2015.

Speranza, C.I. (2013). Buffer capacity: Capturing a dimension of resilience to climate change in African smallholder agriculture. *Regional Environmental Change, 13* (3), 521-535.

Struik, P.C., Klerkx, L., Hounkonnou, D. (2014a). Unravelling institutional determinants affecting change in agriculture in West Africa. *International Journal of Agricultural Sustainability, 12* (3), 370-382.

Struik, P.C., Klerkx, L., van Huis, A., Röling, N.G. (2014b). Institutional change towards sustainable agriculture in West Africa. International *Journal of Agricultural Sustainability, 12* (3), 203-213.

Stubbs, J., Reyes, H. (2004). Migration in the Caribbean: A path to development? *En Breve 48* World Bank. http://documents.worldbank.org/curated/en/2004/05/5408544/migration-caribbean-path-development. Accessed 22 January 2015.

Swaans, K., Boogaard, B., Bendapudi, R., Taye, H., Hendrickx, S., Klerkx, L. (2013). Operationalizing inclusive innovation: Lessons from innovation platforms in livestock value chains in India and Mozambique. *Innovation and Development, 4* (2) 239-257.

Temby, O., Rastogi, A., Sandall, J., Cooksey, R., Hickey, G.M. (2015). Inter-agency trust and communication in the transboundary governance of Pacific salmon fisheries. *Review of Policy Research, 32* (1), 79-99.

Thomas, C.Y. (1988). *The poor and the powerless: Economic policy and change in the Caribbean*. New York: Monthly Review Press.

Thomasson, D.A. (1994). Montserrat kitchen gardens: Social functions and development potential. *Caribbean Geography, 5* (1), 20-31.

Thompson, J., Scoones, I. (2009). Addressing the dynamics of agri-food systems: An emerging

agenda for social science research. *Environmental Science and Policy*, *12* (4), 386-397.

Timms, B.F. (2008). Development theory and domestic agriculture in the Caribbean: Recurring crises and missed opportunities. *Caribbean Geography, 15* (2), 101.

Tittonell, P., Giller, K.E. (2013). When yield gaps are poverty traps: The paradigm of ecological intensification in African smallholder agriculture. *Field Crops Research, 143*, 76-90.

Tomich, T. P., Brodt, S., Ferris, H., Galt, R., Horwath, W. R., Kebreab, E., ... & Michelmore, R. (2011). Agroecology: A review from a global-change perspective. *Annual Review of Environment and Resources, 36*, 193-222.

Tompkins, E.L., Adger, W. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society, 9* (2).

Tonurist, P. (2010). What is a "Small State" in a globalizing economy? *Halduskultuur-Administrative Culture, 11* (1), 8-29.

Totin, E., van Mierlo, B., Saidou, A., Mongbo, R., Agbossou, E., Stroosnijder, L., Leeuwis, C. (2012). Barriers and opportunities for innovation in rice production in the inland valleys of Benin. *NJAS-Wageningen Journal of Life Sciences, 60*, 57-66.

van Rijn, F., Bulte, E., Adekunle, A. (2012). Social capital and agricultural innovation in Sub-Saharan Africa. *Agricultural Systems, 108*, 112-122.

von Braun, J. (2009). Addressing the food crisis: Governance, market functioning, and investment in public goods. *Food Security, 1* (1), 9-15.

Watts, D. (1990). *The West Indies: Patterns of development, culture, and environmental change since 1492*. Cambridge: Cambridge University Press.

Westley, F.R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., Bodin, Ö. (2013). A theory of transformative agency in linked social-ecological systems. *Ecology and Society,*

18 (3).

Wilby, R.L., Dessai, S. (2010). Robust adaptation to climate change. *Weather, 65* (7)180-185.

World Bank. (2003). *Reaching the rural poor: A renewed strategy for rural development*. http://openknowledge.worldbank.org/bitstream/handle/10986/14084/267630REACHING 0THE0RURAL0POOR0.pdf?sequence=1. Accessed 15 January 2015.

World Bank. (2011). *The growing burden of non-communicable diseases in the Eastern Caribbean.* http://siteresources.worldbank.org/LACEXT/Resources/informe2no_jamaica.pdf. Accessed 15 January 2015.

World Bank. (2014). *World Development Indicators World Bank*. http://data.worldbank.org/country. Accessed 15 January 2015.

Zilberman, D., Zhao, J., Heiman, A. (2012). Adoption versus adaptation, with emphasis on climate change. *Annual Review of Resource Economics, 4* (1), 27-53.

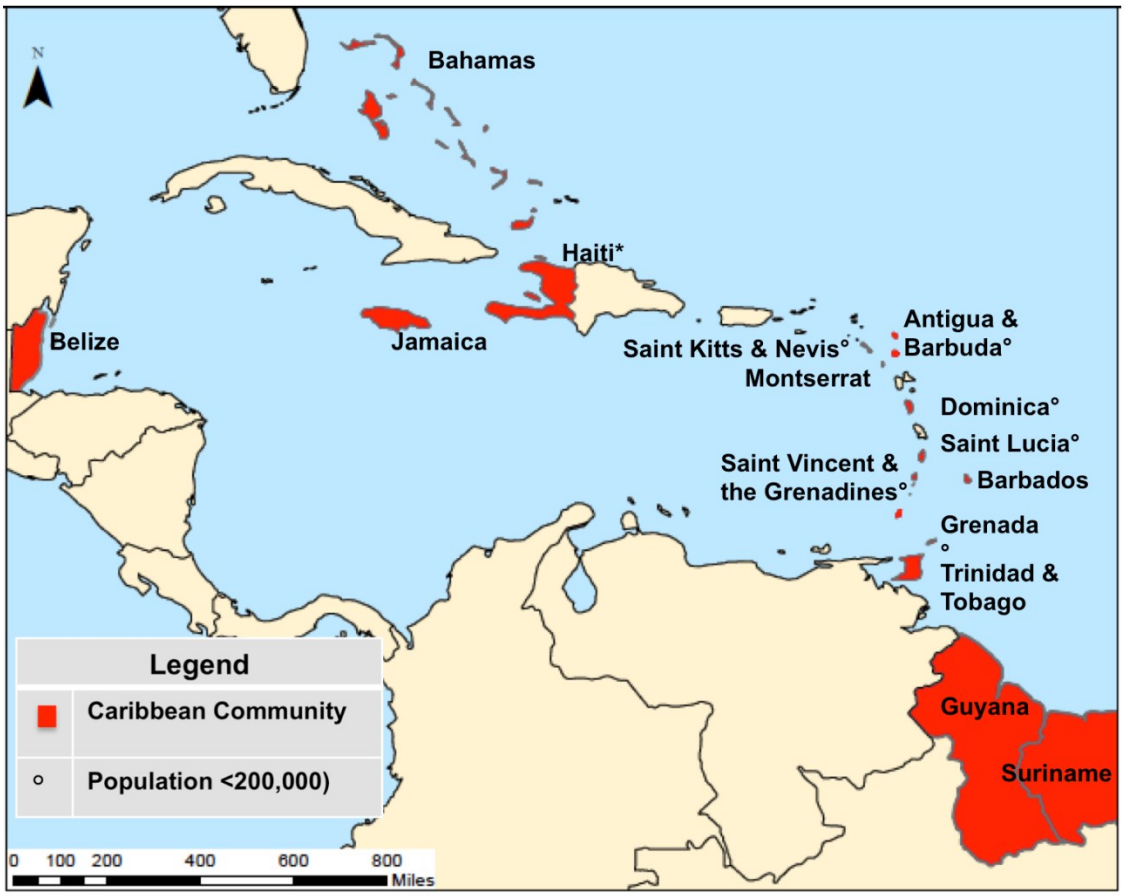

Figure 2.1: Map of the Caribbean Community (CARICOM)

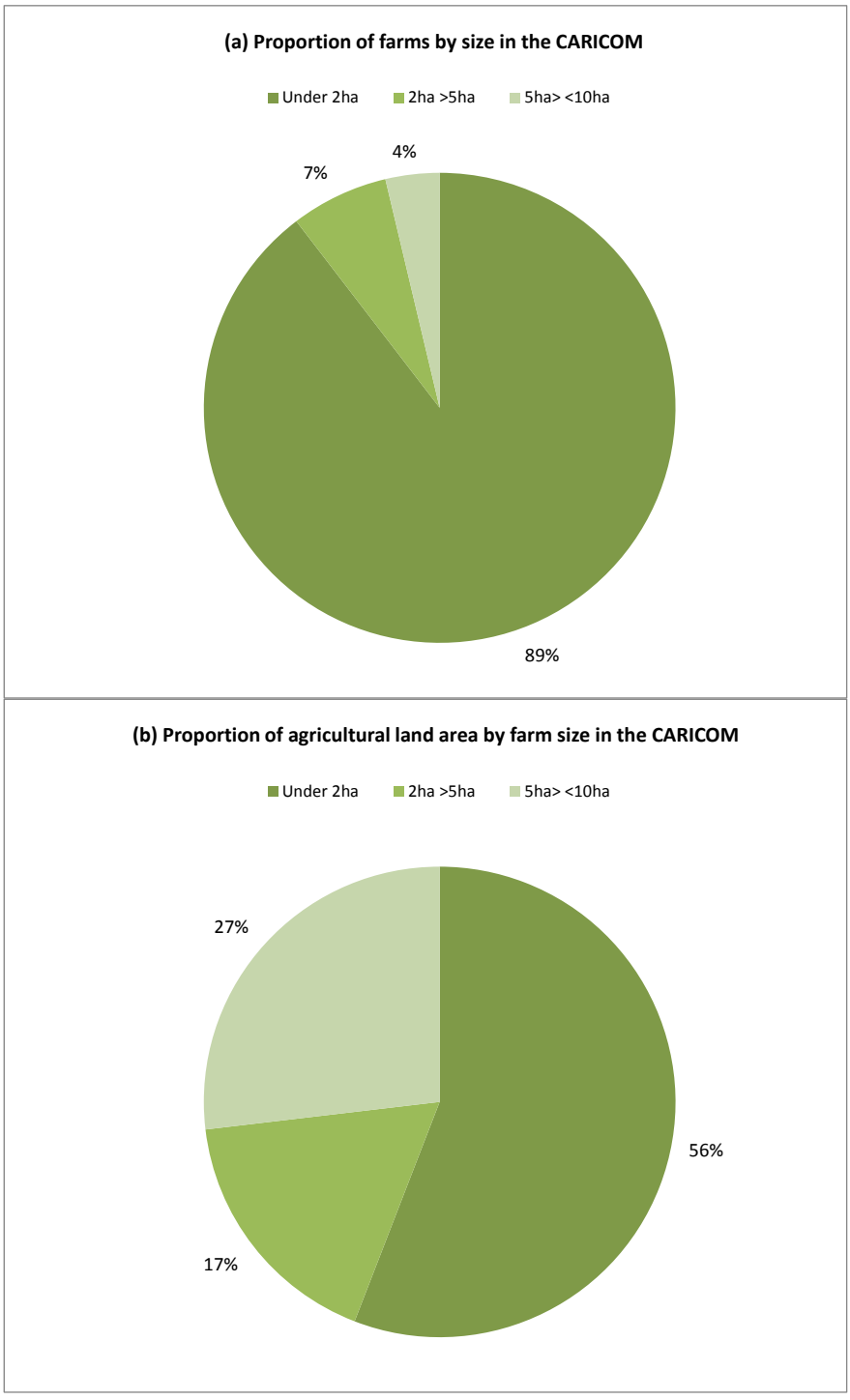

Figure 2.2: (a) Proportion of farms by size *(n)* and (b) Proportion of agricultural land area by farm size in the CARICOM *Data source:* FAO (2012).

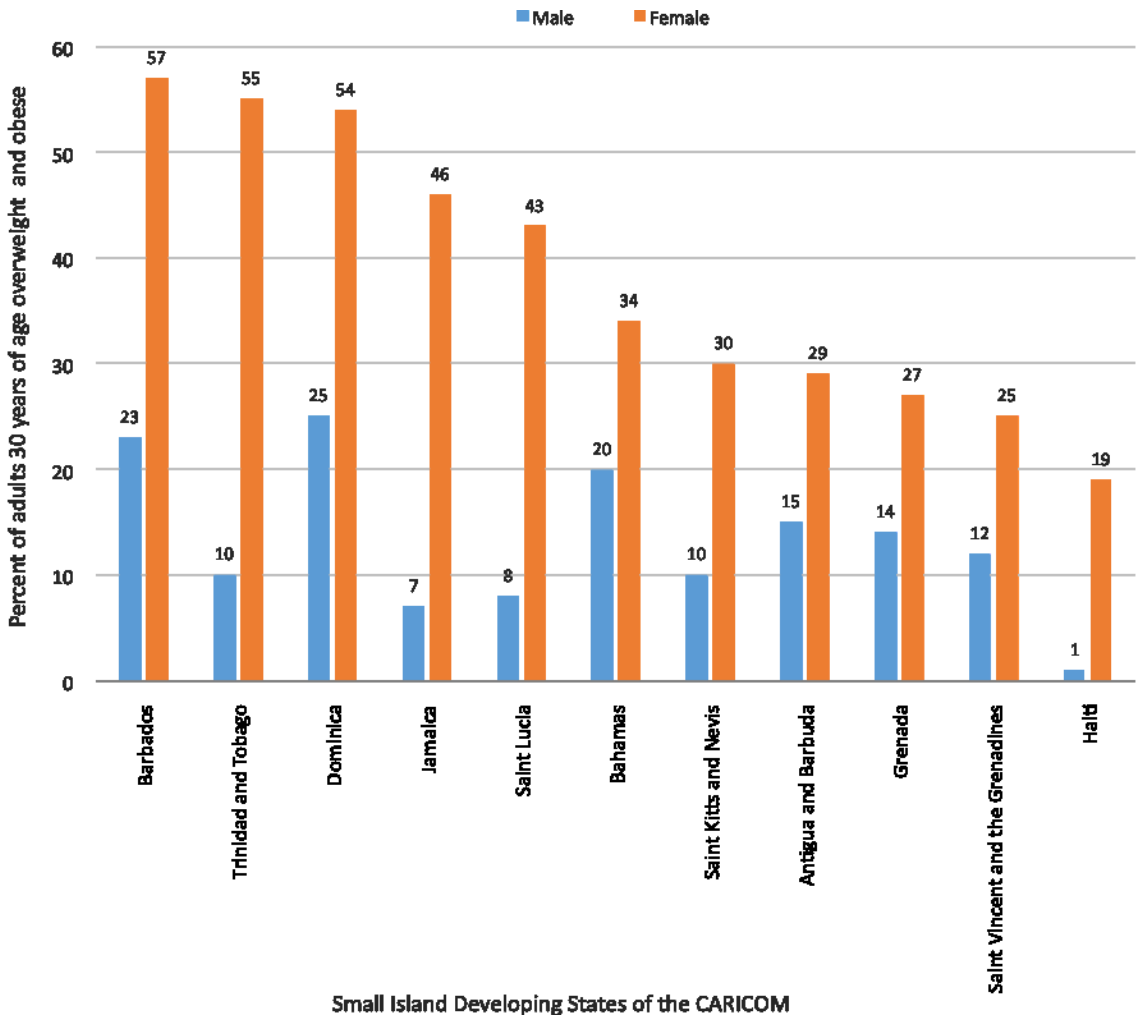

Figure 2.3: Prevalence of overweight and obesity in the Caribbean > 30 years old. *Data source:* Deep Ford, 2013.

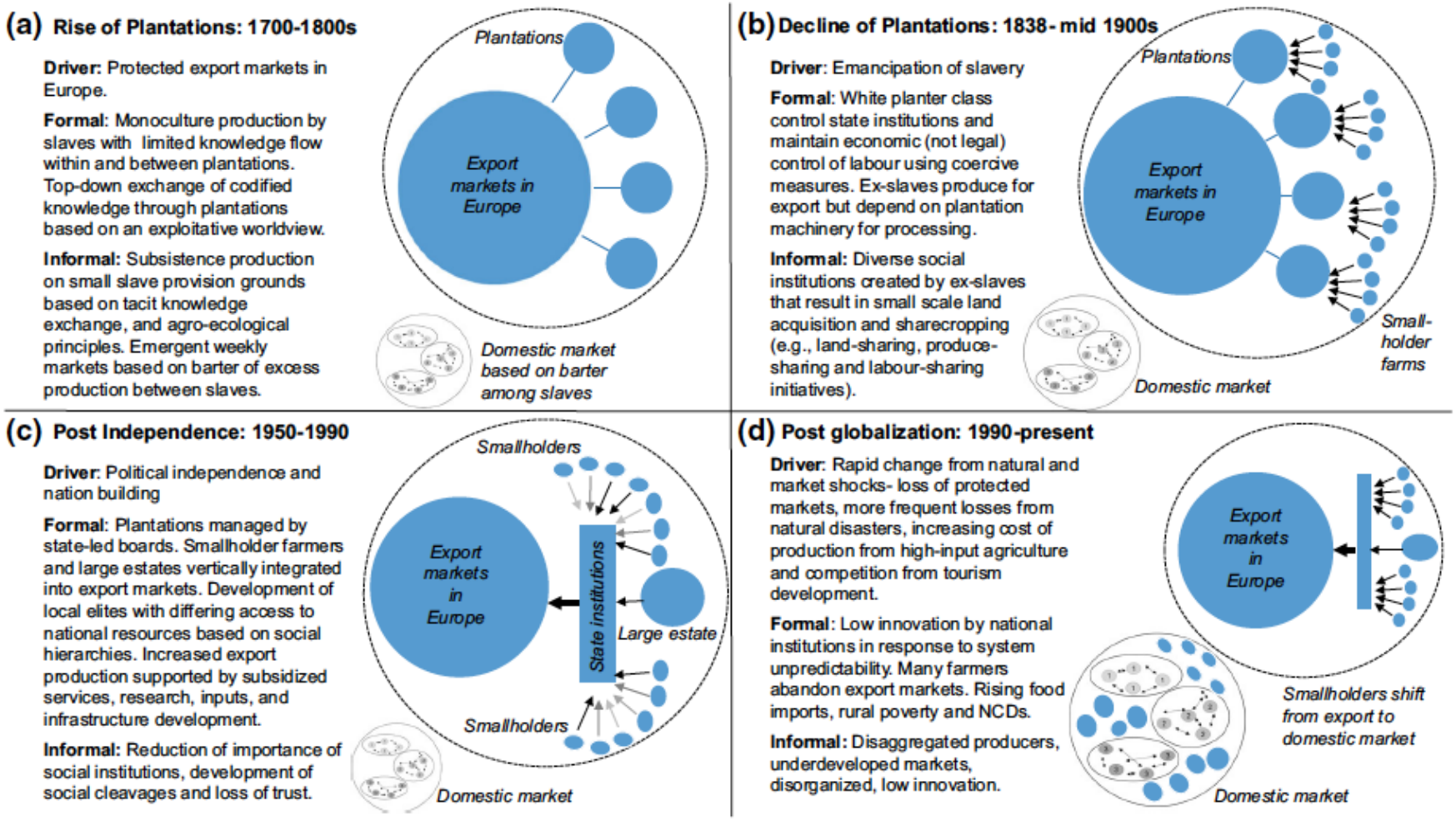

Figure 2.4: Structural conditions underlying the development of CARICOM's two-tiered agricultural innovation system (drawing on the history of the English-speaking Caribbean). Sections a–d depict diverse drivers of change over time, juxtaposed against the institutional inertia of export-oriented formal institutions and the neglect of informal domestic markets.

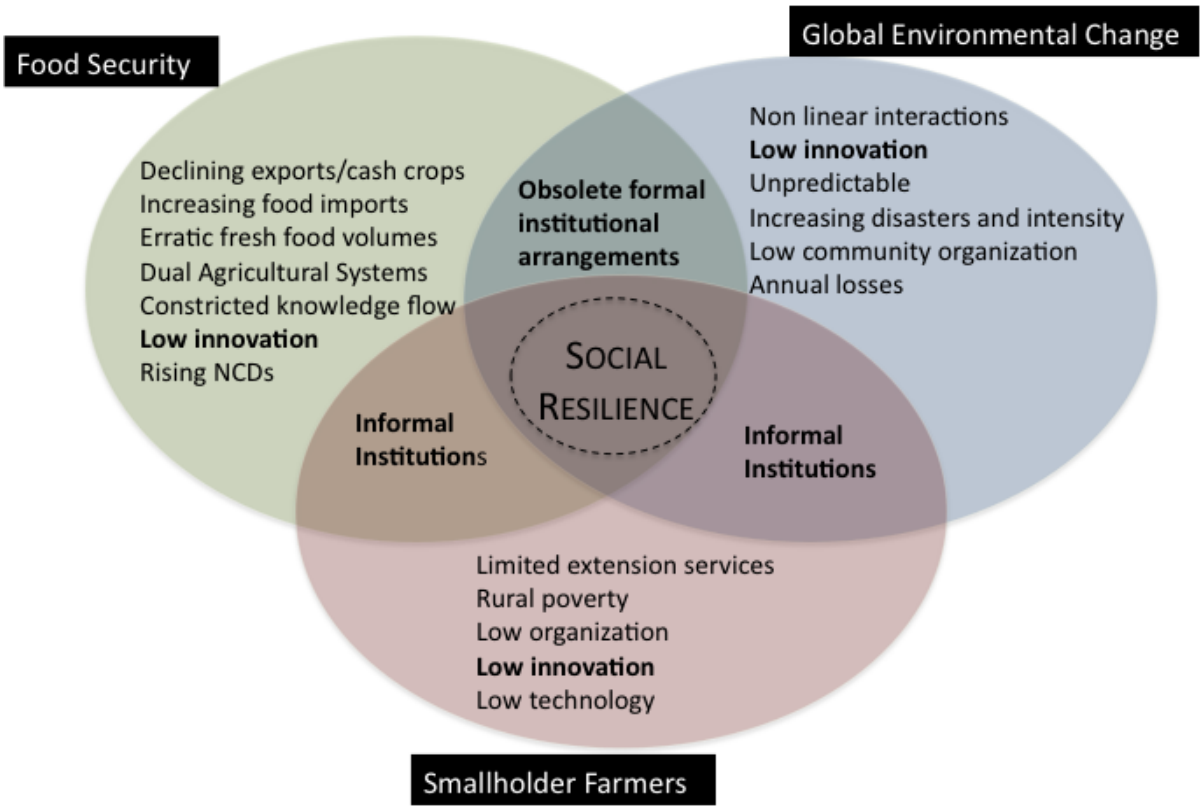

Figure 2.5: Framework depicts social resilience operating at the pivot of human–nature interactions in SIDS, cutting across the three intersecting policy domains of domestic smallholder farmers, global environmental change, and food security; intersection of socioecological systems resilience in the literature; questioning and undermining of institutions (formal and informal); and need for innovation requiring increased interaction in response to shocks and crises.

Preface to Chapter 3

Chapter 2 reviews the need for new approaches to domestic agriculture and food system development in the Small Island Developing States (SIDS) of the CARICOM, drawing primarily on social-ecological systems (SES) and agricultural innovation systems (AIS) thinking. It highlights the central role of institutions in fostering social resilience and points to the potential for inter-institutional "pitfalls" to undermine food security policy innovation by limiting knowledge exchange, trust, and interaction between actors operating in formal and informal institutions. Building on these general observations, the following chapter presents the results of an in-depth institutional analysis conducted in the Caribbean nation of Saint Lucia, a typical SIDS grappling with domestic food and agriculture system innovation challenges. It explores the processes by which the social norms, rules and incentives operate and guide social interactions in Saint Lucia's agriculture-food system with a view to better understanding the critical role played by formal and informal institutions.

CHAPTER 3: INSTITUTIONAL ANALYSIS OF FOOD AND AGRICULTURE POLICY IN THE CARRIBBEAN: THE CASE OF SAINT LUCIA

Abstract

The role played by various institutions in the domestic agri-food systems of Caribbean nations has become an increasingly important area of research and policy attention. This paper assesses the main policies that have been implemented in Saint Lucia's agri-food system over two time periods (pre- and post-1950 to 2010), and analyzes their influence on formal and informal institutions. Results suggest that rule convergence in export (formal) and domestic (informal) agricultural production systems displaced informal institutions to a lower position in the institutional hierarchy. This institutional change has, reduced interactions between farming community members, with negative implications for bonding and bridging social capital in the domestic food production system. Collectively, these changes have resulted in unintended outcomes associated with the decline of many rural communities. Our findings highlight the need to better identify bridging institutions in Saint Lucia's domestic agri-food sector that could help support shared rule-making, the decentralization of power and reciprocal knowledge flows amongst policy actors.

Keywords: Export intensification; Social networks; Rent seeking; Smallholder farming systems; Collective action.

3.1 Introduction

Historically, the plantation institution, as the basic unit of colonial agricultural production in the Caribbean, heavily influenced social norms, interactions and relations in the regional agri-food system (Saint Ville et al. 2015). As a fully integrated institution that ruled over every facet of life in the region, the plantation was more than an economic phenomenon. Levitt and Best (1975) described it as a powerful political, economic and social unit (see also Beckles and Shepherd 1996; Richardson 1992). Despite sweeping social transformations across the Caribbean, ranging from emancipation of slavery, universal adult suffrage and political independence (Beckles and Shepherd 1996), plantations heavily influenced the "rules of the game" (North 1991; Saint Ville et al. 2015) by defining 'formal rules, informal norms and their enforcement characteristics' (see Guha-Khasnobis et al. 2007 on linkages between formal and informal institutions). In recognition of this historical legacy, noted Caribbean "Plantation School" economists such as Lloyd Best, Norman Girvan, George Beckford, and Clive Y. Thomas have called for a re-examination of the agri-food institutions operating in the region (Elliott and Palmer 2008; Timms 2008).

Formal institutions can be defined as the codified laws that govern governments, cooperatives, firms and communities, and which are followed by members (Hodgson 2006), while informal institutions are understood as socially-defined codes of conduct that are transmitted through and by the community (Rahman et al. 2012). Increasing research and policy attention has been placed on how informal institutions facilitate social processes that can enable actors to manage and adapt to change (Folke 2006; Ostrom 2009); and interact, communicate, and innovate (Leewuis and Aarts 2011). Here, the concept of social capital, defined as the enduring connections of

networks, reciprocity and social norms that exist among social actors (Narayan 2002), has increasingly been applied to help understand social processes that influence information flows, power relationships and collective action (Adler and Kwon 2002). Social capital comprises three dimensions: bonding (horizontal ties within a subgroup), bridging (horizontal ties bridging distinct subgroups) and linking social capital (vertical ties to power, finance developed through shared tasks directed towards the common good) (Grootaert, Narayan et al. 2003, Sabatini 2009). Not all social capital is considered equal, with these three dimensions playing different roles in social processes.

While previous research has identified strong relationships between social capital, information flow, and agricultural innovation in smallholder farming systems (see van Rijn et al. 2012; Dessie et al. 2013; Speranza 2013; Wossen et al. 2013; Chen et al. 2014; Reed and Hickey 2016), relatively little is known about how institutional dynamics affect interactions between different dimensions of social capital (Adger 2003; Pelling and High 2005; Kode 2013). Importantly, while there has been some empirical work on the various roles that different institutions play in affecting smallholder agricultural innovation systems in the context of Sub-Saharan Africa (Darr and Pretzsch 2008; Timu et al. 2012; Mashavave et al. 2013), there has been little-to-no empirical research in the Caribbean, particularly in the context of social capital and collective action (see, for example, Dessie et al. (2013) in the context of Ethiopia). Recognizing the need to better understand these complex relationships in Caribbean smallholder farming systems, this paper explores how various dimensions of social capital have evolved and both influenced, and been influenced by, institutional dynamics in Saint Lucia's domestic agri-food system.

3.2 Methods

3.2.1 Data collection

Following a case study research design (Yin 1994), qualitative data were collected using archival, documentary, direct observation and key-informant interview methods. This strategy allowed us to describe complex social relationships and reveal the interconnections between actors (Glaser and Strauss 1967; Becker 1996; Yin 2002). All field data collection activities were undertaken between July and October 2013. Key informant interviews (Becker 1996) were conducted with 57 respondents (Table 1) based across Saint Lucia, including all major farming communities (Castries-Roseau/Millet/Babonneau, Dennery, Micoud, Choiseul, Vieux Fort) on the island (see Figure 1). Interview respondents were purposively sampled following a snowball strategy using two selection criteria: 1) they held a position or role in farmer/ community mobilization at the national level (political activists, sociologists, journalists, environmentalists, anthropologists, trade unionists, historians, folk researchers, linguists); or 2) they were senior smallholder farmers who had been producing in the food system for over 50 years. To ensure that we were able to access a wide a group of these (often retired) farmers, we sought assistance from the Ministry of Agriculture, Food Production, Fisheries, Co-operatives and Rural Development, private sector, NGOs, farmer groups, faith-based organizations and community leaders in the major rural communities to identify and locate prospective farmers across the island.

Interviews followed a semi-structured format and covered four major areas: 1) the "rules-in-use" that direct actors, and help guide their interactions; 2) the nature of interaction between social actors and the collective-action problems related to getting farmers working together to solve their shared problems; 3) power or information asymmetries in their interaction that serve to limit farmers' willingness to work together; and 4) incentives that are associated with

conforming to the different institutions operating in Saint Lucia's agri-food system. Interviews and follow-up discussions were conducted in English or the local dialect of *Kweyol* with the help of a translator/field assistant as required.

3.2.2 Data analysis

Interviews were recorded, translated, and transcribed in full for content analysis (Altheide 1987; Morgan 1993). The constant comparison method (Glaser and Strauss 1967) was used to manually code the data using MaxQDA, with themes and categories emerging through an iterative and recursive process leading to patterns being identified. The Institutional Analysis and Development (IAD) framework (Ostrom et al. 1994) was then used to structure our analysis of institutional change in Saint Lucia's agri-food governance systems. More specifically, we were guided by the adapted IAD frameworks of Fischer et al. (2007) and Rahman et al. (2014) when conducting our analysis of institutional change, focusing on two time periods: pre-1950 (the period preceding the export banana intensification policy) and post-1950 to 2010 (the period following the export banana intensification policy). These two time periods were selected to capture the change from sugar production to contract banana production beginning in 1953 (Grossman 1998), and cover the decline of banana export markets following trade liberalization in the late 1990s. In an effort to limit the scope of this paper, food imports were not addressed in the analysis of focal action situations for the domestic market. This allowed our analysis of change to differentiate between informal institutions involved in the production and marketing of fresh foods for domestic markets, from the formal institutions involved in production and marketing of fresh foods for export markets.

We also applied the Program in Institutional Analysis of Social-Ecological Systems (PIASES) framework (McGinnis and Ostrom 2010; McGinnis 2011) to guide our temporal analyses into

the rules operating in export (formal) and domestic (informal) markets (McGinnis 2013). PIASES is a dynamic framework that uses the IAD framework and facilitates an improved understanding of how interactions, flows of information and resources shape decision-making in a SES. Additionally, our use of PIASES has implications for future research through the use of common conceptual language that intersects with Ostrom's (1994) principles of design.

