

Greenhouse Governmentality:

Discourses of Rural Development and the Negotiation of Farmer Subjectivity in Jamaica

by

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The Jamaican small farmer has long been perceived as backward and technologically inept, and has been severally intervened upon by the state and development agencies aiming to correct this perceived obsolescence. The aggressive promotion of greenhouse farming technology since the early 2000's represents one of the latest of these initiatives. In this thesis, I examine the deployment of greenhouse technology, which has been hailed by some of its promoters as a vehicle for rural development and agricultural modernization. Drawing on the work of Michel Foucault, I argue that this new greenhouse development model can be read as a form of greenhouse governmentality, aimed at cultivating a modern subjectivity defined by technological sophistication and neoliberal entrepreneurship. The discussion and arguments of the thesis are based on a qualitative analysis of a synthesis of data derived from observation, semi-structured interviews and focus group discussion collected over two summers.

My findings suggest that farmers are performing and contesting subjectivity in multiple ways. A number of greenhouse farmers have implemented greenhouses, but have rejected the notion that greenhouse farmers are a special, or new kind of farmer. Conversely, some open field farmers and other greenhouse farmers declare that greenhouse production is transformative.

These contestations about how the farmer should be seen play out in the way that the farm is assembled, and I show that farmers have to negotiate a physical terrain that mediates access to water, predisposes them to hurricanes and results in high temperatures in greenhouses based on elevation differences.

Greenhouse Governmentality:
Discourses of Rural Development and the Negotiation of Farmer Subjectivity in Jamaica

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by

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DEDICATION

This thesis is dedicated to my loving and supportive family whose love and encouragement have been a source of motivation and to the memory of my mentor C. R. Codner who had faith that
this was possible

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LIST OF ACRONYMS

CIDA	Canadian International Development Agency
FAO	Food and Agriculture Organization
IICA	Inter-American Institute for Cooperation on Agriculture
IJAP	Improving Jamaica Agricultural Productivity Project
JBI	Jamaica Bauxite Institute
JBRP	Jamaica Business Recovery Program
JGGA	Jamaica Greenhouse Growers Association
JLP	Jamaica Labor Party
JSIF	Jamaica Social Investment Fund
USAID	United States Agency for International Development
PIOJ	Planning institute of Jamaica
PNP	People's National Party
RADA	Rural Agricultural Development Authority
REDI	Rural Economic Development Initiative
MOAF	Ministry of Agriculture and Fisheries

CHAPTER 1: INTRODUCTION

1.1 Overview

Greenhouse farming is a form of protected agriculture that entails production of crops in an environment that is artificially controlled through the application of systems that regulate, among other things, temperature, levels of light, humidity and other variables that affect plant physiology. This highly intensive system of production is not new to Jamaica, but has become more widely used since the mid-2000s. Protected agriculture can be traced back as early as 1874, when a greenhouse was constructed for the production of European vegetable crops on the Cinchona Garden plantation, a tropical agriculture research station in the hills of the Blue Mountains (Ministry of Agriculture and Mining, 1995). Since that time, the use of the technology among small-scale farmers who practice traditional methods of farming has been limited, and has followed cycles of use and abandonment.

The current greenhouse industry can be set within the context of a revitalization effort following one of these phases of abandonment in the 1980s and a subsequent major hurricane in the mid-2000s. The use of greenhouses during the 1980s was characterized primarily by simple wooden structures that were used for the cultivation of tropical flowers for export. Increased competition from South American grower and disease outbreaks resulted in major declines and the use of greenhouses faded (St. Martin & Brathwaite, 2012; United States Agency for International Development [USAID], 2008). The greenhouse industry was further ravaged by the effects of Hurricane Ivan in 2004. In response to the hurricane, a greenhouse 'renaissance' was initiated by the USAID through the Jamaica Business Recovery Program (JBRP) (Charles, 2011). Since the resuscitation of the greenhouse industry by JBRP, the Jamaican government and several other aid agencies have engaged in a program of greenhouse-driven rural development.

This thrust towards greater use of greenhouse farming technology, and of broader modernization in agriculture, has been described as an agricultural revolution by state agents and by some of the early adopters of the greenhouse technology. The restructuring effort largely reflects a shift in agricultural policy towards neoliberal, high-technology forms of production. Framed within a discourse of advancement, modernity and economic efficiency, this program of greenhouse development now constitutes a whole new agricultural subsector. Greenhouses are now an important feature of farming in Jamaica and greenhouse farmers enjoy exclusive access to some niche markets and market dominance in the production of certain vegetable crops.

Motivated by an interest in this new type of farming, I initially set out to explore how farmers were making the transition from open field farming to protected farming in greenhouses. In 2013, I had an opportunity to sit in on a focus group discussion with a number of farmers who had been awarded greenhouses under a government project. The story of one group was particularly intriguing and motivated further discussions and a site visit. The group in question explained to me that they had been at loggerheads with the government agency that funded the construction of their greenhouse because they felt they had been shortchanged of what they were initially promised. The group's active attempt to negotiate the terms of their greenhouse project suggested to me that the experience of farmers with greenhouses was more complicated than I had initially thought.

The broad aim of my research, therefore, was to sketch out the scope of the greenhouse industry, and to get a sense of the challenges that greenhouse farmers (growers) were facing. I was interested in examining how greenhouse growers strategize with respect to their water management, and whether their strategies redounded to an advantage over their open field counterparts. During the course of interviews and observations with greenhouse growers,

however, it became clear that the advantages and challenges of greenhouse growers were set in the context of a complex set of relationships between growers, state actors and development practitioners. I developed an appreciation that the dynamic between the farmers and promoters of greenhouse farming and agricultural revolution was often contested and revolved around farmer subjectivity. This opened new questions about how farmers interpret their subjectivity and how they perceive and respond to attempts by greenhouse promoters to take on new subject positions.

In answering these questions, I have found it useful to draw upon Michel Foucault's analytics of knowledge-power regimes, particularly the conceptual notion of governmentality. I believe that this theoretical framework allows for an examination of the tactics of governing which have attended the promotion of greenhouse farming and the related agricultural revolution, as well as the mentality that the state envisions that greenhouse growers should subscribe to. Through an analysis of this greenhouse governmentality, my aim is to gain insight on the ways that farmers become constituted as a segment of the population that is intervened upon to promote certain specific aims of the state. I examine the nature of this dynamic between the state and farmers.

The research described below, therefore, has a number of interrelated aims. Empirically, the goal of this thesis is to provide a sketch of the greenhouse farming industry as it is today. I am interested in the way that this industry has developed and with the important features of the industry today. Theoretically, my second goal is to deploy governmentality in an examination of the ways the greenhouses have been promoted (the governmentality rationalities), how the envisioned greenhouse farmer has been described (the mentality) and how greenhouse growers negotiate the new kind of agriculture that greenhouses are envisioned to constitute (subjectivities).

1.2 Structure of the Thesis

This dissertation continues with seven interrelated chapters, a list of references and an appendix section. Chapter 2, which follows, sets the context of this thesis by offering an overview of farming in Jamaica and providing an outline of the conceptual notion of governmentality which informs the analysis of the greenhouse industry (and wider rural transformation) being pursued by state and extra-state actors. This is followed in turn by a presentation of the methodology taken in this research in chapter 3. The fourth chapter addresses the initial research interest into the nature of the greenhouse industry and provides empirical data on the status of greenhouse farming across Jamaica. I identify a number of core benefits that have been outlined as benefits to farmers, including increased efficiency and competitiveness, wealth, and rural development. I also show that the use of the technology has expanded from a fledgling subsector to a dominant one where a number of vegetable crops are concerned. This is followed in chapter 5 by an outline of the discourse within which greenhouse development is situated. I offer an interpretation of the discourse and strategies of greenhouse development as a form of governmentality. I suggest that this greenhouse governmentality aims to produce not just crops, but a subjectivity that is guided by technological modernity and economic rationality.

In chapter 6, I examine how farmers negotiate subjectivity in relation to greenhouse farming and the related modernization and neoliberalization of agriculture. I suggest that a number of subjectivities have emerged in relation to greenhouse farming and that these differences are related to the degree to which farmers subscribe and contest greenhouse governmentality. The analysis of chapter 7 is directed to the ways that the greenhouse farm is contested and is a site of contestation of power in relation to the natural environment. In this chapter, I review how greenhouse farming plays out in the farm landscape and is affected by

certain environmental realities, in particular hurricanes, temperature and water. I also read the negotiations greenhouse farm spaces as biopolitical. There is a biopower, I argue, evident in the ways that conduct of plants is carried out by greenhouse farmers. I conclude in chapter 8 with a review of the salient points of the thesis. Jamaica's greenhouse industry, I conclude, is imbricated with relations of power which I consider as governmentality. This greenhouse governmentality is ongoing and plays out in uneven and contested ways.

CHAPTER 2: FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

The plantation system of agricultural production, dependent primarily on enslaved labor, produced distinctive features in the new world. In Jamaica its effects are still evidenced in the agricultural sector, where distinctive economic, social and cultural features persist. One of the most persistent of these features is a dualistic agricultural economy, a dominant large-scale (plantation) sector directed towards export and a small-scale (peasant) sector focused on domestic markets. The small-scale agricultural sector has been the target of governmental interventions since its emergence. These interventions are all based on a perception that the small farmer is backward, inefficient and resistant to change.

In this chapter, I first provide a review of the development of the small-scale farming system in Jamaica. As we will see, the contemporary agricultural landscape provides the context for the ways in which greenhouses have been both promoted and contested as the newest phase of rural development. I then turn to suggest how the promotion of greenhouse farming can be read through the notion of governmentality, a theoretical perspective that was developed by Michel Foucault and expanded by his interlocutors. Governmentality entails specific mode of power that has been intensified in the development of the modern state and is characterized by a mixing of power with political rationality. This mode of power is concerned with the creation and maintenance of subjectivity through productive rather than coercive or violent tactics.

2.2 Agriculture in Jamaica

In 2014, agriculture accounted for an estimated 6.6% of Jamaica's gross domestic product, with an estimated 206,000 persons economically active in the sector (FAO, 2015). This marks a

growth in the sector compared to 2012, when 196,375 persons (18.1% of the labor force) were engaged in agriculture (MOAF, 2014). The importance of agriculture extends to pre-Colombian times when the island was inhabited by the Arawak. The present nature of agriculture, though, bears the vestiges of the plantation agricultural system that was established in Jamaica through successive colonization by European states.

Jamaica was at first a Spanish colony, claimed by Columbus when he first landed on the island May 5, 1494. The island remained a Spanish colony for 146 years, until 1655 when it was seized by the British. Spain formally ceded possession in 1670 by way of the Treaty of Madrid (JIS, n.d.). The signing of the treaty ended the preoccupation of the English with defense of the colony, and encouraged expansion of agricultural production on large plantations. Mintz (2010) notes that during the period of British West Indian colonization, Jamaica was the crown jewel of the U.K. because of its status as the largest of the Anglophone Caribbean and its economic profitability as a sugar colony. In Jamaica, the primary crop that was grown was sugar cane, while elsewhere in the Americas, cotton, tobacco and rice were also grown.

2.2.1 The Plantation System

British colonization marked a dramatic turning point in the agricultural landscape (Rouse, 1992; Mistry, Berardi, & McGregor, 2009; Santos, Gardner, & Allsworth-Jones, 2013). The development of the plantation entailed a productive system of extensive agricultural production fueled by slave labor, almost entirely for export to the colonizing state (Mintz, 1986, 2007). The agrarian system was a deeply divided racial and social hierarchy, a distinct social stratification that was based on skin colour and race. The laborious nature of plantation farm work and the

racial status of the slave imbued the position of farm laborer with a sense of subservice and disposability.

In Jamaica, the plantation system of agriculture, developed at great pace on the accessible coastal regions as elsewhere in the Caribbean. The coastal lands were conducive to plantation scale agriculture because they were well drained, easily tilled and had rich soils (Mintz, 2010). The expansion of sugar plantations on the region's well suited lands inscribed European colonial and economic interests into the landscape as sugar cane proved to be "the most striking example of an Old World crop that could be much more effectively cultivated in the New World" (Nunn & Qian, 2010, p. 178).

2.2.2 The Emergence of Small-Scale Farming

The development of small-scale farming among slaves was encouraged by the practices of planters in the management of the plantation system of labor and production (Craton, 1994; Mintz, 1973, 2007). Slaves were allowed the opportunity to produce their own food supplies and to sell some of the excess at Sunday Markets to reduce the responsibility of the plantation owner and to reduce the tendency towards insurrection (Mintz, 1973, 2007). Thus a prototypical peasant system developed around the 'provision grounds' system. The provision grounds were initially limited to the small plots, kitchen gardens, in the vicinity of the slave dormitories, but eventually included plots that were much further away on land that was not amenable to plantation agriculture, usually on the fringes of the plantation (Mintz, 2007; Besson, 2002). Provision grounds had become so popular that "as early as 1774, a fifth of the coin in circulation was in the hands of the slaves, much of it made by actually selling their produce to their owners" (Craton, 1994, p. 27). Thus, the peasantry was nurtured and developed on the margins of the plantation by

the slaves. In addition to these practices that were permitted by the plantation owners, small-scale production was also developed by escaped slaves. These ‘maroons’ established settlements in the rugged interior, thereby operating autonomously from the plantation system (Mintz, 1973, 2007).

Combined, the practices of small-scale production for domestic consumption by both the plantation slaves and the maroons cultivated a sense of independence from the plantation and created a distinctly separate system of agricultural production. Greater freedom was provided to the emerging peasantry upon the abolition of the slave trade and the emancipation of slaves in 1838¹ (Mistry et al., 2009; Craton, 1994). The practices related to the provisions grounds and maroon villages foreshadowed the development of an actual peasantry in Jamaica following emancipation (Craton, 1994).

2.2.3 Peasantization in Jamaica

The freedom to leave the plantation resulted in a migration of slaves to the interior of the island, as they sought to distance themselves from the plantations and the wage labor being offered by their former masters ²(Weis, 2003). Although planters tried to prevent the flight of slaves from the plantation and to make them a landless proletariat, their tactics failed, and instead of transformation “into a docile and mobile labor force”, the freed slaves gave rise to, “a thriving network of independent and relatively self-reliant local farming communities producing primarily for households and local markets” (Phillips, 2010, p. 184). The establishment of these

¹ The British Atlantic slave trade was abolished in 1807, but the actual abolition of slavery itself was not until formal emancipation in 1838 following the end of a four year period of apprenticeship which was used to mitigate the losses to planters anticipated would follow as slaves left the plantations.

² Claims that the flight of the former slaves from the plantation would ruin the colonies was used by planters to motivate colonial legislators to permit a system of indentureship, labor was recruited primarily from India

‘free villages’, settlements the former slaves developed on lands they had purchased to avoid interference by their former masters, emboldened the former slaves to plant without fear of eviction or other intimidator tactics (Paget 1964; Besson, 1999, 2002; Weis, 2003). Thus, the free villages became the central force behind the post- emancipation peasant movement. The transformation of the former slaves, “independent yeomen farmers on a grand scale was accomplished in less than a decade” and “its social and economic importance for the subsequent character of Jamaican society cannot be overestimated” (Mintz, 1958, p. 50). Weis (2004) notes that, though many of the new peasants were limited to extremely marginal lands, the emergent peasantry established itself as the backbone the developing post-slavery society. In effect, the peasantry has largely remained outside of the state’s control (Mintz, 1958; Phillips, 2010). The growing independence of the emergent peasantry attracted continued political, economic and socio-cultural opposition and aggression from the colonial powers. Peasant agriculture was characterised as inefficient, environmentally destructive and in need of structural reform. The negative perception of the peasantry led to many state programs and initiatives to modernize the growing peasantry. These state interventions began with land management schemes in the 1800s and moved to incorporate programs for productivity improvement into the mid-1900s (Henry, 1978; Aitkon-Sioux et al., 1981; IICA, 1991; Mistry et al., 2009).

2.2.4 Small-scale Farming Today

Jamaica’s agrarian economy today still bears certain relics of the struggle of peasants in the shadow of the plantation system (Weis, 2004). There remains a divide between large-scale plantation agriculture for export and the small-scale peasant production system developed by the ex-slaves. This “structural dualism in the agricultural sector” has largely “persisted into the

present” and “pervades and influences the direction of agricultural policy” (Beckford & Barker, 2007, p. 121). The last agricultural census indicated that 75% of farms were below 1 hectare (2.47 acres), but these farms account for only 14.64% of farm lands. Conversely, farms 50 hectares or more represent only 0.2% of all farms, but account for 43.37% of farm land. The average size of the farm was found to be 1.6 hectares (3.95 acres) and were primarily engaged in cultivation of short-term crops (STATIN, 2007). The dualism is also attended by the biases of the plantation era. Plantation-scale agriculture is considered modern and efficient, while small-scale farming, which bears the traditional features of the early peasantry, is regarded as inefficient (Weis, 2004; Selvaraju, 2013).

The legacy of the plantation system also persists in the market arrangements for crops. Export oriented (plantation scale) production enjoys formalized marketing arrangements and is often administered by commodity boards. On the other hand however, the marketing system for domestic produce has not changed significantly since the pre-emancipation Sunday Markets. The majority of produce is marketed informally by higglers, independent purveyors (primarily women), who collect small amounts from farmers and sell at regional markets (Katzin, 1960; Norton & Symanski, 1975; Rhiney, 2011). In addition, the convergence of global pressures for trade liberalization and the integration of global markets has increasingly exposed small-scale farmers and the domestic marketing system to competition from cheap food imports (Weis, 2003, 2004; Klak, et al., 2011).

In response, the focus of government interventions, particularly under structural adjustment programs directed by the World Bank and the International Monetary Fund, has been on economic development. This has brought the peasant model of production under the gaze of the state and its development partners across the Caribbean. Beginning in the 1980s, worsening

economic fortunes, and the austerity measures designed in response, have invigorated a focus on reforming agriculture. State projects of the past three decades or so have been focused on modernizing agriculture towards increased competitiveness as the state reduces support (Weis, 2007). In Jamaica, attempts by the government to modernize and reform agriculture have resulted in an increasingly neoliberal agrarian political economy.

The promotion of greenhouse farming in Jamaica should be set within the context of this focus on rural development. Greenhouses have been promoted as the basis of an agrarian reform meant to reduce the inefficiency of small-scale farming and increase the productivity of agriculture. The most recent promotion of greenhouse farming technology began in 2004 with the launch of the United States Agency for International Development sponsored Jamaica Business Recovery Program (JBRP). Since the resuscitation of the greenhouse industry by way of the JBRP, Jamaican government officials and agents from international aid agencies have suggested that their concern is to change the way that farmers interpret their position in relation to farming, and to promote a new agrarian reality. This discourse, and indeed the history state attempts to intervene on the peasantry, I believe, can be fruitfully interpreted through a lens of governmentality.

2.3 Governmentality

The term governmentality was introduced by Michel Foucault in the 1970s during the course of his annual lectures at the College de France, where Foucault engaged in investigations of different modes of political power. In the “Security, Territory and Population,” lectures of 1977 to 1978, Foucault defined government as an activity that attempts to ‘conduct the conduct’ of individuals. This undertaking of the “conduct of conduct” encapsulated both “governing the

self" and "governing others" (Foucault, 1982, p. 220). The management of conduct is not achieved by a single body, such as the state, but is rather enabled by a whole array of authorities that govern at different sites in relation to their respective objectives. In this sense, Foucault's notion of government extended beyond merely the administrative work of the state. His more comprehensive understanding accounts for government as "a term discussed not only in political tracts, but also in philosophical, religious, medical and pedagogic texts" (Lemke, 2002, p. 50). Thus government is concerned, broadly, with the techniques and procedures involved in government of the soul, of the family, of the state, and of one's own self (Rose, O'Malley, & Valverde, 2009). Thus, in the exercise of government, governmentality "consists in guiding the possibility of conduct and putting in order the possible outcome" (Foucault, 1982, p. 789). Governmentality renders reality amenable to specific types of intervention.

Foucault suggests that, increasingly since the Middle Ages and into the 16th century, there has been a governmentalization of the state, in which the state has increasingly attempted to conduct individuals by a number of technologies of power, strategies and techniques of guidance (Foucault, 1997; Rose et al., 2009). This approach to government extends "a view on power beyond a perspective that centers either on consensus or on violence; it links technologies of the self with technologies of domination, the constitution of the subject to the formation of the state; finally, it helps to differentiate between power and domination" (Lemke, 2002, p. 51).

Government has progressively been intensified in the modern state, as technologies of power have become intermingled with political rationality in processes of subjectivity (Foucault, 1982).