It is important to note that this research was based on an assumption that the effects of public policies on agrarian change can be better understood through analyzing institutional development, operation and change processes over time. It therefore adopts a neo-institutionalist perspective, where individuals are seen as having relatively little impact on public policy, with structure and design instead affecting policy outcomes (March and Olsen 1983; Greenwood and Hinings 1996).

3.3 Results

In this section we use the first tier variables of the PIASES (Governance System; Actors; Resource System and Resource Units; and Interactions/Outcomes) to structure our findings from archival, documentary and key informant interviews. Using these headings, we then describe the second tier variables operating, first in the export (formal), and then domestic (informal) markets. In presenting our findings, we describe variables beginning with the pre-1950 period (preceding export crop intensification) and then the post-1950 period (following export crop intensification).

3.3.1 Description of the Focal Action Situation pre-1950: formal and informal institutions

3.3.1.1 Governance system

Formal governance system (pre-1950)

Findings revealed social, political and racial divisions permeated formal governance systems of Saint Lucia in the pre-1950 period. Key informants described highly authoritative and centralized public policy processes, with minimal interaction from the Black citizenry. Caribbean writers have described this period as a relic of slavery, with a plantation agriculture culture in effect that was informed by an exploitative ethic (see also Richardson 1992). Previously, as a Crown Colony, the Colonial Administration vested political power in the Governor who was supported by two councils: a six-member Executive Council (comprising the Governor, Treasurer, Attorney General, and three other unofficial members selected by the Governor from the planter class); and a twelve-member Legislative Council, (comprising the Executive Council and five unofficial members of the planter class and merchant class). With economic and political power concentrated in the hands of the minority "White planter class", formal governance systems can be characterized as monocentric (Wenger 2010). Termeer et al. (2010) defined such a system as one where the state, as the national authority, controls the national agenda and problem-solving takes place through 'top-down' policy definition and implementation. As the centre of political power in such a governance system, White formal actors used their state-appointed political power to control society, resources and the economy. To illustrate, Corthésy and Harris-Roper (2014) have identified that employment law during this period was designed to "subjugate and control" (p.20) the Black working class (p. 20). In the case of Saint Lucia, planters maintained social and economic divides by instituting vagrancy laws, high land sales taxes, and licensing fees on transportation to pressure labourers into continued employment on their estates (Harmsen et al. 2012).

Political power remained in the hands of the White minority until adult suffrage gave political power over to the citizenry. The beginnings of political change began for the Black majority in

1921. At that time, limited franchise allowed only 1,509 people to vote (2.3% of the population) which maintained the top-down approach with a minority of social actors shaping public policy. Without democratic avenues to get their issues heard, exposed to deplorable working conditions on estates and repressive laws, the Black population resorted to civil disobedience, including strikes and riots (Harmsen et al. 2012). As described by George Charles (1994):

> "*As a period (1930s-1940s) of low wages, long hours of work, no rest on Sundays and public holidays, employment of child labour, little or no health facilities, no vacation leave, no compensation for industrial injuries and limited educational facilities and 90% of the people were illiterate and disenfranchised… these conditions meshed into a powder keg which exploded in 1937… with strikes, riots and violence"* (p. 12-13).

The British Government responded to this social unrest across the British Caribbean by instituting the Royal West India Commission (1938) (more popularly known as the Moyne Commission). Their report, released in 1945, made varied recommendations, but it was the legalization of trade unions that initiated the preliminary transformation of the political system by stimulating the trade union movement in Saint Lucia, supported by universal adult suffrage in 1950.

Informal governance system (pre-1950)

While a small White minority dominated the formal governance system, the reverse situation existed in the informal governance system. Although there is a dearth of archival records on this governance system, oral histories shared by key informants described a plethora of informal institutions that governed rural communities. These developments followed the departure of ex-slaves from sugar estates, after the Emancipation of Slavery Act of 1833. Economically

marginalized and politically disenfranchised, our findings suggest that these rural communities developed in proximity to plantations, but were governed autonomously through social capital embedded in intra-community networks. These findings are supported by Louis (1981), in his doctoral thesis on the development of the Saint Lucian peasantry. He described how through well-organized community-based interactions (such as annual cultural Flower Festivals), different communities came together, competed and developed what he termed 'a collective identity' (p. 110). These community-based groups were not limited to cultural development, but also undertook infrastructural development (such as church building).

In the absence of support from the formal governance system, Harmsen et al. (2012), noted how these community-based groups allowed the development of 'self-expression, identity-formation and social-diversification' (p. 187) that supported the development of informal institutions. The role of these groups in rule-making may be explained by the work of Bourdieu (1989), who highlighted the importance of symbolic capital, used to legitimize the social world by actors and likely served to validate these newly developing rules and interactions. Through such social legitimizing processes, communities self-organized through social capital, particularly trust and reciprocity. Examples of informal institutions identified by our key informants included: land sharing, labour sharing (Helping Hands, Cou-de-main), product sharing, Burial Aid, and rotating savings groups (Sous-Sous). These institutions were fostered by horizontal accountability and collaboration and appeared to integrate community members, through their negotiated involvement in mutually relevant activities. As described by a retired farmer of Labayee community:

"[E]verybody would drop their children at a particular person's home and they would together weed each other's gardens, by turns… it was a kind of a spontaneous arrangement where they created their own support".

Although a potential drawback of this informal governance system was that it promoted and required collaboration based on a common identity, Wenger (2010) suggests it is generally more supportive than the monocentric model to collective learning and adaptation.

3.3.1.2 Actors

This section presents our findings on the actors that comprised the focal action situation in the formal (export market), and then informal (domestic market). This is seen as an important facet of institutional analysis in order to better assess how various actors use resources and the nature of their interactions (Fischer et al. 2007; Rahman et al. 2014; McGinnis and Ostrom 2012). Our findings reveal four main actors operating in the pre-1950 agri-food system: planters, agricultural workers/labourers, sharecroppers/metayers (boundary actors), and subsistence farmers.

Formal institutional actors (pre-1950)

Planters

The White planter class owned large sugar estates (~100), with each covering hundreds of hectares of fertile alluvial plain distributed across rural Saint Lucia (Lewis 1968). For example, Marquis Estate, located on the northeast coast, covered over 1,032 ha. Planters in Saint Lucia struggled through varied crises (from natural disasters, slave revolts/labour riots, sugar market declines and military instability) that resulted in their dwindling numbers (Harmsen et al. 2012). In addition to owning prime land resources dedicated to sugarcane production, each planter held significant financial investments in sugarcane, from production equipment, processing facilities to shipping arrangements (Richardson 1992).

Agricultural workers/labourers

Our findings indicate that in the pre-1950 period, these agricultural workers of African origin continued to play the dominant role as labourers on plantations. The 1946 Census showed that 25% of the population (17,528 persons) were involved in wage labour. An estimated 50% of these were employed as agricultural workers (25% in the sugar industry, and 25% in other export crops) and the remaining 50% were employed in non-agricultural pursuits (GOSL 1989; Harmsen et al. 2012). Agricultural workers held no legal contracts but many were employed and housed over long periods of time (covering generations) on estates.

Share-croppers (Metayers)

Metayers were agricultural workers who entered into share cropping arrangements (called *metayage* in French) with planters. Typically from these contracts, share-croppers received three acres of estate lands for an agreed time (usually six years) and shared half of the returns from sugar sales with planters. In exchange, planters provided them with additional lands to build a residence, produce food (subsistence), and raise animals. Through these agreements, planters consolidated their land capital while simultaneously accessing cheap labour from these semi-independent producers, who accessed virtually free labour from their fellow community members through their social networks (Adrien 1996). As a result of their risk taking activities, metayers advanced as entrepreneurs. Ironically, their economic success was predicated on access to labour (based on their social capital) from community members, at costs and productivity levels unavailable to the planter class. As boundary actors, metayers also operated as informal institutional actors who served to bridge the informal and formal domains of agri-food system governance in Saint Lucia. Such bridging interactions were risky, with metayers often accusing planters of overcharging (for cutting, hauling and processing of cane) and, cheating on marketing

accounts (Adrien 1996; Harmsen et al. 2012).

Informal institutional actors (pre-1950)

Subsistence farmers

Key informants described this single group of actors in the informal system, as relatively homogeneous: rural-based, unemployed or under-employed, producing at subsistence levels for their households and the domestic market (GOSL 1989; Harmsen et al. 2012). Cash strapped with limited resources, cooperation among community members was a prerequisite for their survival. Community members worked together, produced food and additional crops (shelter, medicine, rope, firewood), to support themselves and their households. Their low use of technology was compensated by high labour inputs (Brierley 1988), and may help explain why social cooperation guided their interactions to manage and share needed labour inputs.

3.3.1.3 Resource systems and resource units

Formal resource systems and resource units (pre-1950)

As an agrarian society, export production remained the primary economic activity in Saint Lucia. Detailed archival records (such as annual agriculture reports) describe the formal (export markets) from crop quantities produced, processed, exported and incomes generated. Apart from sugar, other export crops included: limes, cocoa, coconuts, and bananas. Despite these emerging export crops, sugarcane production dominated large estates on fertile floodplains. These fields required a long-term investment of time and resources, since the sugar crop took between 12 to 16 months from planting to harvest. Low fertility from longstanding monocrop production required fertilizer application of animal manure and imported nitrogen, typically applied before planting. Annual sugar production volumes were managed through a sugar export quota, with processing of cane occurring at four central factories (Harmsen et al. 2012). Quotas declined

over the period due to competition from cheaper producers. For example, in the period leading up to 1950, the annual quota was less than 10,000 metric tons, compared to half a million metric tons in the 1890s (Adrien 1996).

Sugar market declines (reduced quotas, sugar prices and falling wages) created economic woes for formal actors. In response, colonial administrators sought out substitute export crops, as recommended by the Moyne Commission Report (1945). Earlier efforts (in 1924) to introduce export bananas had proved unsuccessful due to pest infestation from Whither tip disease (*Colletotrichum gloeosporioides*) (Harmsen et al. 2012). With fertile lowlands covered with sugarcane, available flat lands were scarce. The search for new lands to grow bananas encouraged the widespread clearing of forested hillslopes. To illustrate, in one year, 300 ha of forested slopes were cleared (Harmsen et al. 2012). In the absence of conservation protocols, massive landslides resulted, most notably in 1938, when two major landslides killed 100 people, injured 23, and left 700 homeless (Reynolds, 2006).

Informal resource systems and resource units (pre-1950)

Key informants described the pre-1950 time period as cash-strapped, with the majority of rural actors working collaboratively to produce crops at subsistence levels. Sale of excess production took place at weekly farmer markets that served to bolster household incomes. These farmers markets evolved from slavery, to facilitate exchanges of fresh foods produced on small plots (provision grounds) by slaves (Harmsen et al. 2012). Later, their production for the domestic market took place on small farms in the forested hillslopes surrounding rural communities. Volumes were typically small with diverse crops grown (e.g., food crops, wood for shelter and firewood, medicinal plants). Actors sold fresh foods of relatively low economic value, at these weekly markets.

3.3.1.4 Interactions and outcomes

Our findings support the view that the plantation institution had a strong influence on the export (formal) and domestic (informal) agri-food systems in Saint Lucia. In particular, the intuitions governing land rights evolved from two distinct paths influenced by both the British and French. While British law came into force when England gained control of Saint Lucia in 1840, the Napoleonic civil code and French communal land inheritance laws continued due to the longevity of French[2] colonial rule (see Crichlow, 1994). French communal land inheritance laws gave rise to communal lands that represented an estimated 45% of all lands. Informal institutions guided the access and control of these lands. Known colloquially as "family land" they were managed through shared working rules: 1) co-owners hold blood-rights but often lack a deed or other legal evidence of their land rights, 2) bloodline allows right of access and use of lands, and 3) all co-owners are permitted to harvest permanent crops planted on the lands. In contrast, planters held British-influenced private property rights over large land estates. Table 2 presents these parallel land tenure systems using Ostrom et al.'s (1994) seven categories of working rules guiding natural resource management. In the domestic market (pre-1950), boundary/entry rules required community residence/family land access while export markets were guided by production quotas and plantation ownership. Scope rules directed who was authorized to manage the resource, which was the basis of legal and economic rights. In the sugar export market, these rules directed private property rights that covered the most fertile lands, while shared rules oversaw domestic production on communal lands typically located on marginal hillsides. Information rules guiding these markets and cropping systems were markedly different. In the export market, these rules were restricted. They involved protectionist policies and quotas and depended heavily on access to external supports (e.g., imported fertilizers, and market

connections).

In contrast, these rules in the domestic market served to coordinate production volumes and the large numbers of people involved in production. As such, information was guided through open rules and community social networks. Choice rules in the domestic market directed actions that community members could take that supported collaboration and open knowledge exchange. Payoff-rules, by assigning benefits and incentives, and aggregation rules that oversaw control, served to regulate behaviours and limit excess production. For example, labour and land sharing strategies helped ensure that at the community level everyone received assistance, based on their participation guided by the neighbour-reciprocity principle (Ostrom 2000). These rules ensured that collaboration served to obtain and encourage greater equity and accountability.

Operating between these two production systems, metayers appear to have served as 'boundary spanners' between the formal and informal institutions. In their model of policy responsiveness, Gauri and Lieberman (2006) defined such a phenomenon as boundary actors who, through their interaction, play a critical role on the periphery of formal and informal institutions. These boundary actors also provide opportunities to shape the setting of rules that help regulate racial group interaction and manage inter-group behaviour.

3.3.2 Description of Focal Action Situations post-1950: formal and informal institutions

Following Rahman et al. (2014), in this section, we present the second segment of our analysis looking first at the export (formal) and then domestic (informal) institutions operating in Saint Lucia's agri-food system from 1950 to 2010.

3.3.2.1 Governance system

Formal governance system (post-1950)

Key informant interviews described how adult suffrage in 1950 initiated the structural transformation of Saint Lucia's political system. The right to vote placed political power in the hands of the majority Black populace and energized union-influenced political parties. In 1951, Britain approved a new constitution that left the social-political system unchallenged, increased representation by elected members on the two governing councils and reduced the number of nominated members. With these developments, the British colonial administration sped-up the process of statehood in the region and the transfer of political power toward self-government (Harmsen et al. 2012). While these rights and nation-building activities (culminating with independence in 1979) held great symbolic meaning for the citizenry, it did not challenge the underlying monocentric (state-led and directed) governance system. Rather, the election process became the singular means to engage the masses into policy processes (through manifestos every five years), and did not reconcile the low level of citizen engagement in policy processes.

Informal governance system (post-1950)

Key informants described how self-governing institutions in rural communities waned with implementation of the export banana intensification policy. Over a short period of time, large numbers of subsistence farmers exited domestic markets to pursue more lucrative export markets, leaving behind a small group producing in the domestic market. While some informal institutions remained associated with domestic markets, existing social networks became fragmented. New social interactions subsequently emerged. For example, subsistence farmers who were unable to access lands to become export banana farmers migrated into banana-producing areas as agricultural workers. As a result, informal governance systems diminished in influence and coverage. Additionally, as part of nation-building developments, a local Ministry of Agriculture was staffed and mandated to manage domestic markets. Vertical lines of

command guided top-down, command and control governance approaches used by the ministry and statutory agencies (such as state appointed representatives to direct the Marketing Board and Development Bank) working through specialist employees (such as agricultural officers, agronomists, agricultural economists). With the state now setting the agenda in the domestic market, these newly created national ministries and agencies set policy goals, yet operated independently of informal institutions in domestic markets, resulting in a generally poorly coordinated policy environment.

3.3.2.2 Actors

Formal institutional actors (post-1950)

Based on our findings, we identified varied actors involved in the implementation of export banana intensification policy. These actors displayed considerable heterogeneity (scale of operation, cultural and economic interests) as they facilitated the transition from sugar to intensive banana exports. Each performed specialized roles needed to integrate famers into global banana export markets based on newly imposed rules. In the section below, these actors will be discussed in order of decreasing scale (international, sub-regional, national and household/farm household level): Geest Industries, Windward Islands Banana Growers' Association (WINBAN/WIBDECO), Saint Lucia Banana Growers Association (SLBGA), and independent banana farmers.

<u>Geest Industries</u>

By creating the guaranteed protected market for bananas, the British Government initiated the formal policy of export agriculture intensification. This formalized arrangement began in 1953 with the contract awarded to the small British family-firm Geest Industries, to buy all Windward

Island[3] bananas (Grossman 1992). The company flourished as the export market developed over time. By 1971, Geest had expanded into a banana production, shipping and marketing "giant" and owned 4,000 ha of sugar estates converted into Windward Island banana farmland. In 1983, confronted by labor shortages and political unrest, the company divested their banana holdings of over 16,000 ha through sale to ex-laborers (Monrose 2004). By the late 1990s, the company completely sold off its interests in the banana industry, and changed its strategic interest to convenience foods. British media noted that the sale price for the company was higher than expected, with Geest registering a profit of £21.5 UK million from the sale (Stevenson 1995).

Windward Islands Banana Growers' Association (WINBAN)/Windward Islands Banana Development and Exporting Company (WIBDECO)

Initially established to administer crop insurance to protect the fledgling banana industry from hurricane damage, Windward Islands Banana Growers' Association (WINBAN) held a minor role in the supply chain. It was owned by the National Banana Growers' Associations of Dominica, St Lucia and St Vincent and the Grenada Banana Cooperative Society. As Geest Industries banana interests waned, the Windward Island Governments became the major shareholder of WINBAN. Initially WINBAN's role expanded to provide administrative, as well as, research and development services. Later with incorporation in 1961, and commercialization in 1994, it was transformed into the business entity Windward Islands Banana Development and Exporting Company Limited (WIBDECO), with a UK Subsidiary, WIBDECO UK. At this point, WIBDECO became the key intermediary organization in the supply chain, contracted by Geest Industries, to supply bananas from all national Banana Growers Associations. Two years later, WIBDECO, in a joint-venture with Fyffes, purchased interests in the regional banana shipping line of Geest Industries, and five years later, the marketing arm of Geest Industries. In 2003,

WIBDECO bought out the Fyffes partnership and assumed full control (once held by Geest Industries) of supplying, shipping, marketing and distribution of all Windward Island bananas in Europe. Ironically, this expansion coincided with growing market uncertainty, low banana production (34,000 tons, valued at $16 US million) and declining producer participation (1,600 registered farmers in Saint Lucia) (Reynolds 2006).

St Lucia Banana Growers′ Association (SLBGA)/Saint Lucia Banana Corporation (SLBC)

SLBGA linked first Geest, then later WIBDECO with Saint Lucian banana farmers. Formed by the St Lucia Banana Growers' Association Act No. 6 of 1967, the association was managed through a government appointed board. Informants shared how concerns mounted, as the associations' activities became more complex, and less transparent. As SLBGA operations ballooned over time, deductions in farmer payments increased. For example, initially farmers delivered bananas in bunches to the ports. In 1970, the delivery system changed to shipping in boxes. These changes required investments in SLBGA facilities and processes, with bananas washed, chemically treated, crated, stored and transported weekly to ports. Later these "boxing" responsibilities were transferred to farmers (Reynolds 2006). By the 1990s, growing costs of production, market uncertainty from changing trade regimes, and falling crop prices had stoked farmer dissatisfaction. Compounding matters was the flood of cheaper Central American bananas into European markets, as a market penetration strategy (Reynolds 2006). These market uncertainties, and growing charges of corruption by the SLBGA, galvanized farmers into collective action. In 1996, farmer's rioted and refused to harvest banana crops. Many stopped harvesting bananas voluntarily, but others were forced to participate by the burning down of their crops (Reynolds 2006). The government response to this national crisis culminated with two farmers being killed as police attempted to disperse demonstrators (Reynolds 2006). Farmers

had the last say in the general elections of 1997 when the incumbent government was toppled by 16 seats to 1. As promised in their election manifesto, the new government dissolved the embattled SLBGA (September 1998) as part of efforts to return the association to control of farmers (Joseph 2011). After paying off its $16 US million debt (Reynolds 2006), they created a privately-owned company, the Saint Lucia Banana Corporation (SLBC). This company was owned by 3,000 newly certified farmers who each received one share (Reynolds 2006). Other market-based reforms took place, that segregated banana farmers by size and experience, as additional companies entered the liberalized market. By 2000, there were four local privately-owned companies selling fruit to WIBDECO from less than 2,000 banana farmers (Reynolds 2006).

Independent banana farmers

Our key informants described banana farmers as a mixed group comprising ex-sugar planters, ex-metayers, ex-workers and ex-subsistence farmers. An open entry policy allowed almost anyone to become a registered banana farmer, as long as they had access to lands (that could hold one hundred banana mats - less than 0.5 ha). Once registered, they became a member of the St Lucia Banana Growers' Association (SLBGA). As the national purchaser, the association was obligated to buy all their fruit of export quality. After some initial delays, large numbers entered banana production (Harmsen et al. 2012). By 1965, Saint Lucia boasted 12,479 registered banana growers (O'Loughlin 1968; Welch 1994). Clear differences (business skills, social capital use) between members of this group allowed the better-resourced planters and entrepreneurial metayers to make better use of membership opportunities (e.g., SLBGA Board representation, money and farm management).

Formal institutional actors (domestic markets) (post-1950)

Unlike the highly coordinated and defined stakeholder roles in the banana export supply chain, one main formal actor guided policies in the domestic markets. Two other actors played supportive roles, as guided by the Ministry of Agriculture.

Saint Lucia Ministry of Agriculture (the ministry)

With statehood, Saint Lucia received increased local control over internal affairs like agriculture although exports remained of primary policy importance. Soon the Ministry of Agriculture developed as a fledgling public service department with local mandates. Since the institutional arrangement that integrated banana farmers in global food chains were already well developed, the ministry held responsibility primarily for domestic market operations. With the majority of local resources in the agricultural sector (land, infrastructure and labour) allocated towards export banana production, ministry activities played a secondary role in the agri-food system. In the late 1990s, with the collapse of the protected banana market through trade liberalization, the importance of the ministry and domestic food production increased rapidly.

Saint Lucia Marketing Board (SLMB)

In response to difficulties faced by smallholder farmers in the marketing of food crops for the domestic market, the Government established the St. Lucia Marketing Board (SLMB) in the 1960s as a statutory body, managed through a government-appointed Board. These board representatives, policy goals, means and top-down implementation varied widely, with changes in political power and authority. It acts as a wholesaler, purchasing fresh foods from farmers to retail to supermarkets and hotels and to export. Although SLMB was expected to play a dominant role in marketing, it struggled to fulfil its mandate. After one decade of operation, a report by Marhatta et al. (1978), found that it handled only small volumes of local produce as part of its total production and sales. This was estimated at 2 percent annually. The report also

described the challenges of marketing fresh food in Saint Lucia, many of which remain highly relevant:

> *"[V]ery disorganized…small scale, without well-defined standards, marketing practices, or facilities…the marketing system is primitive and inefficient in moving goods…farmers and their wives still perform a significant portion of marketing functions themselves "(p.21).*

Farmers' organizations

As part of development activity in the agricultural sector, farmers' organizations were widely promoted. Seen as overtly positive, these organizations were expected to link farmers (input suppliers, exporters, processors and consumers) along the supply chain to achieve outcomes, but they have proven challenging to sustain. One such example is the Black Bay Farmer's Cooperative. Our key informants acknowledged this cooperative as one of the two most successful farmer groups producing fresh foods for the domestic market. The history of this group records the ongoing external (donor-led) supports required to sustain its survival. Launched in 1974, it comprised eleven family farms growing on 25 acres. It faced a myriad of challenges, and floundered until repeated injections of donor technical, financial and administrative capital re-catalyzed production. By 1988, it had mushroomed to the current size of 35 members producing on 51 acres (IICA 1989). With assistance from OXFAM and other international donor agencies, the group was formally incorporated as an agricultural cooperative in 2008. Despite the expected benefits (economies of scale, reduced transaction costs, and increased power for collective bargaining), such farmer groups in Saint Lucia producing for the domestic market have not been able to coordinate their activities (much like the SLBGA). Most

of our key informants assessed these groups as struggling to operate, while providing minimum services to members.

Informal institutional actors (domestic markets) (post-1950)

Smallholder farmers producing for domestic markets

As contract banana production became more profitable, farmers exited domestic production leaving a smaller, disaggregated group to sustain primarily ad hoc production of fresh foods. These included smallholder farmers (ex-subsistence farmers): whose lands were located in areas (the leeward side of the island) where microclimatic conditions were not conducive to banana production, whose lands were too small (less than 100 mats), or who were unwilling or unable to grow bananas. This phenomenon was noted across the region, as the growing export sector squeezed remaining smallholder producers into a smaller niche (Levitt and Best 1975). Eventually, with the liberalization of banana markets in the late 1990s, large numbers of banana farmers re-entered domestic production (for more information see Saint Ville et al. 2015).

3.3.2.3 Resource systems and resource units

Formal resource use systems (post-1950)

While a number of institutions worked in tandem, SLBGA facilitated all national coordinating activities required for banana production. They performed this role by providing the technical support needed for high-input monoculture production under the objective of maximizing yield. Initial reluctance to plant bananas following the decline of sugar, the associated high risks of monoculture production waned as incomes increased and banana crop insurance provided benefits following natural disasters (provided by WINBAN/WIBDECO). As the coordinating organization, SLBGA managed national activities such as disease control (aerial spraying),

provision of technical services through extension officers, providing inputs (agrochemicals) on credit, purchasing, making sales to Geest and returning payments to farmers (less deductions) (Reynolds 2006). Despite their role as an interface with farmers, our key informants described their interactions with the SLBGA as being fraught with frustration and distrust. A contentious issue was SLBGA deductions from farmer banana payments that increased over time. While it is likely that rising costs were due to increases in administrative and input costs needed to manage pests and coordinate production (Murray 1992), our key informant farmers were more likely to suggest it was as a result of corruption. Large-scale investments by national governments in the industry did not address growing farmer concerns, and failed to recognize the importance of farmer trust in maintaining the banana export industry. In 1995, Geest sold its banana business to a joint venture of WIBDECO -Fyffes for £147.5 UK million (each party purchased a 50% share) (Reynolds 2006). However, with the dismantling of preferential trading arrangements, despite the consolidation efforts by WIBDECO, our respondents described declining levels of trust in the industry that triggered declines in farmer participation in the export market.

Informal resource use systems (post-1950)

Our findings suggest that the small group of homogenous smallholder farmers producing for the domestic markets operated at small scales and in an ad-hoc fashion, until trade liberalization in the late 1990s. In the post-trade liberalization period, smallholders producing food for the domestic market became increasingly heterogeneous as some ex-banana farmers entered domestic markets. Data from the Agricultural Census (2007) covering that period showed that land allocated for temporary crops[4] or short term crops (root crops and vegetables) doubled from 4,570 acres in 1996 (8.9% of the total area) to 6,017 acres in 2007 (accounting for 20% of the total area). These short-term crops were of relatively low economic value, but compared to

bananas, informants reported better returns and lower production costs. With their entry, and in the absence of coordination, domestic producers limited their production volumes to reduce potential losses from gluts, short shelf-life of fresh produce, and limited availability of processing facilities.

Marketing of fresh foods crops continued at weekly (and bi-weekly) markets: particularly the Castries Market and Vieux Fort Market. Farmers typically directly sell their produce to local consumers on Friday and Saturday shopping days. These markets operate with minimal services, storage, grading, sorting, or weighing requirements. They feature a diverse product range that is highly variable because of the importance of seasons on rain-fed farming. Mostly women, vendors typically have small farms, or are members of farm families with responsibility for the sale of household produce, or small-scale "middle-men". Municipal councils are responsible for the farmers markets in the respective city/town with spaces rented daily, by ticket (average cost $2 USD). Market facilities have minimum storage area with produce sold in ambient air temperatures.

3.3.2.4 Interactions and outcomes

In the post-1950s period (see Table 2), state-led policies transformed rules undermining common understanding (community interactions and collective action) that previously guided domestic production systems. While all categories of ex-sugar actors in the post-1950s period entered banana production, it was the loss of the ex-subsistence farmer group that most affected rule development, interactions and outcomes in the domestic market. Since the other actors had played a lesser role in domestic markets, rule development in the post-1950s paralleled the changing relations between ex-subsistence farmers in their new role as independent smallholder farmers in the export market.

In the absence of boundary rules to guide domestic production volumes and protect marginal land use, ex-subsistence producers exited domestic production in droves, deforested hillslopes and replaced them with banana plants (see Table 2 post-1950 columns). Post-1950, these changes led to agricultural production on ill-suited steep slopes with negative environmental consequences (Cox et al. 2005; Rojas et al. 1988). With changing relations between ex-subsistence farmers in their new role as independent smallholder farmers, information sharing rules bolstered by informal institutions became less relevant and social networks became more fragmented. New scope and choice rules emerged as competition, autonomy, and increased output replaced subsistence production with increased disaggregation of producers. As large tracts of land became allocated to monoculture bananas, lands under food production in the domestic market were drastically reduced. To illustrate, the total area of agricultural holdings primarily allocated to banana production, stood at 35, 000 ha in 1961 and post trade liberalization it declined to 12,000 ha (in 2007), a 66% decrease in export bananas (GOSL 2007). The diversion of human and land resources towards export-oriented food production reduced domestic fresh food production volumes and the consistency of their supply, creating a looming food and nutrition security challenge that was not immediately apparent because of the increased household incomes from the banana cash crop economy and easy availability of imported foods (Saint Ville et al. 2015). Food imports in Saint Lucia remain on the increase and are currently estimated at $127 US million per year (GOSL 2013).

Rule convergence in formal and informal institutions helps explain the existing resource management challenge in domestic markets in the post-trade liberalization period. While land acreage and the actors exited export-banana markets and re-entered fresh food production for the domestic market, the “new” agreed upon rules proved inadequate to foster collective action as

each entrant to production in the domestic market decreased the overall welfare of all producers. Our key informants repeatedly described the challenges of managing their production as a result of: supply gluts, high variability in prices, and high rate of food spoilage. Additionally, while the influx of ex-banana farmers to domestic markets did not change the rudimentary marketing system, it ironically changed production systems by introducing higher-input agricultural practices, values and norms.

3.4 Discussion and Analysis of Change

We can observe two important institutional changes, pre-1950 and from 1950 to 2010, that transformed Saint Lucia's domestic agri-food system as the 'rules of the game' from the plantation or export markets (formal institutions) replaced resource management rules guiding domestic markets (informal institutions). First, displacement of informal institutions to a lower position in the institutional hierarchy, driven by rule convergence in export and domestic markets (see Table 2). Second, reduced interactions arising from this displacement changed relations between ex-subsistence farmers in rural communities. These changes appear to have negatively affected intra-community exchanges (bonding social capital), and opportunities for inter community horizontal knowledge flows (bridging social capital), despite apparent increases in linking social capital (see Figure 2).

3.4.1 Displacement of informal institutions to a lower position in the institutional hierarchy, and rule convergence in export and domestic markets

Institutional change has had significant implications for resource use in Saint Lucia. For example, pre-1950 boundary rules of informal institutions for production in domestic markets required community residence that served to aggregate producers at the community level. With

the intensification of banana production post-1950, this was replaced with a minimum land access requirement which allowed anyone with land greater than 0.5ha to enter (and later to exit) export production. Since many people have access to "family land" in Saint Lucia (which represents 45% of lands) (Crichlow 1994), this rule change, combined with inadequate coordination mechanisms (needed to foster common understanding of the rules), led to fragmented and uncoordinated agricultural production systems.