The understanding that technologies of power operate to produce subjectivity entails a view of power as essentially productive. Accordingly, power only exists when it is "put into action" for modifying the actions of others (Foucault, 1982, p. 78). In this regard, power in itself

“is not the renunciation of freedom, a transfer of rights, or a power of each and all delegated to a few;” rather, it is a manner of acting which intends to effect certain outcomes (Foucault, 2001, p. 340). Subjectivity, therefore, is produced from the operation of power in a relational and distributed way among actors who operate strategically towards specific ends (Diver, 1985; Lemke, 2002). Governmentality, Rutherford (2007) argues, is concerned with the body, not simply as the point of power’s application, but as a conduit of its propagation. Power moves in and through the individual (Foucault, 1991, 2003).

2.3.1 Biopower

According to Foucault, an important shift in power emerged in the 18th century, associated with the emergence of the population as a political problem (Foucault, 2003). The emergence of the population as a political problem rendered it something that had to be known in order that it could be engaged and conducted through ‘dividing practices’ (Foucault, 2003). This marked a distinct concern of power over the social body, or more properly in relation to the equilibrium of social life. Through the use of demographic science, it became possible to separate the normal and healthy from the abnormal or infirmed, for example. The concern evolves from one with disciplining individual bodies to one of guiding the population, by working on the vitality of the whole social body. This mode of power is distinctive in that it is not repressive, but operates in a different way; it lets life live through meticulous conducting (Ojakangas, 2005). “One might say that the ancient right to take life or let live was replaced by a power to foster life or disallow it to the point of death” (Foucault, 1990, p. 138).

2.3.2 *(Neo)liberal Governmentality*

The analysis of governmentality is concerned with identifying how certain rationalities inform certain strategies and techniques that are used in government and how the subjectivity of these technologies of power become enacted or contested by subjects (Rose et al., 2009; Oskala, 2013a; 2013b). Thus, Foucault and the many scholars that have deployed governmentality after him, have focused on the ways that populations are problematized and constituted as subjects to be known and governed. In the process of his analysis of governmental rationalities of power, Foucault himself was concerned with the development of liberalism as a political rationality that had specific objectives that were different from the reason of the state. The notion of reason of state, which emerged in the first half of the 18th century, understood government as something that should be done to strengthen the state; liberalism, on the other hand, extended the concern of governing to include the interest of society.

Rose et al., (2009) suggest that Foucault saw a distinction between the state and the society: “Liberalism [was] not so much a substantive doctrine of how to govern. Rather, it is an art of governing that arises as a critique of excessive government---a search for a technology of government that can address the recurrent complaint that authorities are governing too much” (p. 3). Advanced Liberal government (neoliberalism) entails a new formula of governing which encourages the government of the self, or care of the self, in a way that is conducive to enhancing the state, but without excessive government. This kind of government follows a rationality that sets out the boundaries of the state, demarkating the domain of state intervention, but not leaving citizens without government. Governmental techniques are shifted to create citizens who will be actively involved in their government by acting as governors of self, but simultaneously in such a

way that serves the interests of the state. In this way, governmental power operates from a distance and it is not always apparent to people that they are the subjects of conduct (Rose and Miller, 1992; Li, 2007).

2.4 Governmentality Studies

The literature on governmentality inspired by Foucault “has not produced a unified theoretical approach or perspective” (Rose-Redwood, 2006, p. 469). However, what has been common is a shared concern for the role that certain bodies of knowledge and specific political rationalities have played in governmental practices in modern states. Here, I reference some of the governmentality-inspired work in the social sciences in order to highlight the variety of scales and contexts where analytics of governmentality have proven insightful in interpreting how governmental rationalities work to constitute space and subjectivity.

Steven Robins (2002), for example, draws on an analysis of governmentality in the configuration of space in post-apartheid Cape Town. In the governing of Cape Town, Robins (2002) argues, the strategies of the apartheid state worked to render some spaces ungovernable and excluded, facilitating poverty, violence and distrust of the state. Today, the strategies of policing and securitizing the middle class work to reproduce socio-spatial exclusion in the context of an increasingly neoliberal state. According to Robins (2002), as the subjectivities of the apartheid era persist, the efforts by the state to assert “governance and spatial governmentality through the creation of safe public spaces”, in Cape Town’s townships are met by “unruly” contestations of local government and planning officials (p. 683).

Stephen Legg’s (2006) contribution to the literature on governmentality draws on an analysis of the colonial practices that were used to regulate space and subjectivity in Delhi, India.

The practices of colonial urban planners in response to overcrowding, Legg (2006) notes, entailed certain biopolitical strategies of knowing and othering the population through census and statistical data, which often included highly intimate data. Similarly deploying a Foucaultian analysis of urban governmentality in cities of the global South, Schindler (2015) explores how municipal governments work to regulate spaces and govern urban poor populations through the deployment of zoning restrictions, megaprojects, short- and long-term city renewal initiatives, and even by creating entirely new cities. Schindler (2015) concludes that the political-economic rationalities of today's cities "are giving rise to new modes of territory-based urban governance whose goal is to reconfigure the imbrication of people and things in ways that transform urban space" (p. 22).

In "harnessing itself to the 'governmentality' perspective," Lynda Herbert-Cheshire's (2000) exploration of government focuses on rural spaces and discourses of community development in Queensland, Australia. She argues that the strategies of rural community development attempt a form of governmentality informed by advanced liberalism (neoliberalism). Herbert-Cheshire (2000) reasons that the discourses at work in the rural development initiative are based on a notion of responsibility at both the community and individual level, pulling on ideas of grass roots development strategies "which mobilize the skills and resources of the local community and consequently empower it from the imposing structures of government programs" (p. 203). This allows the state to govern community development from a distance, which is masked by notions of devolution of power and empowerment (Herbert-Cheshire, 2000).

Scaling up, Wendy Larner and William Walters (2004) examine globalization as a "global governmentality" (p. 510). The theme of globalization as economic and political

“deterritorialization” entails a narrow conception of territory centered on the individual state in which “globalization presupposes (re) territorialization”, a kind of territorialization at the global level (p. 498). They suggest that “to think of globalization in this way is to place it within a genealogy of ways of imagining the world” (Larner & Walters, 2004, p. 500). This approach is taken up by Clare Newstead (2009) in her examination of regional governmental rationalities focused on the Caribbean Single Market and Economy (CSME), which is concerned with Caribbean Community regional governmentality. Newstead argues that, informed by neoliberal rationalities, the CSME when unhinged from the individual members states is implicated in constituting the region as a “smooth regional economic space”, collectively responding to the global economy (p. 164). Newstead (2009) shows how the work of the CSME to harmonize legal and economic frameworks, policy papers, statements from the Heads of Government from members states and the various regional initiatives, work to create a regional subject, an entrepreneurial subject.

Peter Ove (2013) argues for an examination of development governmentality, what he terms ‘developmentality’, to better account for the specific rationalities and strategies that inform development practice, “a way of repositioning the idea of development itself” (p. 318). Ove suggest that there is an overlap between Foucault’s conception of government and development practice, and that through developmentality the governmental rationalities of improvement which work through the international development apparatus can be made visible. Ove (2013) therefore draws attention to the ways in which development works through the “improvement as opposed to the management of individuals and populations” (p.321). Ove’s approach extends the analysis offered by others such as Tania Murray Li (2007) who described the governmental practices of state and extra-state actors in development projects in Indonesia. For Li, “the will to improve is

situated in a field of power”, in government, since “the concern of government is the well-being of the population at large” (p. 5). The continuation of the programs of development legitimated by a notion of welfare through “practices of government, calculated programs of intervention,” she concludes, have indelibly shaped “landscapes, livelihoods, and identities across the [Indonesian] archipelago” (p. 270).

In what follows, I am concerned with the governmentality of greenhouse development in Jamaica, and thus my deployment of the term follows the common thread of these works on governmentality to examine how the promotion of greenhouses, and the wider rural transformation of which it is a part, attempt to render agriculture and the farming landscape as a space for intervention. The general frame of my concern in this thesis is with the interplay between the governmental intervention into the way that farmers practice farming and the various ways in which the subjects of this intervention see themselves and negotiate this process. I intend to examine how the government agent have constituted agriculture.

In chapter four I provide an overview of some of the benefits of greenhouse farming that have been articulated by the state and in so doing provide a tentative sketch of the rationality of greenhouse governmentality. This is more fully developed in chapter five, where I deploy governmentality in a manner similar to those of Ove (2013) and Li (2007). Greenhouse governmentality in Jamaica, I argue, is a developmentalist intervention that is couched within notions of improvement and well-being. In the process I follow scholars like Nikolas Rose (1989) in suggesting that the subjectivity of greenhouse governmentality is neoliberal in character. Two additional concerns emerge from this examination. The first is to examine, following the insight of Robins (2002), the contested nature of greenhouse subjectivity in

Jamaica. This is the subject of Chapter 6. Second, in Chapter 7, my concern shifts to an analysis of governmentality as it plays out in space. This involves an attention to biopower.

2.5 Conclusion

This chapter has provided an overview of agriculture in Jamaica as well as a brief introduction to the notion of governmentality as the theoretical framework for this thesis. The historical development of farming and of farmers as subjects to be intervened upon, first as prototypical peasants during slavery and then as peasants after emancipation, is characterized by political interventions that problematized life and sought to act upon it towards specific ends. The perspective of governmentality is concerned with governmental rationalities that inform the strategies and tactics that are used in the regulation of the population, and with the ends that specific forms of governmental actions serve. Situating greenhouse development within an analytics of governmentality, I believe, will make clearer the various tactics that are at work in the deployment of discourses of development and rural transformation.

CHAPTER 3: METHODOLOGY

3.1 Introduction

In order to address the research questions I employed a qualitative methodology that drew primarily on semi-structured interviews. This chapter describes how the research was conducted and sets out a description of the study area.

3.2 Qualitative Research

Research that is concerned with descriptive, explanatory or contextual questions related to a particular phenomenon or group is most effectively conducted through empirical inquiry that is based in a qualitative approach (Ritchie, 2003). Qualitative research employs an approach which is more amenable to capturing the social, cultural, political, economic and environmental specificity of the phenomena being studied, and is well-suited for interpreting people's experiences. In this regard, qualitative research design and methodology is multi-dimensional and pluralistic as it relates to geographic thought and practice (Punch, 2005). Qualitative data is not geared towards statistical representability, but rather provides a way whereby rich in-depth data can be derived. Consequently, while the sampling method may not be statistically representative, the personal and value-laden nature of the data gathered from research participants enables the researcher to gain insights which inform a composite representation of the research topic.

It has been suggested by Lincoln and Guba (1985) that the rigor of qualitative research be measured by the extent to which it is trustworthy. This in turn depends on a study's credibility, transferability, dependability and conformability. "Credibility refers to the connection between the experiences of groups and the concepts which the social scientist uses to recreate and simplify them through interpretation" (Baxter & Eyles, 1997, p. 512). The concern of credibility

is intended to guard against the researcher assuming that there is single reality, instead of multiple realities that are subjectively constructed. Therefore the concern for credibility is intended to motivate the researcher to ensure that what is being interpreted and represented based on the data is plausible and adequately representative of the phenomena or group being researched.

Shenton (2004), as well as Rudestam and Newton (2007), note that credibility can be assured by spending adequate time with participants, using multiple avenues for documentation of their responses, and clarifying tentative interpretations with participants.

The second measure of rigor in qualitative research is transferability, which refers to “the degree to which findings fit within contexts outside the study... It is analogous - in principle at least - to the more familiar notion of generalizability or external validity” (Baxter & Eyles, 1997, p. 515). This is related to the issue of dependability, which Baxter and Eyles (1997) define as “the degree to which it is possible to deal with instability/idiosyncrasy and design induced change” (Baxter & Eyles, 1997, p. 516). Long and Johnson (2000) and Shenton (2004) advise that dependability can be increased through auditing, which adds a layer of scrutiny to the researcher’s procedures in arriving at conclusions. Auditing involves having someone else review the data to gauge the extent to which their conclusions reflect those of the researcher. The final component of rigor in qualitative research, according to Lincoln and Guba (1985), is confirmability, which refers to the “coherence of the data in relation to the findings, interpretations, and recommendations” (Bowen, 2005, p. 216). Confirmability therefore is concerned with the extent to which the researcher’s interpretation can be verified were someone else to review the same data (Baxter & Eyles, 1997; Shenton, 2004; Long and Johnson, 2000). Necessarily therefore, in qualitative research, there is a need for self-critical evaluation to identify any biases which may affect the research’s interpretations (Valentine, 2001).

In consideration of these concerns for rigor, several strategies were employed in this study. Research methods and analytical procedures were triangulated to ensure the most effective field research approach and the most accurate representation of research findings. Interviews were conducted using an interview guide and were conversational in nature to ensure that interviewees felt comfortable to respond to questions as they saw fit and could bring up topics that they felt were germane to the conversation (Dunn, 2001; Valentine 2001) (See Appendix A and B). A semi-structured approach was chosen to make the interview more conversational and flexible, so that the order of the interview could be adjusted based on the interviewee's responses and interest (Cloke, et al., 2004; Longhurst, 2010). I chose this format so that interviewees would feel more like participants and knowledge producers and not simply informants being mined for data. This was intended to have an empowering effect which would motivate interviewees to be fully engaged in the interview and to motivate them to correct me if my interpretation of their comments was incorrect (Dunn, 2001; Valentine 2001).

Further, to enhance credibility, I adopted a purposeful sampling strategy to ensure that a range of respondents were captured. I was immersed in the field for several weeks, and interviewees were selected serially over the course of the study and recruited based on the new lines of focus that emerged from the interviews and field observations. This approach ensured that focus could be placed on emergent themes. Selection of respondents continued until there was thematic saturation. The use of quotations from multiple respondents was also used to provide a triangulation of sources and to enhance the credibility of my analysis. I also took an approach of investigator triangulation, which entailed having a second researcher (my thesis advisor) present for interviews. This allowed a comparing of interpretation and results, both

during field work (by way of de-briefing sessions) and post-field work analysis and thesis preparation.

Though this research is concerned with a phenomena within a particular context and is not intended to be readily generalizable, to address concerns of transferability, the description of the methods and sources used are intended to aid other researchers with similar studies. This is also intended, along with the transcripts of the recorded interviews and field notes, to ensure dependability.

3.3 Location of the Study Area

The island of Jamaica is located in the Caribbean Sea, 90 miles (141 km) south of Cuba and 119 miles (191 km) west of Haiti, between latitudes 17° and 19°N, and longitudes 76° and 79°W and is the third largest of the Greater Antillean Islands with an area of 4,411 sq. m. (11,244 km²) (Fig. 3.1). Topography varies from narrow coastal plains to a mountainous interior, which ranges to 2256 m (7402 ft.).



Figure 3.1 Location of Study Area

Jamaica experiences a tropical marine climate moderated by the northeast trade winds. Temperature and precipitation are spatially and seasonally variable across Jamaica. Mean daily temperatures ranges between a low of 26°C in February to a high of 30°C in August. Average mean annual rainfall is ~1,981 mm. Rainfall exhibits a bi-modal pattern, peaking in October and secondarily in May. A dry period is experienced from January to March and July to September. Rainfall is highest in the northeastern regions, with the maximum concentrated over the Blue Mountains. A rain-shadow effect created by the mountainous terrain of the interior and northern coasts, results in especially dry conditions on the south coasts, particularly the Liguanea Plains and Pedro Plains.

3.4 Research Methods

This thesis can be described as a phenomenological study of greenhouse farming in Jamaica (Creswell, 2006). The analysis that follows is informed by two periods of field work, during which data were gathered primarily through semi-structured interviews with greenhouse growers (members of the Jamaica Greenhouse Growers Association [JGGA]), open field farmers, and key informants such as consultants, extension personnel and executive officers of the JGGA. Most of the data were gathered over the course of seven weeks of field research in the summer of 2014. This followed a brief field visit in the preceding summer of 2013, during which I participated in 4 interviews with open field farmers and 3 focus group sessions with 14 different groups from the parishes of Manchester and St. Elizabeth. These focus groups were convened to evaluate the experiences of groups in St. Elizabeth and Manchester who had been provided grants for rural enterprises through the Jamaica Social Investment Funds' Rural Economic Development Initiative (JSIF REDI) Notes taken from the focus groups were used to

develop a list of topics of interest that were used to frame the interview guide that was used in the substantive study.

The information derived from the 2013 field visit was used to guide field research in 2014, during which time I conducted 30 interviews with greenhouse growers and executive members of the Jamaica Greenhouse Growers Association (JGGA) across the island³ (Fig. 3.2).

Participants were purposively sampled from the membership list of the JGGA based on my desire to capture a diverse range of growers in terms of location, crops grown, size of operation, the status of the greenhouse (active or inactive) as listed on JGGA records, and gender.

Greenhouse consultants, contractors and development practitioners were recruited using snowball sampling. Interviews were conducted with growers in the parishes of Clarendon, Kingston and St. Andrew, St. Ann, St. Elizabeth, St. James and St. Mary (Appendix C). Growers were contacted using membership data obtained from the JGGA and were asked to participate.

During the recruiting calls, a brief overview of the study was provided, and interested respondents were scheduled for interviews. In the majority of cases (all but three instances), interviews took place at the respondent's house or farm and included a visit to the greenhouse.

³ The use of the designation grower as opposed to farmer is intended to allow distinction between greenhouse farmers (growers) and traditional farmers. This distinction is necessary to minimize ambiguity concerning some arguments that I make. I also use grower to reflect the JGGA's descriptor of its members

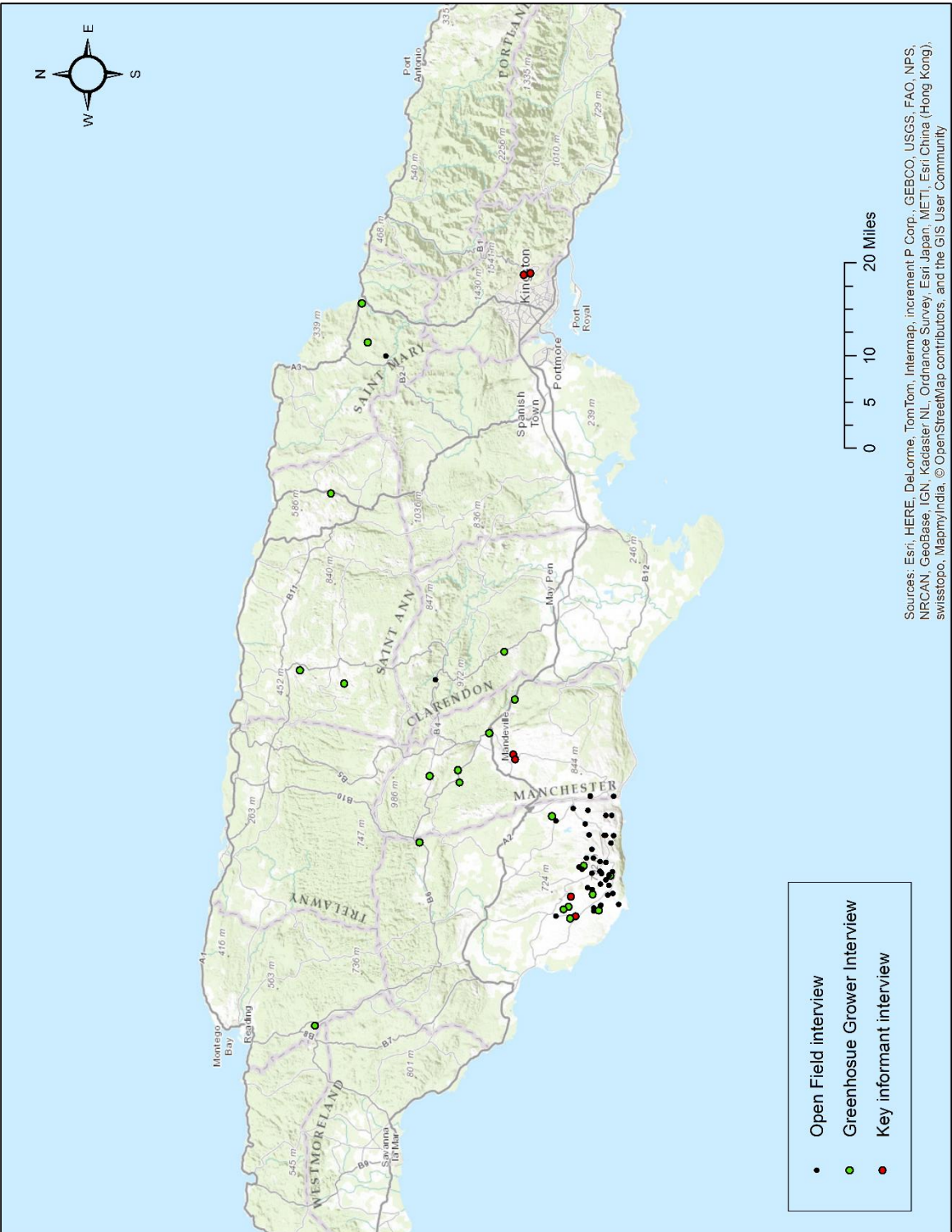


Figure 3.2 Location of Interview Sites

In addition to these interviews, I participated in 35 semi-structured interviews with small-scale farmers who operate open-field plots. My role in these interviews varied from co-interviewer to Jamaica Patois interpreter as a research assistant on a larger project titled ‘The role of vulnerability, resilience and water management strategies in the Caribbean’ within which my thesis research was undertaken. Farmers were generally identified through reconnaissance trips through the farming areas. Identified farmers were approached for participation. Some interviews were conducted at that time, while others were scheduled and conducted at a later date based on the farmer’s convenience. In some instances, subsequent interviews were conducted with farmers whose contact information was provided in interviews.