Growing heterogeneity among community members resulted from differences in farmers being able to access and benefit from export production opportunities. Banana farmers contained a mixed group comprising ex-sugar planters, ex-metayers, ex-workers and ex-subsistence farmers. These differences in resources, interests and roles weakened cooperation and common understanding between banana farmers as a group. However, it was the changing relations between ex-subsistence farmers that most affected rule development, interactions and outcomes in the domestic market and community members. Negative feedback from growing heterogeneity further decreased needed interaction to develop common understanding among smallholder farmers (independent banana farmers), which negatively affected their collective participation in community institutions (such as Helping Hands). Further, community members with access to family land were often unable to access credit facilities and were therefore more dependent on informal community institutions (such as labour sharing) (see De Soto 2000), which served to widen economic disparities. As explained by one retired farmer from Micoud:

> *"[Y]ou had a homogeneous society years ago; everybody was on the same level. So, it's like saying birds of a feather flock together. We were all the same and we tended to gravitate together and we did things together ... But now, there is more disparity".*

As disparities increased, community members who held title for their lands class and better

resourced entrepreneurial class (such as ex-metayers) opted out of participating in informal institutions. Their withdrawal was seen by community members as reneging on their reciprocity obligations and their unwillingness to interact socially or otherwise with the smaller, less-resourced farmers. Further, as these more business-savy farmers grew and expanded their production, their need for ongoing interactions with community members through "identity-development activities" were further reduced, limiting the effectiveness of traditional community sanctions against potential defectors (Schmidt et al. 2001). Ultimately, as the material benefits associated with export agriculture production increased, community-based cooperation was reported as decreasing (see Cárdenas and Ostrom 2004), making collective rule-making and enforcement difficult.

Our results also reveal how rule convergence in both the domestic and export markets post-1950 resulted in domestic markets governed by top-down, monocentric governance systems with state-led control of society, resources and the economy. Such systems have traditionally been associated with exploitative outcomes in Saint Lucia and subsequently suffer from reduced farmer trust in these formal institutions. Initially, social norms maintained racial, social and economic divisions between the minority European planter class (French and British) and more populous citizenry of African origin. Through their role as boundary actors, metayers initially bridged these structural holes and were able to "be the third who benefits" (Burt 1992) despite the planter class monopolizing political, legislative, and economic power. Further, a general lack of recognition of the limitations associated with authoritarian and top-down approaches in Saint Lucia appears to have resulted in low importance being placed on informal institutions and community participation in public policy. This has led to the absence of formal efforts to

acknowledge existing informal institutions and bridge existing gaps when creating new institutions. As described by a natural resource management specialist:

> *" [W]e're still back in the colonial sort of perspective… The tendency has been to use command and control rather than … participatory and adaptive management approaches."*

Low levels of participation by citizens in policy processes have led to a general perception that formal institutions lack accountability and transparency. As such, governance is narrowly defined without the needed focus on broader participation and political inclusion. This limited engagement of the populace in policy development undermines the role of the citizenry in the democratic process with focus on outcomes (votes), and opens up a void in the national policy agenda. Further, our interview respondents reported the key roles played by self-interested elites in the formal institutions that govern Saint Lucia's agri-food system, a situation that is likely enhanced by declining group identity and solidarity (Cárdenas and Ostrom 2004). Adult suffrage in the 1950's gave a voice to the majority Black citizenry through voting, however, the void in the national policy agenda appears to have been filled by Black political elites who supplanted the role of the White planter class. In such a small and isolated population, this division between democratic processes and inputs has enabled a high degree of access to decision-makers and a political environment that has been characterized as "messianic" (Joseph 2011). Further, respondents suggested that because of their interactions with politicians, farmers are often able to advance their personal interests rather than those of the collective. As described by a key informant from the Development Bank:

“"It is who you know!" He (the smallholder farmer) understands the system … and what he is doing now, he is systematically exploiting that system for his own advantage … he hides or has all of techniques to get him around his commitments.”

Such situations suggest that linking social capital is an important resource being used to influence formal institutions for individual benefit, undermining their ability to foster collective action on broader community (public) interests. As noted by a respondent from civil society:

“…. people have difficulty in really determining where their true loyalties lie. Or where their true interests lie, in terms of what benefits them the most….”

These observations were aptly described by the 1997-1999 Blom-Cooper Commission of Inquiry as a “culture of corruption” (Blom-Cooper 1999). In the Commission Report, the author described how this inertia operated in the civil service of Saint Lucia:

“ I have discerned a culture in St Lucia of studied indifference or, at the very least, inattention to the practice, even the concept, of public accountability - a cultural climate in which administrative torpor is often the consequence, and malpractices in government (including corruption) can thrive, unhampered by detection or, if and when uncovered, by disciplinary action… The suspicion in the public's mind that the machinery of government is not working, and consequently that corruption is rife, is almost as damaging to the public weal as individual corruption itself” (Cooper 1999).

Addressing what can be described as the perverse effect of rent-seeking behaviour by individual actors needs to become a priority of the formal institutions responsible for agri-food policy, in order to better respond to the complex challenges facing Saint Lucia’s domestic food system. Here, Hinds (2008) suggested six critical areas that can inform the process of political reform

away from the plantation political legacy: 1) pursuit of democratic outcomes rather than inputs; 2) evolved substantive democracy beyond post-colonial forms; 3) mass empowerment and shared nationhood; 4) rethinking of governance with broader participation and political inclusion beyond periodic elections; 5) redefined rules, procedures and elements to include social justice and equality and; 6) expansion of civil rights and liberties to ensure protection against state oppression.

3.4.2 Reduced interactions negatively affecting bonding and bridging social capital in domestic markets

Through these described rule changes, an unappreciated outcome for the domestic agri-food system was the negative effects on social capital (networks, trust, reciprocity, solidarity) by reduced interactions among social actors (see Figure 2). Rule convergence in domestic and export markets over the period reduced critical intra- and inter community interactions, reducing opportunities for communities to build symbolic capital and forge new institutions. Findings in other settings have shown that high levels of interaction, particularly at the community level, often serve to reinforce expectation, values and belief (Minato et al. 2010). In the absence of these interactions, bonding and bridging social capital in Saint Lucia's domestic markets declined. In contrast, in the export market there were increased interactions, although limited rule-based interactions (for example annual general meetings, workshops, etc.), that facilitated increases in bonding and bridging social capital among actors.

With the arrival of new institutions, community cohesion (based on intra-community interaction) was reported as declining, with important implications for collective action. As explained by an ex-banana farmer from a major banana producing community;

"In a way it (change) was fuelled by bananas because bananas gave the opportunity for those who owned land or had access to land to transform their circumstances almost dramatically… the entire outlook changed because these people now started hiring help…. this community was something like a little New York. People from … all over, started coming in to this community."

These changes in intra-community interactions resulted in changes in identity and de-legitimized existing community institutions. New rules were in effect that guided the rural community as members participated in export agriculture opportunities. With informal institutional structures facing mass withdrawal of subsistence farmers, self-organized community-based networks (based on principles of equity, reciprocity and accountability) broke down with reduced interactions among actors guided by new rules. For example, previously valued bridging social capital and inter-community interaction became less relevant for agricultural production. Banana farmers now received direct support from workers, SLBGA and WINBAN. As a result, neighbours were no longer able to easily monitor each other's behaviours, and the importance of reciprocal flow of information for joint-activities declined.

Declining bridging social capital in the informal institutions appears to have occurred as intra-community interaction reduced quickly over time. Rapid social change in these communities was reported as undermining the self-organizing institutions that had been functioning in communities through social capital, resulting in institutions based more on competition and rising distrust as social inequality and distances between community members increased. Bonding social capital also appears to have decreased and became consolidated around restricted social networks based on kinship bolstered by interactions around the use of communal land lands. Interestingly, as social capital dimensions of bridging and bonding decreased in the

domestic production system, linking social capital appears to have increased. Despite these increases over time, the political power associated with universal adult suffrage appeared to not operate as expected (suggesting limited effectiveness of linking social capital) to solve collective action problems in Saint Lucia's agri-food system.

3.4.3 Policy implications

Better understanding of the effect of public policy/institutions on outcomes for agrarian change in the agri-food system has implications for policymakers, donors and farmer associations. In the case of Saint Lucia, the institutions and common understandings needed to support sustainable resource use in the agri-food system is lacking. The dominant policy focus has been on technological and market conditions, with little consideration of how existing institutional arrangements respond to the need for re-defining formal rules, and social norms away from the plantation legacies (Saint Ville et al. 2017). Ballet et al. (2007) highlights the importance of 'soft skills' rather than technological development in natural resource management by looking at the interplay between linking social capital, cultural and symbolic capital observed in our findings. They describe the need for cultural and structural social capital to be converted into symbolic capital in order to reduce tensions, transaction costs and enhance community-based natural resource management activities. While cultural and social capital allowed resource users to bargain over shared values and rules respectively, it is this process of shared understanding and identity formation that creates symbolic capital. Bourdieu's (1985, 1989) work on symbolic capital used to legitimize rule development in new groups, and Louis (1981) observations in Saint Lucia on the importance of identity in creating shared rules appear to support these observations. This suggests that current efforts in community-based natural resource management to build structural social capital by looking at connections between resource users

may be insufficient on its own (Saint Ville et al. 2016).

Ultimately, those representing linking social capital (policymakers, donors and farmer associations) may benefit from building horizontal linkages between social actors in the ongoing efforts to resolve coordination challenges in the food system. Watts and Wandesforde-Smith (2006) describe such initiatives as operating "under the radar" of formal politics in the Caribbean, but still depends heavily on community-coalitions. Based on past Caribbean successes, they recommend interventions that use existing bridging social capital and good linking social capital to build "triple alliances" comprising informal, multi-level, multi-scalar, pro-sustainability and pro-participation coalitions. While this approach has already been applied in other natural resource sectors in the region (notably in fisheries, coastal zone and watershed management) (Tompkins and Adger 2004) it has not been systematically applied to domestic agri-food systems governance. In doing so, we note a caution by Woolcock (2000) that we should recognize dimensions of social capital as 'resources to be optimized, not maximized' (p. 8).

3.5 Conclusion

This study applied a combined PIASES Institutional Analysis and Development and Social–Ecological Systems (SES) framework to investigate how institutions have influenced outcomes in the agri-food system of Saint Lucia. First, displacement of informal institutions and guiding rules to a lower position in the institutional hierarchy resulted in convergence of rules from export and domestic production systems. Second, these changes fostered reduced interaction, loss of cultural and identity-building activities within and across communities, and a general loss of horizontal linkages between different communities (bridging social capital). Monocentric

governance systems inherited from the plantation system supported by rules that created conditions of low accountability, appear to have weakened the effectiveness of vertical links between different actors in Saint Lucia's agri-food system (linking social capital) to solve collective problems. Collectively these changes transformed domestic agri-food systems, resulting in unintended outcomes such as increasing food and nutrition insecurity, low bridging social capital, and low system diversity.

Going forward, there appears to be a need for public policy to more explicitly and carefully account for the complex institutional legacies and characteristics which continue to affect the sustainable governance of Saint Lucia's agri-food system. Our results suggest the need to better identify bridging institutions in the agriculture sector, perhaps based on an adaptive co-management model, that could support shared rule-making, power and knowledge-sharing amongst policy actors from multiple levels in the governance hierarchy.

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References

Adger, W.N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography, 79*, 387-404.

Adler, P.S., Kwon, S.W. (2002). Social capital: Prospects for a new concept. *Academy of Management Review, 27* (11),17-40.

Adrien, P. (1996). *Metayage, capitalism and peasant development in St. Lucia 1840-1957*. Jamaica: Canoe Press, University of the West Indies.

Altheide, D.L. (1987). Reflections: Ethnographic content analysis. *Qualitative Sociology, 10* (1), 65-77.

Ballet, J., Sirven, N., Requiers-Desjardins, M. (2007). Social capital and natural resource management a critical perspective. *The Journal of Environment and Development, 16*, 355-374.

Becker, H.S. (1996). The epistemology of qualitative research. *Ethnography and human development: Context and meaning in social inquiry*, 53-71.

Beckles, H., Shepherd, V. (1996). *Caribbean freedom: Economy and society from emancipation to the present: A Student Reader.* Kingston: Ian Randle Publishers.

Blom-Cooper, L. (1999). *Commission of inquiry*. Castries: Saint Lucia.

Bourdieu, P. (1985). The social space and the genesis of groups. *Theory and society, 14* (6), 723-744.

Bourdieu, P. (1989). Social space and symbolic power. *Sociological theory, 7*(1), 14-25.

Brierley, J.S. (1988). A retrospective on West Indian small farming, with an update from Grenada In: J.S. Brierley, H. Rubenstein, (Eds.). *Small farming and peasant resources in the Caribbean.* Winnipeg: The University of Manitoba.

Burt, R.S. (1992). *Structural hole*. Cambridge, MA: Harvard Business School Press.

Campbell, D., Beckford, C. (2009). Negotiating Uncertainty: Jamaican Small Farmers' Adaptation and Coping Strategies, Before and After Hurricanes-A Case Study of Hurricane Dean. *Sustainability, 1* (4), 1366-1387.

Cárdenas, J.C., Ostrom, E. (2004). What do people bring into the game? Experiments in the field about cooperation in the commons. *Agricultural Systems, 82 (3)*, 307-326.

Charles, G.F.L. (1994). *The history of the labour movement in St. Lucia 1945-1974: A personal memoir*. St. Lucia: FRC Publications.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis.* London: Sage Publications Limited.

Chen, H., Wang, J., Huang, J. (2014). Policy support, social capital, and farmers' adaptation to drought in China. *Global Environmental Change, 24*, 193-202.

Corthésy, N.G., Harris-Roper, C.A. (2014). *Commonwealth Caribbean Employment and Labour Law*. Kentucky: Routledge.

Cox, C., Madramootoo, C. (1998). Application of geographic information systems in watershed management planning in St. Lucia. *Computers and Electronics in Agriculture, 20* (3), 229-250.

Cox, C., Sarangi, A., Madramootoo, C. (2005). Effect of land management on runoff and soil losses from two small watersheds in St Lucia. *Land Degradation and Development, 17* (1), 55-72.

Crichlow, M.A. (1994). An alternative approach to family land tenure in the Anglophone Caribbean: The case of St. Lucia. *New West Indian Guide/Nieuwe West-Indische Gids, 68*, (1/2) 77-99.

Darr, D., Pretzsch, J. (2008). Mechanisms of innovation diffusion under information abundance and information scarcity: On the contribution of social networks in group vs. individual extension approaches in Semi-Arid Kenya. *Journal of Agricultural Education and Extension, 14* (3), 231-248.

De Soto, H. (2000). *The Mystery of Capital*. New York: Basic Books.

Dessie, Y., Schubert, U., Wurzinger, M., Hauser, M. (2013). The role of institutions and social learning in soil conservation innovations: Implications for policy and practice. *Environmental Science and Policy, 27*, 21-31.

Elliott, D.R., Palmer, R.W. (2008). Institutions and Caribbean economic performance: Insights from Jamaica. *Studies in Comparative International Development, 43* (2), 181-205.

Fischer, A., Petersen, L., Feldkötter, C., Huppert, W. (2007). Sustainable governance of natural resources and institutional change–an analytical framework. *Public Administration and Development, 27* (2), 123-137.

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

Gamble, D.W., Campbell, D., Allen, T.L., Barker, D., Curtis, S., McGregor, D., Popke, J. (2010). Climate change, drought, and Jamaican agriculture: Local knowledge and the climate record. *Annals of the Association of American Geographers, 100* (4), 880-893.

Gauri, V., Lieberman, E.S. (2006). Boundary institutions and HIV/AIDS policy in Brazil and South Africa. *Studies in Comparative International Development, 41*(3), 47-73.

Glaser, B.G., Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research.* New York: Aldine de Gruyter.

GOSL. (1989). *Saint Lucia's annual statistics: A digest containing annual statistics for 1996 and 1997*. Saint Lucia: Government of Saint Lucia.

GOSL. (1950). *Agricultural Census*. Saint Lucia: Government of Saint Lucia.

GOSL. (2007). *Agricultural Census.* Saint Lucia: Government of Saint Lucia.

GOSL. (2013). *Food and Nutrition Security Policy and Action Plan.* Saint Lucia: Government of Saint Lucia.

Greenwood, R., Hinings, C. R. (1996). Understanding radical organizational change: Bringing together the old and the new institutionalism. *Academy of Management Review, 21*(4), 1022-1054.

Grossman, L.S. (1998). *The political ecology of bananas: Contract farming, peasants, and agrarian change in the Eastern Caribbean.* Chapel Hill: The University of North Carolina Press.

Grossman L.S. (1992). Pesticides, caution, and experimentation in St. Vincent, Eastern Caribbean. *Human Ecology, 20* (3), 315-336.

Guha-Khasnobis, B., Kanbur, R., Ostrom, E. (2007). *Linking the formal and informal economy: Concepts and policies*. London: Oxford University Press.

Gumbs, F. (1981). Agriculture in the wider Caribbean. *Ambio 10* (6), 335-339.

Harmsen, J., Guy, E., Robert, D. (2012). *A History of St Lucia*. St Lucia: Lighthouse Road.

Hinds, D. (2008). Beyond formal democracy: The discourse on democracy and governance in the Anglophone Caribbean. *Commonwealth and Comparative Politics, 46* (3), 388-406.

Hodgson, G.M. (2006). What are institutions? *Journal of Economic Issues, 40*,1-25.

IICA. (1989). *Profiles of farmer organization in Saint Lucia*. St Lucia: Inter-American Institute for Cooperation on Agriculture.

Joseph, T.S.D. (2011). *Decolonization in St. Lucia: Politics and global neoliberalism, 1945-2010.* Jackson: University Press of Mississippi.

Leeuwis, C., Aarts, N. (2011). Rethinking communication in innovation processes: Creating space for change in complex systems. *Journal of Agricultural Education and Extension, 17 (1)*, 21-36.

Lewis G.K. (1968). An introductory note to the study of the Virgin Islands. *Caribbean Studies, 8*, 5-21.

Levitt, K., Best, L. (1975). Character of Caribbean economy. In: G. Beckford (Ed.). *Caribbean Economy* pp. 34-60. Jamaica: Institute of Social and Economic Research, University of the West Indies.

Lewsey C., Cid, G., Kruse, E. (2004). Assessing climate change impacts on coastal infrastructure in the Eastern Caribbean. *Marine Policy, 28*, 393-409.

López-Marrero, T., Wisner, B. (2012). Not in the same boat: Disasters and differential vulnerability in the insular Caribbean. *Caribbean Studies, 40* (2), 129-168.

Louis, M. (1981). *An equal right to the soil: The rise of peasantry in St. Lucia; 1838-1900* (Unpublished doctoral dissertation). John Hopkins University, Baltimore.

Lowitt, K., Hickey, G.M., Ganpat, W., Phillip, L. (2015). Developing communities of practice in support of resilient value chains for sustainable food security. *World Development, 74*, 363-373.

Marhatta, H.P., Robbins, R.D., Plummer, L. (1978). *Agricultural marketing system in St. Lucia: Small farmer technology and marketing analysis for rural development*. North Carolina: A and T State University.

March, J. G., Olsen, J. P. (1983). The new institutionalism: organizational factors in political life. *American Political Science Review, 78* (3), 734-749.

Mashavave, T., Mapfumo, P., Mtambanengwe, F., Gwandu, T., Siziba, S. (2013). Interaction patterns determining improved information and knowledge sharing among smallholder farmers. *African Journal of Agricultural and Resource Economics, 8* (1), 1-12.

McElroy, J. L., and De Albuquerque K. (1998). Tourism penetration index in small Caribbean islands. *Annals of Tourism Research, 25*, (1), 145-168.

McGinnis, M. (2000). *Polycentric games and institutions*. Ann Arbor: University of Michigan Press.

McGinnis, M. (2011). An Introduction to IAD and the Language of the Ostrom Workshop: A Simple Guide to a Complex Framework for the Analysis of Institutions and their Development. *Policy Studies Journal*, 39 (1).

McGinnis, M.D. (2013). Updated Guide to IAD and the Language of the Ostrom Workshop: A Simplified Overview of a Complex Framework for the Analysis of Institutions and their Development.

McGinnis, M., Ostrom, E. (2010). *IAD and SES dynamic flows: Introducing the Program in Institutional Analysis of Social-Ecological Systems (PIASES) framework.* Preliminary draft of a paper to be presented at 13th Economics of Infrastructures Conference, Delft, Netherlands.

McGinnis, M., Ostrom, E. (2012). SES Framework: Initial changes and continuing challenges.

Ecology and Society, 19 (2).

Minato, W., Curtis, A., Allan, C. (2010). Social norms and natural resource management in a changing rural community. *Journal of Environmental Policy and Planning,* 12 (4), 381-403.

Monrose E. (2004). *Can the Banana Industry in Saint Lucia Survive post 2008: A critical look* (Unpublished masters thesis)? The University of Birmingham, Birmingham.

Morgan, D.L. (1993). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3* (1), 112.

Murray D.L., Hoppin P. (1992). Recurring contradictions in agrarian development: Pesticide problems in Caribbean Basin nontraditional agriculture. *World Development, 20*, 597-608.

North, D.C. (1991). Institutions. *Journal of Economic Perspectives, 5* (1), 97-112.

Narayan, D. (2002). Bonds and bridges: Social capital and poverty. In Isham J., Kelly, T., and Ramaswamy, S. (eds.). *Social capital and economic development: Well-being in developing countries* (pp.58-81). Northampton, MA: Edward Elgar.

O'Loughlin, C. (1968). *Economic and political change in the Leeward and Windward Islands.* New Haven: Yale University Press.

Ostrom, E., Gardner, R., Walker, J. (1994). *Rules, games, and common-pool resources.* Michigan: University of Michigan Press.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives, 14* (3), 137-158.

Ostrom, E. (2009). *Understanding institutional diversity*. New Jersey: Princeton University Press.

Pelling, M., High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change, 15*, 308-319.

Rahman H., Hickey, G.M., Sarker, S.K. (2012). A framework for evaluating collective action and informal institutional dynamics under a resource management policy of decentralization. *Ecological Economics, 83* (11), 32-41.

Rahman, H.T., Sarker, S.K., Hickey, G.M., Haque, M.M., Das, N. (2014). Informal institutional responses to government interventions: Lessons from Madhupur National Park, Bangladesh. *Environmental Management 54* (5), 1175-1189.

Reed, G. and Hickey, G.M., (2016). Contrasting innovation networks in smallholder agricultural producer cooperatives: Insights from the Niayes Region of Senegal. *Journal of Co-operative Organization and Management 4*, 97-107.

Reynolds, A. (2006). *The struggle for survival: An historical, political, and socioeconomic perspective of St. Lucia*. US: Jako Books.

Richardson, B.C. (1992). *The Caribbean in the wider world, 1492-1992: A regional geography.* Cambridge: Cambridge University Press.

Rojas, E., Wirtshafter, R.M., Radke, J., Hosier, R. (1988). Land conservation in small developing countries: Computer assisted studies in Saint Lucia. *Ambio*, 282-288.

Royal West India Commission. (1945). *West India Royal Commission Report.* West Indies.

Saint Ville, A., Hickey, G.M., Phillip, L. (2015). Addressing food and nutrition insecurity in the Caribbean through domestic smallholder farming system innovation: A review. *Regional Environmental Change, 15* (7), 1325-1339.

Saint Ville, A.S., G.M. Hickey, U. Locher, and L.E. Phillip. (2016). Exploring the role of social capital in influencing knowledge flows and innovation in smallholder farming

communities in the Caribbean. *Food Security 8*, 535-549.

Saint Ville, A.S., G.M. Hickey, and L.E. Phillip. (2017). How do stakeholder interactions influence national food security policy in the Caribbean? The case of Saint Lucia. *Food Policy 68*, 53-64.

Schmidt, D., Shupp, R., Walker, J., Ahn, T.K., Ostrom, E. (2001). Dilemma games: Game parameters and matching protocols. *Journal of Economic Behavior and Organization, 46* (4), 357-377.

Speranza, C.I. (2013). Buffer capacity: Capturing a dimension of resilience to climate change in African smallholder agriculture. *Regional Environmental Change, 13* (3), 521-535.

Stevenson, T. (1995). Geest sells banana business for pounds 147m. http://www.independent.co.uk/news/business/geest-sells-banana-business-for-pounds-147m-1527114.html. Accessed 16 July 2016.

Termeer, C. J., Dewulf, A. R. P. J., Lieshout, M. V. (2010). Disentangling scale approaches in governance research: comparing monocentric, multilevel, and adaptive governance. *Ecology and Society. 15* (4).

Timms, B.F. (2008). Development theory and domestic agriculture in the Caribbean: Recurring crises and missed opportunities. *Caribbean Geography, 15* (2), 101.

Timu, A.G., Mulwa, R.M., Okello, J., Kamau, M. (2012). *The Role of Varietal Attributes on Adoption of Improved Seed Varieties. The Case of Sorghum in Kenya*. Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington.

Tompkins, E.L., Adger, W. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society, 9* (2).

van Rijn, F., Bulte, E., Adekunle, A. (2012). Social capital and agricultural innovation in Sub-

Saharan Africa. *Agricultural Systems, 108*, 112-122.

Watts, N.S., Wandesforde-Smith, G. (2006). The law and policy of biodiversity conservation in the Caribbean: Cutting a Gordian knot. *Journal of International Wildlife Law and Policy, 9* (3), 209-221.

Weis T. (2007). Small farming and radical imaginations in the Caribbean today. *Race and Class, 49* (2), 112-117.

Welch, B. (1994). Banana dependency: Albatross or liferaft for the Windwards. *Social and Economic Studies*, 123-149.

Wenger, E. (2010). Communities of practice and social learning systems: The career of a concept. In C. Blackmore (Ed.). *Social learning systems and communities of practice* (p. 179-198). London: Springer.

Woolcock, M. (1998). Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and Society, 27* (2), 151-208.

Wossen, T., Berger, T., Mequaninte, T., Alamirew, B. (2013). Social network effects on the adoption of sustainable natural resource management practices in Ethiopia. *International Journal of Sustainable Development and World Ecology, 20* (6), 477-483.

Yin, R. (1994). *Case study research: Design and methods*. Thousand Oaks: Sage Publications.

Yin, R. (2002). Case study evaluations: a decade of progress? *Evaluation Models*, 185-193.

Table 3.1: Respondent profile

Key Informants	No	M	F
Group 1: Smallholder Farmer (65-80 years old)			
Location of Farming community	.		
Northern Communities (Castries-Babonneau, Bexon)	4	4	0
Southern Communities (Vieux Fort, Micoud)	12	12	0
Western Communities (Choiseul, Anse la Raye)	7	5	2
Eastern Communities (Dennery)	7	3	4
Sub-total	*30*	*24*	*6*
Group 2: National Specialists			
Agriculture (finance, engineering, policy, economics) and Natural resource management	7	6	1
Historian/Sociologist/Linguist/Anthropologist	8	6	2
Trade Union activism/Civil society activism	2	2	0
Journalists/Counselor	4	3	1
Community Development/Mobilization and disaster Management	3	1	2
Farmer Organizations/capacity building	3	2	1
Sub-total	*27*	*20*	*7*
Total	***57***	***44***	***13***

Table 3.2: Rule Inventory showing changes in rules guiding production in the agriculture food system revealing rule convergence in the formal (export) and informal (domestic) markets from pre-1950 to the post-1950 (to 2010) period.

	Pre 1950		**post 1950-2013**	
Rules under examination	*Informal*	*Formal*	*Informal*	*Formal*
Boundary - number of participants, and conditions for entry and exit	Subsistence, community residence/ for entry/land blood right	Export quotas Legal/market relations (e.g. worker, (planter, metayage)	Minimum requirements/ anyone can enter/land blood right	Minimum requirements/ anyone can enter/land blood right
Position - who holds what position, become leaders and get responsibility	Structural social capital based(social networks), kinship	Property ownership, external monitor/	No formal positions exist /Extension Officer	Extension Officer, Specialists
Scope rules - who is authorized or forbidden or outside of the functional domain	Community-based, joint monitoring	Economic or legal authority	Each individual can take any action in their economic interest	Each individual can take any action their economic interest
Choice rules- assigns actions that actors may, must or must not take	Collaboration/ fixed order (labour, product sharing)	Exploitation	Exploitation, each individual can take any action	Exploitation, each individual can take any action
Aggregation rules- level of control exercised by positions	Neighbor agreement	Independent, contract	Conditional cooperation/ independence	Monitor decision, act independently
Information rules- knowledge sharing, information to be held secret	Open, rule infraction publicity through social networks	Top-down, restricted access	Restricted social networks (*"who you know"*)	Top-down, restricted access
Payoff rules- costs and benefits assigned to actions and outcomes (incentives and deterrents)	Reciprocity, labour obligation	Economic benefit	Limited social cohesion, trust, reciprocity/ economic benefit	Economic benefit, penalty

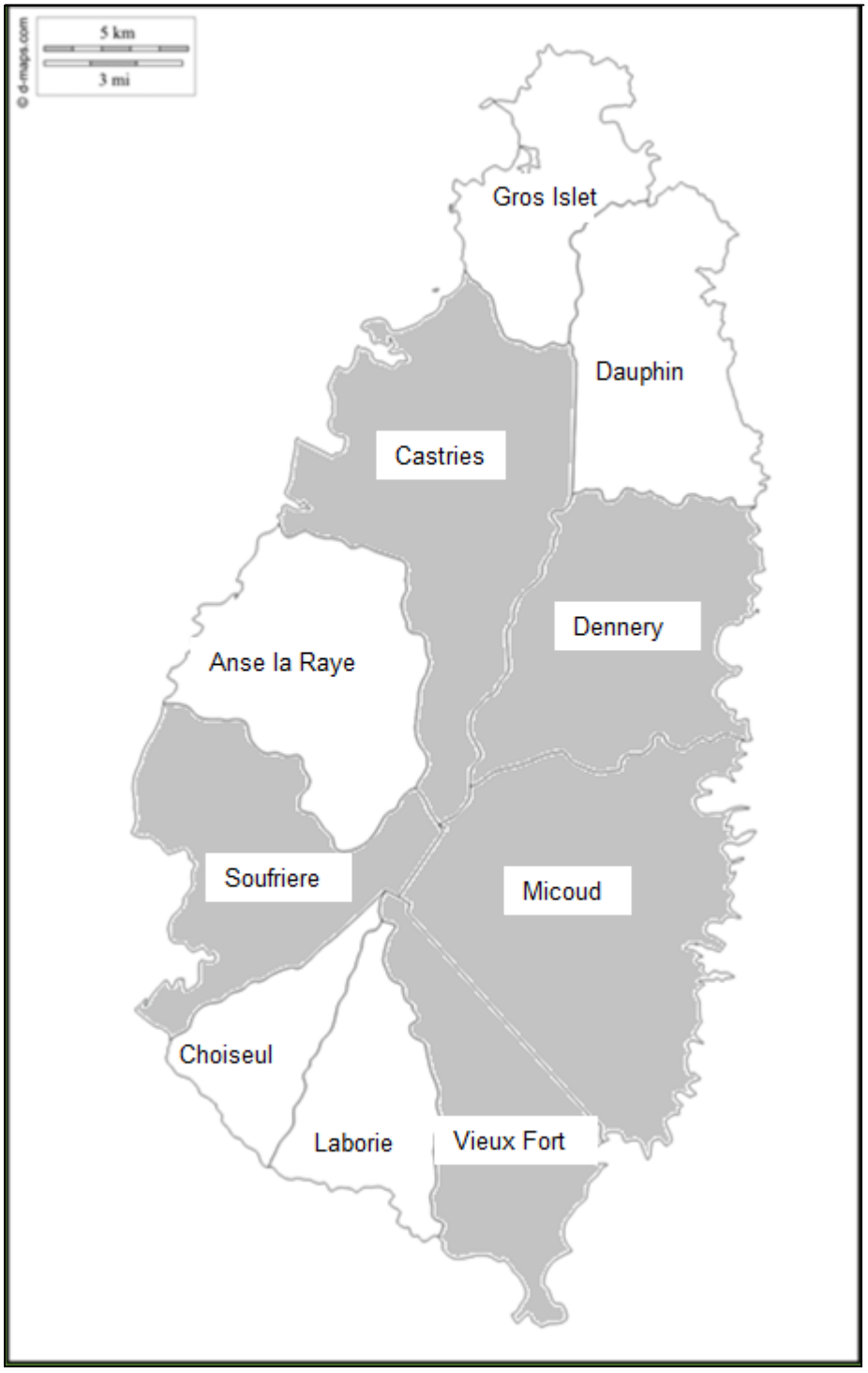

Figure 3.1: Map of Saint Lucia showing major agricultural areas.