The interviews for both greenhouse growers and small-scale farmers were conducted using an interview guide to ensure consistency of the topics covered (Appendix D and E). Interviews were recorded following informed consent of the participants, with the exception of one farmer who asked that he not be recorded. Interviews were supplemented by field notes and observations as well as photographs. In order to ensure proper interpretation of some observations beyond the interview setting, and to enhance rapport with farmers and growers, I also engaged in informal conversations with community members at local venues, attended farmers meetings and assisted in farm activities.

3.5 Analysis

Interviews were transcribed and qualitatively analyzed using inductive coding (Ritchie, Spencer, & O'Connor, 2003; Creswell, 2006). According to Thomas (2006), “the primary purpose of the inductive approach is to allow research findings to emerge from the frequent, dominant, or significant themes inherent in raw data, without the restraints imposed by structured

methodologies” (p.238). As a first step in the process, I read through the transcripts and made note of the general themes within the interview. I then identified quotes that were illustrative of each theme. I repeated the procedure for all transcripts, and then looked for commonalities. When I found themes that cut across multiple transcripts, I noted these and re-read the transcripts to gauge what accounted for the commonality across interviews. I continued this process of cross referencing transcripts and revised the themes as new topics and concepts emerged across the transcripts. The process was repeated until there was theoretical saturation. The themes were then interpreted using the theoretical frame that was chosen based on literature review (Ritchie, Spencer, & O'Connor, 2003b).

Qualitative analysis was also used to analyze text from secondary sources. Documents related to greenhouse projects in Jamaica and the Caribbean were identified through searches of a variety of sources, including the two daily newspapers (the Gleaner and the Observer), the government information agency (the Jamaica Information Service [JIS]), the websites of the Ministry of Agriculture, and various aid agencies. In the cases where these texts could be accessed they were obtained and reviewed for quotes related to the themes that emerged from analysis of the interview data. In addition to the qualitative analysis, some quantitative analysis was performed using membership data supplied by the JGGA. These analyses were primarily descriptive and were used to generate figures (inclusive of maps) and tables.

3.6 Research Ethics

A research proposal for the study was submitted to the University and Medical Center Institutional Review Board (IRB) of East Carolina University for approval. The study (UMCIRB 14-000431) was approved June 9, 2014 (Appendix A). An IRB-approved consent

letter was used to outline the details of the project and to ensure free, prior and informed consent before interviewing (Appendix B). Participants were explicitly asked for permission to be recorded and for the use of images of their greenhouse and farm fields. To reassure the participants of their confidentiality, they were advised that they were not required to sign the document, which would create a record of their names. For added anonymity, interviewees are not referenced by any identifying information.

3.7 Limitations

There are a number of limitations to this research that should be acknowledged. First, the greenhouse growers who were interviewed were contacted from a list provided by the JGGA, and the study therefore considers only the experience of members of that association. The use of the JGGA contact list for selecting the sample also means that some respondents preferred to withhold certain comments which they supposed might reflect negatively on the association. I was only able to access a small number of policy documents and project reports related to greenhouse development. In some instances when documents were available, they contained only incomplete data. The experience of small scale farmers in this thesis is limited to farmers from southern regions of St. Elizabeth parish which has a distinctive open field farming system compared to the rest of Jamaica.

There is some limitation with regard to the proportion of women that were included, and therefore whose experiences are reflected in this thesis. Despite my efforts to include more females so that I could tease out some comments made by males, the study includes only a small proportion of women. Because of a longstanding perception that the typical Caribbean farmer is male, it was my intention to explore whether women felt that their experience of the greenhouse

industry was different and influenced by their gender (Ellis, 2003; Cruz-Torres & McElwee, 2012). In some instances, when contacted, women mentioned that they were preparing for trips to the market, which seems to suggest that women have a ‘double burden’ in farming.

CHARTING THE LANDSCAPE OF GREENHOUSE DEVELOPMENT

4.1 Introduction

Jamaica's greenhouse farming industry is now an important feature of agriculture in Jamaica, and greenhouses are now distinctive indicators of the agrarian modernization and transformation that is envisioned by some promoters of a new kind of farming. In this chapter, I provide an empirical overview of the features of this new subsector in agriculture. The discussion is intended to provide the context for the theoretical interpretation of the process and dynamics at play in the greenhouse industry, which is the focus of subsequent chapters.

4.2 Promotional Benefits

The greenhouse industry in Jamaica today is the outcome of a broader development project involving the state and a number of international aid agencies (Table 4.1 lists a number of the greenhouse projects that have been implemented in the course of the greenhouse projects). Before describing this project, it is worth underscoring that the various actors that have been involved in guiding the development of the greenhouse development agenda have expressed multiple and sometimes opposing interests and concerns regard the direction of the industry. The various state agencies and aid organizations that have been promoting protected agriculture do not necessarily speak with a unified voice when it comes to the promotion of rural development more generally or greenhouse agriculture specifically. Nevertheless, a consistent set of concerns can be identified within the larger greenhouse agenda, and it is these common themes that I will be focusing on in the analysis that follows. From the perspective of farmers,

the technology is promoted on the basis of a number of perceived benefits, including risk reduction, increased efficiency and competitiveness, wealth, and rural development.

Table 4.1 Major Greenhouse projects in Jamaica

Project	Sponsor	Timeline
Jamaica Business Recovery Program	USAID	2004-2005
Rural Enterprise, Agricultural and Community Tourism	USAID	2005-2006
Jamaica Farmers Access to Regional Markets project	USAID	2006
Community-Based Adaptation; Carbon Emission Reduction; Biodiversity Conservation and Alternative Livelihoods Projects	GEF-SGP (UNDP)	2009-2011
Improving Jamaica's Agricultural Productivity	CIDA	2009-2011
Strengthening Jamaica's Food Security Program	EU	2009-2011
Rural Economic Development Initiative	JSIF (GoJ)	2009-2016
Caribbean Local Economic Development Project	CIDA	2012-2018
Water Catchment and Greenhouse Cluster Project	JBI-JSIF	2014-2017

4.2.1 Risk Reduction

The earliest of the benefits to be championed by the sponsors of greenhouse technology was risk reduction, particularly reduced vulnerability to disasters and rapid recovery from shocks (Charles, 2011). In the aftermath of Hurricane Ivan, the USAID launched the Jamaica Business Recovery Program (JBRP) in December 2004. Under that project, 11 greenhouses were constructed in the parishes of Clarendon, Manchester and St. Elizabeth, parishes that were hard hit by Ivan. In addition, some 176 demonstration plots were established to showcase the technology in an effort to get farmers to return to production and increase yields expeditiously (Development Alternatives, Inc [DAI], 2008).

The USAID indicated that the use of greenhouses would reduce the risk to farmers and enable more rapid recovery of farm operations from environmental hazards. Mission Director of USAID in Jamaica, Karen Turner, outlined this benefit at the signing of the grant assistance agreement for the project. Turner noted that the greenhouses would help farmers, “recover; and ‘build back better’” in the short term and “reduce vulnerability to catastrophic damage in future hurricanes” (JIS, 2004). Statements like these are valorized in the ongoing descriptions of the project. In one subsequent report on the project, for example, it is argued that the results achieved by farmers who were granted greenhouses had validated greenhouse technology in risk reduction. Importantly, this capacity for making farmers’ life better is argued as being a compliment to the improvement of the whole state: “[Greenhouse production] represents not only the best opportunity for disaster recovery in the horticulture subsector, but also for lowering risks during future disasters” (DAI, 2008, p. 20).

Motivated by this validation, the USAID launched the Rural Enterprise, Agriculture and Community Tourism project (REACT) at the end of the JBRP in 2005. Continuing with the approach under the JBRP, the USAID provide greenhouses to farmers, noting that the use of the technology would increase the capacity to ‘react’ to environmental shocks that affect their farm enterprises (USAID, 2008). In the face of an impending hurricane, the farmer is supposed to be able to disassemble the greenhouse, pack up the farm, and reconvene it once the threat has passed. Plants are to be stored away when possible and resituated in the greenhouse as soon as the threat has passed. In this way the farm is made more adaptable and manageable in entirely new ways. It was also noted: “Even in the event of weather damage to the structure, the increase in yields and sales help offset repair costs” (DAI, 2008, p. 25).

4.2.2 Increased Productivity

The dissemination of the technology is also presented under the trappings of agricultural productivity. The controlled environment and the technological sophistication of the greenhouse is celebrated for enabling a more efficient use of resources and markedly improved yields. One of the first projects to explicitly reference this benefit as justification for the expansion of greenhouses was the aptly named ‘Improving Jamaica Agricultural Productivity project’ (IJAP). The project was funded by the Canadian International Development Agency and implemented by the Inter-American Institute for Cooperation on Agriculture (IICA) in the wake of Hurricane Dean. Dean swept across the island in 2007 destroying approximately 90% of the existing greenhouses, all but wiping out the previous manifestation of greenhouse agricultural transformation. The destruction of the greenhouses highlighted the limitations of greenhouses as an element of a risk reduction strategy, since Jamaica is frequently affected by hurricanes and other tropical systems. The launch of IJAP in 2009 therefore marked a critical juncture, signposting the beginning of the second wave of greenhouse deployment, but more importantly, a renewed commitment by international donors and the Jamaican government to a greenhouse agricultural reality. Improving on the scope of the JBRP, some 40 greenhouses were constructed as well as an agro-processing facility. The new greenhouses were presented as more sturdy and became the new standard for the industry.

There is something to be said of the inclusion of agro-processing in greenhouse projects. Farmers are not only given the means to increase their production, they are provided with the options that will ensure that the maximum value is added to it. This also points to the creation of new kinds of logistical relations in agriculture between the farm and the consumer. Taken together, greenhouses and agro-processing initiatives convey the need to adopt a more

technological form of farming and to embrace a more productive kind of livelihood. This sense can be gleaned from the statement by MOAF, which declared that greenhouse adoption would “address issues related to low production and productivity, high prices, inconsistent supply and variable quality which has characterized local vegetable production for decades” (MOAF, 2011). In line with the Ministry’s efforts at greenhouse promotion, the Rural Agricultural Development Authority (RADA), which is responsible for agricultural extension and rural development within the agricultural sector, created a Greenhouse Unit, which is tasked with monitoring the greenhouse sub-sector and providing directed extension services to greenhouse growers.

This casting of greenhouses as productive is also expressed in documents from the Inter-American Institute for Cooperation on Agriculture (IICA). Its assessment is that greenhouses provide “an opportunity to change the current landscape in the Jamaican agricultural sector to a technology driven sector with increased efficiencies and productivity” (IICA, 2009, p. 6). Throughout the implementation of the project, IICA repeatedly touted the benefits of increased productivity through improved use of farm resources. In its 2010 report on technical cooperation in Jamaica, for example, IICA indicated that the continued promotion of greenhouses would remain a part of its program of “Introducing Technology and Innovation for the Modernization of Agriculture and Rural Life” (IICA, 2010, p. 16).

4.2.3 Greater Entrepreneurship

Reduced vulnerability to hazards and increased productivity serve as supporting steps towards improving the economic fortunes of farmers and a consequent reduction in rural poverty. There is a sense among greenhouse supporters that the structures can enable farmers to be more entrepreneurial and that this enterprising attitude will generate wealth for farmers as they access new markets and increase their competitiveness. The USAID, for example, described its

greenhouse projects in Jamaica as part of a new strategy of aid intended to “reduce poverty and spur economic growth” (USAID, 2005). Farmers are encouraged to think of greenhouse operations as rural enterprises, and to operate as savvy business people who are involved in farming for profit-making and economic independence, rather than as peasants. One of the clearest expressions of this new mode of thinking is found in statements made by then-Minister of Agriculture Roger Clarke, who articulated that the technology offers farmers an opportunity to shift from subsistence farming to “profitable” farming from which they can improve their standard of living (The Jamaica Gleaner, 2007).

This notion of wealth creation as a consequence of greenhouse farming and related entrepreneurship was also mobilized by members of the subsequent administration. Prime Minister Golding notably posited that: “We want to see agriculture as an avenue to create wealth, and it can be done. But, it has to be in a new way of thinking and approach to agriculture. We are doing it with greenhouse technology” (The Jamaica Gleaner, 2010). This new way of thinking, combined with the increased productivity of farm operations, is presented to farmers as the doorway to more strategic operations that target markets that have traditionally been beyond their access. One consultant at the agriculture ministry’s Centre of Excellence for Advanced Technology in Agriculture, explained to me that, “[greenhouse farming] technology is something that is globally recognized as one that could aid in improving the ability of farmers to meet the demands of certain key markets on a more consistent basis” (Interview 28, consultant, Kingston). These key markets include the hotel and tourism industry, the agro-processing and packaging industry and high end supermarkets, primarily in high income communities in Kingston and St. Andrew.

4.2.4 Rural Development

The fourth and perhaps overarching theme attending the promulgation of GHFT is rural development. There appears to be some degree of consensus among the various donor agencies that have been involved in promoting this new model of farming that greenhouses can be used to create economic good fortune and ultimately rural development. Minister Clarke left no doubt of the Jamaican government's unanimity with the idea of greenhouse rural development. Clarke explained that the government's aims are one and the same with those of the donor agencies, affirming that donors' promotion of greenhouse, "fit nicely with the government's focus on rural development" (JIS, 2006). The state's focus is evidenced by the inclusion and prioritization of greenhouse diffusion in a number of important policy documents (Schnakenberg, 2013). For example, 'Vision 2030', the national development plan for attaining first world status, lists the dissemination of greenhouse technology among the supporting actions to be implemented in agriculture.

Sectorial plans for agriculture such as the 'Strategic Business Plan for 2013-2016' also explicitly include the promotion of the technology as a key component of rural development strategy (PIOJ, 2009; MOAF, 2013). Greenhouse sub-sector development has also been prioritized in RADA:

Greenhouse technology offers significant potential for vegetable horticulture and consequently, rural development in Jamaica. RADA is committed to a strategically planned program for development of the industry in the context of a collaborative approach among stakeholders. To this end the Authority has assigned high priority to these efforts, in support of the current thrust by the Ministry of Agriculture and Lands sector development thrust (Rural Agricultural Development Authority, n.d.),

The agriculture ministry has also partnered with the education ministry to provide training in the fabrication and operation of greenhouses at national and vocational skills training centers (JIS, 2008b, 2008c; USAID, 2008). Supporting the state's greenhouse-driven rural development

efforts, the Jamaica Social Investment Fund (JSIF) has included the provision of greenhouses as part of its programming toward poverty alleviation and community development. JSIF launched the Rural Economic Development Initiative (REDI) in 2010, and has since partnered with the Jamaica Bauxite Institute (JBI) for the creation of greenhouse clusters to promote alternative livelihoods in mining areas (The Jamaica Observer, 2014; Miller, 2014).

4.3 The Adoption of Greenhouses

Given their active promotion by the state and development agencies, it is no surprise that greenhouses are now distinctive features of Jamaica's agricultural landscape. According to the JGGA some 275 greenhouses have been registered by growers, with a total area of 2.2 million sq.ft⁴. There are now greenhouses in every parish, but there is a distinct agglomeration, with 83% of greenhouse capacity located in just 5 of Jamaica's 14 parishes (Fig. 4.1). This geography is consistent with the parishes which have traditionally led in domestic food production, notably the breadbasket region which encompasses the parishes of St. Elizabeth and Manchester.

⁴ Unless otherwise indicated, the figures and statistics presented in this chapter are based on analysis of data supplied by the JGGA based on its record as at June 30, 2013. My field work experience suggest that the JGGA data is limited by inconsistent supply of information by growers and by the currency of the data based on when it was last updated

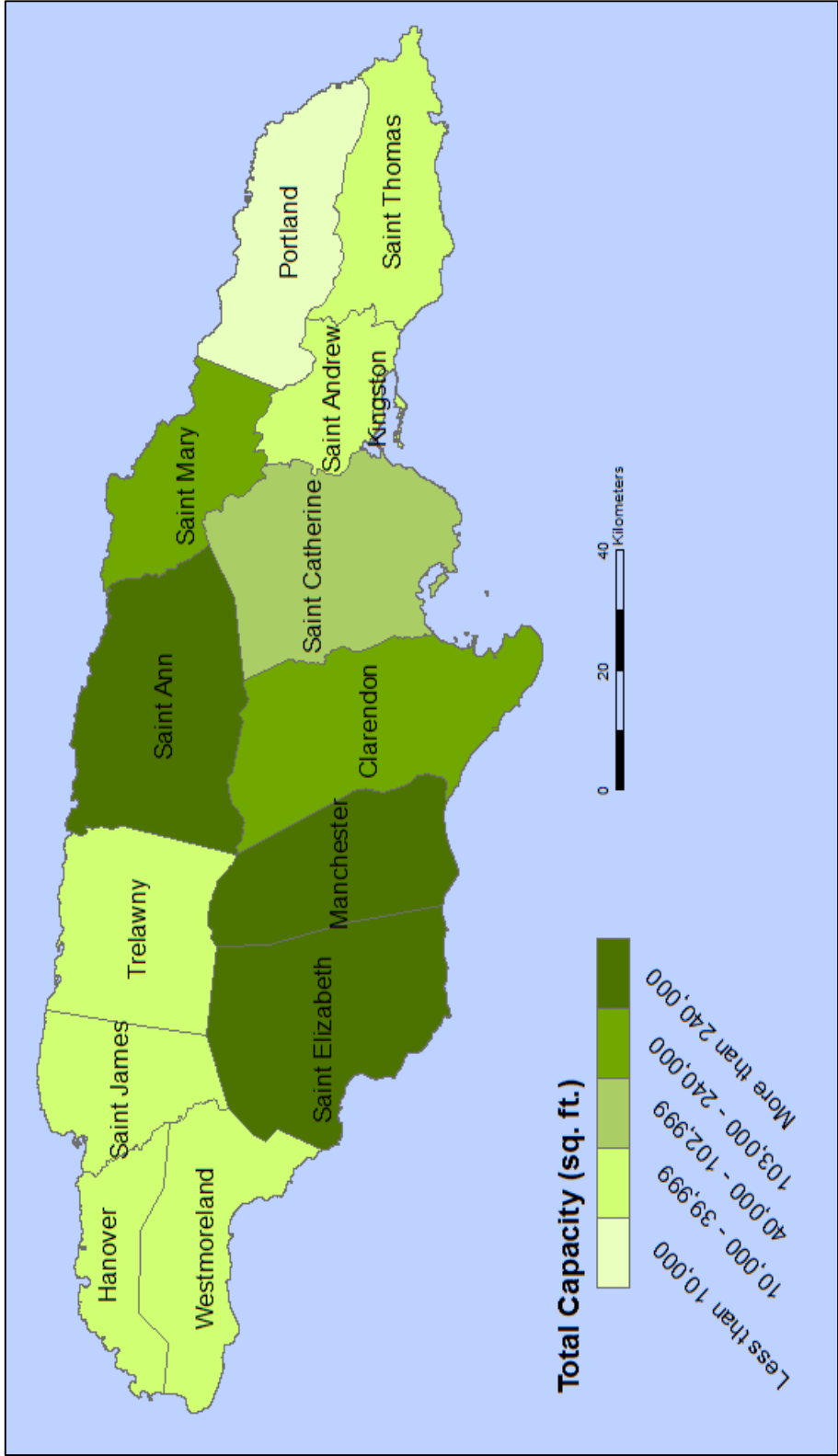


Figure 4.1 Jamaica Total Greenhouse Area (sq. ft.)