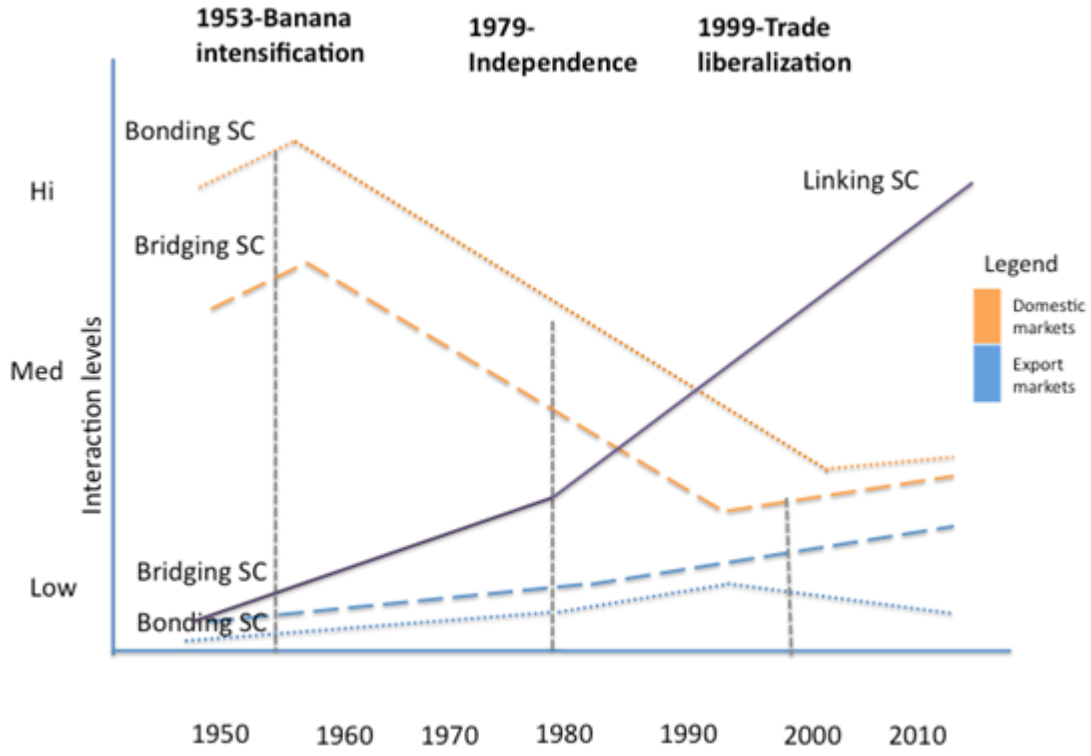

Figure 3.2: Changes to the dimensions of social capital (SC) in the agriculture-food system pre-1950 to 2010 based on interaction levels between actors. Rule convergence in domestic and export markets over the period resulted in reduced intra- and inter community interactions. We show significant declines in bonding and bridging social capital in domestic markets, small increases in bonding and bridging social capital in export markets, alongside significant increases in linking social capital.

Preface to Chapter 4

Chapter 3 identified how the intensification of export banana farming changed the rules that supported community institutions resulting in converging rules, social capital and incentives in the domestic- and export-oriented food production systems of Saint Lucia. While this change increased inter-institutional interactions, it also had the effect of reducing community cooperation, leading to reduced information flow and collective action among smallholder farmers in domestic markets. Building on these findings, Chapter 4 details the contemporary processes through which national stakeholder interactions informed the development Saint Lucia's National Agricultural Policy 2009-2015 and discusses the implications for smallholder innovation and food security policy.

CHAPTER 4: HOW DO STAKEHOLDER INTERACTIONS INFLUENCE NATIONAL FOOD SECURITY POLICY IN THE CARIBBEAN? THE CASE OF SAINT LUCIA

Abstract

Increasingly, multi-stakeholder processes have been recognized as being necessary to the development of public policies seeking to promote systemic innovation in response to complex and multidimensional challenges, such as household food security, rural development, and environmental change. Saint Lucia, a small island developing state located in the Caribbean, has been grappling with a wide range of agriculture, food and nutrition security challenges with varying degrees of policy success. Recognizing the significance of the challenge, this paper explores the nature of the stakeholder interactions surrounding the development of Saint Lucia's 2009-2015 National Agricultural Policy and considers some of the implications for food and agriculture-related policy outcomes. Results reveal a general lack of supportive conditions for effective multi-stakeholder processes, including low stakeholder participation levels, conflicting roles of different forms of social capital in the interactions between stakeholders, and missing "boundary" organizations capable of facilitating a transition towards more flexible and adaptive institutions, enhanced knowledge exchange and learning, and greater trust among stakeholders in the policy network. Future avenues for research and development are subsequently identified.

Keywords: Multi-stakeholder processes; Social capital; Stakeholder analysis; Social network analysis; Smallholder farming systems

4.1 Introduction

Food and nutrition security presents a significant challenge for member states of the Caribbean Community (CARICOM), an economic grouping of fifteen former colonies of Europe (Lowitt et al. 2015a). Within CARICOM, the island nation of Saint Lucia offers a typical example of the food security policy challenges facing national governments in the region. Farms in Saint Lucia are generally less than two hectares in size, with rain-fed agricultural production dependent on seasonally distributed cyclonic rainfall (Cox et al. 2005). The historical dominance of sugar estates on flat flood zones have pushed smallholder farms into the sloped interior (Cox et al. 2005), with 87% of the farms located on slopes considered unsuitable for conventional agriculture (Rojas et al. 1988), resulting in high rates of soil erosion (Cox and Madramootoo 1998). Farming in St. Lucia is also heavily exposed to frequent hurricanes (Poncelet 1997; Michel-Kerjan et al. 2013).

Despite the many challenges facing the agri-food system in St. Lucia, the national agricultural policies, initially structured under colonial rule, have not significantly evolved since the country gained independence in 1979. Monocrop (banana) plantation agriculture for commodity export continues to dominate the national and regional agricultural psyche, with minimal policy attention being directed towards developing locally-oriented food systems involving agricultural diversification and the reduction of farmer vulnerabilities to external shocks (Welch 1994; Leys 1996; Grossman 1998, Klak et al. 2011, Barker 2012). The general lack of domestic agricultural diversification, coupled with declining export markets for bananas grown in St. Lucia has raised important policy questions. Similarly, rising imports and consumption of processed, energy dense foods (CARICOM 2010) have contributed to increasing rates of obesity and non-communicable diseases (NCDs), such as diabetes and hypertension among the population of St.

Lucia (World Bank 2011; Samuels et al. 2012), raising further questions for government. There has subsequently been an increasing recognition by various stakeholders of the urgent need to realign domestic agriculture and food policy (CARICOM 2007).

4.2 Background

The Caribbean community (CARICOM) has struggled with devising regional policies in support of developing domestic food systems capable of improving the nutritional outcomes of its citizens, particularly in the context of promoting micronutrient-rich foods. As early as 1990, the Prime Minister of Antigua and Barbuda, in the feature address at the first sub-regional project hosted by the Organization of Eastern Caribbean States (OECS) Vegetable Development Projects (IICA 1990), noted that it had taken an "extremely long time to focus on vegetables (p.42)". In Saint Lucia, earlier policies aimed at increasing production and consumption of local fruits and vegetables proved unsuccessful (Singh et al. 2005) due to what can be best described as an export policy "rigidity trap" (Carpenter and Brock 2008). Historically, agricultural policies and food system innovation supported export production that hindered domestic agriculture and favored the importation of cheaper processed foods (Saint Ville et al. 2015). While the word 'trap' suggests a situation of stasis, Carpenter and Brock (2008) defined a rigidity trap as a "persistent maladaptive (p.40)" situation that occurs when the intensive management of a single dimension (often by rigid bureaucracies unable to integrate and respond to new information) of a social-ecological system results in extreme fluctuations in other dimensions. In the case of Saint Lucia, this situation can be seen through policies that often appear to pursue a "technological transformation" of the local agriculture-food system (Singh et al. 2005), and enhancement of structural efficiencies (IICA 2010) rather than responding to local contexts.

In 2009, Saint Lucia, launched the draft of a new "*National Agricultural Policy 2009-2015*" (the

policy), that was subsequently endorsed by the Saint Lucia Cabinet of Ministers. A Strategic Management Plan accompanied the policy to help improve institutional coordination for more effective policy implementation (IICA 2010 p. 16). The policy had a strong focus on both the technological and market conditions required to foster agricultural innovation, with little consideration of how existing institutional arrangements may also need to evolve in support of innovation. For example, the policy promoted a value-chain approach to increase agricultural effectiveness and competitiveness (Policy Objective 1). It was assumed that this proposed approach would integrate all stakeholder groups into decision-making, supported by the establishment of a special National Advisory Committee (NAC), and the strengthening of producer organizations. In contrast, efforts to enhance national food security (Policy Objective 3) was based on pro-production activities that involved mobilizing local and community actors to reduce food losses and promote the consumption of local foods in collaboration with other ministries.

4.2.1 The policy challenge: Interlinking food security, food policy and innovation

Many of the food and agriculture system challenges facing Caribbean nations likely stem from relatively poor levels of connectivity between the various institutions responsible for food security, agriculture and food policy and a generally heavy bias towards technology and market-based approaches to promoting innovation in the agri-food sector (Zilberman et al. 2012). As a result, public food policy has generally assumed that markets are the most efficient institutional mechanism for ensuring food security, focusing on either through producer-oriented (i.e., higher food prices that could stabilize the long term livelihoods of producers) or consumer-oriented (i.e., lower food prices to ensure short term access for consumers) approaches (Timmer 1980). Caribbean food policy has subsequently rarely focused beyond actors in commodity supply

chains. However, significant changes to global food systems, primarily associated with globalization processes (Conway 2013; Conway & Barbie 1988; Gomez et al. 2013), have led to changes in how government understand food security (World Food Summit 1996) and highlighted the need to better coordinate an increasing number and diversity of stakeholders (Pinstrup-Andersen 2009). Recognizing the complexity of the challenge, agricultural innovation systems (AIS)[2] thinking has emerged as a useful way to help policy makers broaden their focus from technological innovation towards enhancing interactions between actors and how their institutional and policy contexts might create enabling environments to foster innovation (Klerkx et al. 2012).

In light of recent research suggesting that the food policy choices available to national governments remain relatively limited (Benson et al. 2013), exploring stakeholder engagement issues in food and agriculture policy processes become a critical research gap. Improving the quality of such interactions has the potential to better inform and empower key actors in the agri-food system, while also producing more pluralistic and inclusive public policy capable of delivering desired outcomes (see Mockshell and Birner 2015 on food policy outcomes with stakeholders of differing beliefs).

This paper explores the nature of stakeholder interactions in Saint Lucia's agri-food system and considers some of the implications for food security-related policy outcomes (see illustration in Figure 4.1). We broadly define stakeholder interactions as involving the coming together of actors to: identify common goals, question existing arrangements, promote interactive learning toward joint action and, create new products/services, processes or organizations (Saint Ville et al. 2015). Previous research in the Caribbean has already raised important questions concerning

[2] AIS are defined by Hall et al. (2006) as "networks of organizations or actors" that work together to influence outcomes through interactive learning (p. 12).

the socio-political challenges affecting policy development in the context of: NCDs (Samuels et al. 2012); biodiversity conservation (Watts and Wandesforde-Smith 2006): and education (Lam 2011). There has, however, been little to no research published in the context of domestic food security policy. Focusing on the multi-stakeholder process of Saint Lucia's *National Agricultural Policy 2009-2015*, we seek to: 1) identify the nature of interactions among different stakeholders in the development of national agri-food policy with a view to understanding how such interactions might better support policy innovation; and 2) consider how multi-stakeholder processes might better support the reorganization of national agri-food systems in support of domestic food security.

4.3 Methods

4.3.1 Research design

Following a case study research design (Glaser and Strauss 1967; Yin 1994), Stakeholder Analysis (SA) was used to assess stakeholder interactions in the agriculture-food system, focusing on their characteristics, actions and interests, and role in affecting outcomes (Brugha and Varvasovszky 2000). This analysis method has been previously used to: 1) identify actors affected by policies and to influence outcomes (Reed et al. 2009); 2) highlight gaps to improve institutional effectiveness (Brugha and Varvasovszky 2000); 3) identify resources available to stakeholders to affect outcomes (Archer et al. 2007); d) describe diverse and potentially conflicting interests; and e) understand the dynamic nature of stakeholder needs and priorities (Reed et al. 2009). The SA method is generally used to identify actors affected by, or affecting, the decision-making process (Friedman and Miles 2006); and it has been widely applied in natural resource management (Newman and Dale 2005; Bodin et al. 2006; Bodin and Crona 2009; Bodin and Prell 2011; Rastogi et al. 2010). Stakeholder Analysis is appropriate for

studying food security policy issues in Saint Lucia because: 1) the issue crosses-over natural, social and economic systems (Weis 2007; Isaac et al. 2012); 2) there are diverse stakeholders with a range of influence, knowledge systems and interests (Coffey and O'Toole 2012); 3) there are multiple beneficiaries; 4) there is recognition that markets are ill-suited to manage such a multidimensional issue (Maetz et al. 2011); 5) there are a multiplicity of objectives and cross-sectoral/discipline concerns; and 6) actors have been marginalized as a result of inequality and poverty (Grimble and Wellard 1997; Foran et al. 2014).

4.3.2 Data collection

In order to identify stakeholders, reduce researcher bias in the selection process and ensure a diversity of representatives, we utilized two approaches to selecting stakeholders. Using a "reputational approach", we first consulted key informants working in the agri-food system (farmer organizations, public policymakers, researchers, private sector representatives) to develop a list of stakeholders (Brugha and Varvasovszky 2000). Next, we used a snowball sampling approach that involved asking each stakeholder (respondent) to identify other stakeholders/groups that they felt should be consulted on the issues surrounding food and nutrition security policy in Saint Lucia. We subsequently identified ten major stakeholder groups: policy (agriculture, health and education ministries), research, education, credit, extension and information, inputs-processing-outputs marketing (IPOM), farmer organizations, private consultancy, external assistance, NGOs. These groupings were designed to reflect similarities in function, common goals and joint action around innovation activities (see Temel 2004). We then conducted 37 semi-structured interviews with key informants from each group, between December 2011 and August 2012 (Table 4.1). Interviews took an average of 90 minutes and were collected in accordance with McGill's ethical research guidelines.

Interview questions covered the involvement of participants in the development of the National Agricultural Policy 2009-2015, interactions with other stakeholders, and perceptions of stakeholder influence on the policy and issues confronting policy development in the Saint Lucia agri-food system more broadly. Secondary data were collected from policy documents, reports, newspaper articles, newsletters, website information and leaflets/flyers in order to "fact check" and corroborate data collected through the interviews (Hancke 2009). We recognize that our analysis did not consider consumers as being a stakeholder group in the national policy process and this is a limitation of our study.

4.3.3 Data analysis

Interviews were audio recorded and fully transcribed for qualitative data analysis. Ongoing memo-writing by the interviewer (ASV) helped identify recurring themes that were then used to further develop existing questions and generate new questions. Qualitative data were analyzed using content analysis techniques (Altheide 1987; Morgan 1993), that involved reflective and iterative reviews of transcripts to identify emergent themes rather than using predefined or rigid categories. The general procedure involved reviewing each interview, and assessing the role and level of involvement of the participant in the policy process. Stakeholder groupings were used to reflect overlapping interests and knowledge sources in the agricultural system. For example, we grouped all high-level public policymakers from different ministries into the 'Policy' stakeholder group. The Inputs-Processing-Outputs-Mar keting (IPOM) stakeholder group reflects the increasing consolidation (see Temel, 2004) and close links of private interests covering areas of inputs, food processing, distribution, retail and marketing. We interviewed representatives from the three main farmer cooperatives/groups producing fresh foods for the domestic market: Bellevue Farmers' Cooperative, Black Bay Farmers' Cooperative, and Grace Farmers Group. We

then assessed interactions across stakeholder groups (daily, weekly, monthly frequency), focusing on the nature of their communication (formal/informal), the motivation for their engagement in the multi-stakeholder process (voluntary, contractual, legal mandates), and the level of influence associated with their involvement as noted by other stakeholders. We then applied the constant comparative method in order to generate key themes, and identify relationships in the qualitative data collected (Glaser and Strauss 1967). More specifically, we compared themes and codes arising within each interview for consistency, then between interviews within a stakeholder group to identify similarities and differences, then across different groups to assess the broader context and identify overarching themes (Boieje 2002). Data coding was conducted manually using MaxQDA software. In an effort to help the reader better assess the nature of the emergent themes in our data we present illustrative quotes.

Following data coding, we applied Mitchell et al.'s (1997) theory of stakeholder identification and salience, in order to systematically assess the configuration of relations and interactions between national stakeholders and smallholder farmers. This theory is based on the assumption that "stakeholder salience" depends upon how decision-makers perceive attributes of *power, legitimacy* and *urgency,* among other stakeholder groups (Mitchell et al. 1997). We assessed these attributes primarily based on the nature of the communications and interactions described by our interview participants, and supplemented this information with secondary document data, where possible. Stakeholders were classified according to their perceived possession of the following attributes: 1) the stakeholder's power to impose their will in the interaction through the use of coercive, utilitarian, or normative power sources (Etzioni 1964); 2) the legitimacy of the stakeholder's actions/claims as being appropriate and desirable (Suchman 1995); and 3) the urgency associated with the stakeholder's claim(s). This final attribute corresponds well to the

short “shelf life” of much of the fresh food being produced by smallholder farmers in Saint Lucia, and the low-level of post-harvest technologies generally available to them.

Qualitative data analysis was complemented with Social Network Analysis (SNA) (Prell et al. 2009); which allowed us to graphically represent the perceived relations identified by respondents to better understand the overall structure of communication and interactions being reported (see Wasserman and Faust 1994). Reed et al. (2009) has also recommended the use of SNA to identify central actors, trust and influence. We constructed two-mode affiliation networks that consist of two key elements: a set of actors (respondents) and a collection of events (stakeholder groups) by transferring answers from interviews into binary data (presence/absence). These two-mode matrices identified: 1) interaction (yes/no) with our ten stakeholder groups and; 2) stakeholders identified because of their perceived influence in the agri-food system. We adjusted the size of nodes using the degree centrality measure (denoted by $C_D(P_i)$ of each respondent and stakeholder group, to highlight by increased size, those groups that can be seen as important based on their level of activity or number of contacts (Faust 1997). Network analysis was undertaken with UCINET VI, and graphical analysis with NetDraw II.

4.4 Results

4.4.1 Stakeholder interactions in the policy development process

The Saint Lucia Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development (the Ministry) is the primary authority responsible for the development and implementation of the *National Agriculture Policy 2009-2015* that includes national food security objectives. The Ministry comprises primarily two of our stakeholder groups: the ‘Policy’ group comprising administrators, technocrats and the Corporate Planning Unit (with the later

directly responsible for the policy development and coordination), and (2) the 'Extension' group. As early as 2004, the Inter-American Institute for Cooperation on Agriculture (IICA) (part of the 'External Assistance' group) provided support to the 'Policy' stakeholder group of the Ministry of Agriculture. These efforts were directed towards rationalizing the institutional framework of the Ministry to support *"efficient administrative and technical management of the agricultural growth and development process 2010 through 2015"* (IICA 2010 p.10). To support these efforts, a multi-sectoral consultative participatory process was initiated. Our results indicate that the Ministry ('Policy' stakeholder group) played a central role guiding the consultative participatory process as stated by the policy, which required them to *"manage the process of integrating all stakeholders in the planning, implementation and evaluation process"* (p.5) (Figure 4.2). We used social network analysis (two node-affiliation network) to map interactions between stakeholder groups and respondents, and found the Policy stakeholder at the Ministry played a central role. 'External Assistance', 'Farmer Organizations' and 'IPOM' stakeholder groups played a secondary or bridging role in this process. This finding was also supported by qualitative data:

> *"So it was a lot of consultation ... It took us about ten years to develop the whole thing...we talked to schools, we talked to farmers, we talked to farmer groups, we talked to bankers, we talked to everybody who we identified as stakeholders and then we developed a document, and sent out a draft"* (Policy stakeholder).

Despite the key role of, and time involved in developing, the policy, respondents provided mixed views on the *National Agricultural Policy 2009-2015.* Those who were involved in the process described the policy as having minimal impact, taking too long to develop, and as a result being poorly implemented. Respondents who were not involved in the process questioned the existence

and measurable outcomes of the national policy. Generally, many respondents seemed unfamiliar with the final content of the policy, particularly in the area of food security.

> *"[T]here's an excellent policy framework…but I don't know that it's really influencing farmer decisions. Because I don't know who is really implementing that policy and in what way it is being implemented…"* (IPOM-Outputs stakeholder).

In the area of enhancing national food security (Policy Objective 3) the policy prescribed collaboration with other ministries (Education, Health, Tourism, Finance, and Social transformation), to *"promote and influence the consumption of locally grown food products"* (p. 9). However, respondents suggested that the consultative participatory approach proved inadequate to create a common vision, prioritize action, and integrate differing stakeholder perspectives in a meaningful way. A noted limitation of this consultative participatory approach might be explained by respondents claiming that it did not go far enough, and that the scope of policy consultations had been too narrow and lacked transparency. For example, one 'Policy' respondent from the Ministry of Health shared:

> *"There is no role for Ministry of Health in the (agriculture-food) policy development process that was undertaken by MAFF (Ministry of Agriculture)…MAFF is not working in collaboration as they should"*.

This was seen by many as resulting in a lack of co-ordination and integration:

> *"You don't see structure and coordination in a lot of things that by now you should have expected from an agricultural sector"* (External Assistance stakeholder).

One area this lack of coordination and collaboration could be seen was in national food security (Policy Objective 3). Although the Ministry held responsibility for supporting

domestic food security, the policy appeared to be focused on sector-driven activities of food production (i.e. the food availability dimension). No other mention was made of the national policies related to other dimensions of food security managed by other line ministries. To illustrate: the Ministry of Commerce managed the National Food Supply (food accessibility dimension) mandated by the *Distribution and Price of Goods Act 1967*. As part of this mandate, the Ministry procured, stored and distributed, managed and monitored prices of processed food imports (rice, flour, and sugar) at an annual cost of US$5-7 Million (GOSL 2010). Additionally, the Ministry of Education manages the School Feeding Program (food utilization dimension) which feeds ~38% (7,106) of primary school children daily (GOSL 2003; 2010). The absence of efforts to integrate these initiatives into the policy appeared to support qualitative data that suggested:

> *"[M]echanisms are needed to foster collaboration to get the job done"* (IPOM-Processing stakeholder).

There appeared to be a lack of appreciation for such mechanisms to support the consultative participatory approach from the 'Policy' stakeholder group. Respondents also described the Saint Lucia agriculture and food governance system as being driven "from the top". As a result, while there were varied meetings, national consultations to discuss and review the policy document, the end product appeared to develop from officials within the Ministry of Agriculture (government administrators and policymakers/politicians). A major perception of stakeholders was that there was a tension between policy development and practice in the agri-food system that tended towards *ad hoc* project implementation (unrelated to policy goals). Respondents characterized these actions as reactive and "politically expedient":

> *"[T]hey (policy makers) don't want to sit and work through things in a lot of instances now... they want quick fixes. Anything that will sort of take some time to unravel… they tend to shy away from it now in the sector because they want immediate answers, they want to see immediate solutions"* (IPOM-Outputs stakeholder).

Respondents described this policy focus on short-term action rather than long-term development of the food system as undermining the usefulness of policy process and limiting the potential importance of projects implemented. For example, issues such as responding to climate variability and frequency of natural disasters were not addressed in the policy document.

4.4.2 Informal and formal stakeholder interactions in the agri-food system

There have been varied efforts over the years to create multi-stakeholder processes to facilitate the development and implementation of agri-food policy in Saint Lucia (Budhram 2007; Singh et al. 2005). In 2009, the Ministry established a National Advisory Committee (NAC) to: 1) function as a think tank to advise the Minister on emerging issues; 2) propose strategies for intervention; and 3) monitor implementation of the policy framework. Previously in 1988, another formal mechanism, the National Agricultural Advisory Council (NAAC) was developed with support from external assistance. The Team on Agricultural Technology (TAT) was then mandated to develop policies with broad representation and input from multiple stakeholders in the agri-food system. Initial membership of the seven-member TAT comprised senior officers of the Ministry of Agriculture (Director of Agricultural Services, Head of Extension Division, Head of Research Division, Manager of Agricultural Stations, Head of the Planning and Statistics Unit, Head of Marketing), however there was little detail on the NAAC membership (IICA 1988). These two entities had overlapping roles, with the NAAC mandated to support the Minister of

Agriculture in the development of agricultural policies and plans operating through four committees, and the TAT on developing agricultural plans. However, with the demise of the NAAC mechanism in the mid-1990s, our respondents reported a lack of direction in the policy development, coordination and implementation processes which led to its re-activation in 2002 to facilitate broader input into policy development for agriculture and related strategies (UNCCD 2002). By 2003, NAAC was replaced with a "consultative process" that many respondents reported had negatively impacted efforts to find 'common ground' on contentious issues, with policy processes becoming more *ad hoc*, top-down and less transparent. Without a clearly identified group and transparent process for integrating the varying views, farmers felt marginalized by policymakers and other respondents felt that certain key stakeholders were entirely left out of the policy process:

> *"I get the feeling that exporters are not important to them…"* (IPOM-Export stakeholder).

> *"You know who I think is really minimized?…intermediaries, these people who can create the change that is needed to grow the farmer. Nobody tends to make policies to support them …exporters, agro processors… They don't get as much of a voice as the producer" (*IPOM-Outputs stakeholder*).*

While our respondents, especially the individual smallholder farmers, who were not directly involved in the process felt marginalized, those who were involved described the informal benefits of face-to-face interaction from their participation in the long-running national meetings associated with their involvement in the domestic agri-food sector. Many of these respondents described the central importance of their informal interactions in facilitating easy communication between them.

"It's usually based on your own relationship with the person. I think a lot of agriculture is developing relationships" (Policy stakeholder).

"It is more informal, we have not reached that stage… as time goes by we would look at ways of putting more structured collaboration policy in place… but for now it is more an informal setting" (Education stakeholder).

"[M]ost of the people who work in these organization we go a long, long, long way back…you know everybody" (Research stakeholder).

"We work with extension officers mostly through a 'gentleman's agreement', especially when working with the farmers and with the field demonstrations" (IPOM-Inputs stakeholder).

One respondent explained the process by which stakeholders get to better understand the perspectives of each other and work together:

"[I]n the past people tended to misunderstand each other, they tended to misunderstand the issues confronting different organizations, especially the farmers. And then as you meet with them they start breaking the ice, they start to understand issues that confront you and they tend to be a little more accommodative to your problems" (IPOM-Outputs stakeholder).

Despite these described benefits, a resource challenge associated with the move from the use of formal multi-stakeholder processes (such as the NACC) to more informal multi-stakeholder consultative participatory processes was the absence of a coordinating, implementing and monitoring body separate from the Ministry. As described by a 'Policy' stakeholder:

*" Corporate planning is responsible for …(*interacting with*) international agencies …(managing the) statistics department…(*liaising with*) FAO for example. We are responsible for all projects"*

This responsibility for donor projects also requires interaction between the Ministry (Policy group) and diverse stakeholders resulting in a plethora of additional national consultation processes. Saint Lucia receives a large number of donor-funded projects with one report estimating that there were 38 active or recently completed donor funded projects (Sir Arthur Lewis Institute of Social and Economic Studies 2013). The same report estimated that 34% of these projects targeted the agricultural sector with an estimated value of US$25 million, representing diverse donors with differing objectives, reporting requirements and timelines.

4.4.3 Stakeholder salience and influence on the agri-food system

Our findings indicated generally high levels of distrust between smallholder farmers and some stakeholder groups that served to limit the reciprocal knowledge flows needed to support the development of value chains. As described by a 'Policy' stakeholder:

"Farmers generally don't trust anybody but another farmer. So if you are in a position of authority it's kind of difficult for them to trust you".

Respondent farmers explained this distrust as arising from consistently unmet service expectations. As stated by a smallholder farmer:

''If I call the Ministry of Agriculture now and tell them I have a problem on my farm and I need an expert to come and analyze this thing for me. . . I don't know how long it will take or if I will ever see one because they seemed to be more engaged in doing their own business".

In the context of agricultural co-operatives, respondents described administrative difficulties and limited capacity in terms of advocacy, market access and knowledge exchange. As described by an IPOM-Inputs stakeholder:

> *"There are issues with mismanagement, poor management and inappropriate use of funds… tardiness of payment … thirty day, or two- month, three- month delays in making farmer payments".*

These internal limitations of cooperatives often result in farmers opting out of participation and conducting their marketing activities separately from their cooperatives. One possible explanation for this situation is the differing interests that serve to separate farmer group elites from other group members. As explained by a respondent farmer elite:

> *''Farmers like to pull down their associations. . . It is always a question of whether the leaders are loyal, whether the leaders are going to deal with farmer interests because there's always a suspicion of that".*

Interestingly, respondents perceived the (Consolidated Food Limited) CFL supermarket as being the most influential in the domestic agri-food system (Figure 4.3). The extension stakeholder group was perceived as the next most influential stakeholder. The Black Bay Farmer's Cooperative, Bellevue Farmer's Co-operative, Development Bank, and Ministry Policy Group were perceived as having less influence. The Saint Lucia Marketing Board, a statutory board was perceived as the stakeholder with the least influence. Three main explanations were provided for this high level of perceived influence of the CFL Supermarket:

1. <u>The farmer certification program</u>: This program implemented jointly by CFL and the Ministry of Agriculture trains vegetable farmers on market-based issues, such as business operations, food

traceability, quality and safety standards. The CFL Supermarket then provides a price premium of an additional US $0.0362 (per kilogram) to these certified farmers. Such a price premium is not provided to farmers by other local purchasing establishments such as the National Marketing Board (a statutory agency), or hotels.