Individual farmers control 80.7% of the JGGA greenhouses across the island. Of these growers, 82% are males. Collectives, such as faith-based or community groups and farmers’ cooperatives, account for 12%, and a further 7.3% belong to research and educational institutions. The majority of greenhouses, 71%, have remained in production and have an estimated total area of 1.8 million sq. ft. of under cultivation. The majority of the greenhouses not being actively cultivated, 94%, are now idle, while the remaining structures have been abandoned or otherwise destroyed. The greenhouses not in production have primarily been abandoned. Based on interviews with growers, the primary reason for abandonment is the difficulty of maintaining production due to temperature problems and lack of access to water resources (I offer a more in-depth discussion in in Chapter 7). In other instances, particularly on the eastern section of the island, greenhouse have been destroyed or seriously damaged by hurricanes and other tropical systems. The proportion of greenhouses that have remained in active production varies across the parishes, as illustrated in Figure 4.2

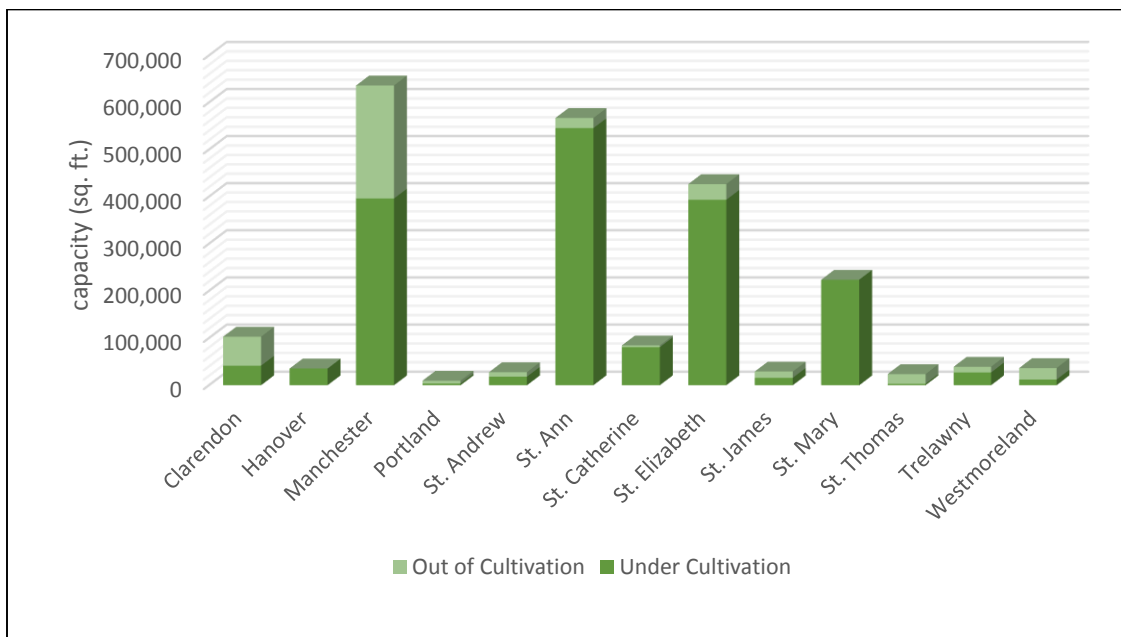


Figure 4.2 The utilization of greenhouse capacity

As shown above, only in the parishes of St. Mary and Hanover was it reported that the entire cultivatable space was being used. In the other parishes, the level of use ranges from 96% in both St. Ann and St. Catherine and 92% in St. Elizabeth down to 33% in Westmoreland and 13% in St. Thomas. Field interviews and observations suggest that these figures may not be entirely accurate. Several growers listed as active in the JGGA data, when contacted for interviews, indicated that they were not presently cultivating in their greenhouses.

Grower-supplied data to the JGGA regarding the structural material of the greenhouses was also found to be inconsistent with the observations and interviews that were carried out. The structural material for the majority, 68%, of the greenhouses across the island has not been reported to the JGGA. It is reported that 28% of the structures are metal. The available data would seem to suggest that metal structures are most common, and 17 of the greenhouse operators I spoke to had metal structures, compared to 12 who had wooden ones, or ones that were primarily wooden with some metal components. Nonetheless, growers reported to me that based on their knowledge of other growers in their communities, wooden structures were most common. Field work observations bear this out; three of the growers who I observed with metal houses indicated to me that they had in fact started out with wooden ones.

The preference for wooden structures is likely a result of the cost associated with metal ones. Wooden greenhouses cost as little as \$JM57.14 per sq. ft.⁵ If this wood is treated, costs can range between JM\$89.52 and \$166.67 per sq. ft. for local and imported lumber respectively. Metal houses, by comparison, can cost anywhere between JM\$193.10 per sq. ft if locally sourced metal is used and JM\$243.00, if the structure is imported (USAID 2008).

⁵ The average exchange rate for JM\$ to US\$ for 2008 was 72.92:1, the average rate for 2014 was 111.22: 1 according to the Bank of Jamaica (http://www.boj.org.jm/foreign_exchange/fx_rates_annual.php)

Based on my interviews with growers, there are two primary avenues of adoption. Since the Jamaica Business Recovery Program (JBRP), a number of other aid agencies and the Jamaican government have launched projects that provide farmers with funds to construct greenhouses. Farmers are generally required to submit a proposal to the agency and, if successful, applicants are then awarded grants for the construction. The process can be gleaned from the experience related to me by one grower from Beacon in St. Elizabeth:

It is a part of a project from 2009 when I when I won that award- Youth Agrobusiness Award.. each person have to write a proposal. There was supposed to be one in Clarendon, one in St. Mary one in St. Elizabeth and I wrote my proposal. It was a lot of proposal went up for that greenhouse. [Then] the lady call me and she said you are short listed in the 5. I say well if it come it come. If it don't that's it, I still working. But my dream was to have a greenhouse. Until finally she call me and say you are the successful applicant of the greenhouse through the FAO program and you need this certain amount of money to secure the investment and all of that. I said no problem. I prove to them, I gave them a business plan. (Interview 27, grower St. Elizabeth)

The other channel for farmers to acquire greenhouses is through self-financing. Of the 27 growers with whom I spoke, only 9 indicated that they had funded the cost of their greenhouses without a grant from the government or an aid agency. Among them was a farmer who explained to me that:

I bought it from the Potato Growers Association and it cost me JM\$1.2 million to buy. They have a system where they import houses from China and they sell it- the complete house you know. So what they do is that they assemble the house here. So what I do. I bought the house from them brand new and them assemble it out here. (Interview 25, grower Manchester)

Five of the farmers indicated that, though their first greenhouses were provided through grants, they were planning to expand capacity on their own, or in fact had already done so. Farmers who finance the cost of their greenhouses themselves generally favor low cost solutions. Many such grower, especially those who live near forested areas, construct their houses using sourced

wooden poles for the frame of the structure. In other instances, wood from the forest is combined with treated lumber to construct greenhouses (Fig. 4.3).



Figure 4.3 Wooden greenhouse under construction, St. Ann

4.4 The Structures

In general, the greenhouses that I encountered during my fieldwork modestly-designed structures that were covered with plastic (polyethylene or polycarbonate), with an incorporation of insect meshing in the sidewalls. The mobilization of different materials in the construction of greenhouses has produced various kinds of technological components. These assemblages are as diverse as the growers that have assembled them (McFarlane & Anderson, 2011; Müller, 2015). One grower explained it to me succinctly: “It’s how you put it together to make it work the best for you” (Interview 17, grower St. Elizabeth). This ‘putting together’ involves an arranging of various structural components and cultivation practices, such as drip irrigation lines, planting media, and farm management techniques, that enable growers to ‘make the greenhouse work’ for them.

Although greenhouses are fairly diverse, they can be classified into three main categories based on design. Hoop houses were made popular under the Jamaica Farmers Access to Regional Markets project (JA FARMS) sponsored by the USAID in 2006. These ‘high tunnel’ structures are the simplest with regard to design, featuring a covered arch just above the height of an average person. The simple design of these structures enables easy disassembling in the case of severe weather (Fig. 4.4a). Second is the ridged roof greenhouse, designed to maximize passive ventilation. There are two kinds. The double-ridge structure, which is similar to the hoop house, is differentiated by the presence of a ridge that caps the roof of the greenhouse. Running the length of the greenhouse, and covered by insect screening, the two-sided vent allows maximum dissipation of heat (Fig. 4.4b). Additionally, the higher side walls compared to the hoop house mitigates the accumulation of heat directly over the plants. The Improving Jamaica Agricultural Productivity project (IJAP) featured this design with sloped sides. The other ridged roof type, the single-ridge structure, feature an open vent on the leeward side of the greenhouse. In this design, the roof is raised to create uplift to the incoming wind, creating a gap (Fig. 4.4.c). The passage of wind over the raised section of the house creates vacuum pressure on the leeward side, which pulls heat from the gap which forms the vent (St. Martin and Brathwaite 2012). The Jamaica Social Investment Fund (JSIF) greenhouses typically utilized this design. Third, the gable roof design is one of the most popular designs because of its simplicity and is therefore more commonly a low-cost wooden structure. The roof is comprised of sloping sides that form a ridge at the center of the roof (Fig. 4.4d).



Figure 4.4. Greenhouse Designs: a. hoop-house; b. double-ridge house; c. Single ridge house; and d. gabled house

The size of these structures that have been constructed are equally varied, ranging in size from 200 sq. ft. to 171,000 sq. ft., with the most common sized greenhouse being 3,000 sq. ft. Table 1 shows that while the majority of greenhouse are 3,000 sq. ft. or less, as a percentage of the total greenhouse capacity and of the greenhouse capacity being actively cultivated, these structures account for only a small proportion of the greenhouses subsector. Conversely, 48% of total capacity and 50% of capacity under active cultivation is accounted for by just 10% of the greenhouse. This pattern would seem to suggest that the top 10% of growers in terms of greenhouse size control half of the production of greenhouse vegetable crops, a point that was supported by interviews with leading growers.

Table 4.2 Distribution of greenhouse sizes

Greenhouse Size	Frequency	% of Total Greenhouses	% Total Capacity	% Total Active Capacity
Up to 3,000	138	50	16	7
3,001 - 6,000	60	22	14	7
6,001 - 9,000	24	9	10	8
9,001 - 12,000	16	6	7	14
12,001 - 15,000	10	4	5	14
Over 15,000	27	10	48	50

4.5 Greenhouse Systems

The protection afforded by the greenhouse keeps out rainfall, which makes irrigation a fundamental concern in the production of crops. Water and nutrient management systems observed in the greenhouses were all centered on drip irrigation, which growers report provides for more efficient water use and more convenient fertilization, compared to open field production. Growers explained to me that this is an important consideration because greenhouse production uses a lot of water. Indeed, the recommended industry standard locally is a daily supply of 1-2 liters of water per plant, depending on the stage of growth (McPherson 2012; USAID 2008). Thus, the average greenhouse requires approximately 196 gallons of water per square foot.

Based on my observations of growers' strategies, water and nutrient management involves an array of concerns and components. For example, the water used for irrigation in the greenhouse has to be free of excess particulates, which can clog drip lines, and should be at a pH between 5.0 and 7.0, failing which the absorption of nutrients by the plant is hindered. Of similar importance is electrical conductivity (EC), for which a range of between 1.5 and 2.5 Micro mhos per cm of solution is recommended. Water must be monitored to prevent over watering, and the nutrient regime must be carefully controlled (St. Martin and Brathwaite 2012; USAID 2008).

The systems that growers assemble to meet these prerequisites for plant growth vary considerably with regards to specific components and level of complexity. To begin with, the network that delivers nutrients (fertilization) and water (irrigation), called the fertigation system, is assembled around water storage and various social and mechanical relations. In sourcing water for greenhouse operations, growers must tap into various networks of individuals. Securing water entails interactions and negotiations with multiple players: water truck drivers, a dispatcher at the National Irrigation Commission (NIC), other growers and sometimes even neighbors. The source of water and the nature of the relationship with these players affects the price, ease and consistency with which water can be secured.

Regardless of the source, greenhouse growers reported that an important component of the assemblage is water storage (Fig. 4.5). Harvested water is often stored in a pond or in-ground catchment (concrete tank). The use of plastic drums (black tanks) is also very common, especially when water is purchased by the truck load. Storage methods are often combined. The distribution of this stored water draws on any number of components; solar or gasoline pumps are used to deliver water under pressure, injectors and proportions are used to modulate and introduce nutrients according to specific balance. The majority of adopters with whom I spoke related to me that growers lack the technical and financial resources to implement ‘proper greenhouses’ with automated systems, and fewer still engage in most of the prescribed best practices. For example, only a handful of the growers with whom I spoke told me that they had conducted soil tests. As one of them explained: “doing the soil test and the water test and all of those...you might have the intention but you don’t have the funds to really do all or get all” and so more often than not growers “just decide that boy we can’t bother with that part there so we left out that part” (Interview 10, grower St. Mary).



Figure 4.5 Water management options: a. Water harvesting pond; b. Black tank; c. Greenhouse drip system connected to with a metered connection to government irrigation line; d. Concrete tank

Based on these decisions of what to ‘leave out’ and what to keep in the making of greenhouses and in the process of greenhouse cultivation, many growers employ only the most basic forms of technology in their greenhouses, and make minimal use of expensive components. The greenhouses in these instances were described by the growers as more or less protected plots of land that were not far removed from traditional cultivation on small-scale in the open field. One adopter of a low technology greenhouse explained to me that in addition to the cost considerations, many times farmers decide against too much technology in their greenhouse because it takes them out of their comfort zone:

Maybe [greenhouse farming] too high for me- the technology- too high for me. A man come and him teach we about [the greenhouse] farming... Him say him only teaching us that. Him can’t go up to it...show us on screen, draw it on board show us. But him say him have his greenhouse where [even] him can’t do the requirement. Him can’t go up to it. So it’s above us. No man we can’t bother- just can do what we do and we a get good result in terms of what we do. (Interview 5, grower St. Ann)

These low-cost, low-tech greenhouses thus represent the only avenue of adoption for many farmers seeking to engage in greenhouse cultivation. Such structures may be used as transitional houses, with growers integrating more components and technology over time.

4.6 Production

There are two main categories of growing media in which plants can be propagated in the greenhouse: soil culture and non-soil culture (St. Martin & Brathwaite, 2012; USAID, 2008). The former dominates in Jamaica, taking one of a number of forms. Soil culture involves the growth of plants directly in the soil within the greenhouse. This method is widely used in the low-cost, low-technology greenhouses. Plastic mulch cover is widely utilized by growers practicing soil culture (Fig. 4.6). In southern St. Elizabeth, one grower was seen utilizing grass mulch, a technique that is characteristic of open field farmers in that region, in his greenhouse. In soil culture, it is recommended that growers sanitize soil to prevent root and plant damage by nematodes and pathogenic organisms (McPherson, 2012). But only a handful of the growers with whom I spoke indicated that they had undertaken any such sanitization. Instead, the most common practice was soil culture in grow bags. In this method, instead of planting directly into the soil the plant is grown in native or non-native soil contained in individual bags. This method reduces the threat of harmful microorganisms since the soil can be easily replaced after crops.



Figure 4.6 Soil culture cultivation; left: raised beds with mulch cover, right: grow bags

Non-soil culture involves cultivation of plants in an organic substrate or water. There are two techniques: soil less non-soil substrates technique (SNST) and nutrient film technique (NFT). SNST involves propagation in materials such as coir (which is made from grounded coconut husks), perlite (aluminum silicate), vermiculite, sand, peat, or prepared mixes of these material. The plant is grown in beds or individual bags containing the respective material. NFT involves propagation in a nutrient-enriched solution that is circulated throughout the greenhouse in small channels as a thin film. The plants are grown directly in the circulating water. Depending on complexity and the degree of automation involved, NFT systems are more expensive and are not commonly reported (McPherson 2012; St. Martin and Brathwaite 2012; USAID 2008). In the course of my interviews, almost all of the growers made reference to ‘high tech’ greenhouses that they had seen, many of which were described as having NFT systems. However, only one of the growers with whom I spoke had such a system. He explained to me that he was only aware of a few other growers that were using the system because it was expensive and required full automation and a range of components:

Persons now who have gone to the other level by growing in hydroponics, you know, whether it be medium or I mean solid medium or you gonna use NFT systems, you know those persons now have taken it now to the other level... They integrating more computerized control systems. Yu EC probes, pH probes. You have humidity meters. You have tension meter checking for moisture content. You checking EC in. Checking EC root zoned. Checking EC in the leachate, you know. So you have farmers who have taken it to that level. But we have very few structures in Jamaica. (Interview 20, grower Manchester)

Aided by these systems of various degrees of technology, the greenhouse industry is now an important source for a number of vegetable crops (Fig. 4.7). The crops produced in greenhouse are intended to primarily target the hotel, high-end supermarket, and agro-food processing niche markets. In St. Ann, some greenhouse growers have established contracts with Walkerswood Caribbean Foods, and in St. Elizabeth, contracts can be undertaken with the Grace Kennedy Post Harvest and Packaging Facility at Hounslow, Southern Fruits and Food Processors Ltd., or Jamaica Exotic Flavors and Essences Company. Ltd. One farmer in St. Mary explained to me that through the St. Mary Multipurpose Coop, of which he is a member, he is able to sell most of his produce to a number of high end supermarkets in Kingston.

Access to these markets entails contract farming arrangements based on predetermined prices. These marketing arrangements are different from those traditionally used for produce distribution in local market network. Unlike small-scale open field farmers, greenhouse growers can produce with enough consistency and quality required to secure such contracts, which allows them to bypass the higglers who act as itinerant purveyors and take a cut of the price. To meet the taste preferences of its clientele, the hotel industry has traditionally relied heavily on imported food stuff, establishing few connections with domestic producers (Rhiney, 2011; 2009; Timms, 2006; Jayawardena and Ramjeesingh, 2003). In fact, Dodman and Rhiney (2008) note

that “the rapid growth in Jamaica’s tourism industry has been accompanied by a drastic decline in the agricultural sector” (p. 118).

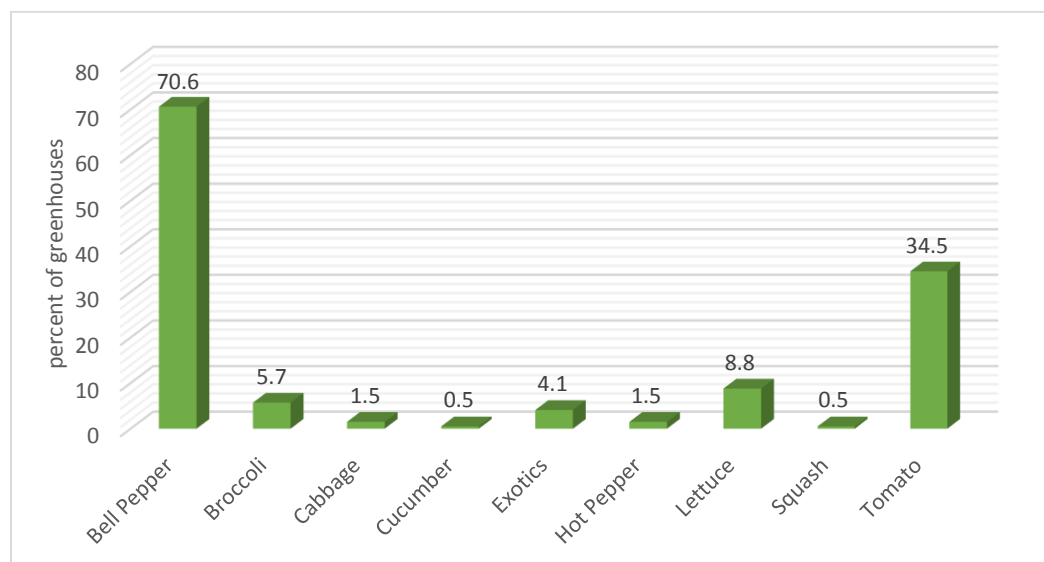


Figure 4.7 Crops grown by JGGA members

Growers explain that through greenhouse production, the industry has been able to reduce imports. This is primarily the case for colored bell (sweet) peppers, as one consultant explained to me: “Before the greenhouse development we imported all our bell peppers, because bell peppers was not in the purview of the traditional agricultural sector. The majority of hotels imported” (Interview 28, Consultant in MOAF). The controlled environment of the greenhouse allows growers the ability to maintain the peppers until they are ripened to the proper color, whereas in the open field, the peppers start deteriorating before they ripen and are therefore sold when green. As the exclusive source of local colored sweet peppers, greenhouse growers therefore enjoy unrivaled access to these niches for which they enjoy premium prices. This fact seems to be a factor in explaining why sweet pepper is the crop of choice for the majority of the JGGA’s members. Table 4.3 provides an illustration of the differences in prices (price per (JM\$)

between colored sweet pepper cultivated in the greenhouse and uncolored/green sweet pepper from open field production for the week of June 28 to July 05, 2014 (during the field work period) based on the agriculture ministry’s Agriculture Market Information System.

Table 4.3 Sweet Pepper prices for June 28 to July 05, 2014

Variety	Source	Price
Green	Open field	\$132
Green	Greenhouse	\$176
(colored) Red	Greenhouse	\$330
(colored) Yellow	Greenhouse	\$330

Greenhouse growers enjoy a similar advantage in tomato production, especially in the early and late rainy season and in dry periods when outdoor production is hampered by the weather. The cultivation of grape and cherry tomatoes, in particular, is popular among greenhouse growers because they are not widely grown by open field farmers and are also in high demand in certain segments of the local markets (Lawrence 2013). The cultivation of strawberries, ginger, ornamental flowers and herbs and spices, all classified as exotic crops, along with lettuce (iceberg and romain) and broccoli round out the list of the 5 most popular crops cultivated by greenhouse growers. All of these can be produced at a quality that opens up the possibilities of niche markets to growers.

Analysis of the data reported to the JGGA indicates that there is a concentration in the production of the 4 most common crops in just three parishes: St. Ann, St. Elizabeth and St. Mary (Fig.4.8). St. Ann growers dominate the production of sweet peppers and also have more capacity dedicated to the production of lettuce and broccoli than growers in other parishes. While not obvious from the figure, Manchester dominates the production of tomatoes.

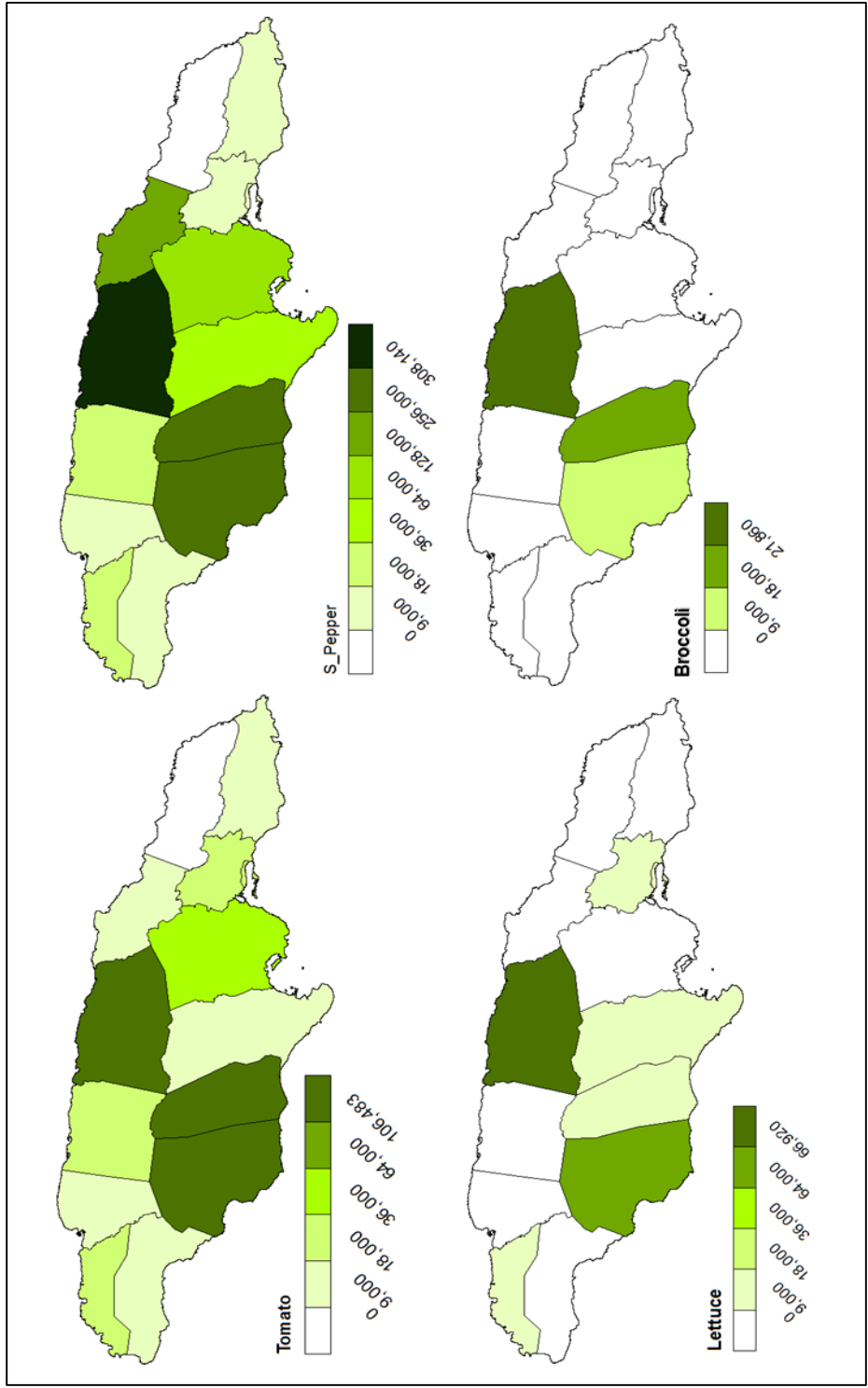


Figure 4.8 Area under cultivation for select crops⁶

⁶ Data supplied by the JGGA is aggregated with respect to capacity used for crops in some greenhouses. Calculations here assume equal space allocation in greenhouses growing multiple crops.

The geography of greenhouse production seems to be accounted for by a number of factors. In general, the parishes within which there is a concentration of greenhouses are parishes where there is an abundance of rainfall (St. Ann and St. Mary, and northern sections of Manchester), parishes that have traditionally been major producers of vegetable crops (St. Elizabeth and Manchester) and parishes that are close to the prime markets on the north and north western tourist regions (St. Ann, St. Elizabeth and St. Mary).

4.7 Conclusion

In this chapter I have sketched out a number of the important features of the greenhouse industry. In just over a decade the once fledgling industry which had all but gone dormant has been revitalized. The promotional benefits touted by state and aid agencies have had effect in creating interest in greenhouses, with dramatic effect. The industry has expanded beyond the 11 greenhouses of the JBRP to an industry with some 195 greenhouses and 1.8 million sq. ft. of greenhouses under cultivation. The greenhouse, assembled in different ways by growers, serve as markers of the progress towards agricultural modernization that the state envisions. This empirical story is important in itself because greenhouse vegetable production has emerged as such a distinct and dominant subsector in agriculture and because the production process involves components and practices that are, or at least perceived as, new to Jamaican farming.

However, I believe that this empirical story can be enriched by an application of the notion of governmentality. In the chapters that follow, I turn to governmentality because I believe an analytics of governmentality will make clearer the subtle relations of power that are at work in governmental interventions such as the sustained promotion and funding of greenhouse projects in Jamaica. I adopt such an approach because I am interested in problematizing the development

of the greenhouse industry as a component of a broader vision of rural transformation. I want to also show how the new kind of farming associated with greenhouse production entails a subjectivity with a mentality that serves the interests of the state.

CHAPTER 5: THE DISCOURSES OF RURAL TRANSFORMATION: TOWARD A THEORY OF GREENHOUSE GOVERNMENTALITY

5.1 Introduction

In this chapter I examine the discourse that has accompanied the promotion of greenhouse technology and the wider agricultural restructuring that it is a part of. Applying a Foucauldian theoretical framework, I suggest that the program of greenhouse development should be read as greenhouse governmentality concerned with the production of a new agricultural subjectivity that is based on neoliberal entrepreneurship and technological savvy. The dissemination of greenhouses, in other words, implies a new kind of farmer, who I term Homo agro-economicus, driven by a proclivity for technology and a kind of farming that is driven by a calculated pursuit of self-interest and production maximization. This new subjectivity is presented as an improvement over the subject position that traditional farmers have occupied in relation to the market and technology. My intention is to show that the promotion of greenhouses, and of wider agrarian transformation, is not a simply development program. It is greenhouse governmentality and it is attended by multiple relations of power, some of which are subtle and some of which operate in more covert ways.

5.2 Greenhouse Governmentality

Through sustained and aggressive promotion of greenhouses, the state and agencies such as the USAID and CIDA have placed this new technology firmly on the front burner of rural development in Jamaica. The propagation of greenhouses and the promotion of a new way of thinking to farmers has been defined and described in particular ways, both verbally and in texts

by state actors and development agencies. This discourse identifies increased efficiency, competitiveness, wealth, and rural improvement as key benefits of the transformation of agriculture and of farmers' ways of practicing it.

The greenhouse narrative thus promotes not just a dissemination of greenhouse structures, but a transformation of the agricultural landscape towards technological modernization and a neoliberal sensibility. Implicit in this new vision of Jamaican agriculture is an image of the traditional farmer as backward and in need to change. I argue in this chapter that the discourse of technological modernity and rural progress that supports greenhouse promotion in Jamaica is best viewed as a form of governmentality. Conceptually, the idea of governmentality calls attention to the ways in which political rationality and technologies of power have become increasingly comingled and progressively intensified in the course of the development of the modern state (Foucault, 1982). Governmentality, as Foucault put it, is concerned with "[people] in their relations, their links, their imbrication with...wealth, resources, means of subsistence" and "[people] in their relation to...customs, habits, ways of acting and thinking" (Foucault, 2007, p. 96). Characterised in this broad sense, an analysis of governmentality is concerned with the power relations and subjectivities that are related to governing. In the discourse of greenhouse development we see similar concerns. Through a calculated program of greenhouse development, a series of discursive and political interventions are being made, with the stated aims being the production of a new kind of farmer who practices an efficient type of farming.

5.2.1 Governmental Rationality for Greenhouse Farming

Greenhouse adoption, and the more general production of technological modernity in agriculture, is about the mentality of farmers in relation to their subsistence. The aim is to

cultivate new relations that govern how the farmer thinks and practices farming. The basis of this new mentality of the greenhouse subject, the modern and technologically savvy farmer, was positioned at the launch of the Jamaica Greenhouse Growers Association (JGGA). Minister Clarke asserted that, through the adoption of the technology, farmers subscribe to a truth that farming need not be “marginal and back-breaking”, but can be more “sophisticated” (The Jamaica Gleaner, 2007). It is worth noting here that, as the primary lobby group for the interests of growers, the JGGA is more or less complicit with the state in greenhouse governmentality. The organization works as an institution to mediate the governmental work of constituting agriculture as a space for ordering farmers in relation to the project of rural transformation.

The discourse of greenhouse promotion cuts across political party lines. Clarke’s successor, Christopher Tufton of the Jamaica Labor Party (JLP)⁷, presented a similar rationality for greenhouse governmentality. In his first budget presentation in the House of Parliament outlining the new administration’s plans for agriculture, Minister Tufton articulated that the early adopters of greenhouse technology had, “seen the new agriculture” (Tufton, 2008). This new agricultural reality, he explained, is characterized by “technological improvements” and market-oriented production. Tufton further asserted that his administration interpreted its election after nearly two decades in opposition as a mandate, “to encourage and facilitate the movement of this thinking into the mainstream... [T]his is the government’s vision, and the thinking that will drive our policy for the agricultural revolution which we must achieve” (Tufton, 2008)⁸. In his 2010 presentation, Tufton pointed to increases in the production of select greenhouse groups in the

⁷ The People’s National Party (PNP) administration, in which minister Clarke was appointed, lost general elections in September 2007 and was replaced by the Jamaica Labor Party (JLP)

⁸ Tufton primary training was in business, on which he lectured at the University of the West Indies campus in Jamaica (UWI, Mona). He holds a Doctorate in Business Administration from the University of Manchester (UK) and Master's degree in Marketing (Georgia State University, USA) and Management Studies (UWI, Mona). Tufton was transferred to the Industry, investment and Commerce Ministry in 2011.

previous two years in reiterating his administration's commitment to "modernize agricultural production" through the diffusion of greenhouse technology (Tufton, 2010).

The aim, as Tufton's comments make clear, is not that every single farmer, or even the majority of farmers, eventually adopt greenhouses. Rather, the state is aiming to apply discursive 'encouragement' that will 'mainstream' a kind of thinking that will result in a wider agricultural transformation. Tufton's comments mirror those of the JLP Party leader and Prime Minister Bruce Golding, who declared that, "we are saying to farmers that there are better ways to do what you are doing, [and] we have to make sure that we bring our farmers into this new framework of a scientific approach" to farming (The Jamaica Gleaner, 2010). In one of his call-in radio sessions in 2008, Golding had already expressed that this new framework was not only beneficial, but imperative for the continuation of small farming:

If farming is going to be around in 10 years' time, (then) we are going to have to improve the technology...which refers to things like greenhouses... We have to get cracking on farming. We can't expect to compete with the rest of the world if we are going (to the) bush with the same hoe and cutlass, and riding the same donkey that our grandfathers used to ride, and with the same hamper across the donkey; that is not going to cut it... We have to get serious (JIS, 2008a).

The statements of Tufton and Golding are particularly salient because of the invocation of duty and the expression of concern with the future of farming. The implication of these features of their arguments is important. First, the desire to create subjects through greenhouses is presented as the duty of the state; the implication is that, as the elected leaders, the prime minister and ministers of government have a responsibility to ensure the proper 'conduct' of the farmers in a way that will lead to the best outcome for the farmers. In Foucauldian terms, this political rationality, couched in a sense of duty, is being used as the crux for "guiding the possibility" of farmers conduct for the "putting in order" of a certain outcome (Foucault, 1982, p. 789). There

is an alignment here between the interests of farmers and those of the nation in the discursive pursuit of ‘conducting’ the ‘conduct’ of farmers (Foucault, 1982). In pointing to uncertainties 10 years into the future, the Prime Minister ascribes a pastoral ethic to this duty; he is concerned with the salvation of the farmer and sees it as his beneficent duty to ensure that farmers set about preparing themselves to remain viable. This ensemble of duty and beneficence in the name of the farmers’ security embodies the practices and tactics of the metaphorical pastor-parishioner relationship which Foucault associates with governmentality (Foucault, 1982; Ojakangas, 2005). These techniques do not act to coerce farmers into accepting neoliberal and technologically modern subjectivities. Rather, they encourage and motivate subjectivity as in the farmers’ best interest. The action of discourse is on the desires and affects of the farmer. He must be led to adoption, but this adoption must be of his own volition (Ojakangas, 2005; Golder, 2007; Siisiainen, 2015). The salvation or security that Tufton and Golding are concerned with is a secular one. This is a concern related to the worldly aims of “health, well-being (that is, sufficient wealth, standard of living), security” (Foucault, 1982, p. 784). This ideal outcome is attainable only through the guidance of government.

5.2.2 Towards Greenhouse Mentality

The statements of state officials like Clark, Tufton and Golding, indicate that as farmers set out on this path, the required path toward modern and profitable farming, they are to undergo a methodological and physiological change. In this regard, then, farmers’ progress is to be directed by their own desires. This is the kind of self-government that Foucault explains is at the core of the totalizing but simultaneously individualizing nature of governmental rationality and techniques of power. As these state actors outline it, the farmer must be guided to change his

‘thinking’ and approach to agriculture and take on one which is ‘sophisticated’, ‘serious’ and ‘scientific’. It is a shift in mentality. Government produces, or at least encourages, a new subjectivity. The infusion of technology into agriculture, on the farm and into the ways the farmer thinks and operates on the farm, is presented as a step out of the past and into the present day, and a move away from the traditional practices which are implicitly and explicitly described as antiquated and uneconomical. The onward progress of contemporary farming will henceforth be technologically directed.

Though this propensity for technology and for neoliberal conduct is to be cultivated by the farmers themselves, they are not left unattended. There are a number of governmental agents that more or less arbitrate the ways that the farmer comes to understand what is required of them. One JSIF Social Officer, for example, explained to me that his organization is keen on conveying the importance of this new approach to farmers through training programs and preparatory sessions before greenhouses that have been awarded to farmers by his organization are provided. He explained that “invariably using greenhouse technology, for us, we saw it as a step, a movement in the technological sphere...moving from open field to more scientific approach to plant production...All our training speaks to using more efficient and again, more technologically advanced methods” (Interview 30, consultant, Manchester).

One document authored by Webster McPherson, a consultant agronomist in MOAF who conducts island-wide training in greenhouse farming technology, also makes clear that the state believes that the decision to embrace the new farmer subjectivity and implement greenhouse operations must follow training and that this training should act on the farmer to ensure that the farmer possess the acumen for successful greenhouse farming. McPherson advises that the complexity and intricacies of greenhouse production and greenhouse operation requires a certain

“temperament and commitment to pay attention to details because all production operations require constant vigilance” since any deviation, “can lead to disaster” (McPherson, 2012, p. 6). He further cautions that: “It is critically important therefore for the farmer to participate in and successfully complete a training program on greenhouse production management and basic farm business management before committing to an investment in greenhouse agriculture” (McPherson, 2012, p. 6).

There are a number of important points worth noting here. First, there is the presumption that persons like McPherson are experts, possessing a body of knowledge that enables them to function in administrative capacities. From these positions they operate to relocate the narrative of transforming agriculture from a governmental project that should be read as controversial, to a technical and logical solution to a problem. One of McPherson’s colleagues with whom I spoke extolled similar virtues of the proper disposition needed when it comes to greenhouses. As he explained it to me, the absence of this thinking among ordinary farmers has attracted the kind of investors that others like himself and McPherson (2012) call for:

That with the introduction of greenhouse farming in Jamaica, which is a more technologically savvy sort of farming it has attracted a whole new breed of investors. Our investors are medical doctors, lawyers, teachers, engineers, pilots and you know persons who are up to a tertiary level. Prior to that your farmer would have been a high school dropout. A person who have a bad rap with society... these were persons who did not have the mental faculty. Would not have the mental- wouldn’t have the training to do this sort of thing... I believe that we are in the new era of agriculture (Interview 15, consultant, Manchester).

There is no ambiguity in the message: backwardness must give way to conscientiousness and outdated agricultural practices must be reformed in line with modernity. Tellingly, like McPherson, the consultant does not describe the ‘new breed’ of growers as farmers, but as

“investors”. Thus greenhouse farming is seen to be a pedagogic exercise in the production of a new farm worker (Schnakenberg, 2013).

The use of the descriptor ‘new breed’ also suggests colonial overtones which seem to reflect the matrix of state power and farmer subjectivity. Traditional farmers, like their predecessors, the slaves, are seen as commodities that can be intervened and experimented upon to produce specific and desired characteristics. Thus, greenhouse governmentality involves biopolitical tactics. The body of the farmer becomes targeted for reforms that are intended to make the farmer a productive subject who contributes to the well-being of the social body. The argument about a ‘new breed of farmer’ also suggests that the state envisions a subjectivity that is produced biopolitically, through intervening in the social biology of farming.

Through the use of greenhouse technology the farmer is able to regulate the circulations that make plants produce crops to desired specifications. “Mundane technical practices like how crops are fertilized or how bugs are controlled may not seem closely related to lofty matters like power, but there is an essential link between them” (Henke, 2008, p. 6). No matter how inconsequential certain actions might appear they involve a “primal penetration and conditioning” of the body to make it docile (DuBois, 1991, p. 20). How the seed is planted, in what medium, the fertigation regiment and the specific environmental conditions for each stage of growth all requires that the body of the adopter be (re)educated in order to operate and maintain the technology.

In the course of the training that consultants like McPherson recommend, and through the daily performance of new greenhouse practices, the farmer comes to regulate himself and gradually changes his mode of operation. The predispositions or ‘temperament’ that make the farmer a suitable greenhouse grower are honed and perfected. The transformation of agriculture

becomes embodied in the farmers' daily operation use of time. The farmer who takes on greenhouse work, and dedicates the keen attention and vigilance to the way they operate their farm, continuously accentuates the characteristics of greenhouse subjectivity and steadily constructs the ideal self. Embodied in greenhouse governmentality, then, is a renunciation of the traditional farmer identity and the rebellious spirit is has been associated with since the days of slavery. Through the embrace of the new subjectivity, the new farmers do what the early proto-peasantry would not; they accept a subject position that yeilds to, and assures the stability of, the state.

5.2.3 Homo agro-economicus

This new greenhouse mentality is profoundly coincident with modernity and a certain neoliberal ethic. This new 'breed' of farmer is a kind of Homo agro-economicus, who, like Homo economicus, is an economic subject that is "manageable" and "eminently governable" (Foucault, 2008, p. 270). This new kind of farmer, who contributes to the state's development through his own reform, is technologically predisposed, keen on detail and has a penchant for profit maximization. Officials like McPherson are at the interface of government and the governed, and are the agents through which governmental knowledge works on the farmers to bring about this subjectivity (Ong, 2007). Thus, an additional implication of McPherson's (2012) comments that I noted above, is that contrary to open field production, greenhouse farming is first and foremost a business and requires business mindedness. The adoption of greenhouse farming is an investment decision, and the greenhouse grower is an entrepreneur operating with economic rationality. In this way, the new agricultural subjectivity is fully neoliberal in character. By this I mean that the greenhouse grower is a farmer who is expected to demonstrate

fiscal discipline and economic judiciousness in his investment decisions in agriculture and act fully self-reliant apart from the state (Peck, 2001; Brenner et al., 2010; Popke and Torres, 2013). In this way, as Ong (2007) argues, “neoliberalism as a governing by calculation suggests new relations between the governing, the self-governed and the space of administration” (p.4).