2. Interest-free loans to selected farmers: This loans program evolved in the aftermath of Hurricane Tomas in 2010 when farmers experienced widespread loss of crops and faced difficulties restarting their production. The program was implemented jointly by two members of the IPOM stakeholder group (CFL supermarket and Renwick & Company Limited- the largest input supply company in Saint Lucia). Farmers are provided with interest-free loans for purchased supplies through the use of open bills. Loan amounts are based on five percent of the farmer's produce sales for the previous three to five years. CFL supermarket deducts monthly loan payments when the farmer delivers weekly produce to CFL. Respondents cited this innovative and easily accessible financial instrument as being a significant benefit to local farmers:

> *"The majority of farmers I would say are influenced by CFL (supermarket) because they are the purchasing body... The other thing is that the farmer is able to get a loan from CFL. I don't think that there is another private company that would give a loan to farmers"* (External Assistance stakeholder).

> *"[G]etting loans for farmers proves difficult… CFL understands and know that it is important to farmers in order to help farmers produce quality products"* (IPOM-Inputs stakeholder).

3. Relationship building: Respondents recognized that CFL had improved their image as a good corporate citizen and had developed a strong relationship with smallholder farmers. These

investments by CFL improved the legitimacy of the CFL Supermarket and responded to the urgency of the smallholder cash flow demands. These changes created new farmer-centered services and processes:

> *"Supermarkets are actively interested in the farmer and have invested in relationship building, supporting the farmer in expanding his ability to go further than he would have gone before"* (Credit stakeholder).

> *"Supermarkets (CFL) have changed the strategy, they are preparing themselves for challenges, the global situation, and new supermarkets coming in… (CFL) built a lot of storage … for local produce. They have cultivated relationships with the farmers"* (Education stakeholder).

Such initiatives increased the legitimacy of the supermarket chain with smallholder farmers and distinguished the supermarket from hotels in their powerful position as buyers in a price-taker market, by reducing waiting times for payment (Figure 4.4). Six of the stakeholder groups were identified as "latent stakeholders" because they held one of the three attributes (coloured in blue) of: 1) *power* to influence the food system; 2) *legitimacy* within the food system and; 3) *urgency* associated with the stakeholder's claim. Three "expectant" stakeholder groups held two of the three attributes (coloured in orange) while the CFL Supermarket Chain held all three attributes (coloured in green) (Table 4.2).

Improved interactions between farmers and the CFL Supermarket chain were reported as building legitimacy and stands in contrast to the missing reported interactions between the 'Policy' group and farmers. As described by a farmer respondent:

> *[T]here isn't the feedback loop (between farmers) . . .and (government) institutions providing services (to us). . ."*

Our findings also pointed to a trend of merger and consolidation in the local supermarket-retail industry. CFL was formed through the merger of the two main local chains in 2004. Changes in CFL interactions with famers were initiated as part of aggressive efforts to legitimize their interactions and improve their brand image, with the entry of a competing supermarket chain (GL Foodmart) in 2010. In 2013, CFL bought GL Foodmart and became the sole supermarket chain operator in Saint Lucia, operating 11 stores with over 1,200 employees. In 2014, there was further consolidation with the majority of shares in CFL bought by the regional conglomerate, Neal and Massey.

4.5 Discussion

4.5.1 Participation and collaboration

Despite efforts by the Ministry to utilize a consultative participatory process, our findings suggest limited success in identifying common goals, questioning arrangements and creating new processes to respond to food security challenges through the *National Agricultural Policy 2009-2015.* The nature of the reported interactions can be broadly characterized as a consultative participatory process, which can allow for ongoing communication between stakeholders, however do not appear to meet the threshold to create integrative food security-related policy (Pretty 1994; Kanji and Greenwood 1988). Such contested policy areas, with diverse stakeholder interests and differing stakeholder access to resources, generally requires open, collaborative and integrative multi-stakeholder processes in order to facilitate system innovation in support of the desired outcomes (Hall et al. 2006; Klerkx et al. 2012; Lowitt et al. 2015a; Lowitt et al. 2015b). In the context of AIS (Hall et al. 2006) such processes need to go beyond any single sectoral goals (as observed in our case study) to facilitate interactions that stimulate interdependencies between actors, and promote different forms of social capital (Kilelu et al. 2013). Food security

policy development processes could benefit from explicitly acknowledging participation as a right, creating learning opportunities and becoming more inclusive in order to better accommodate, integrate and gain acceptance from diverse stakeholder perspectives (Vervoort et al. 2014).

4.5.2 Social capital and informality

While individual institutions, ministries, donors and corporations, through varied projects and sector-specific initiatives may be able to address elements of food insecurity in Saint Lucia, our results suggest that greater integration of these actions will be required to reduce duplication and enhance coordination between the disconnected institutions operating at various levels. According to IICA (2011) poor coordination has been a long-standing issue limiting the effectiveness of public policy in the Caribbean. While our findings identified some limitations in the national public policy process, we also found they have relationship-building benefits, but these benefits have not been able to galvanize efforts to address the broad areas of policy concern. Reported benefits included the building of interpersonal relationships among respondents involved in the policy process; and the key linking role played by the Ministry in fostering diverse participation. Areas of concern identified by respondents included: 1) a disconnection between policy and practice; 2) poor quality of collaboration (with key agencies and historically ignored intermediaries), distrust and knowledge gaps between policymakers and smallholder farmers; 3) tension between short-term project benefits (supported by formal mechanisms) and long-term policy changes (supported by informal mechanisms); and 4) lack of transparency in a top-down policy development process. The importance of social capital (characterized by trust, shared norms, reciprocity and social networks) for engendering trust, and improving the success of multi-stakeholder policy processes is already well known (Sanginga et

al. 2007; Lowitt et al. 2015a). Such interactions have been viewed as being generally positive for agricultural system innovation (Fischer and Qaim 2014; Lowitt et al. 2015a; Saint Ville et al. 2016; Reed and Hickey 2016), however high levels of social cohesion [particularly among technocrats and elites in the small populations of SIDS (Briguglio 1995)] can also serve to limit innovation potential.

In this way, our findings also highlight a potential issue of 'elite capture' in the national policy processes of Saint Lucia, which may help to explain why there is resistance to institutional change despite the recognized limitations of maintaining the status quo. In such situations, individuals with superior political status (due, for example, to economic, education or other social characteristics) take advantage of their position to capture a disproportionately large share of resources or benefits (Bardhan 2002; Persha and Andersson 2014). For example, Granovetter (1973) showed that strong ties created among homogenous subgroups are often created when actors spend large amounts of time together, developing emotional intensity, intimacy, and reciprocity. The social cohesion among elites formed by these strong ties (also known as bonding social capital) may help explain why stakeholders in our case study were unable to address longstanding issues despite working together (for ten years) in the policy development and implementation process. Building on Granovetter's work, Burt (1992) identified the "structural holes" that can develop within such cohesive subgroups, potentially hindering effective information flow across the larger group of stakeholders (Burt 2002; Burt 2005). Such holes have been shown to create an advantage for third parties (who can receive a competitive advantage) by brokering the flow of information and controlling the interaction between stakeholders (see Floress et al. 2011; Alexander and Armitage 2015; Barnes-Mauthe et al. 2015). In small island developing states like Saint Lucia, where mutually reinforcing social rewards of

friendship and prestige often exist among elites (Briguglio 1995), there can be powerful, yet unseen, pressures to conform to the prevailing viewpoint in decision-making processes, a situation also known as 'Groupthink" (Janis 1973). This is an area that requires further empirical research to look at how these conditions may support elite capture phenomena in the context of SIDS.

A review by Leeuwis and Aarts (2011) on communication and innovation offered three recommendations that may help to change communication patterns in complex multi-stakeholder policy processes, as follow: 1) review and re-ordering of stakeholder relations; 2) recognition of complex interdependencies; and 3) alternatives that supplement regularized communication patterns. Future efforts to resolve the complex food security challenge facing Saint Lucia will likely require strong collaboration across government ministries, the reconciling of policy conflicts and increased policy innovation involving multiple stakeholder groups (Saint Ville et al. 2015).

4.5.3 Roles and responsibilities of government

Many of the challenges identified in our study are not exclusive to Saint Lucia, and instead relate to the complexity and multi-dimensionality of the sustainable food security challenge, with agri-food systems impacted by a multiplicity of drivers and activities that cross scales and sectors (Margulis 2013). Addressing such complex challenges will, however, likely require a range of adjustments to the conventional institutional arrangements of the Saint Lucia Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development (the Ministry) as the authority responsible for the development and implementation of the National Agriculture Policy. The reported inability of public policy institutions to respond to the ongoing transformation of the agri-food system stands in contrast to the flexibility attributed to other

stakeholder groups and may explain why our respondents identified the CFL supermarket chain as the most influential and salient national stakeholder. Their perceived influence is largely a result of the growing importance and consolidation of local supermarkets that are increasing their investments in the domestic agri-food system. While there are a wide range of potential benefits to both producers and consumers from these efforts to build dedicated supply chains (e.g. created by no interest loans to farmers), the public interest in improved nutritional outcomes needs to backstopped and bolstered by broader-based societal action. Other potential issues include challenges for smallholders to access these types of markets due to rigid product quality and uniformity standards (Brooks and Loevinsohn 2011). Recognizing that market-led activities are going to be essential to developing the domestic agriculture-food system in Saint Lucia, Grote (2014) warned that issues of sustainability, equity and food and nutrition security will need to be carefully managed. This is an important role for government and warrants further research and policy attention.

Termeer et al. (2010) defined a 'monocentric approach' as one where the state, as the national authority, controls the national agenda and problem solving through top-down policy definition and implementation. In such a situation, because of the lack of appreciation of the complex interactions required to respond to the issue, there is a reduced role for non-state stakeholders. In this case it is unlikely that policy goals can be accomplished using a sector-driven approach with clear divisions of tasks and responsibilities with distinctive legally-based authority. However, in the context of food security, inherent conflicts between stakeholder interests are likely to result in incoherence, fragmentation and poor coordination due to the complexity of the challenge (Margulis 2013). When poorly appreciated, a 'top-down' approach to policy development and implementation is likely to increase conflict. Clearly all stakeholders require approaches that can

better facilitate regular two-way dialogue, interaction across sectors, and commitment to continuous learning, flexibility, and knowledge exchange (Misselhorn et al. 2012).

Additionally there is need to better integrate public and private sector policies in the Saint Lucia agri-food system. In order to better connect market and non-market approaches to agri-food system governance, "boundary spanning" actors/ organizations have been suggested as important for fostering agricultural innovation (Klerkx et al. 2009; Chaudhury et al. 2013; Hermans et al. 2013; Klerkx et al. 2013; Westley et al. 2013). According to Misselhorn et al. (2012), in the context of food security, boundary organizations "sit between sectors (such as science and policy, or market and natural resource management)…between or across geographic scales... facilitate the flow of information across sectors" (p.13) and help identify the appropriate scale at which food system issues should be addressed. Organizations or actors involved in boundary work have been shown to provide added benefits of enhancing decision making, building trust and supporting more flexible responses to complex problems (Chaudhury et al. 2013) and appear to be much needed in the Saint Lucian agri-food system. Identifying such actors and organizations will require an assessment of the credibility of technical knowledge/experts, the salience or relevance of actions or information provided; and the perceived legitimacy of actors in the policy process (Chaudhury et al. 2013). Agricultural cooperatives and research institutes were both identified as key secondary stakeholder groups in our study and have been found to play critical knowledge brokering roles in support of agricultural system innovation in different contexts (Hermans et al. 2013). In the case of Saint Lucia, further research is needed to assess opportunities for strengthening these boundary spanning actors to champion multi-stakeholder processes in support of innovation.

4.6 Conclusion

Multi-stakeholder processes are necessary in the development of public policies seeking to promote innovation in the face of complex and multidimensional challenges. Focusing on Saint Lucia, a small island developing state in the Caribbean grappling with complex agriculture, food and nutrition security challenges, we explored how a national multi-stakeholder process was shaped by stakeholder interactions. Our findings suggest that, while multi-stakeholder processes were utilized, stakeholder participation was limited by a number of factors with perceived negative effects on policy coordination, integration and stakeholder acceptance. Future efforts to resolve the complex food security challenges facing Saint Lucia, and Small Island Developing States more generally, will likely require stronger collaboration across government ministries, better reconciliation of policy conflicts and increased policy innovation involving multiple stakeholder groups through the work of boundary organizations. Such efforts have the potential to build more flexible and adaptive institutions, enhance knowledge exchange and learning, and build trust among stakeholders in the policy network.

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References

Alexander, S. M., Derek, A. (2015). A Social Relational Network Perspective for MPA Science. *Conservation Letters, 8*, 1-13.

Altheide, D. L. (1987). Reflections: Ethnographic content analysis. *Qualitative Sociology, 10*, 65-77.

Archer, E., Mukhala, E., Walker, S., Dilley, M. Masamvu, K. (2007). Sustaining agricultural production and food security in Southern Africa: An improved role for climate prediction? *Climatic Change, 83*, 287-300.

Bardhan, P. (2002). Decentralization of governance and development. *Journal of Economic Perspectives, 16* (4), 185–205.

Barker, D. (2012). Caribbean agriculture in a period of global change: vulnerabilities and opportunities. *Caribbean Studies, 40* (2), 41–61.

Barnes-Mauthe, M., Gray, S. A., Arita, S., Lynham, J., Leung, P. (2015). What determines social capital in a social–ecological system? Insights from a network perspective. *Environmental Management, 55* (2), 392-410.

Benson, T., Mino, N., Pender, J., Robles, M., von Braun, J. (2013). Information to guide policy

responses to higher global food prices: The data and analyses required. *Food Policy, 38,* 47-58.

Bodin, Ö., Crona, B., Ernstson, H. (2006). Social networks in natural resource management: what is there to learn from a structural perspective. *Ecology and Society, 11* (2).

Bodin, Ö., Crona, B. I. (2009). The role of social networks in natural resource governance: What relational patterns make a difference?. *Global Environmental Change, 19* (3), 366-374.

Bodin, Ö., and Prell, C. (2011). *Social networks and natural resource management: Uncovering the social fabric of environmental governance*. Cambridge: Cambridge University Press.

Budhram, D. (2008). *Institutional Review of the Ministry of Agriculture, Lands, Fisheries and Forestry of St. Lucia: Major Findings and Recommendations*. Saint Lucia: Inter-American Institute for Cooperation on Agriculture.

Boeije, H. (2002). A purposeful approach to the constant comparative method in the analysis of qualitative interviews. *Quality and Quantity, 36*, 391-409.

Briguglio, L. (1995). Small island developing states and their economic vulnerabilities. *World Development, 23*, 1615-1632.

Brooks, S., Loevinsohn, M. (2011). Shaping agricultural innovation systems responsive to food insecurity and climate change. *Natural Resources Forum,* 35, 185-200.

Brugha, R., Varvasovszky, Z. (2000). Stakeholder analysis: A review. *Health Policy and Planning, 15*, 239-246.

Burt, R.S. (1992). *Structural hole*. Cambridge MA: Harvard Business School Press.

Burt, R.S. (2002). The social capital of structural holes. In: *The new economic sociology: Developments in an emerging field* (pp.148-190). Guillen, M.F., Collins, R., England, P., and Meyer, M., (Eds.). NY: Russell Sage Foundation.

Burt, R.S. (2005). *Brokerage and closure: An introduction to social capital*. Oxford: OUP.

CARICOM. (2007). *Strategic approach to realising the agriculture contribution to CARICOM development*. In: CARICOM (Ed.), Caribbean Community Agriculture Donor Conference, Crowne Plaza Trinidad Hotel, Port of Spain. Trinidad and Tobago: Caribbean Community.

CARICOM. (2010). *Regional food and nutrition security policy.* Guyana: Caribbean Community.

Carpenter, S. R., Brock, W. A. (2008). Adaptive capacity and traps. *Ecology and Society, 13* (2).

Chaudhury, M., Vervoort, J., Kristjanson, P., Ericksen, P., Ainslie, A. (2013). Participatory scenarios as a tool to link science and policy on food security under climate change in East Africa. *Regional Environmental Change, 13* (2), 389-398.

Coffey, B., O'Toole, K. (2012). Towards an improved understanding of knowledge dynamics in integrated coastal zone management: A knowledge systems framework. *Conservation and Society, 10* (4), 318.

Conway, G. (2013). *One Billion Hungry: Can We Feed the World?* NY: Cornell University Press.

Conway, G. (1987). The properties of agroecosystems. *Agricultural Systems, 24,* 95-117.

Conway, G. R., Barbie, E. B. (1988). After the Green Revolution: Sustainable and equitable agricultural development. *Futures, 20* (6), 651-670.

Cox, C., Madramootoo, C. (1998). Application of geographic information systems in watershed management planning in St. Lucia. *Computers and Electronics in Agriculture, 20* (3), 229-250.

Cox, C. A., Sarangi, A., Madramootoo, C. (2006). Effect of land management on runoff and soil

losses from two small watersheds in St Lucia. *Land Degradation and Development, 17* (1), 55-72.

Etzioni, A. (1964). *Modern organizations. Foundations of modern sociology series*. NJ: Prentice-Hall.

Faust, K. (1997). Centrality in affiliation networks. *Social Networks, 19*, 157-191.

Fischer, E., Qaim, M. (2014). Smallholder Farmers and Collective Action: What Determines the Intensity of Participation? *Journal of Agricultural Economics, 65* (3), 683-702.

Floress, K., Prokopy, L. S., Allred, S. B. (2011). It's who you know: Social capital, social networks, and watershed groups. *Society and Natural Resources, 24* (9), 871-886.

Foran, T., Butler, J. R., Williams, L. J., Wanjura, W. J., Hall, A., Carter, L., Carberry, P. S. (2014). Taking complexity in food systems seriously: An interdisciplinary analysis. *World Development, 61*, 85-101.

Friedman, A. L., Miles, S. (2006). *Stakeholders: Theory and practice*. USA: Oxford University Press.

Glaser, G., Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine de Gruyter.

Gómez, M. I., Barrett, C. B., Raney, T., Pinstrup-Andersen, P., Meerman, J., Croppenstedt, A., ... & Thompson, B. (2013). Post-green revolution food systems and the triple burden of malnutrition. *Food Policy, 42*, 129-138.

GOSL. (2003). *Economic and social review*. Saint Lucia: Government of Saint Lucia.

GOSL. (2010). *Economic and social review*. Saint Lucia: Government of Saint Lucia.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology,* 1360-1380.

Grimble, R., Wellard, K. (1997). Stakeholder methodologies in natural resource management: A

review of principles, contexts, experiences and opportunities. *Agricultural Systems, 55*, 173-193.

Grossman, L. S. (1998). *The political ecology of bananas: Contract farming, peasants, and agrarian change in the Eastern Caribbean.* Chapel Hill: The University of North Carolina Press.

Grote, U. 2014. Can we improve global food security? A socio-economic and political perspective. *Food Security, 6*, 187-200 .

Hall, A., Janssen, W., Pehu, E., Rajalahti, R. (2006). *Enhancing agricultural innovation: How to go beyond the strengthening of research systems*. Washington DC: The World Bank.

Hancke, B. (2009). *Intelligent research design: A guide for beginning researchers in the social sciences*. London: Oxford University Press.

Hermans, F., Stuiver, M., Beers, P. J., Kok, K. (2013). The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems. *Agricultural Systems, 115*, 117-128.

IICA. (1988). *Annual Report to the Government of Saint Vincent and Grenadines*. Saint Vincent and the Grenadines: Inter-American Institute for Cooperation on Agriculture.

IICA. (1990). *First regional OECS vegetable development projects workshop: Proceedings*. Antigua and Barbuda: Inter-American Institute for Cooperation on Agriculture.

IICA. (2010). *Inter-American Institute for Cooperation on Agriculture 2009 annual report: IICA's contribution to the development of agriculture and rural communities in Saint Lucia*. Saint Lucia: Inter-American Institute for Cooperation on Agriculture.

IICA. (2011). IICA *Technical Cooperation Strategy 2011-2014*. Saint Lucia: Inter-American Institute for Cooperation on Agriculture.

Isaac, W. A. P., Joseph, M. C., Ganpat, W. G., Wilson, M., Brathwaite, R. A. (2012). The Caribbean's Windward Islands Banana Industry: A Heritage of Dependency. *Journal of Rural and Community Development, 7* (2).

Janis, I. L. (1973). Groupthink and group dynamics: A social psychological analysis of defective policy decisions. *Policy Studies Journal, 2* (1), 19-25.

Kanji, N., Greenwood, L. (2001). *Participatory approaches to research and development in IIED: Learning from experience*. London: International Institute of Environment and Development (IIED).

Kilelu, C. W., Klerkx, L., Leeuwis, C. (2013). Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme. *Agricultural Systems, 118*, 65-77.

Klak, T., Wiley, J., Mullaney, E., Peteru, S., Regan, S., Merilus, J.Y. (2011). Inclusive Neoliberalism?: Perspectives from Eastern Caribbean farmers. *Progress in Development Studies, 11* (1), 33–61.

Klerkx, L., Adjei-Nsiah, S., Adu-Acheampong, R., Saïdou, A., Zannou, E., Soumano, L., ... & Nederlof, S. (2013). Looking at agricultural innovation platforms through an innovation champion lens: An analysis of three cases in West Africa. *Outlook on Agriculture, 42 (3)*, 185-192.

Klerkx, L., Hall, A., Leeuwis, C. (2009). Strengthening agricultural innovation capacity: Are innovation brokers the answer? *International Journal of Agricultural Resources, Governance and Ecology* 8 (5-6): 409-438.

Klerkx, L., Van Mierlo, B., Leeuwis, C. (2012). Evolution of systems approaches to agricultural innovation: Concepts, analysis and interventions. In *Farming systems research into the*

21st century: The new dynamic. I. Darnhofer, D. P. Gibbon and B. Dedieu. (Eds.). New York: Springer.

Lam, E. (2011). Sharing best practices in Barbados and Trinidad and Tobago: Patterns of policy implementation and resistance. *Compare, 41*, 25-41.

Leeuwis, C., and Aarts, N. (2011). Rethinking communication in innovation processes: Creating space for change in complex systems. *Journal of Agricultural Education and Extension,* 17, 21-36.

Leys, C. (1996). *The rise and fall of development theory*. London: EAEP.

Lowitt, K., Hickey, G.M. Ganpat, W. Phillip, L.E. (2015a.) Developing communities of practice in support of resilient value chains for sustainable food security. *World Development, 74*, 363-373.

Lowitt, K., Hickey, G. M., Saint Ville, A., Raeburn, K., Thompson-Colón, T., Laszlo, S., Phillip, L. E. (2015b). Factors affecting the innovation potential of smallholder farmers in the Caribbean Community. *Regional Environmental Change, 15* (7), 1367-1377.

Maetz, M., Aguirre, M., Kim, S., Matinroshan, Y., Pangrazio, G., Pernechele, V. (2011). *Food and agricultural policy trends after the 2008 food security crisis: Renewed attention to agricultural development*. EASYPol Module. Rome: FAO.

Margulis, M. E. (2013). The regime complex for food security: Implications for the global hunger challenge. *Global Governance, 19*, 53-67.

Michel−Kerjan, E., Hochrainer−Stigler, S., Kunreuther, H., Linnerooth−Bayer, J., Mechler, R., Muir- Wood, R., ... & Young, M. (2013). Catastrophe risk models for evaluating disaster risk reduction investments in developing countries. *Risk Analysis, 33* (6), 984-999.

Misselhorn, A., Aggarwal, P., Ericksen, P., Gregory, P., Horn-Phathanothai, L., Ingram, J.,

Wiebe, K. (2012). A vision for attaining food security. *Current Opinion in Environmental Sustainability, 4* (1), 7-17.

Mitchell, R. K., Agle, B. R., Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review, 22 (4),* 853-886.

Mockshell, J., Birner, R. (2015). Donors and domestic policy makers: Two worlds in agricultural policy-making? *Food Policy 55*, 1-14.

Morgan, D. L. (1993). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3* (2),112.

Newman, L., Dale, A. (2005). Network structure, diversity, and proactive resilience building: A response to Tompkins and Adger. *Ecology and Society, 10* (1).

Persha, L., Andersson, K. (2014). Elite capture risk and mitigation in decentralized forest governance regimes. *Global Environmental Change,* 24, 265–276.

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security, 1* (1), 5-7.

Poncelet, J. L. (1997). Disaster management in the Caribbean. *Disasters, 21*, 267-279.

Prell, C., Hubacek, K., Reed, M. (2009). Stakeholder analysis and social network analysis in natural resource management. *Society and Natural Resources, 22 (*6), 501-518.

Pretty, J. (1994). Alternative systems of inquiry for a sustainable agriculture. *IDS bulletin, 25*, 37-49.

Rastogi, A., Badola, R., Hussain, S. A., Hickey, G. M. (2010). Assessing the utility of stakeholder analysis to Protected Areas management: The case of Corbett National Park, India. *Biological Conservation, 143* (12), 2956-2964.

Reed, G., Hickey, G. M. (2016). Contrasting innovation networks in smallholder agricultural producer cooperatives: insights from the Niayes Region of Senegal. *Journal of Co-operative Organization and Management, 4* (2), 97–107.

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., ... & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management, 90* (5), 1933-1949.

Rojas, E., Wirtshafter, R. M., Radke, J., Hosier, R. (1988). Land conservation in small developing countries: Computer assisted studies in Saint Lucia. *Ambio*, 282-288.

Saint Ville, A. S., Hickey, G. M., Phillip, L. E. (2015). Addressing food and nutrition insecurity in the Caribbean through domestic smallholder farming system innovation. *Regional Environmental Change, 15* (7), 1325-1339.

Saint Ville, A. S., Hickey, G. M., Locher, U., Phillip, L. E. (2016). Exploring the role of social capital in influencing knowledge flows and innovation in smallholder farming communities in the Caribbean. *Food Security, 8* (3), 535–549.

Samuels, T. A., Guell, C., Legetic, B., Unwin, N. (2012). Policy initiatives, culture and the prevention and control of chronic non-communicable diseases (NCDs) in the Caribbean. *Ethnicity and Health, 17* (6), 631-649.

Sanginga, P. C., Chitsike, C. A., Njuki, J., Kaaria, S., Kanzikwera, R. (2007). Enhanced learning from multi-stakeholder partnerships: Lessons from the Enabling Rural Innovation in Africa programme. *Natural Resources Forum, 31* (4), 273-285.

Singh, R. H., Rankine, L.B. Seepersad, G. (2005). *A review of agricultural policies: Case study of Saint Lucia. Competitiveness Study*. Trinidad: University of the West Indies.

Sir Arthur Lewis Institute of Social and Economic Studies. (2013). *Compete Caribbean OECS*

project private sector assessment and donor matrix report for St. Lucia (Final Report). Barbados: University of the West Indies, Cavehill Campus.

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20* (3), 571-610.

Temel, T. (2004). Mapping organisational linkages in the agricultural innovation system of Azerbaijan. *International Journal of Agricultural Resources, Governance and Ecology 3* (1-2), 134–153.

Termeer, C. J., Dewulf, A. R. P. J., Lieshout, M. V. (2010). Disentangling scale approaches in governance research: comparing monocentric, multilevel, and adaptive governance. *Ecology and Society, 15*.

Timmer, P. C. (1980). Food prices and food policy analysis in LDCs. *Food Policy 5* (3), 188–199.

Vervoort, J. M., Thornton, P. K., Kristjanson, P., Förch, W., Ericksen, P. J., Kok, K., ... & Wilkinson, A. (2014) Challenges to scenario-guided adaptive action on food security under climate change. *Global Environmental Change, 28*, 383-394.

Wasserman, S., Faust, K. (1994). *Social Network Analysis: Methods and applications*. New York: Cambridge University Press.

Watts, N. S., Wandesforde-Smith, G. (2006). The law and policy of biodiversity conservation in the Caribbean: Cutting a Gordian knot. *Journal of International Wildlife Law and Policy, 9* (3), 209-221.

Weis, T. (2007). Small farming and radical imaginations in the Caribbean today. *Race and Class, 49* (2), 112-117.

Welch, B. (1994). Banana dependency: Albatross or liferaft for the Windwards. *Social and*

Economic Studies, 123-149.

Westley, F. R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., Bodin, Ö. (2013). A theory of transformative agency in linked social-ecological systems. *Ecology and Society, 18* (3).

World Bank. (2011). *The growing burden of non-communicable diseases in the Eastern Caribbean*. Latin America and the Caribbean Region: Human Development Unit, Caribbean Country Management Unit.

World Food Summit. (1996). *Declaration on World Food Security and World Food Summit Plan of Action*. Rome: FAO.

Yin, R. (1994). *Case study research: Design and methods.* Thousand Oaks: Sage Publications.

Zilberman, D., Zhao, J., Heiman, A. (2012). Adoption versus adaptation, with emphasis on climate change. *Annual Review of Resource Economics*, *4*, 27-53.

Table 4.1: Stakeholder groups and sample included in our analysis

Stakeholder groups	*Number of people interviewed*	*Male*	*Female*
Policy	5	3	2
Research	3	2	1
Education	2	1	1
Credit	2	2	0
Extension and information	3	2	1
Inputs-processing-outputs marketing	9	8	1
Farm organizations and farmers[a]	8	6	2
Private consultancy	3	1	2
External assistance	1	1	0
NGOs	1	1	0
Total	**37**	**27**	**10**

[a] These farmers were involved in and were able to comment on the policy process because of their additional roles (such as technical officers, extension officers, policymakers).

Table 4.2: Power, legitimacy and urgency in the interactions reported between stakeholder groups and agricultural producers in Saint Lucia

Stakeholder groups	*Evidence of power*	*Source of legitimacy*	*Urgency*	*Nature of relations-between the stakeholder group and smallholder farmers*
Policy	x**	-	-	Limited acknowledgement; restricted interaction; unused power
Research	-	x^^^	-	Limited attention or acknowledgement; dependent upon informal involvement
Education	x***	-	-	Limited acknowledgement; restricted or no interaction; unused power
Credit	x***	x^^		Increased responsiveness through formal mechanisms; acknowledged importance of relationship; communication delegated to specialist
Extension and information	-	x^	-	Limited attention or acknowledgement; dependent upon individual social relationships
Inputs-processing-outputs marketing	x*	x^^^	x	Responsiveness manifested through uni-lateral acts; subject to change without notice; use of coercive tactics: actions dangerous or uncontrollable threat to well-being
Farm organizations	-	-	x	Limited attention generally ignored; even irritating relations; limited impact
Private consultancy	-	-	x	Limited attention generally ignored; even irritating relations; impact limited to project objectives
External assistance	x***	x^	-	Increased responsiveness; operates through the advocacy of more powerful stakeholders
NGOs	-	-	-	Non-stakeholder

Types of power:
*Coercion - abhorrent tactics, violence or force (strikes, threats).
**Utilitarian - material or financial means (goods, services).
***Normative - symbolic resources (respect, acceptance).