In the era of globalization where the farmer is expected to compete with the rest of the world, the farmer must retire his donkey and the backward thinking it signals and become ‘serious’. He must accept personal responsibility for his future and actively pursue the best outcome through a competitive ethos. He is partner with the state in creating economic good fortune, not dependent on the state. In describing this serious farmer to me, one government consultant explained that: “I think it’s really a function of attitude and intent. I think what you looking for are people who recognize that farming is a business. Therefore the approach you take to agriculture is not different than you take to running a factory or whatever” (Interview 28, consultant, Kingston). This new approach, the serious approach, directs the farmer to make “the transition from farming the hobby, to farming the business” (Interview 28, consultant, Kingston). As the same consultant put it, “this is a competitive space, so you just have to be competitive with what you do and if you not being competitive you just gonna fall by the wayside. But eventually the efficient producer will remain” (Interview 28, consultant, Kingston). This is a kind of biopower related to the rise of the discipline of the self, entrepreneurs of self, that neoliberal subjects are expected to become (Rose, 1989). Based on the sketches of the individual that we can trace in the statement of the policy makers and development practitioners, this is new kind of actor is supposedly been absent from Jamaican farming but will emerge as greenhouse subjectivity is embraced.

The neoliberal farmer is therefore the preferred economic, political and cultural subject because performance is built around economic rationality and entrepreneurship, which contributes to the general social welfare. In the same tone, one grower explained to me a similar vision for the restructuring of the agricultural landscape. The grower related to me that the entrepreneurialism and commitment to competition being advanced by the state, to which he subscribes, is nothing but good economics, without ill-will or malice:

We want to drive the open field farmer out of the vegetable business and into root tubers. It's just that yams and potatoes will not grow- do well in a greenhouse. So why not put the yams and potatoes where they will do best and put the tomatoes and sweet potatoes where they will do best. You not making the farmer obsolete. He can do greenhouse farming if he wants... If we claim that we want to feed ourselves and reduce our imports then we must use the land for the best- the best way we can. So it takes open field farmer 4 times as much land to produce as much tomatoes as a greenhouse farmer. So he could use all of that land that he just used, [rather] wasted, producing what I produce in a quarter acre, he could use all of that acre to produce corn and sweet potatoes and yams. Making the most of that piece of land

It is the willing adoption of a greenhouse subjectivity by growers like the one above that makes the relationship between the state and the farmer a productive one; the new farmer fully embraces the neoliberal rationality and governs the self accordingly. In embracing the neoliberalization of agriculture, farmers are individualizing responsibility to act for themselves and are absolving themselves of any responsibility for others (Rose, 1989; Popke and Torres, 2013). This 'responsibilization' being pursued through greenhouse governmentality serves to increase economic independence and competitiveness among farmers and make them more governable subjects since this attitude is more amendable to the neoliberal ideology of the state (Davies, 2006).

The farmer is subjected, and indeed subjects himself, to life as a player fully implicated in the game of supply and demand. The farmer is convinced that there is really no alternative to

acting in this way. This kind of action, which requires an intensification of his production, must necessarily embrace the greenhouse technology that will facilitate a competitive performance. As one grower put it: “The way to go forward is technology and if you are in a world and you not moving with it then you will be behind” (Interview 21, grower, St. Elizabeth). The point was repeated to me by another grower from Manchester who reiterated the importance of technology in the new kind of farming with a sense of: “If we don’t have technology man we’d be dead in this day and age. I mean farming cannot be like it was 40, 50 years ago. No way... So I mean we constantly have to be dealing with technology...So without that we can’t survive right now” (Interview 13, grower Manchester). These kinds of statements suggest that growers interpret the traditional way of farming as risky and are motivated by that evaluation to take on a technological mentality which will allow them greater power to determine their future. In other words, the survival of the farmer in the forward movement of agriculture is made possible through technology.

The reflections by the growers on the necessity of technology, combined with the earlier statements on the efficient and competitive operation of agriculture by government agents and growers alike, point to an important element of greenhouse governmentality. Though not always explicit, greenhouse governmentality advances the idea that the need for a neoliberal ethos and technological modernity in agriculture is a kind of truth. There is a sense of inevitability and a certitude about these things becoming key to agricultural life. The farmer concedes his fortune to the market as the arbiter of his production outcome and must commit himself to the proper disposition of technology and economic decision making to have favorable outcomes. There is to be no intervention from the state. Following Foucault (2007), my suggestion here is that the state is functioning “neither fundamentally nor primarily” as a judge, “but as a physician” who shapes

and influences the citizen towards decisions for mutual enhancement (p. 178). As Davies (2006) observes, there is a kind of dogmatism to this process of subjectification, one that works discursively to subvert resistance; the farmer sees no alternative and therefore commits to the path that has been discursively paved. As we will see in the next chapter, however, greenhouse governmentality in Jamaica is far from inevitable, and entails a significant degree of negotiation, and even outright contestation.

5.3 Conclusion

The program of rural transformation being pursued in Jamaica through the promotion of greenhouse technology, and an associated change in the ways that farmers approach farming, should be seen as a form of governmentality. This greenhouse governmentality is concerned with the production of not only crops, but an entirely new farmer subjectivity, a special kind of farm worker who I call Homo agro-economicus. The new farmer is the ideal subject for the transformed agricultural sector because of their embrace of technology and neoliberal attitude, which the state believes advances as the desirable kind of behavior for farming today. The new subjectivity, therefore, acts on the political economy of farming, but it also targets the very soul of the farmer.

The greenhouse governmental rationality, therefore, extends the economic grid onto the social fabric of how farmers see themselves. This socialization of farmers into an economically efficient and modern form of agriculture forms the basis of an entirely new social contract between the state and the new kind of farmer. This new relationship is supposed to mitigate any risk of resistance since the farmers would be involved in governing themselves. The mentality of the new farmer works to reinforce the aims of the state without identifiable government. In the

next chapter, my analysis will show that there has been a considerable degree of contestation of greenhouse subjectivity and that as a result there are a range of farmer subjectivities, as growers have responded to governmentality in different ways.

CHAPTER 6: THE SUBJECTS OF GREENHOUSE GOVERNMENT: CONTESTING THE GREENHOUSE FARMER SUBJECTIVITY

6.1 Introduction

The ways in which farmers experience and respond to greenhouse governmentality is variable, and thus a range of different farmer subjectivities exist in relation to greenhouses and the new agricultural reality that they are supposed to signify. These differences flow from the degree to which growers embrace or diverge from the neoliberal ethos and technological focus that the state greenhouse governmentality has implied. In this chapter, I examine these intersecting and often overlapping subjectivities with respect to the use of greenhouse technology and the new mentality that farmers are exposed to.

The different subjectivities reflect the fact that the relationship between the government and the farmers is not just one of governor and governed, entailing either acceptance or rejection of the new mentality. Rather, there is an ongoing interaction between governmental agents and growers in a dynamic that is about power and also about whose knowledge matters in determining the nature of what farming is and what the farmer should become.

6.2 Conflicting Subjectivities

As described in the previous chapter, the Jamaican government and many aid agencies are interested in the production of a new farmer subject who is to inhabit a qualitatively different agrarian reality. Greenhouse farming is presented as being different because of the mentality of the greenhouse grower. It is the inculcation of this mentality, and not so much the actual implementation of greenhouses, that is of importance to the transformation of agriculture. In this

context, the actual levels of greenhouse implementation provide only a glimpse of the outcomes of governmentality⁹. This was borne out in the course of interviews, during which there were cases where farmers who had not adopted greenhouse spoke of a transformation in farming along the lines of what is being called on by the state. In other instances, farmers who had implemented greenhouses explicitly rejected the idea of a transformation in the way the farmer should be seen. These divergences, I found, were related to what growers think greenhouse technology should signify and the type of subjectivity that should accompany greenhouse use, and by extension the wider technological modernity that it heralds.

6.3 Contesting the Path to the Agricultural Transformation

The conflicting sensibilities that attend to greenhouse governmentality emerged during my research from the ways that growers discussed their subjectivity. This points to the many, and at times contradictory, understandings of what technological modernity and the neoliberalization of agriculture should look like on the ground. As Skelton and Mains (2009) note, these kinds of contradictions “cut across a range of scales”, evident event at the level of the Caribbean region as a whole, and give rise to multiple subjectivities “that are dislocated at critical moments”(p. 156). These dislocated and contradictory narratives of the farm and the farmer play out as well in the ways that a number of farmers pursue greenhouses and take up or resist greenhouse subjectivity.

In general, government has tried to cultivate an enterprising spirit among farmers and the overall sense seems to be that this entails some degree of individualism. However, greenhouse governmentality has intersected with the social and economic realities within which most

⁹ In the context of Jamaica’s 200,000 registered farmers, 275 greenhouses represents less than 1% of farmers.

farmers operate. The majority of farmers will never be able to implement greenhouses or engage in any serious technological modernization of their farms because of the costs associated with such modifications. These realizations seem to account for the promotion of collective greenhouse adoption by the state, particularly under the PNP administration. In this way the state's greenhouse governmentality has intersected with local sensibilities of agricultural cooperation and collective action. Here, greenhouse governmentality acts to govern individuals through notions of community, whereby farmers become active in their own development through the formation of, and participation in, groups (Rose, 1996; Herbert-Cheshire, 2000). Group implementation of greenhouses and the collective embrace of the greenhouse farmer subjectivity also point to important elements of governmentality, that is, its networked nature.

Governmentality features various kinds of networks, including both material assemblages and the social relations through which power circulates. These social networks enlist state agents and agencies, and are the conduits through which citizens operate to identify and act on their own desires and the desires of others in ways that can either strengthen or contest government aims. Governing therefore takes places at many sites, and is often diffused from identifiable government institutions. In other instances, the nature of these networks is such that farmers are brought into more direct kinds of interaction with governmental forces. Here the farmers are not simply implementing greenhouses autonomously on their farms; rather, the state is actively engaged in the production of the farm and in the subjectivity that greenhouse farming should entail.

6.3.1 Greenhouse Politics

Some projects, for example, require an endorsement from an extension officer or local official. In these instances, the list of beneficiaries may be biased to include supporters of a particular party in exchange for continued support. The result in such cases is often that the greenhouses are not productively used in the long run. One farmer bemoaned how: “Right now me know of a fact you know, I know people who get greenhouse through RADA and because is not their own money spend to do it, it is there like a white elephant (Interview 8, grower, St. Mary). The growers’ implication of RADA in the appropriation of greenhouses was more or less corroborated by one RADA Extension Officer with whom I spoke. The Extension Officer pointed to the directives from politicians as the basis for allocation: “Because sometimes when greenhouses come out here you know, they place it based on politics. Right. So [the politicians] don’t find the most suitable area but if this man have some money or things like that, maybe [the politician] decide to give that man, and when you look you find a houses of grass” (Interview 31, Extension Officer, Manchester). Of the growers I spoke with, one indicated that her greenhouse was provided because of political clientelism. She explained that, rather than being given the greenhouse to ensure patronage of a political party, her Member of Parliament (MP) ensured that she received a greenhouse to cover his biased allocation of other greenhouses to his party’s supporters:

Yes the decision was made through the MP. I was a farmer, not all the persons who got greenhouses were farmers. I suppose I met the criteria. Mine, I heard it was political because I got a call to find out what party. But mine, I was on the other side for that MP. I was not one of his. But I was a farmer. So the actual ground breaking ceremony was held on my plot (Interview 23, grower, St. Elizabeth).

This kind of clientelism again captures the networked pattern of the relations of power that I mentioned earlier. The relationship between the state and citizens comprises a whole array of

networks through which the relations of power work and governmental rationality is inscribed. David Scott (2003) describes this kind of clientelism as a “rhizomatic” set of networks, or what can be seen as, “networks of unequal but reciprocal flows between the differently situated subject-positions of client, broker and patron” (p. 18). Moreover, Scott (2003) suggests that “clientelism in effect defines the rational principle of government in Jamaica, the principle of calculation by which certain ends of conduct are aimed at” (p. 19).

More commonly, groups of farmers do not need political sponsorship or patronage, but they do need to prove that they are registered as groups in order to benefit from projects. Section 3.1.1 of the REDI Project Operations Manual Supplement for example, states that groups applying for greenhouses as part of the rural enterprise component of the project,

[Groups] must be legally registered as Cooperatives, Benevolent Societies or Friendly Societies. Groups do not have to be registered before applying however once they have been provisionally selected rural enterprises will be required to be registered as Cooperatives, Benevolent Societies or Friendly Societies before final authorization of funding. Alternatively, enterprises may associate with or be sponsored by a legally registered community organization. (JSIF, 2009, p. 12)

The access to grant funding reduces the dependence on individual state actors like politicians and RADA Extension Officers. Importantly, however, this channel to the greenhouse also serves to reinforce the neoliberal nature of the subjectivity that the farmers are encouraged to take up. In such circumstances, access to a greenhouse requires submission by the group of a competitively written grant proposal. These proposals must, among other things, feature clear plans for how the greenhouse will function as a business and the steps that groups will take to ensure the profitability of the operation. Grant submission might require that documents be typed or electronically submitted, bringing farmers into contact with computers, and with technology.

However, notwithstanding the various elements of the neoliberal and technological subjectivity that farmers begin to cultivate just by seeking grants, and the business mindedness that a successful group must demonstrate to be awarded a grant, many growers are opposed to grant-supported greenhouses. The basis of this opposition is that this undermines the competitive nature of greenhouse farming. One grower who shared such a mindset expressed to me that the farmers who were being 'given' greenhouses were backward and reluctant to change and as such would not be transformed into the new kind of farmer that greenhouse agriculture is supposed to cultivate. The general argument by the growers who oppose grant supported greenhouses was that the traditional farmer, the 'poor' and 'backward' farmer, would eventually abandon the greenhouse and would not cultivate the mentality of modern farmers that is prescribed by the state. This is captured in the comments of one grower who noted that:

You have aid agencies that give greenhouses to groups. You have 20 to 30 men, or people in that group. You give them a 3,000 square foot house. When you realize and you look around, you get the house and the aid agency gone. How can one 3,000 square foot house feed 20 to 30 people? They have their children to go to school now, and they have their needs right now... So a lot of them [abandoned greenhouses] all over the island are these groups. They were given to a group and they abandon it because it don't make any sense. It don't make any sense. These [aid agency] people come around too and I talk to them and I say how on earth can 20 people gonna survive off this greenhouse. But the project say is only a group can get it, you can't give one man. (Interview 16, grower, St. Elizabeth)

The comment by this grower was essentially reiterated by a consultant in the industry who lamented that he thought it was unfair that farmers who could not afford to invest in their own greenhouses were simply being 'given the technology'. The consultant suggested that this inability to finance the transition into the greenhouse era of agriculture is an indication of obsolescence, and that these farmers should therefore be left to fend for themselves:

You have persons who I have worked with who have actually gone ahead to commercial banks and other lending institutions to invest in the technology and now you gonna have them to be competing with persons who were just given the technology... It is not fair to

persons who have been there using their hard cash to hold up this industry. This industry evolved out of the private sector.... We not looking out for anybody specifically. This is the technology. Can you afford it? That has been one of the problems that we have had, where several of these NGOs they walk into these deprived communities [with] thousands of persons inside there, a lot of them uneducated and they take this technology and they give it to them and the persons don't know what to do with it. (Interview 15, consultant, Manchester)

These two statements capture the sentiment expressed by a number of growers, but they take on added importance because both the consultant and the grower are senior members of the JGGA. In general, the role of the JGGA leadership seems more or less complicit with state and with greenhouse governmentality, advancing a narrative that encourages farmers to become growers and to be integrated into a new agricultural reality of neoliberalism and technological modernity. However, here the comments by these senior JGGA members suggests that the organization can be unhinged from the state and articulate its own conception of the new agricultural reality. While the state and aid agencies might be interested in 'giving' greenhouses to as many farmers as they can, the JGGA is concerned with protecting the industry and the spirit of investment which forms the central point for the development of a modern and technological farming system. If this spirit of investment is absent, many current growers feel that greenhouse are simply going to be abandoned.

As a result, a kind of Darwinist ethic has developed, where the onward march to the transformation of agriculture is a competition based on the financial and social fitness of farmers. Expressed in various ways to me by consultants and growers alike, this is essentially a situation of survival of the richest. This competitive mode of social articulation has produced a subjectivity of individualism in keeping with the neoliberal approach to the new model of farming. This individualistic mentality views, with consternation, the provision of greenhouses to farmers as undermining the development of a truly self-regulating market place. In this way, the

JGGA is itself contesting certain flows within the networked relations of governing. The problem seems not so much related to the ideals of collectivism per se; the JGGA, rather, is concerned about farmers not being able to cooperate and organize themselves in a manner that would allow them to establish a single competitive unit. This sense is captured in the evaluation of one grower who reasoned that: “Most of the funding agencies they are taking guidelines from Africa and Asian countries where people work together as a unit to make things work.... As I know it, most co-operatives in Jamaica failed” (Interview 16, grower, St. Elizabeth). Indeed, the history of cooperative attempts of agricultural enterprising and development seems to support this line of reasoning (IFAD/IICA, 1994; Crichlow, 2005; Weis, 2006; Sammons, 2014)¹⁰.

However, some groups of farmers have been able to function as units and have cultivated their entrepreneurial zeal collectively. These group greenhouse projects serve more or less as rural enterprises, employing multiple farmers. Farmers use the strength in numbers to achieve competitive participation in the new agricultural reality. In a number of cases, these groups have formed specifically to acquire greenhouses, but in other instances groups that already existed before the greenhouse revolution have pursued funding for greenhouses to expand the range of their collective ventures.

6.3.2 Shareholding Co-op

There are two primary group approaches. The first can be called the ‘shareholding cooperative approach’, in which farmers establish a group based on shares. Ownership of a single greenhouse, and distribution of the profits made from the operation, are proportional to the

¹⁰ Carl Stone’s (1978) appraisal of sugar cooperatives to which the Michael Manley led Jamaica Government divested sugar estate lands in 1972, found that among other things, the transfer to coop failed to produce the expected results because of the size of the individual coops and unwillingness of co-op members to reinvest and treat the operations like business.

shares farmers purchased when establishing the group. The number of shares available is determined in the first instance by the total amount the group needs to raise as a security deposit for the disbursement of grant funding. This security deposit was a requirement for a number of projects. Beneficiaries of JSIF-funded greenhouses under the REDI project, for example, were expected to fund 20% of the project cost in cash or in kind (such as sweat equity) (The World Bank, 2009). The requirement of an initial investment serves to not only raise the money to secure grant aid, but also functions as a filter to remove farmers who would not be committed to the long-term continuation of the group. One group leader explained:

[Given] the amount of us that were in [the initial group], it couldn't be less than 10,000 Jamaican dollars for a minimum share and some persons said - [that was] little bit too big and I don't think I want to go into it. But I said if this [greenhouse] is what you doing and this is what you want to grow with, 10,000 dollars is not really a lot. So it's just that putting that to the test determine how many persons really serious (Interview 13, group leader Manchester)

The idea of 'shares' in the greenhouse operation, as the group leader explained, is key to creating a sense of responsibility and investment. Further, by weeding out farmers who would not be serious, the prerequisite of shareholding functions to protect all the stakeholders and the overall investment, so that future expansions can be made. These are key elements of a neoliberal ethos; investment and commitment to protect the investment through business mindedness. Thus, in this instance, even though the greenhouses is being operated by a group, there is no forgoing of the neoliberal ethos. In a sense, the network of power relations become localized in these kinds of groups and subjectivity is engendered through the structure of the co-op. The share-holding dynamics of the group offers farmers that live alongside the co-operative members a model of the subjectivity that the state has promoted. The co-op members are involved in their own guidance. They are an additional tier of government and further diffuse power from the identifiable agents of the state.

6.3.3 Greenhouse Clusters

The second approach is the ‘cluster approach’ which has become particularly popular among farmers in areas where there are bauxite mining operations. The Jamaica Bauxite Institute (JBI) and JSIF have partnered to provide greenhouses to groups of farmers in communities around mined out lands under the Water Catchment and Greenhouse Cluster Project (WCGP). In this approach, each farmer is allocated a greenhouse, instead of one shared greenhouse for all the farmers in the group. In some cases, two farmers might share a greenhouse to begin with, but it is expected that the proceeds will be used to finance individual greenhouses in the future. This model evolved out of the USAID’s JA FARMS project, which encouraged groups of farmers to establish contracts with key regional markets by coordinating planting to increase yields. Generally in this model, a constellation of greenhouses are erected on a site with shared utilities (USAID, 2008).