Types of authority:
^moral- what is considered right or accepted behavior
^^legal- based on the law or contract
^^^ property-based-rights of (shared) ownership

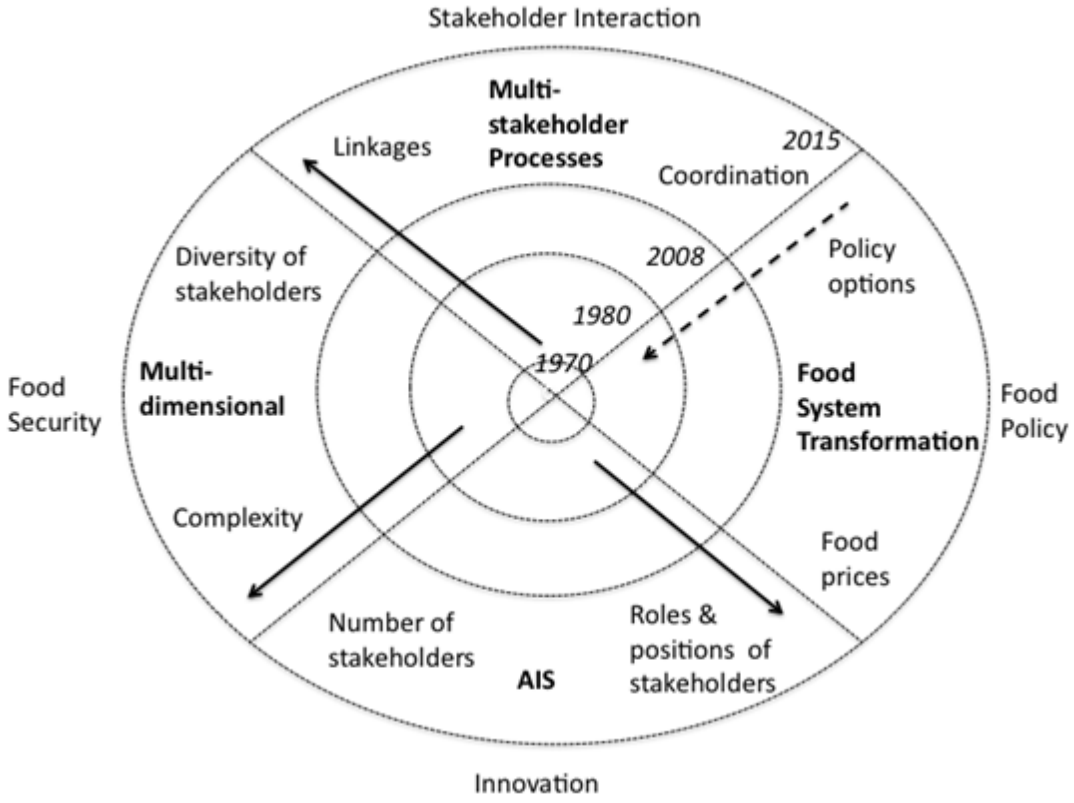

Figure 4.1: The growing importance of multi-stakeholder interaction in design of policy to improve nutritional outcomes. This figure illustrates how developments in these literatures trend away from linear, narrow, single dimensional approaches towards coordination of the growing diversity of stakeholders. The interlinked literature of food security, food policy and innovation reveal multi-stakeholder processes as an emerging research area to better address food and nutrition challenges.

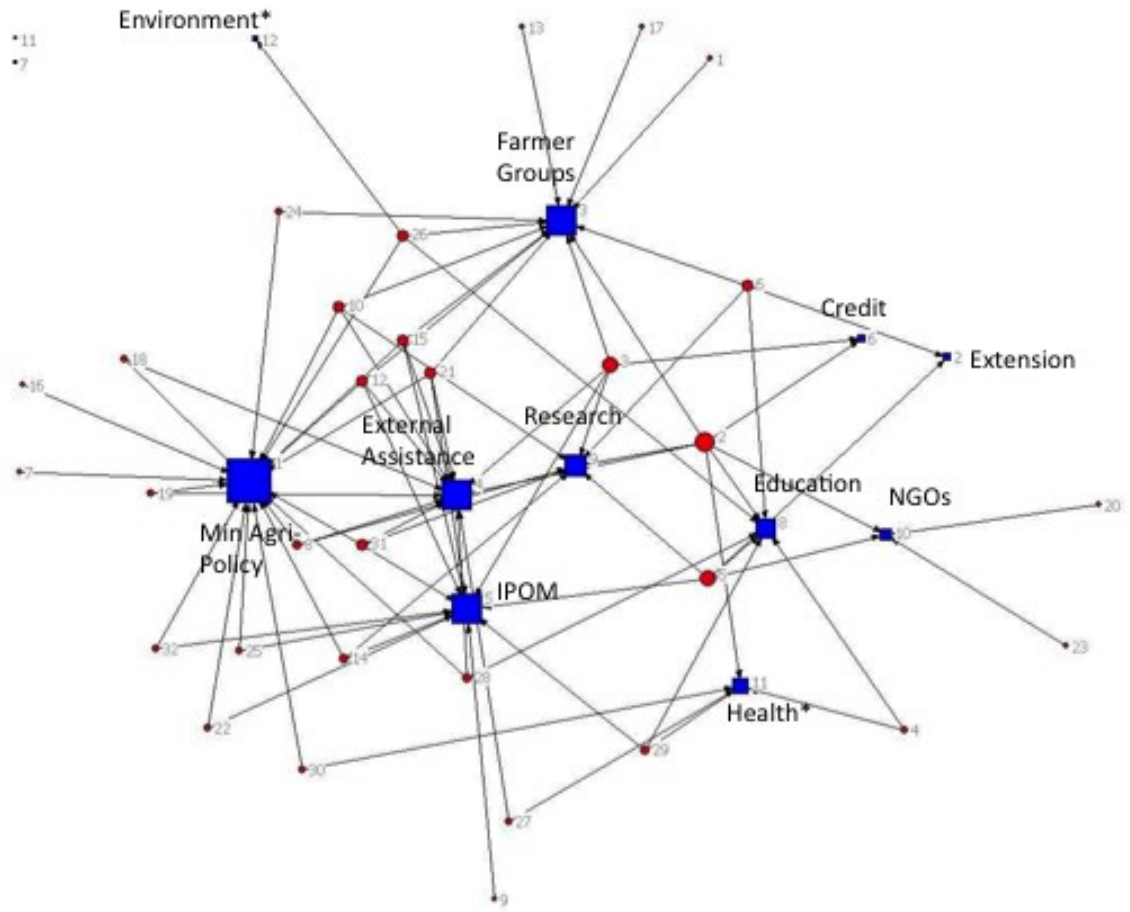

Figure 4.2: Social network analysis (two-mode affiliation network) mapping the interaction between respondents (n=32) and Stakeholder Groups* (n=12). The policy group (11) played a central role with three other groups playing a secondary role (1-Policy, 2-Extension, 3-Farmer Organizations, 4-External Assistance, 5-IPOM, 6-Credit, 7-Consultants, 8-Education, 9-Research, 10-NGOs, 11-Health) in the interaction with respondents. *Stakeholder Group 11-Health was pulled out of the Policy Stakeholder Group to show its separate and distinct interactions with other policy groups. 12-Environment* was not interviewed but added because of increasing interactions associated with natural resource management activities.

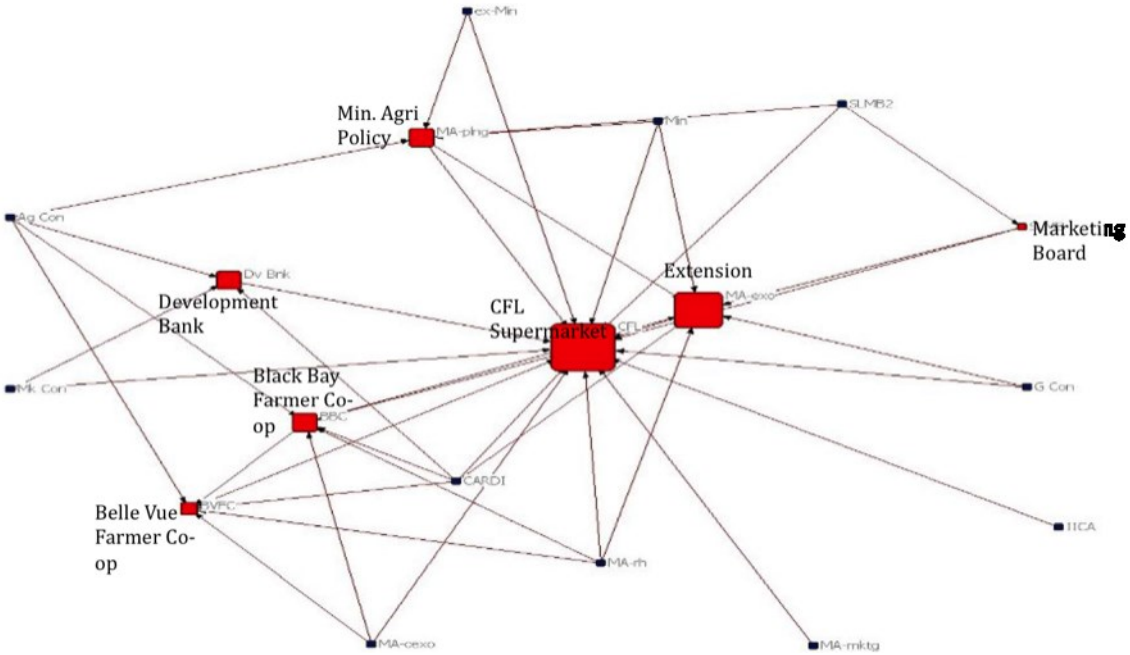

Figure 4.3: Diagram showing perceived influence of stakeholders in the Saint Lucia agriculture-food system. CFL Supermarket within the 'inputs-processing-outputs marketing' (IPOM) group features prominently as the key stakeholder with a secondary position held by the extension stakeholder group (MA-exe). The Black Bay Farmer's Cooperative (BBC), Bellevue Farmer's Co-operative (BVFC), Development Bank, and Ministry Policy Group (MA-plng) were perceived as holding a lesser role. The Marketing Board, a statutory board was perceived as the stakeholder of least influence (SLMB). Node sizes (red) were adjusted for degree centrality. Blue nodes represent respondents.

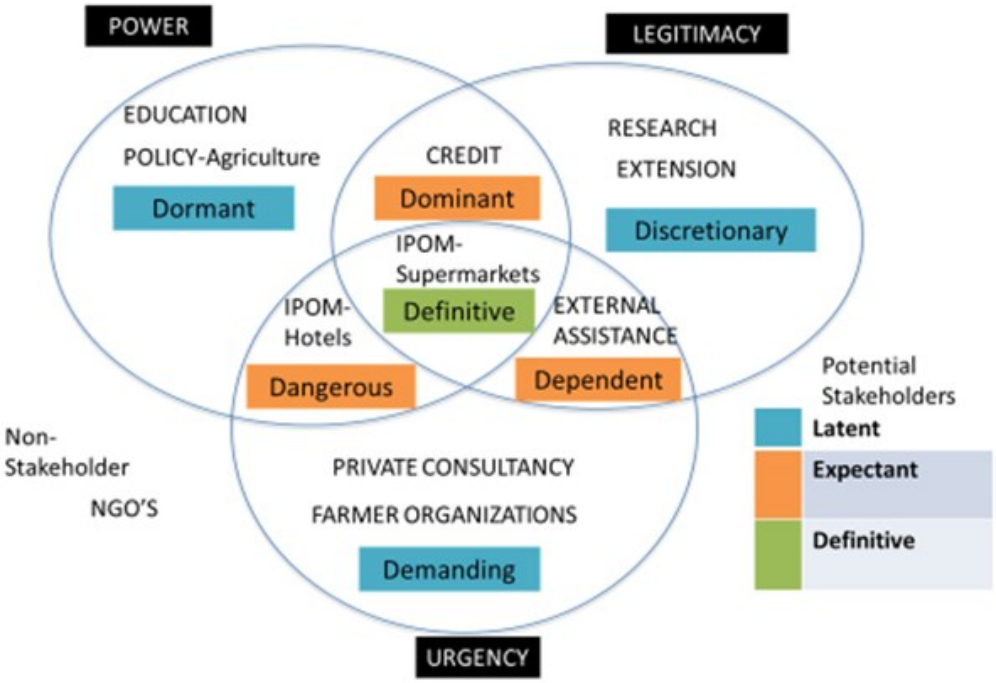

Figure 4.4: Supermarket Chain (CFL) emerged as the definitive stakeholder in its interactions with smallholder farmers based on possession of attributes of *power, legitimacy* and *urgency,* among other stakeholder groups. We applied Mitchell et al.'s (1997) theory of stakeholder identification and salience to identify who would really count in a business environment.

Preface to Chapter 5

Chapter 4 assessed how the interactions among national stakeholders can affect policy innovation outcomes using the case of Saint Lucia's National Agricultural Policy 2009-2015. The results highlighted a high degree of social cohesion (bonding social capital) but low coordination and knowledge flow among stakeholder groups. The dormant role played by formal policy institutions raised important questions concerning the role that bonding social capital played in reciprocal knowledge flows, innovation and coordination among smallholder farmers. Chapter 5 further explores these questions through an assessment of the structural social capital in two rural smallholder farming communities involved in fresh food production for the domestic market in Saint Lucia. Here, the aim is to better understand how social capital influences smallholder farmer knowledge networks and innovation systems at both the individual and community levels and consider the implications for social resilience.

CHAPTER 5: EXPLORING THE ROLE OF SOCIAL CAPITAL IN INFLUENCING KNOWLEDGE FLOWS AND INNOVATION IN SMALLHOLDER FARMING COMMUNITIES IN THE CARIBBEAN

Abstract

This paper presents the results of an exploratory study into how different forms of social capital embedded within community-based social networks may affect innovation in smallholder farming systems to better support food security in the Caribbean. Focusing on two rural communities in the small island developing nation of Saint Lucia, our results indicate the strong presence of interpersonal agricultural knowledge networks operating to: 1) facilitate farmer-to-farmer knowledge exchange; 2) increase farmer access to information; and 3) connect farmers to sources of support. In both communities, 'peer farmers' were reported as being the primary source of new agricultural knowledge for farmers, with government 'extension officers' the secondary source. Comparative social network analysis reveals how different forms of social capital within the two agricultural knowledge networks can affect self-reported farmer innovation in different contexts. Based on these findings we identify a number of opportunities for policy initiatives to better support, coordinate and enhance innovation opportunities among smallholder farmers in the Caribbean with a view to building their adaptive capacity in the face of environmental change. The findings provide important evidence and insights relevant to domestic agricultural system governance and regional food security programming in the Caribbean.

Keywords: Agriculture extension services; Agricultural Innovation Systems (AIS); Caribbean Community (CARICOM); Sustainable rural development

5.1 Introduction

Despite extensive research and technological investments in international agriculture, the ways in which institutional arrangements support or undermine sustainable farming systems remains generally poorly understood (von Braun 2009; Godfray et al. 2010; Grote 2014). Importantly, agricultural system innovation in high risk or fragile natural environments requires careful institutional management of informal and formal knowledge systems (Brooks and Loevinsohn 2011), particularly in the context of the smallholder farmers operating in developing areas (Foley et al. 2011; Anthony and Ferroni 2012). Many studies have identified the potential for smallholder agro-ecological approaches to promote social and ecological sustainability in different developing area settings (Pinstrup-Andersen and Hazell 1985; Conway 1987; Pinstrup-Andersen et al. 1999; Pinstrup-Andersen and Herforth 2008); however, their potential to innovate is often undermined by limited access to resources, low levels of technology adoption, difficulties in coordination, asymmetries in information flow, and high levels of exposure to external and internal shocks (Dorward and Kydd 2004; Kydd and Dorward 2004; Birner and Resnick 2010).

The smallholder farming systems found in the Caribbean's Small Island Developing States (SIDS) confront additional difficulties to innovation (Briguglio 1995; Lowitt et al. 2015b; Saint Ville et al. 2015) including high levels of exposure to market shocks, competition from relatively cheaper imports, resource conflicts from growing tourism development, and losses from extreme weather events and other natural disasters (Timms 2006; Timms 2008; McGregor et al. 2009; López-Marrero and Wisner 2012).

Innovation adoption studies began with the Green Revolution's quest to better understand the transfer to farmers of divisible agricultural technologies developed at research institutes and

universities (Zilberman et al. 2012). At that time, agricultural innovation theory and practice generally equated food security with food availability (Maxwell and Wiebe 1999; Scoones et al. 2009). More recent developments have accepted food security as being multidimensional, comprising 1) food availability; 2) accessibility; 3) utilization; and 4) stability (Pinstrup-Andersen 2009). Despite this generally agreed upon multidimensionality, the concept of food security has challenged Caribbean governments partly because of the initial bias towards relying on technological solutions to increase food production (Sheeran 2010). Smallholder farmers in the region have often faced market-led (Isaac et al. 2012), or supply-led innovation pressures termed "technology push" (Pant 2013 p. 341), which have generally not led to enduring solutions. As a result, agricultural innovation efforts to enhance regional food security in the Caribbean are being increasingly recognized as complex and context-specific (Weis 2004; FAO 2012; Isaac et al. 2012). Recent research has identified access to markets, financing and knowledge networks as being critical constraints facing smallholder agricultural innovation in the region (Lowitt et al. 2015b), suggesting the need to better understand how innovation is shaped by relations between social actors (Leeuwis and Aarts 2011). However, very little, if any, empirical research has explored the relationships between actors in contemporary Caribbean agriculture-food systems and how these interactions may work to enhance or limit smallholder farmer innovation in support of context-specific food security challenges.

Social capital, defined as the enduring connections of networks, reciprocity and social norms that exist among a group of social actors (Ostrom 2000), provides a particularly useful conceptual framework when seeking to understand how the interactions between actors in smallholder farming contexts can affect innovation (Lowitt et al. 2015a). In particular, it has been shown to play an important role in developing area contexts where strong social ties function to counter

poorly developed or weak institutions (Fafchamps 2006; van Rijn et al. 2012; Lowitt et al. 2015a). For example, social capital has been used to assess the barriers and opportunities for rural community collective action (Rastogi et al. 2014; Rahman et al. 2015); to improve understanding of agricultural innovation in smallholder farming systems (van Rijn et al. 2012); to help design more integrative and decentralized policy frameworks (Bodin and Crona 2009; Crona and Hubacek 2010); and to enhance collaborative governance through supportive community institutions (Compton and Beeton 2012). Through such research, social capital has been usefully conceptualized as comprising three dimensions: 1) *bonding* social capital, which includes the horizontal connections found within a group, (also referred to as 'strong ties'); 2) *bridging* social capital, involving the horizontal links that are found connecting or bridging individuals who belong to distinct groups ('weak ties'); and 3) *linking* social capital, described as vertical ties to sources of power and finance developed among social actors involved in shared tasks to improve the common good (Grootaert et al. 2003; Sabatini 2009). While many studies have identified the positive contributions of different forms of social capital to communities, others have identified the 'dark side' of social capital (Rubio 1997; Ballet et al. 2007). For instance, 'network closure' (Granovetter 1973; Burt 2000) can result from bonding social capital leading to increased homogeneity of beliefs, behaviour, and knowledge within the network while reducing exchange with outsiders (see for example, Barnes-Mauthe et al. 2015). Social capital can also favour those who are already well-resourced (Fafchamps 2006; Maertens and Barrett 2013), and may lead to associations that undermine the greater societal good (van Deth 2010).

Recognizing that previous research has identified positive and negative relationships between social capital, information flow, and agricultural innovation in smallholder farming systems (van Rijn et al. 2012; Dessie et al. 2013; Speranza 2013; Wossen et al. 2013; Chen et al. 2014),

relatively little is known about the nature and extent of social capital in Caribbean agriculture. This is significant because an improved understanding of social capital dynamics within Caribbean smallholder farming systems has been identified as having the potential to inform sustainable natural resource management policy and practice (Adger 2003; Pelling and High 2005) and contribute to regional food and nutrition security objectives (Lowitt et al. 2015a). In this paper we present the results of a comparative case study designed to explore how the different forms of social capital embedded within community-based social networks may be affecting smallholder farmer innovation in the Caribbean nation of Saint Lucia with a view to informing future research and policy in the region.

5.2 Methods

Following a combined grounded theory – case study research design (Glaser and Strauss 1967; Yin 1994), we utilized a mixed methods approach to data collection and analysis, further described below. Our research aimed to better understand the role of social capital in developing agricultural knowledge networks and the ability of farming households to innovate in Caribbean smallholder farming communities. More specifically we sought to explore the association between smallholder farmer social capital and self- reported innovation at the household level (using ego-centric analysis); and community level (using socio-centric analysis). According to Monge and Contractor (2003), adopting such multi-level analyses increases the comprehensiveness of social network research by identifying the processes occurring at multiple network levels.

5.2.1 Location of the study

Saint Lucia is a volcanic island with rugged topography located within the Caribbean archipelago. The land area is 616 km^2, with approximately 9% of this considered arable (Cox et al. 2005). Smallholder farms, typically less than two hectares in size, dominate the domestic agriculture-food system which is generally small-scale and rain-fed (GOSL 2007). Seasonality in rainfall, with heavy cyclonic rains in the wet season (from May to November) and a pronounced dry season from December to April (Cox et al. 2005), combined with considerable spatial variation in annual rainfall from mountainous to coastal regions (Isaac and Bourque 2001; Cox et al. 2005) challenge efforts towards consistent food production. The historical dominance of plantation sugar estates on the flatter flood zones has resulted in approximately 87% of smallholder farms practicing cropping on hillsides with generally fragile soils (Rojas et al. 1988); contributing to high rates of soil erosion and land degradation in many agricultural watersheds (Cox and Madramootoo 1998).

Through a collaborative research initiative between McGill University and the University of the West Indies (2011-2014), two rural farming communities were selected in order to analyze the various factors affecting innovation among smallholder farmers: Black Bay and Marquis (see Figure 5.1). These two communities have quite different local histories and institutions in place to support smallholder agriculture (see Table 5.1); the two communities provide an excellent opportunity to conduct an exploratory and comparative analysis of the role of social capital in agricultural knowledge networks and innovation.

The agricultural history of both Black Bay and Marquis began with sugar plantations but subsequently followed divergent paths. In the case of Black Bay and surroundings, after slaves were freed from plantation labor in 1838, that sugar estate was restructured into one of four central factories (Harmsen et al. 2012). This amalgamation made the Vieux-Fort Factory the

major landowner (4,000 acres /1,619ha of land) and employer in the area until 1936, when the Vieux Fort Sugar Company shut down causing economic hardship (Harmsen et al. 2012). As part of a World War II agreement, the United Kingdom leased all lands in the area (5,000 acres) to the United States military that were subsequently returned to the Government of Saint Lucia with the deactivation of the Naval Base (Harmsen et al. 2012). In 1974, the British Development Division initiated the Black Bay Vegetable Project to promote economic development, comprised of eleven family farms each leasing ten hectares of alluvial plain (IICA 1989). Due to administrative inefficiencies, from 1974 to 1978, production fluctuated and stalled. In 1978, another external injection of technical, financial and administrative resources re-catalyzed agricultural production; however this increased production was short-lived due to natural disasters and recurring administrative mismanagement (IICA 1989). By 1988 the project's membership had increased (to the current size of 35) and the production acreage doubled (IICA 1989). In 2008, the Black Bay Cooperative became formally incorporated, responsible for managing the state-owned land by allocating farm units (typically 1-2 acres) to its members. While each member independently operates their farm, they engage in voluntary shared product marketing through the cooperative. This involves the cooperative sourcing produce from members in response to orders received (primarily from hotels). Product grading, weighing and packaging takes place at the cooperative and is then delivered to the buyer. This is the primary revenue generating activity of the cooperative, with monthly deductions from the payments to members used to support transport, facilities, utilities and staff[3].

Unlike Black Bay, where agricultural lands were owned centrally by the state and ultimately managed through the cooperative, in Marquis farmers enjoyed access to mountainous forested

[3] The cooperative employs one to two administrative staff, located in a centrally located facility in close proximity to farms and includes two offices, a meeting room, washroom, a storage area and greenhouses.

lands on the periphery of Marquis Estate lands. After the abolition of slavery in 1833, Marquis' 1,032 hectare sugar estate remained but experienced labor shortages as ex-slaves opted to hunt, subsist, and squat in nearby mountains rather than enter into voluntary employment on estates. Planters responded by using their legislative authority to institute vagrancy laws, high land sales taxes and licensing fees on transportation to restrict land ownership and create forced labor conditions (Harmsen et al. 2012). Despite these restrictive strategies, where lands were available, a land-owning peasant class developed and by 1890 they produced one-fifth of all sugar grown in St. Lucia (Harmsen et al. 2012). By 1897, an estimated 6,000 ex-slaves purchased small farms across the island representing a 347% increase in land ownership levels from 1845 (see Adrien 1996). Declines in sugar markets in the early 1900s resulted in severe economic hardship but in 1953, things improved when the British government created a guaranteed market and awarded a British company the contract to buy all Windward Island bananas. This transition from sugar to bananas created many economic opportunities (Grossman 1998) and by 1965, bananas represented 90% of Saint Lucia's total exports, grown by 12,479 registered growers (O'Loughlin 1968; Welch 1994). Booming export market conditions and labour shortages in Marquis resulted in the private sale of half of the estate (405 ha) in 1980. Initially targeted towards ex-workers at reduced cost in farm sizes ranging from 1-10 ha, many failed to meet financing requirements and the majority of the land was sold to people living outside the immediate local community (OAS 1986). Post-liberalization, with the loss of the protected market in Europe (1999), farmers in Marquis increasingly abandoned banana production and joined Black Bay farmers in producing fresh fruits and vegetables for local markets.

These private farmers produce, harvest and market their fresh foods for the domestic market independently. On a weekly basis, their short-term crops (including cucumber, peppers, lettuce,

green onion, eggplant, okra, tomatoes) are sold to supermarkets, the government-controlled marketing board and directly to consumers at the Castries Farmers Market. Friday and Saturdays are the major selling days at the market, with crop availability, quality and volumes highly variable.

Table 5.1 summarizes the major characteristics of each community. Although they have different historical paths and social-ecological conditions, the majority of the smallholder farmers in both communities grow fresh fruits and vegetable for the domestic market. In the case of Black Bay, farmers have a longer history and more experience producing for the domestic market than the farmers in Marquis. Farmers in both communities have easy access to water for irrigation from nearby rivers. Other common characteristics include: 1) low precipitation due to their proximity to the coast; and 2) location on flood plains with fertile, alluvial soils. Key differences can be found in land tenure arrangements and the operation of an agricultural cooperative. In Marquis, farm land is privately owned and held across generations as 'family lands' while in Black Bay all farm land is publicly owned and leased to individual smallholder farmers; the majority of whom access this land through their membership in the Black Bay Cooperative.

5.2.2 Data collection

We conducted 112 farmer household surveys following a purposive snowball sampling strategy in both communities (40 in Black Bay and 72 in Marquis). In addition, we collected qualitative data through eight farmer focus groups and 55 key informant interviews with community leaders. We also directly observed community farmers during various stages of marketing and production. All field data were collected between June and August 2012 in accordance with McGill's ethical research guidelines.

Smallholder farmer households were the primary unit of analysis and included those directly involved in farm production, such as agricultural labourers, subsistence producers and commercial scale farmers. Locally-oriented agricultural commodities of interest included fruits, roots, and vegetables. Surveys were administered by trained enumerators and conducted on farms and households in English. While surveys were administered in English, questions were translated into 'Kweyol' (a local language used in rural areas) to ensure ease of communication with older farmers as needed. Our surveys followed a snowball sampling strategy to ensure we reached farmers named by respondents in each community. While this sampling approach helped us to identify the type and nature of connections between social actors within what was an unknown network, we acknowledge that it did not allow us to identify disconnected social actors in the network (Hanneman and Riddle 2005) and recognize this as a limitation of our dataset.

Our research design sought to capture a broader picture of local network contexts by using the Socio-Spatial Knowledge Network (SSKN) method (Gregory and Urry 1985), which has been widely applied in the health sector to help identify community spaces for effective knowledge dissemination (Skelly et al. 2002; Gesler et al. 2006). This involved community scoping and discussion with community leaders, including teachers, elected officials, community-based organisations, faith-based organisations, health care workers and civil servants, to better understand the different community issues, gain support for the research, and to understand local needs and concerns (Cravey et al. 2001; Skelly et al. 2002). We then used the survey instrument to examine demographics and attitudes of respondents, the use of activity spaces, prepare a place inventory and identify key nodes/areas for knowledge sharing in each community (Cravey et al. 2001). Activity spaces helped us to identify and select the best locations to meet with potential respondents for surveys and recruit participants for focus groups. The SSKN method ensured that

key smallholder farmers in each community were appropriately captured in the network analysis (Forsé and Degenne 1999). We used the community boundaries defined by those people living in the community to ensure the relevance of our network boundaries (Marsden 1990). We applied name-generator questions using a relation-based approach (Borgatti et al. 2009) to elicit the network links directly from respondents. This involved answering questions that required them to name other farmers in the community with whom they had relations of interest: potential sources of farming support, requests for support, friends, sources of new knowledge and recipients of new agricultural knowledge. As a follow-up question, respondents were then asked "are you related to this person?" to identify kinship associations with these other farmers in their community.

In order to better examine the relationships emerging in our quantitative data, qualitative data were collected using Focus Group Discussions (FGDs) with smallholder farmers in each community (four in Black Bay and four in Marquis) and interviews with community leaders. Qualitative data were important to our study due to the complexity of the issues being explored and the need to contextualize the survey data, including understanding various motives, constraints and mechanisms in more detail (Hancke 2009; Krueger and Casey 2009). Focus group discussions were used to collectively clarify views, attitudes and motivations and delve into shared understanding (Litosselit 2003). Of the four FGDs conducted in each community, we ensured that one brought together young farmers, and another focused on the unique perspectives of women farmers. The discussion time in each FGD ranged from one to two hours and each comprised between eight to 18 participants. Participants were asked about their agricultural knowledge needs, knowledge networks, sources of knowledge, and were encouraged to draw charts as needed. Each FGD was audio recorded and fully transcribed for coding and analysis.

5.2.3 Data analysis

Our study adopted a broad definition of innovation, as being an "idea, practice, or object" perceived as novel by a social actor or adopter (Rogers 1983 p. xviii). We operationalized this definition in our study as: adopting a new crop, new way of doing things, new planting method, new pest management, soil or water management technique or some other technological learning in agriculture in the past five years. We used two questions to assess self-reported innovation of respondents: 1) Have you ever been involved (at any time) in an agricultural project with the Ministry of Agriculture? (past innovation variable); and 2) In the last five years have you developed or adopted a new crop, a new way of doing things, new planting method, new pest management technique, soil or water management or some technological learning in agriculture (recent innovation variable)? Since the practical aim of the study was to assess how social capital might influence knowledge networks and self-reported innovation in Caribbean smallholder agriculture, the level and nature of the particular innovation was self-reported and not independently verified.