Though the greenhouses are owned and operated by individual farmers and not the group, the farmers are expected to cooperate on key areas, such as the maintenance and repair of structures, water management, and importantly, marketing. The success of the model, according to a grower in one of the largest clusters, is the blend of cooperation with the individual sense of responsibility: “I manage my own business and they manage their own business, and we just assist [each other] if we have a problem... We come together and plan work days and then we gone back to our regular farming. We have monthly meetings. That’s how we operate” (Interview 4, group leader, St. Ann). Thus, the cooperative action is not made to obviate the necessity of individual responsibility and business attentiveness. Through coordinated planting, the cluster increases and extends production. This allows a group of growers to leverage their combined scale of operation to secure contract arrangements with premium prices. These kinds

of strategic maneuvers illustrate the deeply neoliberal nature of these groups despite their cooperative nature. The cluster, then, is not just a composite of different farmers who share resources; in a sense, the clusters form distinctive micro-networks, internally self-governing units that cultivate subjectivity.

6.3.4 Benevolent Groups

There is a third group-based approach, characteristic of not-for-profit groups. This approach, typical of faith-based groups and groups whose operation is for community development, is differentiated by the basis of ownership and use of earnings from the greenhouse. The greenhouse in these cases is owned by the community, as a sort of commons, the care of which is a communal responsibility. Proceeds from the operation of the greenhouse are used for the good of the community. These kinds of common property greenhouses are often provided through missionary organizations affiliated with a local congregation, or through grants from non-governmental organizations targeting such groups. In one instance, a group reported to me that they actually procured a loan in order to acquire greenhouses. The leader of that group explained that the group used the loan to purchase and renovate some greenhouses:

Farmers cannot come up with the money to put up their own greenhouse, so we find the money to build the greenhouse for them and... they pay rent and as soon as we recoup the cost of building a greenhouse, we build another one...It means that farmers who were doing subsistence farming will now be able to enjoy comfortable way of life [and] it means there will be less strife in the community... So the society will become a better society (Interview 14, Clarendon)

In this case the greenhouse is managed by a ‘Greenhouse Management Committee’ of the community development group which ensures repayment of the loan used to purchase the greenhouse. The committee uses the income from the rented greenhouses to maintain the structures and fund training sessions, and to subsidize the cost of supplies for the local primary

school. Importantly, the experience of this group suggests that even where the groups are not operating to provide an income to the members, the neoliberal ethos is very present. Farmers are investing and are using the greenhouse as a business venture to maximize their investment, even if their profits are used for communal projects.

6.4 The Contested Image of the Grower

The contestation about how farming is done is related to an equally contested aspect of the greenhouse governmentality: the perception of the farmer, or as it was repeatedly put to me by farmers and growers alike, the image of the farmer. The traditional farmer is often derided as backward and inefficient, and in the course of interviews was severally caricatured as someone in soiled and torn clothes who rides a donkey. This kind of image seems to trickle down from state agents to the growers with whom I spoke. For example, Ian Hayles, a State Minister in Agriculture, speaking at a forum in St. James, suggested that persons, especially young persons, who might not want to get their hands dirty should venture into greenhouse farming. He declared that this is a ‘clean’ farmer and, “persons who do not want to get their nails and hands dirty can embark on greenhouse and hydroponics farming” (Jamaica Observer, 2012). This type of portrayal was repeated to me by growers with whom I spoke in St. James. One grower explained to me that he saw greenhouse farming as being clean because of the modern technology that eliminated the need for the farmer to be in the dirt. He reasoned that the days of the, “dirty shirt, tear up trousers” farmer have passed because the greenhouse eliminates the need to get dirty (Interview 2, grower, St. James). The focus on cleanliness seems to point to the racial and social associations with being a farmer. The traditional farmer is here being casted as occupying a low socio-economic position, one which is associated with unkemptness. Through the application of

technology and the improved management of the farm that this technology is supposed to enable, farmers are able to, metaphorically and literally, lift themselves from the dirtiness. The increased profitability provides farmers with better resources so that they can be properly attired. The technology allows management of the farm from a safe distance behind a computer screen, eliminating the need for the farmer to get dirty.

The endorsement of this clean and improved image of the farmer would seem to be most evidently demonstrated by the implementation of a greenhouse, but even among open field farmers where the greenhouse is not present to signal their subscription to the new mentality, interviews reveal that it is very much present. The inability to implement a greenhouse due to finances, or even the reluctance to undergo the training that is said to be required to ‘make’ the new kind of farmer, has not prevented the inculcation of the greenhouse mentality into these open field farmers out on their small-scale plots. A number of open field farmers I spoke to, explained to me that they were fully subscribed to greenhouse farming and to the new agricultural subjectivity. While the plaintive complaint from most of these farmers was that they simply could not afford a greenhouse and that the state ought to do more to make owning a greenhouse easier, they expressed ambitions of someday acquiring one. The reflections of one farmer from Bull Savannah is illustrative: “[Greenhouse?] Yes I would do it. Yes. I always think about it” (Interview 51, farmer, St. Elizabeth). Likewise, a farmer from Tryall explained to me that though, “the greenhouses, right now, is for people, who again we are talking about people who have finance, can afford greenhouse”, but that he went on to note that “I would like to have greenhouse farming” (Interview 32, farmer, St. Elizabeth). With a bit more enthusiasm one open field farmer from Southfield explained to me that making a greenhouse farm would solve all his problems:

Everybody is trying to see if them can get them self together and build a greenhouse. You know say them something there cost money still...Boy I would a do good with one of course. Of course I would do good with one. If me have one of them [greenhouses] I would a quite alright. My problem would be over. Greenhouse, boy is the best thing me see them come in with. The best thing. (Interview 35, farmer, St. Elizabeth)

Another farmer reasoned that:

I guess that is Jamaica biggest problem- farmers do not invest in technology and for that reason what we use to produce a 100 pounds, the other country use less amount and produce that. So we have to really embrace technology... Certainly if I could afford a greenhouse, or could buy one, I would. [I]t's like you are running a business to be honest. (Interview 39, farmer St. Elizabeth)

In a similar vein, the declaration by another farmer that, “greenhouse is very good” was followed by an admission that “the greenhouse it's a different farming from the outdoor. But you have seminars. So if you gonna go into a greenhouse all you have to do is go to the seminar and them will tell you the basic things that you need to do” (Interview 48, farmer, St. Elizabeth). In pointing to the seminars, the farmer is making clear his belief that through participation in training and information sessions his mentality can be changed and aligned to the new farm work.

6.4.1 The New Image of Farming

Growers who were not previously involved in farming were especially keen on the notion of a new, clean image of farming. A number of these individuals who have entered farming by taking up greenhouses explained to me that the traditional image of the farmer, the dirty farmer, had been a barrier to their previous involvement in farming. The greenhouse is seen as markedly different, as “clean work”, which can be performed in “jacket and tie” once the proper set up has been implemented (Interview 19, grower, Manchester). These newcomers, who are predominantly college graduates and professionals, explained that through the adoption of

greenhouses, the perception of who a farmer is had changed and that this new image aligned with the professional respectability that they were used to. One female grower told me that greenhouse technology provided her with a doorway to becoming a farmer, one she felt would otherwise not be possible for a career-oriented women like herself. She explained that once she heard about the technology her interest was piqued:

This new technology came about and I consider myself to be somewhat intrigued by technology and because of that I wanted to learn this thing. I wanted to know about it. [Greenhouse] does change the identity of a farmer. It does. It does change the identity of a farmer. Because what we find now a lot of greenhouse farmers are business people or persons who do other things. Because in the past persons would look at a farmer- farmer had this stigma attached to them. Where you are in a water boot, dirty clothes and on a donkey. (Interview 12, grower, Clarendon)

Referencing her training in the natural sciences, the grower explained to me that, “because of the technology and the education, or the knowledge that comes with it” (Interview 12, grower, Clarendon), greenhouse farming was above the average kind of farming that the traditional farmer practices. She further explained that this type of farming required that the farmer be literate and thus it excluded most traditional farmers. Her perception of traditional farming was shared by another newcomer in Clarendon, who indicated that he had taken up greenhouse farming after retiring from a career working for a multinational corporation. The former senior manager reasoned that, unlike the stigmatized image of the traditional farmer, he fully embraced his status as a greenhouse grower since, “because of the technology the greenhouse farmer doesn’t have to get dirty” (Interview 14, grower, Clarendon). The grower’s celebration of the new subjectivity, the new image, of the farmer is particularly illustrative of the differences in the way a lot of growers view themselves as opposed to traditional farmers. This was borne out further as the grower recalled how as a youth he excelled in school and passed his

high school placement examinations to avoid becoming a farmer and enduring the shame that was associated with farming:

Agriculture in Jamaica has kind of a stigma where it was culturally people who could not do anything else who farm. When I was going to sit Common Entrance Exam, my father bought me a machete and told me if you don't pass the Common Entrance Exam, farming is what you going to do. So I was lucky I passed... [T]o tell a young man to get into farming is like telling him that you see him as a loser. To tell a young man to get a greenhouse and get into farming, kind of lift the status of [farming] because of the technology (Interview 14, grower, Clarendon)

The growers' reflections on his childhood are shared by a number of other older newcomers who have taken on greenhouses ahead of retirement or as a post-retirement activity. These aged newcomers to farming explained to me that they truly see greenhouses as investments. They reasoned that through greenhouse farming, they are able to bolster their pension while at the same time taking on what is more or less an interesting hobby. It is not uncommon for such retirees to be overseas migrants who have returned to rural Jamaica following decades as professionals abroad. Newcomers are therefore able to leverage social and financial capital to acquire greenhouses, which as a result are often more sophisticated than those erected by open-field farmers who transition into greenhouse operations.

The greenhouse mentality of a clean farmer is also shared by many of the young professionals and college graduates who have ventured into farming. In most instances, these are children of farmers who were attracted to the new farming and not the farming of their parents. Making clear that if it was left to his father, he would not have a greenhouse, one of these young growers explained to me that, "I am a second generation farmer so my father has always been involved in open field, but I have always leaned towards technology" and that "the skill set is something that's gonna have to be taught because you have to have an open mind. For example my father close his mind towards it" (Interview 25, grower, Manchester). He explained that with

his university education, greenhouse training came easy. Further, he pointed to the role of the new mentality, the new business mindedness, as the motivating factor behind ‘second generation farmers like himself talking up greenhouse farming: “Let me tell you something the image of farming is changing you know...the face of farming is changing because money can be made you know... the whole business model changing” (Interview 25, grower, Manchester).

6.4.2 Grower or Farmer

Some growers, on the other hand, expressed opposition to the idea that greenhouse farmers should be seen as being fundamentally different compared to traditional farmer. One grower posited that many promoters might celebrate the cleanliness of greenhouse farming with all the technological components but that it was not very practical in the long-term: “So they say oh, you are cleaner and you know, things look prettier to them. But it doesn’t really help or work” (Interview 18, Manchester). The counter argument of these kinds of growers is that with the addition of the greenhouse to the farm, the image of the farmer might be “diversified”, but it is not necessarily changed. Farming inevitably involves getting dirty and “intertwining with the dirt”, “you cannot escape that because you are intertwining with the dirt... But there is nothing wrong with that, you know. So we have to understand, it’s a part of the job” (Interview 18, grower, Manchester). The sentiment is shared by another greenhouse grower, who explained that she does not want to get to the stage where, because of greenhouse technology, she stops getting her hands dirty. The traditional farmer, she said, is the farmer “who is the mix of everything, in the dirt and the dust and the soil” and these farmers are the backbone of agriculture without whom the state agents calling for a new farmer subjectivity would “dead for hungry and look like they are idiots” (Interview 13, grower, Manchester).

These growers, who chose to be described as farmers first and foremost, have implemented greenhouses, but contest certain aspects of the subjectivity that the state has outlined that they exhibit. They do not see themselves as new farm subjects whose comportment requires a separation from the dirt through the use of technology. Thus, whilst their greenhouses generally evidence subscription to the technological modernity and perhaps even the neoliberal entrepreneurship it is envisioned to entail, in the process of doing their farming and being farmers, these greenhouse growers chose to assert an image which deviates from the ones they have been prescribed by the state. These growers, who I would describe as transitioners, suggest that, “it’s alright to be a farmer [in the traditional sense] and it’s alright to be, you know dirty. You know, it’s your work clothes- if you working in the soil it supposed to be soily- it supposed to be dirty” (Interview 13, grower, Manchester). There are a number of important considerations to be noted here. There is a conflict between how some greenhouse growers reconcile the state’s description of the envisioned new kind of farmer with the way growers see themselves. Second, the reconciliation of the two images of the farmer are evidently related to the role or value some growers see in being connected with the earth which is the source of their livelihood. The contestation around these two issues is important in highlighting the difficulties of separating the greenhouse grower, especially those who have transitioned from open field farming, from the farmer in the traditional sense. The character of the old kind of farmer, the traditional small-scale farmer, is stubbornly visible in the new farm worker.

In rejecting the idea that newcomers to farming, those who fit the mold of the new subjectivity, should be called farmers, one grower suggested that: “You not really a farmer if you ask me. You just a have a little investment and you want to turn over something to make you survive a little bit better and you have your pension that you can draw back on” (Interview 26,

grower, St. Elizabeth). He went out to explain that with respect to, “a really true blooded farmer I don’t think there is much changes there” (Interview 26, grower, St. Elizabeth). The same grower however, is fully implicated in the neoliberal kind of approach that he is citing as opposed to ‘true blooded farming’. This was illustrated to me as he related that he supports and has been involved with training traditional farmers in the use of greenhouse technology around “better planting techniques [and] how to better manage their, what you call it, their inputs, to kind of regulate the price”, so that, “farmers have a better yield, to make more money and to make a profit at all times” (Interview 26, grower, St. Elizabeth). He noted that one of his own ambitions was to start exporting: “that is what I am looking at- the bigger picture of exporting. You know, and to me that is one of the thing that we need to open up to” (Interview 26, grower, St. Elizabeth). The example of this grower shows that while some growers might suggest that they are resisting the mentality of greenhouse farming, they are in reality subscribed to a certain form of greenhouse subjectivity.

6.5 Conclusion

The diverse attitudes and opinions described about suggest that greenhouse subjectivity entails both indirect and direct relations of governing that are bound up in the process of contesting and navigating the prescribed subjectivity in relation to the one that farmers have traditionally occupied. This is a networked aspect of governing and in the process the new farmer subjectivity play out in response to the farmers’ decisions about how to engage in farming. To some degree, and especially as it concerns the group greenhouse subjects, there is an obscuring of governmentality by the notions of co-operative empowerment and social capital. In reality,

governmentality is networked at local levels through the various group formats that farmers take in collective greenhouse projects or as individuals.

The contestations around the new subjectivity of farming that is being pursued within greenhouse governmentality seem to reflect the multiple and at times contradictory interpretations that farmers have regarding the essence of what the new farmer and new kind of farming should entail. The idea that the greenhouse marks an entirely new kind of farming is rejected by some farmers, even as they implement greenhouses and practice the kind of competitive and technologically modern farming that the greenhouse subjectivity is all about. In other instances, while there is no greenhouse present on the farm, a farmer can be fully subscribed to the greenhouse mentality. Thus, greenhouse governmentality becomes filtered by individual growers to mean different things. In the next chapter I will illustrate how the farm becomes a site of contestation, and how the experience of greenhouse farming is mediated by the actual landscape.

CHAPTER 7: SITES OF GREENHOUSE GOVERNMENT: CONTESTING THE NEW KIND OF FARM

7.1 Introduction

The new era of agriculture that greenhouses signify has a lot to do with the farm itself. Greenhouse farming technology is meant to ensure that farmers use their resources more efficiently, thus making the farm a site of production not only of crops, but also new relationships between the grower and the environment. In this chapter, I suggest that as sites of production, greenhouse farms are also sites of contestation about modernity and technological ways of governing nature. I outline a number of the contestations by growers in relation to how they think that the farm should be constituted. I suggest that these contestations are inherently biopolitical, in that they have to do with growers' pursuit of a kind of biopower over plants and crop cultivation. In this regard, the greenhouse becomes the site of a number of dividing principles, which gives growers a control over certain variables of production that enable them to produce ideal crops.

7.2 Spaces of Contestation

Greenhouse farming is presented as less susceptible to risk, more efficient, more economically productive and more complementary to rural development as compared to traditional farming. The fundamental basis of this difference, though, is what is important. Greenhouse governmentality advances the greenhouse farm as a new kind of farm operation, a space within which business-minded and technologically-inclined farmers are able to maximize their investment and realize good fortune. The discourse of progress and improvement associated

with the transformation of the farm and of farming therefore casts the greenhouse as the space of a kind of salvation. The greenhouse, the argument goes, is intended to save the farmer from the backward and marginal work of traditional farming, and to save the plants (and the farmer's income) from the failures related to the traditional farming system. There are, however, a number of areas of contestation around this new agricultural space.

7.3 Convening a New Kind of Farm

First and foremost, greenhouse governmentality is being contested in the way that farmers are assembling greenhouses. The greenhouse is emblematic of the mentality that greenhouse governmentality envisions, ostensibly a signifier of a farmer's commitment to the new type of farming that is intensive and oriented around profit maximization and technological modernity. However, the idea of what constitutes a greenhouse, and how the greenhouse is implemented or integrated into existing farm operations, are things that are contested among farmers. In explaining to me that the greenhouse project he had started in his community was, "the next step forward" in a series of projects to "bring sanity" to the way that farming was done, a Jamaica Agricultural Society official pointed out that the implementation of the greenhouse made it possible for farmers to convene a farm in new ways. He noted that, "As a greenhouse farmer, once you set your thing together, you can sit at this desk and everything is being done out there. That's what we working towards. That's where we need to get to" (Interview 2, JAS officer, St. James).

Similarly, one consultant explained to me that if farmers just decide "on doing the right thing, not with the fork and hoe, and wasting time", but by "going high-tech" a new kind of farm could be made, one he argues is more attractive to young people (Interview 15, consultant, St.

Elizabeth). This is a computerized farm, he explained, where farmers “sit down on [their] computer and work out [their] fertilizer program, work out [their] spraying schedule” and most important one where “agriculture can go on computer” (Interview 15, consultant, St. Elizabeth). Another grower from St. Elizabeth who had one of these automated systems explained his set up to me:

I have a timer on it. That one it come in at 7am, 10 am, 1pm and 4pm. Yeah. Most people don't use it because they don't understand it and all of that. But without the timer it wouldn't make sense. Yeah man. Definitely. Definitely, because having the timer make work easier for everybody and is a reliable way of watering the plants. Because when a person will forget, the timer not going to forget to come in. It don't work like how people work... So the timer comes in 4 times for the day and it runs for 8 minutes. Depending on- as the plants get older or bigger you can increase or decrease. (Interview 21, grower St. Elizabeth)

These statements make it clear that through the technological components of the greenhouse, the farm is supposed to be made into an easily governable space, one from which the farmer can be separated without losing control over production. These statements also indicate that the greenhouse farm is to be a picture of technological modernity.



Figure 7.1 Greenhouse farmer demonstrating the use of his automated fertigation system

The reconstitution of the farm around greenhouse technology would seem to be something that growers endorse and demonstrate by the implementation of a greenhouse. However, this is not necessarily the case. There are a number of growers who believe that the implementation, or what they described as the integration, of greenhouses into their farming operations does not change the farm itself. In explaining this point to me, a grower explained that the promotion of the farm as a new space simply because the greenhouse is added points to a more profound Jamaican tendency to, “gravitate to things we see going on around the world” (Interview 18, Manchester). The grower explained that this tendency is problematic because, “a lot of time what is new doesn’t really works” and “in Jamaica now there are certain little things that will do wonders and there are certain things that our ancestors used to pay attention to” (Interview 18, Manchester).

The invocation of the ancestral knowledge by this grower suggests that his interpretation of the farm is embedded with historical and cultural meanings which he does not feel should be altered. The grower charged that the promotion of a technological farm flows from technocrats who do not have working understanding of farming. He put it this way: “But you go in and you put in a lot of little fancy things and it doesn’t really works... But it is more attractive and then because a lot of times the persons who are pushing them they are not farmers” (Interview 18, Manchester).

The invocation of the ancestors’ way of farming by this grower in particular is telling. The grower is in his mid-twenties and is a college graduate, and is therefore the kind of person that promoters of the new farm space have suggested would be interested in the technologically modern farm. The rejection of the ‘fancy things’ of modern farming, however, is not limited to this young farmer. One consultant with whom I spoke and who was involved in the IJAP and other greenhouse projects related a similar view of the greenhouse farming and the model of greenhouse based rural development as an ill-informed acceptance of things foreign. He explained that:

When you think about rural development you talking about a farmer with 2 and a half acres with marginal lands, some of them don’t even have a flat piece of land to put the greenhouse on... We have to be realistic, is like you giving a small farmer- you telling him to buy a Mercedes Benz, right. But you know that boy, even if he has the money to but the Mercedes Benz, he cannot maintain... But unfortunately for us developing countries right, for some reason or the other we always tend to take things wholesale and not looking at the different component parts. (Interview 29, consultant, Kingston)

Many of the growers have indeed, examined the component parts and have convened farms based on these negotiations of what can and cannot work. In many instance, particularly in cases where growers were previously involved in open field cultivation, these farms have been assembled into the existing farm operations (Fig. 7.2).