Networks compose interactions at multiple levels that may be viewed from the individual, dyad, subgroup and entire network level (Prell 2012). We conducted our social network analysis at two levels, the ego-centric and socio-centric level. At the ego-centric level of analysis, we viewed the network from the perspective of a focal node (ego), based on relations of "knowledge received", and "knowledge shared". We looked at direct connections between the ego and other nodes (alters) (farming households in the community) and the connections between these alters. By isolating the nodes in an ego-network, the software UCINET VI generated a measure of each smallholder farmer households' structural social capital, defined in terms of "size" and "ties". "Size" measured the number of direct connections between the ego and other actors (alters).

"Ties" measured the total number of ties between the alters in the ego network (not counting ties involving the ego). We then used these network-derived measures to conduct individual-based (ego) statistical analyses using SPSS VI in order to test the level and significance of association between a respondent's self-reported innovation and their "sizes" and "ties". We selected Goodman and Kruskal's (1954) Gamma to measure this association because of our small sample size, and use of ordinal variables (Gans and Robertson 1981).

For the socio-centric network analysis, we also examined the larger knowledge network to see overall patterns in the network structures of the two farming communities. UCINET VI was used to provide social network measures and graphical analysis was conducted using NetDraw II. Multiple connections (multiplex relations) were mapped to identify the level of overlap between the ties. These multiplex relations were used to develop the community knowledge networks by overlaying three types of ties between respondents and the other farmers in the community (knowledge received, knowledge shared, and kinship/blood ties). Ties were assumed to be bidirectional (B is in A's network if A claims B). The resulting maps of these overlays of relations allowed us to better capture the nature of the bridging (non-overlap with kinship ties) or bonding (overlap with kinship ties) social capital.

Qualitative data were analyzed using content analysis techniques (Altheide 1987; Morgan 1993) looking at key themes in the data around innovation conditions, farmers attitudes to innovation, trust, farmer-farmer interaction and knowledge exchange (Glaser and Strauss 1967). All qualitative data coding was conducted manually using MaxQDA software.

5.3 Results

Table 5.2 provides a summary of the respondent profile in each community, indicating that most

were male and had a marital or common-law partner. Most of the respondents had lived and farmed in either Black Bay (75%) or Marquis (61%) for 11 years or more, and more than half of this group had been involved in farming for 21 years or more. The median age range was 45-54 (33%) in Black Bay and 55-64 (31%) in Marquis. In Marquis, 18% of respondents owned their farms, 40% farmed on family lands[4], and 15% leased from private landowners. In contrast, 87.5% of respondents from Black Bay farmed on government land. Over half of respondents reported farming as providing between 75-100% of their income, with similar proportions reporting that their farms were producing under-capacity. Primarily, respondents were dependent on weekly farmers' markets as the primary endpoint for the sale of their crops. Approximately 12% of all respondents were involved in banana production with the majority of these respondents (17%) from the Marquis community. More than 50% of respondents had never been involved in banana production while 38% of respondents who had been involved in export banana production exited this market primarily in the 1990-1999 period. General trust was low among respondents (85% in Black Bay and 70% in Marquis), with relatively higher community trust levels (with distrust at 46% in Black Bay and 64% in Marquis). In Marquis, 42% of respondents claimed membership in the Babonneau Fair Trade Association (a banana exporter group) or other farming groups, while in Black Bay, 64% of respondents held membership in the Black Bay Cooperative.

Figure 5.2 shows that in both communities (75% in Black Bay and 51% in Marquis), 'peer farmers' were reported as being the primary source of new agricultural knowledge for farmers, with government "extension officers" the secondary source (39% in Black Bay and 43% in

[4] "Family land" is a generational land title and exists in St. Lucia as part of French colonial inheritance laws and results in lands being owned across generations of a family. Typically the land is accessed and used by a multiplicity of heirs, and successors without title by virtue of shared bloodline.

Marquis). Innovations identified by respondents included: new crops (kale, zucchini), new planting methods, new pesticides, non-chemical weed management techniques such as plastic mulch, chemicals such as hormones to induce flowering, soil stimulants, use of heavy equipment, new irrigation techniques and seedling development. A key difference in the two communities was the role of 'relatives' and 'friends' in providing new knowledge, reported in Marquis at 36% and 36% compared to Black Bay at 18% and 20% respectively.

Generally, Marquis and Black Bay respondents showed similar trends in their self-reported innovation activities. In both communities, qualitative data highlighted that respondents held a positive association with innovation resulting from their participation in past agricultural development projects. Descriptive statistics supported this assertion with 72% of respondents expressing a willingness to participate in future projects. Two-thirds of respondents in both communities reported that they had adopted an innovation in the past five years while 37% had been involved in past agricultural projects (donor-funded or with the Ministry of Agriculture).

In focus group discussions, farmers raised a wide range of issues that had implications for their level of interest in particular innovations. Of primary focus were challenges related to finding markets to sell their perishable produce, growing incidences of pest infestation, theft, and difficulties accessing labour. Of these challenges, there was wide consensus that a lack of domestic markets was the primary challenge that limited their ability to produce and innovate. More specifically, participants identified inconsistent supply of inputs and highly variable prices as challenges arising from the small domestic market, the large number of producers, lack of contracts (based on the small size of producers) and limited coordination among farmers. At certain times of the year, such as the dry season from January to May (called "*kawenm"* by farmers in *Kweyol*), there are optimal conditions for growing crops such as tomatoes, cucumbers

and watermelon, resulting in seasonal over-production and drastically lowered prices. While participants acknowledged that this situation proved detrimental to all farmers, there appeared to be an inability or unwillingness to formally organize and coordinate production. This situation suggests that greater communication among farmers will be required in order to foster a level of collective action in the form of voluntary coordination of production planning. When asked why the efforts of the Ministry of Agriculture to develop formal production scheduling plans to reduce risk and curtail overproduction had failed, farmers voiced concerns relating to low trust, and indicated their dissatisfaction with the associated risks to their livelihoods (without any means to ensure compliance by Ministry officials). As explained by one Black Bay farmer in reference to the short-lived production scheduling plan initiated in the late 1990s:

"they're asking you to take risk that they are not taking themselves"

These risks were generally viewed as resulting from the ease with which the entire production plan could be undermined by noncompliance by any party. In the absence of formal contracts and production planning, the clear preference of the farmers we interviewed was for them to continue their production scheduling informally by observing the crops and volumes being planted by the other farmers in the area and availability at the farmer's market and supermarkets.

5.3.1 Ego-centric network analysis

Figure 5.3 presents the frequency distribution of "size" and "ties" in the social networks of farmers surveyed in Black Bay and Marquis, revealing key differences in the number of links between farmers that supported interpersonal knowledge networks. Our sample of Marquis smallholder farming households comprised almost double the "size" and "ties" of our Black Bay sample. Table 5.3 shows the correlation between measures of social capital (direct links with other farmers in their community - "size" and indirect links among alters - "ties") and self-

reported innovation. These findings show a stronger positive relationship between respondents who self-reported as "recent innovators" and "size" .406 (.000), and "ties" .491 (.000), and those who self-reported as "past innovators" and "size" .397 (.000), and "ties" .404 (.000), suggesting that the larger the farmer's network of indirect connections (friends of friends), the greater the likelihood of them innovating.

5.3.2 Socio-centric analysis of interpersonal agricultural knowledge networks

The number of respondents (nodes) per community (k) were 40 in Black Bay and 72 in Marquis (Table 5.4). Our findings show that the average degree (the average number of connections between actors in the network shown graphically as the number of lines connected to each node) was 4.45 in Black Bay and 6.58 in Marquis. In each network, there are (k * k-1) number of total possible ties (without calculating self-ties), with 1,560 total possible ties for our respondents from Black Bay and 5,112 for the Marquis data. Out of this these total possible ties, respondents in Black Bay reported only 62 'knowledge received' ties, and 59 'knowledge shared' ties; corresponding values for Marquis were 107 and 102 ties. In Marquis, "kinship ties" comprised the largest network component (268) unlike Black Bay where knowledge ties were largest. Network density (the proportion of all possible ties against those that are actually present) was 11.4% in Black Bay and 9.3% in Marquis, indicating that information diffuses relatively slowly among nodes in both networks, but this measure may mask community variations associated with the quality of interpersonal ties (Scott 2000). The distance measure considers how the actors are embedded in the network by looking at the number of links that separate them. For example, two adjacent actors have a distance equal to one. This means that in one step, information can go from one farmer to the other. In contrast, if A tells B, and B tells C (and A does not tell C), then farmers A and C are at a distance of two. Where distances are great, it may take a long time for

information to diffuse across a population. In our case studies, average distance measures were 2.610 in Black Bay and 2.365 in Marquis, again suggesting that there are more than two people on average separating information diffusion from one farmer to another in the network.

Figure 5.4 graphically depicts the social structure of the smallholder farmer knowledge networks of our respondents from the Black Bay (4a) and Marquis (4b) communities. In each figure the nodes represent respondents and the lines the relation between two nodes. To help clarify the "strong ties" in each network, line colours were used to show the overlap of relations. It should be noted that while Figure 5.4 shows two knowledge networks of dissimilar sizes, what is more important is their structural differences. We found that by mapping the structures created by these different kinds of relationships (kinship, knowledge), we are able to identify different dimensions of social capital operating in the two case study networks. The knowledge network of our Black Bay respondents (Figure 5.4a) consists of more bridging social capital measured at 31% of overlap between knowledge and kinship. These "weak ties" connect different groups of people who do not share family bonds. In contrast, the knowledge network of the Marquis respondents (Figure 5.4b) consists of higher bonding social capital, or "strong ties" measured by 61% of overlap between knowledge and links to family members. The intersection of knowledge and kinship relations in the Marquis data results in a more centralized network dominated by a few central nodes connected by family ties.

5.4 Discussion

Over half of our survey respondents reported farming as being their only source of income. This situation likely makes them vulnerable to shocks resulting from either internal or external factors. In the case of Saint Lucia, smallholder agricultural livelihoods are often based on highly vulnerable production systems creating 'poverty traps', generally characterized by a lack of

connectedness and low resilience (Carpenter and Brock 2008). This situation creates a significant challenge for smallholder agricultural policy in Saint Lucia and points to the need to foster greater trust and interaction between social actors (farmers) and institutions in the agriculture-food system. More specifically, there is likely a need to help smallholders better connect across the system in order to foster their capacity to adapt in the face of change and work collectively to address common problems (Carpenter and Brock 2008). Issues that undermine such adaptive capacity include: limited formal education, small farm sizes (<2 acres or .8 ha), producing at under-capacity, low trust, and informal marketing arrangements, resulting in a relatively high degree of household vulnerability to shocks. The following quotes provide some insight to the situation facing smallholders in our study area:

> *" ... anything that I can plant, I plant...once I can make a dollar, so long it comes to my mind, I plant,... whether I make something out of it or I make nothing out of it, I am just trying something"* (female farmer Marquis);
>
> *"Well sometimes even though you know that there is a glut, there are not many things that you can plant and there are so many farmers. And you yourself you have to live, you have children you have your family to feed. So sometimes, you just have to plant it you know"* (male farmer Black Bay).

Social relationships have been identified as performing a critical function in building (and limiting) adaptive capacity in smallholder farming systems (Pretty 2003). According to Norris and Stevens (2007), if farmers have resilient social supports, then it is likely that they would be used in times of uncertainty or resource limitations. Pretty et al. (2011) further suggested that sustainable agricultural intensification in low-yield areas (of Africa) will depend upon developing new forms of social infrastructure among smallholder farmers, likely involving the

leveraging of their social capital in support of adaptive capacity in resource-scarce settings (Pretty and Ward 2001).

Our socio-centric analysis generally supported these observations, indicating that the presence of interpersonal agricultural knowledge networks supported the production capacity of smallholder farmers in both communities. The characteristics of these networks were quite different, likely reflecting the particular social-ecological characteristics of the community and supporting the need for context-specific approaches to agricultural extension and innovation (Hellin 2012; Wood et al. 2014). For example, the farmer knowledge network in Black Bay (Figure 5.4a) appeared to be based largely on bridging social capital with kinship playing a relatively minor role. Such bridging social capital is known to provide sources of new information (Granovetter 1973) and can facilitate the diffusion of innovation (Sabatini 2009; Scott 2011). In Marquis, the knowledge network (Figure 5.4b) was based more directly on bonding social capital, known to foster group identity and cohesiveness; but be less responsive to externally driven innovation and change processes (Burt 1995; van Rijn et al. 2012). Despite their differences, both knowledge networks can be seen as performing a critical function in the smallholder agricultural innovation system, by providing a trusted means to support innovation, and facilitate farmer knowledge exchange beyond what is available through the formal institutions of government.

Not only did our findings reveal that respondents employed social networks to better connect with each other, but that new knowledge sourced from interpersonal networks were generally considered of greater importance than those provided by the state-run agricultural extension services. While, the results of our exploratory study are limited by the fact that we did not focus on a particular innovation and its diffusion process, they do support future efforts to do so. Our survey results also indicate that there may be a declining importance being placed on state-led

agricultural extension services compared to 'peer farmers', and this is another area that would benefit from targeted research in the Caribbean context. Ganpat et al. (2010) highlighted a number of factors that might explain the limited effectiveness of formal extension services in the Caribbean, including: 1) weak linkages between agricultural research and education; 2) limited coordination of limited resources; and 3) inadequate adaptation of the institutional structures to meet existing needs and resource limitations. Recent research in Jamaica has highlighted the importance of shared local knowledge among smallholder farmers to their adaptive capacity (Campbell and Beckford 2009; Gamble et al. 2010). By experimenting with different approaches to agricultural extension services to foster peer-to-peer interactions and reciprocal knowledge flows between farmers, the interpersonal and procedural trust required for collective action may be enhanced (Hellin 2012; Schroeder et al. 2013; Yang et al. 2014).

Despite differences in the dimensions of social capital that comprised the knowledge network in our two case studies, the self-reported level of innovation among respondents in each community showed no significant difference. Egocentric analysis which was designed to capture the social networks of our sample of individual smallholders showed that although the direct links to other farmers in the network were significant in farmer self-reported innovation, the combined effect of the direct and indirect links were more significant. These results suggest that not only is bridging social capital within the knowledge network potentially positive for innovation, but the links between alters or "friends of friends" in the network is also important. This finding is supported by van Rijn et al. (2012) who suggested that the larger the network of adopters (direct and indirect links), the greater the likelihood that farmers would adopt innovations due to increased knowledge, access to resource and sources of support (see also Wossen et al. 2013).

The lack of significance in self-reported innovation between respondents in the two communities despite wide variabilities in their ego-centric social networks and the differences in the provisioning knowledge networks provides an interesting result. One possible explanation for this situation is that the farmers are able to receive support that influences their self-reported adoption of agricultural innovation through different mechanisms and types of interaction in each community. For example, in the case of Black Bay, farmers are likely able to share knowledge and work together with a more diverse but fewer number of farmers, to achieve shared outcomes through regular formal and informal gatherings at the cooperative (including annual meetings, committee meetings, weekly trips to the office to deliver harvested crops targeted for hotels, workshops planned by the Ministry of Agriculture to address topical issues in agriculture, and projects being undertaken through the cooperative by donors). In contrast, the Marquis farmers were likely accessing new agricultural knowledge through larger numbers of interpersonal ties comprising of primarily family-based interactions that generally require greater personal investments of time, more deliberate interaction with more people and social expectations of reciprocity. As noted by Granovetter (1973), these "strong ties" are a costly investment because of the amount of time social actors need to spend together in order to foster and sustain an emotional connection, intimacy and commit resources to reciprocity of exchanges. Our findings may suggest that farmers in Marquis have less time available to participate in other activities. In contrast, farmers of Black Bay with their knowledge networks based on bridging social capital function through "weak ties" fostered by the operations of the cooperative and likely have more time and resources available for innovation. There are other potential disadvantages to the farmers of Marquis where, despite bonding social capital being helpful for the creation of favorable community conditions, 'network closure' can develop (Burt 2000). In the context of

our two case studies, while social capital appeared to play a generally equalizing role in fostering innovation in the absence of secure land tenure (Black Bay) and a lack of formal farmer organization (Marquis); more research is needed to look at the differences in capital investment required to achieve these self-reported innovation returns.

While social capital and knowledge networks differed in our two case studies, their existence highlighted some of the pathways available to formal institutions, donors, and NGOs working to enhance knowledge exchange in the resource-poor, smallholder agricultural systems common to the Caribbean. These knowledge networks, built on interpersonal trust, represent resources invested by individual smallholder farmers and their communities to improve communication and knowledge exchange. Recognizing the limitations in the existing agricultural extension services in Saint Lucia, we suggest that such interpersonal networks provide a potentially powerful and adaptive mechanism through which to interact with smallholder farmers and ensure better-targeted interventions. Previous research by Osbahr et al. (2010) evaluated four agricultural development projects in southern Africa and revealed the important use of interpersonal networks as platforms from which to build more formal organizations (maize collectives). This suggests that by better linking formal and informal interactions, governments may be able to foster more decentralized and synergistic knowledge production and exchange at minimal additional cost (see also Mikulcak et al. 2015; Rahman et al. 2015). Better identifying and working with interpersonal networks may also help policy-makers initiate more integrated responses that can link smallholder farmer social capital to the significant human and financial capital of governments, donor agencies, the private sector and NGOs.

5.5 Conclusion

Policy interventions designed to better support smallholder agricultural innovation systems in the Caribbean will likely require creative and decentralized governance approaches to facilitate knowledge flow and build interpersonal and procedural trust. The results of our comparative case study highlight the presence and nature of the interpersonal agricultural knowledge networks operating in two farming communities in the nation of Saint Lucia. Despite structural differences, farmers in both communities reported using their social networks to access new agricultural knowledge and innovate, noting that this was a more important knowledge source than state-run agricultural extension services. Socio-centric analysis revealed that in the Black Bay sample, the knowledge network was based more on bridging social capital, while in Marquis it was based more on bonding social capital, with implications for how farmers can and do access the knowledge they require to innovate in different contexts. Egocentric analysis of individual farmer social networks showed that although the direct links to other farmers in the network were significant for self-reported innovation (past and recent), the indirect links between alters or "friends of friends" were more significant. These results suggest that not only is bridging social capital within the agricultural knowledge network necessary to support system innovation, but the total number of links between smallholder farmers in the network is essential. Our findings support the view that by utilizing their social networks to increase their connection to a larger number of farmers, smallholders may improve their adaptive capacity to: 1) facilitate knowledge exchange; 2) increase access to resources, and 3) connect to sources of support. Despite the recognized equity challenges associated with social capital in the literature, it has a potentially significant role to play in improving smallholder agricultural system innovation in the Caribbean context, both at the individual and community levels. Our results provide important

insight to how these often hidden and decentralized networks may present food security-related policy and programs with an important and adaptive informal mechanism through which to better reach and coordinate smallholders in the absence of other, more reliable, democratic institutions.

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References

Adger, W.N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography, 79*, 387-404.

Adrien, P. (1996). *Metayage, capitalism and peasant development in St. Lucia 1840-1957*.

Jamaica: Canoe Press, University of the West Indies.

Altheide, D.L. (1987). Reflections: Ethnographic content analysis. *Qualitative Sociology, 10 (1)*, 65-77.

Anthony, V.M., Ferroni, M., (2012). Agricultural biotechnology and smallholder farmers in developing countries. *Current Opinion in Biotechnology, 23 (2)*, 278-285.

Ballet, J., Sirven, N., Requiers-Desjardins, M. (2007). Social capital and natural resource management a critical perspective. *The Journal of Environment & Development, 16*, 355-374.

Barnes-Mauthe, M., Gray, S.A., Arita, S., Lynham, J., Leung, P. (2015). What determines social capital in a social–ecological system? Insights from a network perspective. *Environmental Management, 55 (2),* 392-410.

Birner, R., Resnick, D. (2010). The political economy of policies for smallholder agriculture. *World Development, 38*, 1442-1452.

Bodin, Ö., Crona, B.I. (2009). The role of social networks in natural resource governance: What relational patterns make a difference? *Global Environmental Change, 19 (3)*, 366-374.

Borgatti, S.P., Mehra, A., Brass, D.J., Labianca, G. (2009). Network analysis in the social sciences. *Science, 323* (5916*),* 892-895.

Briguglio, L. (1995). Small island developing states and their economic vulnerabilities. *World Development, 23*, 1615-1632.

Brooks, S., Loevinsohn, M. (2011). Shaping agricultural innovation systems responsive to food insecurity and climate change. *Natural Resources Forum, 35 (3)*, 185-200.

Burt, R.S. (1995). *Structural holes: The social structure of competition*. MA: Harvard University Press.

Burt, R.S. (2000). The network structure of social capital. *Research in Organizational Behavior 22*, 345-423.

Campbell, D., Beckford, C. (2009). Negotiating uncertainty: Jamaican small farmers' adaptation and coping Strategies, before and after hurricanes-a case study of Hurricane Dean. *Sustainability, 1* (4), 1366-1387.

Carpenter, S.R., Brock, W.A. (2008). Adaptive capacity and traps. *Ecology and Society, 13* (2).

Chen, H., Wang, J., Huang, J. (2014). Policy support, social capital, and farmers' adaptation to drought in China. *Global Environmental Change, 24*, 193-202.

Compton, E., Beeton, R. (2012). An accidental outcome: Social capital and its implications for Landcare and the "status quo". *Journal of Rural Studies, 28* (2), 149-160.

Conway, G.R. (1987). The properties of agroecosystems. *Agricultural Systems, 24*, 95-117.

Cox, C., Madramootoo, C. (1998). Application of geographic information systems in watershed management planning in St. Lucia. *Computers and Electronics in Agriculture, 20* (3), 229-250.

Cox, C., Sarangi, A., Madramootoo, C. (2005). Effect of land management on runoff and soil losses from two small watersheds in St Lucia. *Land Degradation and Development, 17 (1)*, 55-72.

Cravey, A.J., Washburn, S.A., Gesler, W.M., Arcury, T.A., Skelly, A.H. (2001). Developing socio-spatial knowledge networks: A qualitative methodology for chronic disease prevention. *Social Science and Medicine, 52*, 1763-1775.

Crona, B., Hubacek, K. (2010). The right connections: How do social networks lubricate the machinery of natural resource governance. *Ecology and Society, 15* (4).

Dessie, Y., Schubert, U., Wurzinger, M., Hauser, M. (2013). The role of institutions and social

learning in soil conservation innovations: Implications for policy and practice. *Environmental Science and Policy, 27*, 21-31.

Dorward, A., Kydd, J. (2004). The Malawi 2002 food crisis: The rural development challenge. *The Journal of Modern African Studies, 42* (3), 343-361.

Fafchamps, M. (2006). Development and social capital. *The Journal of Development Studies, 42*, 1180-1198.

FAO, 2012. *Report on workshop of small scale farming in the Caribbean*. Latin America and the Caribbean: FAO.

Foley, J.A., Ramankutty, N., Brauman, K.A., Cassidy, E.S., Gerber, J.S., Johnston, M., Mueller, N.D., O'Connell, C., Ray, D.K., West, P.C. (2011). Solutions for a cultivated planet. *Nature, 478* (7369), 337-342.

Forsé, M., Degenne, A. (1999). *Introducing social networks*. London: Sage Publications Limited.

Gamble, D.W., Campbell, D., Allen, T.L., Barker, D., Curtis, S., McGregor, D., Popke, J. (2010). Climate change, drought, and Jamaican agriculture: Local knowledge and the climate record. *Annals of the Association of American Geographers, 100* (4), 880-893.

Ganpat, W.G., Ragbir, S., de Freitas, C., Badrie, N. (2010). *The use of information and communication technologies in the modernization of Caribbean agriculture: Focus on agricultural extension.* 2009 West Indies Agricultural Economics Conference. Caribbean Agro-Economic Society, Barbados.

Gans, L.P., Robertson, C. (1981). Distributions of Goodman and Kruskal's gamma and Spearman's rho in 2× 2 tables for small and moderate sample sizes. *Journal of the American Statistical Association, 76*, 942-946.

Gesler, W.M., Arcury, T.A., Skelly, A.H., Nash, S., Soward, A., Dougherty, M. (2006).

Identifying diabetes knowledge network nodes as sites for a diabetes prevention program. *Health and Place, 12*, 449-464.

Glaser, B.G., Strauss, A.L. (1967). The discovery of grounded theory: Strategies for qualitative research. New York: Aldine de Gruyter.

Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M., Toulmin, C. (2010). Food security: The challenge of feeding 9 billion people. *Science, 327* (5967), 812-818.

Goodman, L.A., Kruskal, W.H. (1954). Measures of association for cross classifications. *Journal of the American Statistical Association, 49*, 732-764.

GOSL. (2007). *Census of agriculture: Final report*. Saint Lucia: Government of Saint Lucia.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 1360-1380.

Gregory, D., Urry, J. (1985). *Social relations and spatial structures*. London: Macmillan.

Grootaert, C., Narayan, D., Woolcock, M., Nyhan-Jones, V. (2003). *Integrated questionnaire for the measurement of social capital (SC-IQ).* Washington, DC: The World Bank Social Capital Thematic Group.

Grossman, L.S. (1998). *The political ecology of bananas: Contract farming, peasants, and agrarian change in the Eastern Caribbean*. Chapel Hill: The University of North Carolina Press.

Grote, U. (2014). Can we improve global food security? A socio-economic and political perspective. *Food Security 6* (2), 187-200

Hancke, B. (2009). *Intelligent research design: A guide for beginning researchers in the social sciences*. London: Oxford University Press.

Hanneman, R., Riddle, M. (2005). *Introduction to social network methods.*

http://faculty.ucr.edu/~hanneman/nettext/C9_Ego_networks.html. Accessed 1 October 2012.

Harmsen, J., Guy, E., Robert, D. (2012). *A history of St Lucia*. Vieux Fort, St Lucia: Lighthouse Road.

Hellin, J. (2012). Agricultural extension, collective action and innovation systems: Lessons on network brokering from Peru and Mexico. *The Journal of Agricultural Education and Extension, 18*, 141-159.

IICA. (1989). Profiles of farmer organization in Saint Lucia. St Lucia: Inter-American Institute for Cooperation on Agriculture.

Isaac, C., Bourque, C.P.A. (2001). Ecological life zones of Saint Lucia. *Global Ecology and Biogeography, 10*, 549-566.

Isaac, W., Joseph, M., Ganpat, W., Wilson, M., Brathwaite, R. (2012). The Caribbean's windward islands banana industry: A heritage of dependency. *The Journal of Rural and Community Development, 7 (2)*, 98-117.

Krueger, R.A., Casey, M.A. (2009). *Focus groups: A practical guide for applied research.* California: Sage.

Kydd, J., Dorward, A. (2004). Implications of market and coordination failures for rural development in least developed countries. *Journal of International Development, 16* (7), 951-970.

Leeuwis, C., Aarts, N. (2011). Rethinking communication in innovation processes: Creating space for change in complex systems. *Journal of Agricultural Education and Extension, 17* (1), 21-36.

Litosseliti, L. (2003). *Using focus groups in research*. London: Continuum Intl Pub Group.

López-Marrero, T., Wisner, B. (2012). Not in the same boat: Disasters and differential vulnerability in the insular Caribbean. *Caribbean Studies 40* (2), 129-168.

Lowitt, K., Hickey, G.M., Ganpat, W., Phillip, L. (2015a). Developing communities of practice in support of resilient value chains for sustainable food security. *World Development, 74*, 363-373.

Lowitt, K., Hickey, G.M., Saint Ville, A., Raeburn, K., Thompson-Colón, T., Laszlo, S., Phillip, L.E. (2015b). Factors affecting the innovation potential of smallholder farmers in the Caribbean Community. *Regional Environmental Change, 15* (7), 1367-1377.

Maertens, A., Barrett, C.B. (2013). Measuring social networks' effects on agricultural technology adoption. *American Journal of Agricultural Economics, 95*, 353-359.

Marsden, P.V. (1990). Network data and measurement. *Annual Review of Sociology*, 435-463.

Maxwell, D., Wiebe, K. (1999). Land tenure and food security: Exploring dynamic linkages. *Development and Change, 30,* 825-849.

McGregor, D., Dodman, D., Barker, D. (2009). *Global change and Caribbean vulnerability: Environment, economy and society at risk.* Jamaica: University of the West Indies.

Mikulcak, F., Haider, J.L., Abson, D.J., Newig, J., Fischer, J. (2015). Applying a capitals approach to understand rural development traps: A case study from post-socialist Romania. *Journal of Land Use Policy, 43*, 248-258.

Monge, P.R., Contractor, N.S. (2003). *Theories of communication networks*. London: Oxford University Press.

Morgan, D.L. (1993). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3* (2), 112.

Norris, F.H., Stevens, S.P. (2007). Community resilience and the principles of mass trauma

intervention. *Psychiatry: Interpersonal and Biological Processes, 70*, 320-328.

O'Loughlin, C. (1968). *Economic and political change in the Leeward and Windward Islands*. New Haven: Yale University Press.

OAS. (1986). *Saint Lucia Natural Resources and Agricultural Development Project-Studies and Proposals for the Implementation of a Land Registration Programme.* Department for Regional Development Executive Secretariat for Economic and Social Affairs, Organisation of American States. http://www.oas.org/dsd/publications/Unit/oea36e/oea36e.pdf. Accessed 20 January 2015.

Osbahr, H., Twyman, C., Adger, W.N., Thomas, D.S. (2010). Evaluating successful livelihood adaptation to climate variability and change in southern Africa. *Ecology and Society, 15* (2).

Ostrom, E. (2000). Social capital: A fad or a fundamental concept. In: P.S. Dasgupta, I. Serageldin, (Eds.). *Social capital: A multifaceted perspective* (pp. 195-198). Washington DC: World Bank.

Pant, L.P. (2013). Critical systems of learning and innovation competence for addressing complexity in transformations to agricultural sustainability. *Agroecology and Sustainable Food Systems, 38*, 336-365.

Pelling, M., High, C. (2005). Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change, 15*, 308-319.

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security, 1* (1), 5-7.

Pinstrup-Andersen, P., Herforth, A. (2008). Food security: Achieving the potential. *Environment: Science and Policy for Sustainable Development, 50*, 48-61.

Pinstrup-Andersen, P., Pandya-Lorch, R., Rosegrant, M.W. (1999). *World food prospects: Critical issues for the early twenty-first century*. Washington DC: IFPRI.

Pinstrup-Andersen, P., Hazell, P.B.R. (1985). The impact of the Green Revolution and prospects for the future. *Food Reviews International, 1* (1), 1-25.

Prell, C. (2012). *Social network analysis: History, theory and methodology*. London: Sage.

Pretty, J. (2003). Social capital and the collective management of resources. *Science, 302* (5652), 1912-1914.

Pretty, J., Toulmin, C., Williams, S. (2011). Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability, 9* (1), 5-24.

Pretty, J., Ward, H. (2001). Social capital and the environment. *World Development, 29*, 209-227.

Rahman, H.M.T., Hickey, G.M., Sarker, S.K. (2015). Examining the role of social capital in community collective action for sustainable wetland fisheries in Bangladesh. *Wetlands, 35*, 487-499.

Rastogi, A., Thapliyal, S., Hickey, G.M. (2014). Community Action and Tiger Conservation: Assessing the Role of Social Capital. *Society and Natural Resources*, *27* (12), 1271-1287.

Rogers, E.M. (1983). *Diffusion of innovations (3rd ed.).* New York: Macmillan Publishers.

Rojas, E., Wirtshafter, R.M., Radke, J., Hosier, R. (1988). Land conservation in small developing countries: Computer assisted studies in Saint Lucia. *Ambio*, 282-288.

Rubio, M. (1997). Perverse social capital: some evidence from Colombia. *Journal of Economic Issues*, 805-816.

Sabatini, F. (2009). Social capital as social networks: A new framework for measurement and an empirical analysis of its determinants and consequences. *Journal of Socio-Economics, 38*

(3), 429-442.

Saint Ville, A., Hickey, G.M., Phillip, L. (2015). Addressing food and nutrition insecurity in the Caribbean through domestic smallholder farming system innovation: A review. *Regional Environmental Change, 15* (7), 1325-1339.

Schroeder, C., Zeller, M., Agboh-Noameshie, A.R. (2013). Women, social capital and collective action: The case of NERICA rice technology in Benin. *Quarterly Journal of International Agriculture, 52*, 329-356.

Scoones, I., Thompson, J., Cambers, J. (2009). *Farmer first revisited: Innovation for agricultural research and development*. UK: Practical Action Pub.

Scott, J. (2000). *Social network analysis: A handbook*. London: Sage.

Scott, J. (2011). Social network analysis: Developments, advances, and prospects. *Social Network Analysis and Mining, 1*, 21-26.

Sheeran, J. (2010). How to end Hunger. *The Washington Quarterly, 33*, 3-16.

Skelly, A.H., Arcury, T.A., Gesler, W.M., Cravey, A.J., Dougherty, M.C., Washburn, S.A., Nash, S. (2002). Sociospatial knowledge networks: Appraising community as place. *Research in Nursing and Health, 25*, 159-170.

Speranza, C.I. (2013). Buffer capacity: Capturing a dimension of resilience to climate change in African smallholder agriculture. *Regional Environmental Change, 13* (3), 521-535.

Timms, B. (2006). Caribbean agriculture–tourism linkages in a neoliberal world: Problems and prospects for St Lucia. *International Development Planning Review, 28*, 35-56.

Timms, B.F. (2008). Development theory and domestic agriculture in the Caribbean: Recurring crises and missed opportunities. *Caribbean Geography, 15* (2), 101.

van Deth, J.W. (2010). Participation in voluntary associations: Dark shades in a sunny world?

American Behavioral Scientist, 53, 640-656.

van Rijn, F., Bulte, E., Adekunle, A. (2012). Social capital and agricultural innovation in Sub-Saharan Africa. *Agricultural Systems, 108*, 112-122.

von Braun, J. (2009). Addressing the food crisis: Governance, market functioning, and investment in public goods. *Food Security, 1* (1), 9-15.

Weis, T. (2004). Re-Making the Case for Land Reform in Jamaica. *Social and Economic Studies*, 35-72.

Welch, B. (1994). Banana dependency: Albatross or liferaft for the Windwards. *Social and Economic Studies*, 123-149.

Wood, B.A., Blair, H.T., Gray, D.I., Kemp, P.D., Kenyon, P.R., Morris, S.T., Sewell, A.M. (2014). Agricultural science in the wild: A social network analysis of farmer knowledge Exchange. *PLOS One, 9* (8).

Wossen, T., Berger, T., Mequaninte, T., Alamirew, B. (2013). Social network effects on the adoption of sustainable natural resource management practices in Ethiopia. *International Journal of Sustainable Development and World Ecology, 20*, 477-483.

Yang, H., Klerkx, L., Leeuwis, C. (2014). Functions and limitations of farmer cooperatives as innovation intermediaries: Findings from China. *Agricultural Systems, 127*, 115-125.

Yin, R. (1994). *Case study research: Design and methods*. Thousand Oaks: Sage Publications.

Zilberman, D., Zhao, J., Heiman, A. (2012). Adoption versus adaptation, with emphasis on climate change. *Annual Review of Resource Economics, 4*, 27-53.

Table 5.1: Summary of community characteristics in Black Bay and Marquis

Community characteristics	*Black Bay*	*Marquis*
Active agricultural cooperative involved in domestic production	Yes	No
Rural community	Yes	Yes
Land ownership	Leased (owned by the government)	Owned/family land/leased (private ownership)
Land capability	Alluvial, fertile, flat	Alluvial, fertile, flat and steeply sloping
Banana production history	No	Yes
Livelihood strategies	Fruits and vegetable for the domestic market	Fruits and vegetable for the domestic market
*Number of households in community (estimated involvement of households in agriculture)	138 (50%)	212 (50%)

* Based on Enumeration Districts, Saint Lucia 2010 Population and Housing Census: Preliminary Report (2011).

Table 5.2: Demographic and farm characteristics of survey respondents

Respondent attributes	*Black Bay (n=40)*	*Marquis (n=72)*
Demographics		
Male	93%	72%
Without a partner	40%	39%
Lived in community for more than 11 years	75%	61%
Median age range	45-54 (33%)	55-64 (31%)
Completed primary school	33%	35%
Completed secondary school	43%	40%
Completed college	18%	13%
Completed university	5%	10%
Land ownership		
Land owner	13%	18%
'Family land' owner	-	40%
Leased-Government	87.5%	-
Leased-private	-	15%
Co-owner	-	8%
Share tenant	-	11%
Production/Marketing/Membership		
Less than ¾ of farmland under cultivation	59%	56%
More than ¾ of farmland under cultivation	41%	44%
Farming contributes more than 75%-100% of household income	58%	50%
Weekly farmers market –main market	32%	69%
Past involvement in banana production	30%	43%
Current involvement in banana production	2.5%	17%
Membership in cooperative/farmer group	65%	42%
Trust		
Generally trust-most people cannot be trusted	85%	70%
Community trust-'strongly agreed' and 'somewhat agreed' that "you have to be alert or someone in this community is likely to take advantage of you"	46%	64%

Table 5.3: Correlation between ego network metrics (size and ties) with innovation adoption

Independent variables	*Recent innovation*	*Past innovation*	*Innovation (combined "recent" and "past")*
"Size"	.406 (.000)	.397 (.000)	.471 (.000)
"Ties"	.491 (.000)	.404 (.000)	.481(.000)

Table 5.4: Network summary data for Black Bay and Marquis

Network characteristics	*Black Bay (40 nodes)*	*Marquis (72 nodes)*
Types of ties found between respondents	No of ties	No of ties
New farming knowledge shared	59	102
New farming knowledge received	62	107
Kinship	53	268
Support requests	33	68
Potential support	50	102
Friendship	45	64
Average degree	4.450	6.583
Density	0.114	0.093
Average distance	2.610	2.365

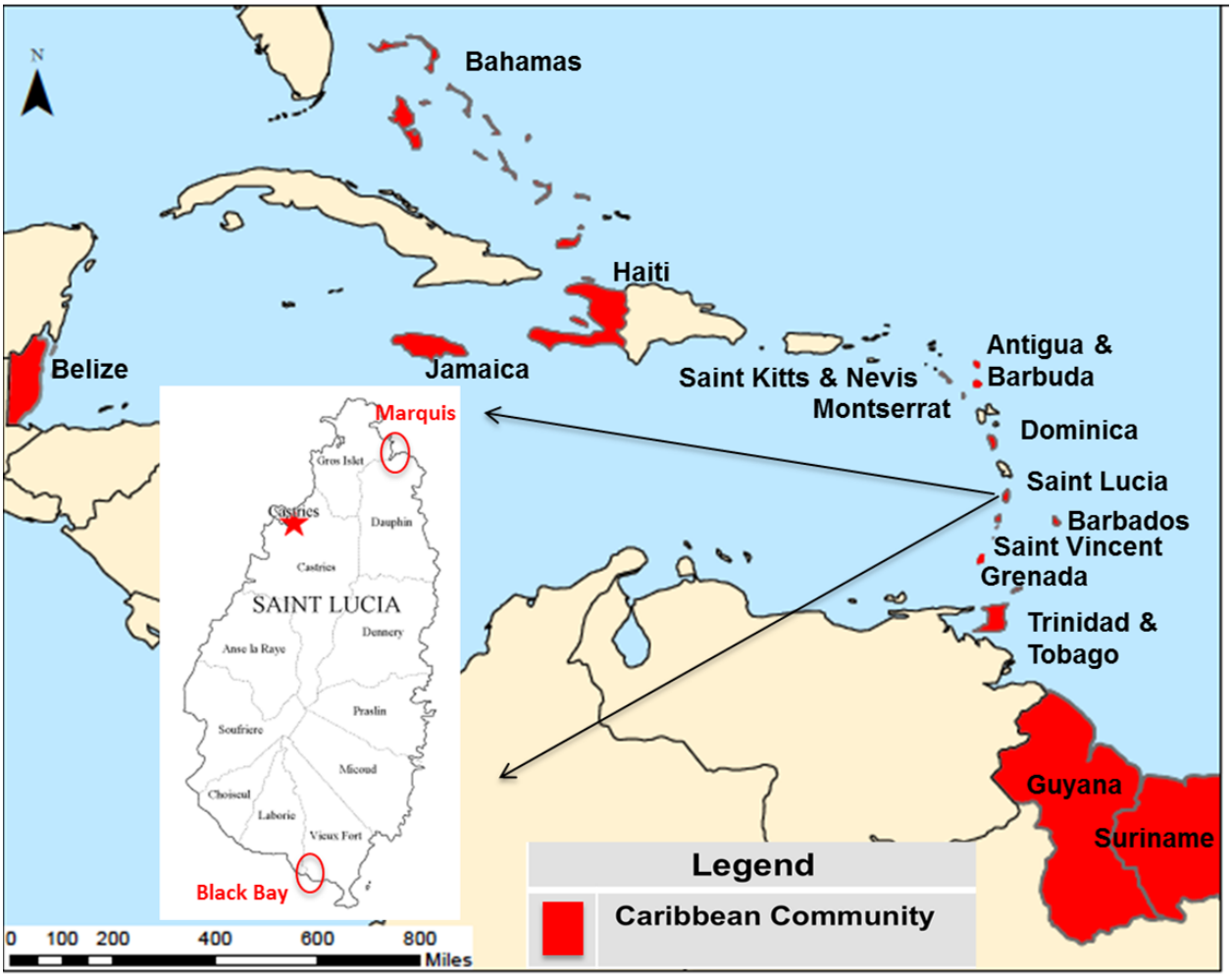


Figure 5.1: Map showing Saint Lucia in the Caribbean Archipelago and all fifteen member states of the Caribbean Community (CARICOM). An inset map of Saint Lucia shows the position of the two study sites relative to the capital city, Castries. *Data source (inset map):* http://www.d-maps.com/pays.php?num_pay=157&lang=en

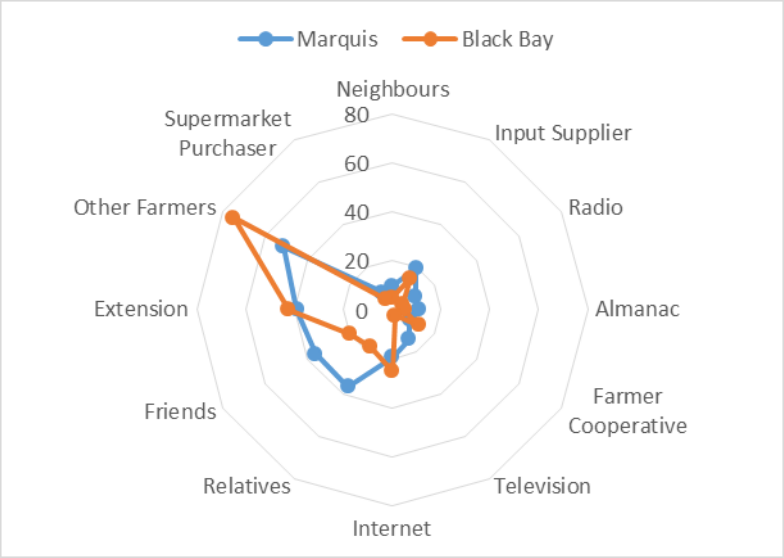
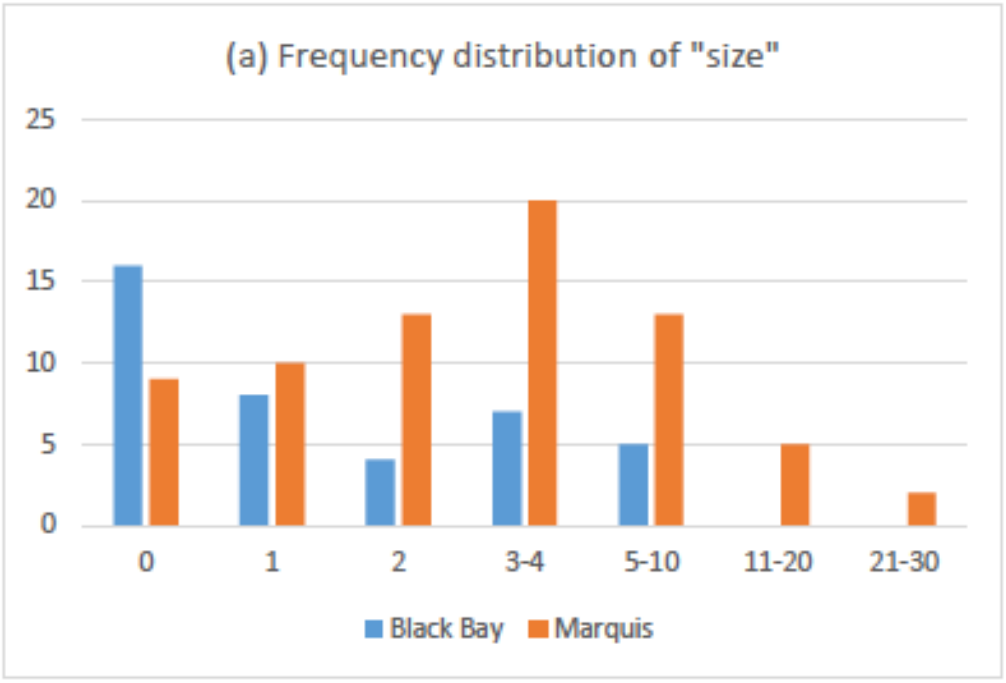
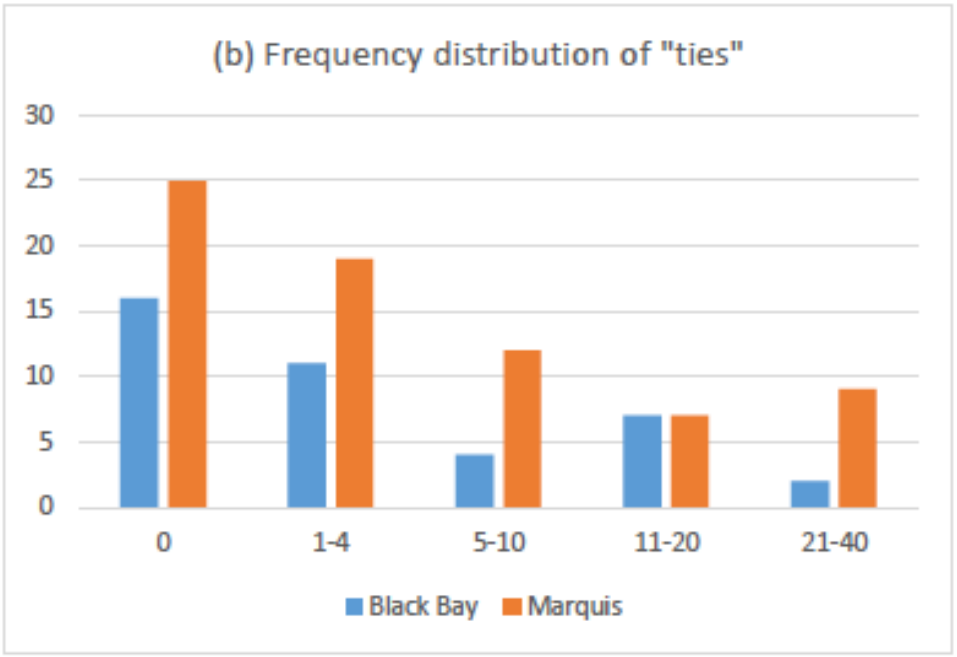


Figure 5.2: Percentage of respondents who reported receiving new agricultural knowledge from different knowledge sources showing the important role played by 'peer farmers' relative to extension officers in both communities



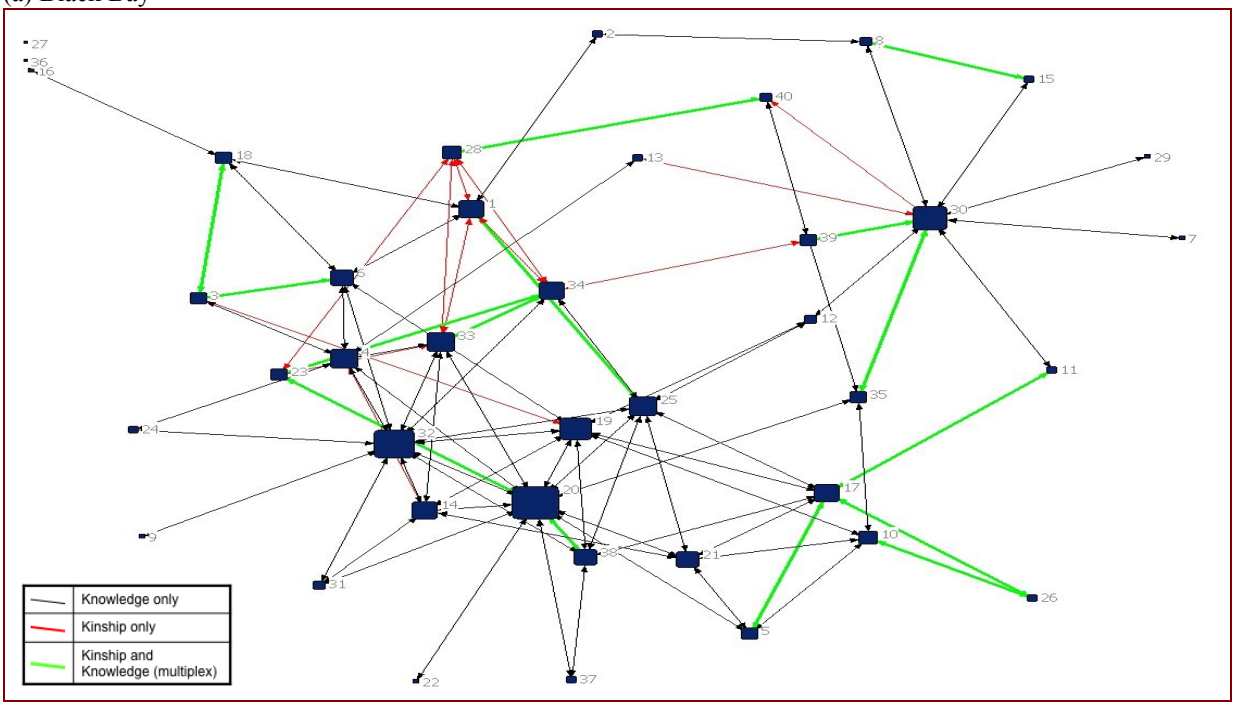
Black Bay: Mean 1.7; SD 2.090 *Marquis:* Mean 4.44; SD 5.232 *Total:* Mean 4.25; SD 4.583



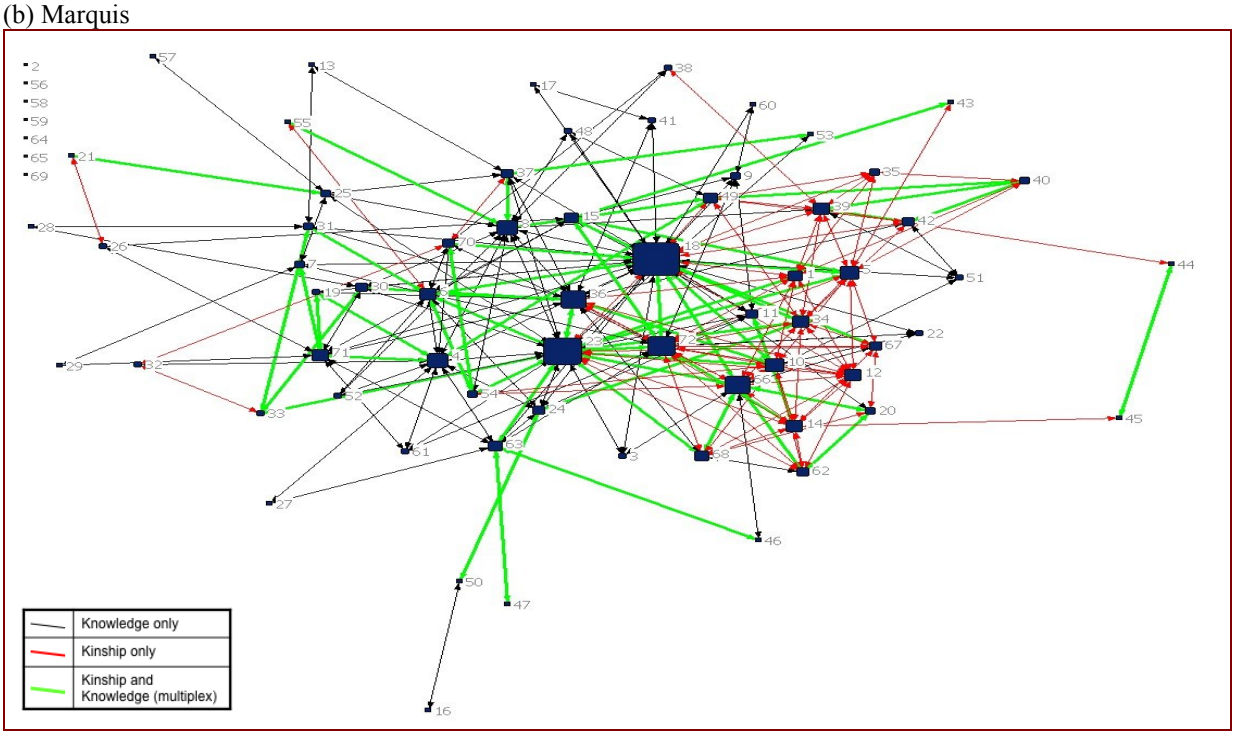
Black Bay: Mean 5.63; SD 8.539 *Marquis:* Mean 9.31; SD 16.534 *Total:* Mean 7.99; SD 14.262

Figure 5.3: Frequency distributions of (a) “size” and (b) “ties” for Black Bay and Marquis. Mean “size” and “ties” in Marquis were almost double that of Black Bay.

(a) Black Bay



(b) Marquis



*Node size relates to the number of ties to other nodes.

Figure 5.4: Depiction of multiplex relations and overlap of knowledge shared, received and kinship ties in the knowledge networks of (a) Black Bay-40 nodes; (b) Marquis-70 nodes. Node sizes were adjusted by degree centrality to highlight the key nodes in the networks.

CHAPTER 6: GENERAL CONCLUSIONS

Smallholder farmers represent 90% of CARICOM's agricultural producers and use 55% of all regional farmland (FAO 2012). Typically poor, these farmers generally produce fresh foods on farms less than 2 hectares. By growing fresh fruits and vegetables, they provide the main supply of critical micronutrients for local consumers, however low levels of organization, innovation and collective action serve to limit their consistent production (Saint Ville et al. 2015). Many of these smallholder producers operate within a historically two-tiered agriculture-food system, with the vast majority of public resources being directed primarily towards commodity-oriented export production systems. Efforts to realign domestic food production strategies and improve regional food security using technological advancements and the institutional arrangements used for export markets have proved unsuccessful. These difficulties appear to align with a persistent inability to coordinate historically disconnected policy actors, an issue common to other natural resource management challenges in CARICOM SIDS (see Watts and Wandesforde-Smith 2006).

This research explicitly identifies the problem of low adaptive capacity in the domestic agriculture-food systems of the CARICOM SIDS and argues for a different approach to foster food security policy innovation that draws primarily on social-ecological systems (SES) and agricultural innovation systems (AIS) frameworks. In so doing, it illustrates that responding to environmental change and shocks (social, political, economic and environmental) will need to build upon and expand existing social resilience in order to foster social transformation and innovation. For policymakers, donors and community-based organisations, as noted by Westley et al. (2013), this will involve the questioning of arrangements, undermining of existing rules and authority, and the need for increased interaction to foster new collaboration toward common goals (Chapter 2). One way this can be done is through the strategic development and use of

social capital, which has the potential to facilitate the absorptive, adaptive and transformative capacities of diverse smallholder farming systems. Our findings show that careful attention is needed in this area since Caribbean smallholder farmers utilize their social capital with differing outcomes (negative and positive) for coordination and innovation. With the intensification of export agriculture in Saint Lucia, rule convergence in export and domestic markets changed interactions among policy actors. This resulted in bridging and bonding social capital decreasing in the domestic production system, despite significant increases in linking social capital which limited local coordination efforts (Chapter 3). More recently, in their efforts to enhance on-farm innovation, our research showed that smallholder farmers in Saint Lucia leveraged both bridging and bonding social capital (with differing allocations of time and social effort) to increase their connection to a larger number of farmers, and improve their adaptive capacity to better: 1) facilitate knowledge exchange; 2) increase access to resources; and 3) connect to sources of support (Chapter 5). Contemporary efforts to foster food security showed slow public policy progress due to diverging stakeholder interests, historically disconnected policy actors, disaggregated smallholder farmers and critical human resources diverted to donor projects rather than the coordination of the domestic agriculture-food system, especially when contrasted against the growing importance of supermarkets in domestic agriculture and food systems (Chapter 4). Taken collectively, this research identifies numerous challenges and opportunities for food security policy innovation in the Caribbean region.

This research further reveals how the social conditions needed for domestic agriculture-food system developments have challenged food and nutrition security policy in the Caribbean context and argues for a more systemic approach to understanding the complex and adaptive interactions that occur. Such thinking will require policymakers and donors to acknowledge and emphasize

existing system complexity, feedbacks, systemic interactions and adaptive capacities (Foran et al. 2014). Here, issues of governance need to be explicitly addressed in policy development activities by examining how planned processes and institutions address the challenges and create opportunities in society (Armitage and Plummer 2010). The findings of this study support the need for further review and reimagining of existing governance arrangements in Saint Lucia to better support adaptive governance in the face of shocks and uncertainty. The challenge is how best to frame appropriate adaptive governance institutions that can enhance social capital, facilitate collaboration, support reciprocal knowledge flows, co-learning and collective action while remaining flexible enough to be adjusted to local contexts. This dissertation provides some much needed empirical evidence in support of developing more coherent, locally-specific and culturally relevant agriculture and food system-related policies in the Caribbean.

6.1 General Summary

This research was directed at understanding the role of social resilience in domestic food security policy and smallholder farmer innovation in SIDS of the Caribbean. A detailed literature review helped underline how social resilience intersects the linked public policy challenges of supporting smallholder farming systems, and food and nutrition security, amidst global environmental change.

Focusing on the case of Saint Lucia, I then outlined how the export crop intensification policy resulted in rule convergence (in domestic and export markets) and transformed governance systems in the domestic food production market post-1950. These rule changes altered resource use, incentives and interactions and served to reduce rule-based interactions between rural community members. Future food security-related policy initiatives will be susceptible to these legacies, and will require the careful development of new governance structures capable of

enabling flexibility in problem solving, developing solutions and responding to local feedback.

A national-level study of stakeholders operating in the agriculture-food system helped outline that there were missing interactions in the policy sphere and a lack of institutional infrastructure conducive to support smallholder agricultural system innovation. More specifically, I found divergent policy initiatives, an unclear understanding of food and nutrition security policy requirements; and dormant public policy in contrast to perceived supermarket dominance. Future food security policy innovation will require improved accountability and broad-based partnerships designed to promote multi-level learning, relationship building and shared understanding of problems and solutions.

It is also important to understand the extent to which local communities have the capacity to self-organize, respond to low knowledge flows and innovate. By assessing the structural social capital in two rural communities, I found that smallholders were able to utilize their networks to increase their connection to a larger number of farmers, and improve their innovation potential. Such decentralized networks may present opportunities for policy initiatives to better support adaptive governance, coordinate and enhance innovation among smallholder farmers.

6.2. Future Directions

This study confirmed the need for SIDS-specific studies to help improve policy understanding of the challenges and opportunities facing these unique social-ecological systems. While the present research examined the role of social resilience in food security-related innovation in Caribbean SIDS, it was exploratory in nature. As a result, there are a number of areas that would benefit from further research:

- A detailed discourse analysis around contemporary food and nutrition security issues in the

Caribbean would be a valuable step to help outline popular perceptions of the food and nutrition security challenges and identify opportunities to mobilize disconnected actors (farmers, consumers, health practitioners, importers) in the agriculture-food-health system.

- Further SNA in different smallholder contexts is needed to better understand the community-based social networks operating within and between communities is needed. This will help to identify the diversity and nature of support exchanged through informal networks that may help bridge disconnected communities and better link existing social capital, to the significant human and financial capital of governments, donor agencies, the private sector and NGOs.
- Future research could also experiment with different mechanisms for building adaptive institutions that foster trust and information flow through informal partnerships. Greater work in this area will likely improve the design of such pro-participation coalitions and limit resource diversion associated with perverse local political processes.
- Many of my research findings are based on case study research conducted in the small island developing state of Saint Lucia. Therefore, it would be valuable to explore similar research questions in other SIDS, both in the Caribbean and internationally, in order to further develop the emergent theory and consider the generalizability of the findings.

References

Armitage, D.R., Plummer, R. (2010). *Adaptive capacity and environmental governance.* London: Springer.

FAO. (2012). *Report on workshop of small scale farming in the Caribbean*. Latin America and the Caribbean: FAO.

Foran, T., Butler, J.R., Williams, L.J., Wanjura, W.J., Hall, A., Carter, L., Carberry, P.S. (2014). Taking complexity in food systems seriously: An interdisciplinary analysis. *World Development, 61*, 85-101.

Saint Ville, A., Hickey, G.M., Phillip, L. (2015). Addressing food and nutrition insecurity in the Caribbean through domestic smallholder farming system innovation: A review. *Regional Environmental Change*, *15* (7), 1325-1339.

Watts, N.S., Wandesforde-Smith, G. (2006). The law and policy of biodiversity conservation in the Caribbean: Cutting a Gordian knot. *Journal of International Wildlife Law and Policy, 9* (3), 209-221.

Westley, F.R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., Bodin, Ö. (2013). A theory of transformative agency in linked social-ecological systems. *Ecology and Society, 18* (3).

Annex 1: Jagdeo Initiative Nine Binding Constraints

1. Limited financing and inadequate levels of new investments
2. Deficient and uncoordinated risk management measures
3. Inadequate research and development
4. Outdated and inefficient agricultural health and food safety (AHFS) systems
5. Weak land and water distribution and management systems
6. Inadequate transportation systems, particularly for perishables
7. Weak and non-integrated market information and intelligence systems
8. Weak linkages and participation of producers in growth market segments;
9. Lack of skilled and quality human resources

Source: CARICOM, 2010