Figure 7.2 Scallion being cultivated in open field plot alongside greenhouse

A number of other growers conveyed that they perceive marked differences between greenhouses and open field farms, differences that tend to position the greenhouse farm as superior. In explaining that their implementation of greenhouses was simply an attempt to protect their crops, growers frequently articulated a sense that the greenhouse was a farm space within which they had greater control and which therefore ensured better fortunes. The explanation by one grower in St. Ann for example, was that previously, “it was a [situation] where we use to plant sweet pepper and it only have a season, like from the spring to the summer. But from it touch the hotter months it tend to stop, but the greenhouse you can go right through”. The grower’s comment captures his belief that the greenhouse creates a space that, in essence, allows an additional growing season. In a similar fashion one grower explained how, “I see [greenhouse] as the only way to go. Because over the years doing outdoor farming, I saw the risk keep increasing day by day and I decide to try and minimize the risk by going protected agriculture... Greenhouse is to protect the crops from pest and disease” (Interview 27, grower,

St. Elizabeth). The grower's statement suggests that he views the greenhouse as a different kind of farm, one that enables him to mitigate the threat of pests and disease in ways that he did not think were possible in his open field farm operations.

This ability to control the space of the greenhouse increases with the sophistication of the greenhouse assemblage. With automated controls and other technological implements, the grower is able to create a whole different set of set of conditions for farming. In their daily farm practices and interaction with technological innovations, then, some growers come to perform a greenhouse subjectivity. This new subjectivity becomes embodied in the growers through the new practices that the greenhouse requires: fertigation, pruning and trellising, controlling the micro-climate of the greenhouse, and managing these operations away from the farm through computer technology. In these ways, farmers come to think and see the farm differently. This point was made to me by one grower: "It's a very clinical operation- it is a very clean, sanitized place [and so] you have to be able to measure, calibrate instruments. You would have to be able to check the pH of your water and modulate it and stuff like that. So it takes sophistication and intelligence" (Interview 14, grower, Clarendon). As another grower put it, "this is not just what you do on the outside that you go in and do in the inside. No, it's totally different" (Interview 23, grower, St. Elizabeth). One consultant echoed the sentiments: "Because it is not an ordinary sort of dig up ground and throwing in there and fertilizer. It is beyond that" (Interview 15, consultant, Manchester). The important element of this new kind of farm is that it gives the farmer more control.

7.4 The Limitations to Controlled Production

The ability to attain this level of control over the plants and the production process is mediated by the physical terrain of Jamaica. The physical geography of the island sets the stage upon which the greenhouse farm must be constituted. Thus, the physical environment becomes implicated in the negotiation of greenhouse subjectivity. In some respects, the influence of the environment in the new agricultural subjectivity is similar to the role played by the landscape in the birth of the peasantry alongside the plantation during the colonization of Jamaica. The new farm subject is not produced simply by governmental tactics, but is influenced by the landscape upon which the power relations play out. There are three primary aspects of the landscape to be considered.

7.4.1 Terrain and Temperature

The most commonly identified check on the power that growers have in staging life in their greenhouses was that of elevation. The ideal recommended temperature for greenhouse cultivation is 26-28°C (78.8- 82.4 °F). Average daily temperatures in Jamaica range between 25 to 30 °C (77 to 86 °F) in the lowlands and 15 to 22 °C (59.0 to 71.6 °F) at higher elevations (Black, et al., 2013). The heat retaining nature of the greenhouse restricts the practical value of a fully polyethylene greenhouse below 400 meters above sea level (m.a.s.l). Heat dissipation can be aided with the inclusion of anti-virus mesh in the side walls or through other design features to maximize passive ventilation. However, adopters still reported that high temperatures inside greenhouses often hamper production.

One grower at an approximate elevation of 251 m.a.s.l reported that temperatures in his greenhouses reach 35.5°C (96 °F) (Interview 16, grower, St. Elizabeth). Another in St. Ann, at

approximately 397 m.a.s.l, reported that temperatures in his greenhouse often reached 48.8°C (120°F) (Interview 4, grower, St, Ann). The frustrations of one grower are illustrative:

“greenhouse were initially designed for you know, the colder climate to trap the heat, so when you are in a fire ball and you drop the heat in there, you know it’s crazy. It’s closer to hell”

(Interview 18, grower, Manchester). These kinds of statements regarding the problems associated with the new kind of farm are frequent, and in at least one case led to the abandonment of greenhouse farming. A grower in St. Mary related to me that, before being destroyed by hurricane, his greenhouse operation was not profitable due to the elevation at the site where the greenhouse was located:

We really had an elevation problem because of the heat, [so] for me right now, for me to have a greenhouse, I would think about that for in my backyard. No further than my backyard. No. If you ever think to work sometime beyond 9 o’clock, you are in problem. The thing is if you get up early out a your bed and you are to leave to come all this distant, when time the sun hot now you would want to go home now. You go home now you won’t feel like come back. But if it in your backyard now, you get up early in the morning and you do what you doing in the greenhouse. You see if you get up 12 o’clock at night you just switch on your light and you gone work and you’re cool and you’re nice.
(Interview 10, former grower, St. Mary)

The draining effect of working in his greenhouse proved too much for this farmer, who has won national awards for his farming operations. This issue of very hot greenhouses at lower elevations was raised in my interviews with greenhouse consultants, and their recommended response was to add mechanical fans (extractors) to the greenhouses. This insistence on more technology is consistent with the character of the new model of farming and of the farmer subjectivity articulated within greenhouse governmentality. The greenhouse grower is expected to treat their greenhouse like a business and install the relevant technological implements that are needed. Challenges to profitability are to be responded to with calculated actions to protect the investment. In supporting their belief that Jamaica’s environmental challenges can be overcome,

consultants and growers pointed to other countries where greenhouses are being used widely.

One consultant related to me that:

We do have some climatic conditions that are suitable with greenhouse development. Of course in other countries they don't necessarily put greenhouse on the hillsides. I mean greenhouses or on the flat. So there is that. There is a feeling in Jamaica that we shouldn't put greenhouse on flat land or on the coastal area. I think the issue is having a system that can maintain certain temperature within the house despite what will be outside. So in a lot of countries you have a lot of automated greenhouse. Spain for example, where the greenhouse maintain a certain temperature. (Interview 28, consultant, Kingston)

Similarly, another consultant pointed to the extensive use of greenhouses in Israel, noting that, "they have greenhouse and they are not ideally at the North Pole" (Interview 30, consultant, Manchester). The consultant concluded that, based on his assessment, greenhouses had been "validated" in Jamaica and all farmers needed to do was to apply the appropriate technology (Interview 30, consultant Manchester). The consultant's point of view was shared by some growers with whom I spoke. One grower for example, related to me that he had travelled extensively and that his assessment was that, if anything, Jamaica was quite suited for greenhouses:

I have been to California. I have been to places elsewhere in the world where, I mean Jamaica is cool with wind compared to those areas. I mean greenhouse, research shows where greenhouse do best at a higher elevation above sea level right. Israel is not above sea level. It's hot. Its desert and if you go to Israel and see those fans blowing air in those greenhouse you will say something else. (Interview 27, grower, St. Elizabeth)

This sentiment that more technology can address the issue of heat was rejected by a number of the growers with whom I spoke. Most of the growers who saw that solution as untenable, indicated that the costs would simply make greenhouse production unprofitable. In making this point to me, one grower explained that most farmers already cannot afford greenhouses with a lot of electronic parts, and along with the cost of more mechanical components, growers would also have to get their farms electrified. In the prototypical greenhouse he explained, "the temperature

inside there now would have to be 75” and “with our high energy cost we couldn’t sell the plants”. He questioned: “You can think of where we are there now maybe 96 and to carry it down to 75 and you have something else controlling the humidity inside there for the plant to grow. How much energy that would take?” (Interview 16, grower, St. Elizabeth).

7.4.2 Water

The second limit to growers’ ability to control the space of the greenhouse is related to water. Water is at the very center of greenhouse farming, or as one adopter put it to me, “water run greenhouse” (Interview 19, grower, Manchester). It is a best practice of the JGGA, and the policy of most of the funding agencies, that persons venturing into greenhouse farming first secure water and adequate storage. The reality of the situation, however, is that many farmers lack the environmental or financial resources to do so. As one respondent put it, “where you have the greenhouse- the ideal location, there is no water and that water problem is not going to be solved anytime soon” (Interview, 28 consultant, Kingston). Growers at higher elevations reported relying on water that has been harvested from the roof of their greenhouse or purchased by the truck load. The government-run NIC Rapid Response is one source, but it is not preferable due to extended wait times before delivery. The alternative, though more expensive, is a burgeoning private water supply network made up of trucks of various sizes and truckers of differing temperaments which offer growers more speedy delivery. It is commonly reported that familiarity with a trucker ensured even more expeditious delivery.

One grower in the hills of Clarendon informed me that, with the Rapid Response now “defunct” in his area, water has to be purchased from private truckers at considerable cost: “4,000 gallon is anywhere from JM\$12-15 thousand (US\$107.48-134.36)”. A similar price was

quoted to me by a grower in St. Elizabeth: “We have to buy water from a truck man for like JM\$3,500 (US\$31.35) a load fi carry it come”. One grower explained that prices in the hilly interior are higher than on the plains, where irrigation water is available and the cost of trucking water is less expensive because of the flatter terrain. She reasoned that growers have to simply accept whatever prices they are charged: “they have the luxury of irrigation that we don’t have, so anywhere we can get it. Sometimes it is private. Sometimes it is NIC. It’s not cheap” (Interview 13, grower Manchester).

Growers at lower elevations, particularly those in southern St. Elizabeth, St. Catherine and Clarendon, have access to government-built NIC irrigation schemes. The rates across the schemes vary, but are markedly lower than the price of trucked water and even lower than what it would cost to use domestic water. To supply greenhouses located in the irrigated area, growers simply request a connection. This process, however, involves far more formal interactions, as titles for the land must be presented to verify ownership and work orders put in for a hydrant to be placed on the farm. The fertigation system is connected to the hydrant and the flow of water kept constant through the payment of the water bills. Showing me a bill for JM\$2,000 dollars, one grower on the Hounslow scheme in St. Elizabeth explained to me that because the water is so cheap he often waits until his bills accumulate:

I haven’t paid anything last month for it. Because when I am paying I pay like JM\$20-30,000. I don’t pay every month... I am a part of the irrigation. I have irrigation water... Most of the areas have domestic water but what they want the water for is for agriculture and then we cannot afford to provide domestic water for agriculture. Because at the end of the day it going to be very expensive. The irrigation water is a bit cheaper... Basically is a good venture once you have it the right principles, you know, the crop can continue on and on and on. (Interview 21, grower St. Elizabeth)

The limited coverage of irrigation schemes, and the absence of piped water for domestic use in many communities, gives power to those who have secure access to water. In outlining his

difficulty in sourcing water, especially in the context of a drought within the field work period, one grower recounted an incident which captures the struggles of growers to access water:

I am carrying water daily, 25 miles, 1,000 gallons at a time to my farm that has a capacity-our consumption is 5,000 gallons per day. And I can only carry 3 trips per day, right. It takes me 2 and a half hours to pick up and get back to the farm with water. And I can only carry a 1,000 gallons per trip. And somebody from the National Irrigation Commission is telling me that I cannot go and suck up water out of the river to take to my farm. So mi say well this is one case where you going to have to call the police. Because I don't have a choice. Is either that or I have to shut down my farm and after that we decide what we gonna do with the escalating price in food (Interview 15, grower, Manchester)

Growers with water are endowed not just with a physical resource but also a financial one. With access to water, the greenhouse farmer is able to produce during times when conditions make open field production a challenge. The point is made by one grower from St. James, who noted that: "The fact about it is that since you have water then you have no problem. You should be able to farm all year round. You should be able to farm 13 months of the year. If you can find that year" (Interview 2, grower, St. James). Another grower made a similar point, noting that: "greenhouse farmer can produce anytime of the year. Right now see the dry spell on yah. Right now mi can't plant those peppers out a door. For me would have to carry water like a hell or pump water like a hell. And at the same time you cannot save them. I send the amount of water that I know that a root should get" (Interview 5, grower, St. Mary). The annual dry spell to which the grower above refers is becoming more unpredictable and intense, particularly in the southern section of the island including the breadbasket regions (McGregor, Barker, & Campbell, 2009; Gamble, et al., 2010; Campbell, Barker, & McGregor, 2011; Popke, Curtis, & Gamble, 2014). Growers note that under such circumstances they are advantaged by storage which allows them to plant at strategic times instead of depending on rainfall.

7.4.3 Hurricanes

A number of greenhouse growers, and indeed open field farmers as well, explained that the location of the island in the tropics and the seasonal hurricane threat is a significant challenge to greenhouse production. The point was made by one grower who explained that, “Hurricane is one of the biggest enemy” and that “the greenhouse becomes a kite in a case of hurricane” (Interview 4, grower, St. Ann). In a number of instances, farmers questioned the state’s insistence on greenhouse farming as an integral part of an agrarian revolution, given the potential for food insecurity that is posed by hurricanes and other tropical weather systems. The point was made by one grower, who questioned:

How can you be pushing greenhouse, where if you get a Category 5 storm then your nation will be starving? Look at what I am saying. If you plant your yam, your carrot, your cabbage, your cocoa, your sweet potato, no matter what storm you get, after the storm you will be able to salvage something from that to eat. With a greenhouse you get a storm like that and you are out of food for the next 4 months while you rebuild and start to produce again... you can’t get rid of your roots. (Interview 18, grower, Manchester)

The prototypical greenhouses can be disassembled when a hurricane is imminent and reassembled after it has passed. The point was reiterated by a JAS executive: “the greenhouse is so structured that if and when a hurricane or thing like that, you can bring it down. You can close it in. Provision is there for that to be done. So it would not necessarily be damaged if you follow the instruction” (Interview 2, JAS officer, St. James). In a similar attitude one grower explained to me that his disassemblable greenhouse, procured through IJAP, means that he has few worries in hurricane season:

I mean this structure is something else. It’s a, I think it’s coming out or, or was designed in Spain and it was specifically made for our conditions based on the hurricane season that we normally have. This is the man for the country. No matter where you go this is the template. And if you go less than this you going to have problems. Because if hurricane is coming- because the last one that came, although it didn’t do much thing it

didn't carry much- if a category 2 hurricane is coming I'm not doing anything. I am not troubling anything (Interview 19, grower, Manchester)

However, most of greenhouse are not easily disassembled. In fact, for the majority of wooden and self-built greenhouses, the covering material is nailed on to the structure or otherwise permanently affixed. The process of removing the plastic or insect meshing would therefore inevitably cause damage to the material and necessitate covering. Given this, most greenhouse growers reported to me that they simply take the chance. This is a practice even among some growers whose greenhouses can actually be dismantled. The reasoning among such growers, as explained to me, is that it is not economically feasible to respond to every hurricane threat:

I think it's a waste of time. Because if I call a crew of guys to take my plastic off every time there is a warning I would be spending more money on plastic than water and fertilizer- or plastic removal. And then nothing happens and you have to call the guys to put it up, so I say I'll just gamble. The greenhouse growers association they do recommend that you have a plan in place to remove your plastic. But maybe if I had 10 greenhouse, the cost of replacing 10 roves would make it worth it for me to have such a contingency plan. But with 1 roof I figure if I get 5 false alarms then the one time when it blows off I can bear the cost. (Interview 14, grower, Clarendon)

The likelihood of damage to greenhouse due to hurricane strikes is highest on the eastern section of the island in the parishes of Portland, St. Mary and St. Thomas, which are along the corridor that hurricane most frequently track. The frequency of damage to greenhouses and total destruction was illustrated to me by one farmer who has had to rebuild his greenhouse on a couple of occasions. The farmer from St. Mary, near the coast explained that: "Is two time I build back my [greenhouse]....You can't protect it from storm ...It lift up everything and throw it down. It became like a kite" (Interview 9, grower, St. Mary).

7.5 Exercising Power on the Farm

For growers who are able to successfully negotiate the environmental challenges described above, production in the greenhouse involves the staging of a new kind of farming, which entails new relations of power between the farmer and the farm based on the technological control of the processes that bring about plant production. The deployment of the technology accompanied by the serious, scientific and vigilant approach that is prescribed for greenhouse work, provides the grower with the ability to regulate key variables that would be difficult to manage in the open field because of the exposure to the environmental vagaries. The point was made to me by one grower who declared that, unlike the open field farmer, he is unencumbered by the changes in the environment. Referring to the greenhouse in reverent terms he explained to me that:

I hear them talking about the climate change...this [greenhouse] is the savior for conditions like these [emphasis added]...whether it is rain, whether it is sun, whether a drought- I mean the whole concept, if you look at it the plastic on the roof is to take off all of that water off the plant and the mesh on the side- the insect can't come through (Interview 19, grower Manchester)

Similarly, other growers explained to me that through their implementation greenhouse technology, they were able to create spaces within which they exercised a great degree of control. The responsibility of the grower to exercise control is essential to the new subjectivity and is outlined in the widely used Reference Manual for greenhouse cultivation which was published by the USAID (2008) with the endorsement of stakeholder such as the JGGA, RADA and MOAF. In the manual growers are advised for example, that they “must possess a fundamental understanding that plants are living entities” and to “accurately scout” their greenhouses for pests “effectively, economically, and responsibly control them (USAID, 2008, pp. 38, 49).



Figure 7.3 Trellising system comprised of polyethylene string, suspended from the frame of a greenhouse where crops have just been reaped

Trellising is done to support the plant, but also to make sure that they grow upright and develop a structure that will be able to sustain the optimum yields (Fig. 7.4). Other practices, such as pruning, ensure that the otherwise unruly plant grows in the correct fashion, producing the correct number of stems to maximize bearing. This was explained to me by one grower:

[T]he pruning is to encourage the growth in a uniform way. Once you prune all of them, the fruit tend to come basically the same size. When you don't prune them, you will get big and small. But once you prune them, you know you guaranteed once size right through. Right through, because they will be getting the same amounts of nutrients. But the more branch you have is the more the plant absorb the nutrient. Yeah. That is it. That is the key thing in greenhouse- is to be consistent with the same size, quality. Because is really quality you deal with when you are dealing with it. Not really quantity, is quality. (Interview 21, grower, St. Elizabeth)

The sentiment is shared by one greenhouse consultant with whom I spoke, who noted that:

It's a controlled environment so you can determine how the plant grows and what the plant- the trees produce. So if you do it effectively then you have a pretty good sense of what you'll produce, what quality you will get, what yield you'll get. Because you know what you need to manipulate. So you can end up with a very consistent taste. Greenhouses

are systems and systems can be designed in particular ways. (Interview 28, consultant, Kingston)

The plant is made governable through systems that regulate life in the greenhouses. Here, greenhouse governmentality is concerned with a biopolitical relationship between the grower and the plant. In other words, the grower is seeking to establish biopower in the greenhouse. In the greenhouse, biopower is concerned to produce healthy, productive and ideal life, albeit non-human life, as the farmer adopts a nurturing responsibility and attempts to organize and regulate the vital properties of plants (Ojakangas, 2005). It begins by screening out unwanted elements of life and then acting on the properties of the plants for maximum production. The grower explained: “greenhouse is to protect the crops from pest and disease. And once you can get that, those mites, those white flies, those worms, those bats, those bugs in- once you can keep them out you don’t even have to spray in the greenhouse” (Interview 27, grower, St. Elizabeth). The point was also made by a grower in St. Ann: “it more secure from insects, rainfall and all that... so when you put it in here, you monitor the whole thing- you monitor how much water it get and even the sunlight and all of that” (Interview 19, grower, St. Ann). The explanation of the process by one grower offers a more animated overview:

The insect can’t come through. So when him come outside and when him look and see inside him say wow food. But him try and him can’t come in. Him call all him fiends them on them cell phone and say wow a whole heap a things in there but I can’t get in... Him get frustrated. Him a say, you can stay there fight that....over there, him have a whole heap and I can just fly into it when I’m ready and build even my house side it with my family and eat food. That’s how the insect them operate you know (Interview 19, grower, Manchester)

The description of the pests provided by the grower above reflects a perception of the greenhouse that was shared with me by a number of growers. This perception is informed by

essentially biopolitical motivation of the grower to secure the life of the plants whose vitality is maintained until harvest.

This conceptualization of greenhouses renders the farm as a sort of war zone. In a number of interviews, the pests and disease were described to me in adversarial terms, as active threats to not just plants, but to incomes and investment: “You run a very efficient business in a greenhouse... You just give the crop what it need to survive and produce continually” (Interview 27, grower, St. Elizabeth). In essence, as another farmer related, the farmer takes “total control over what the plant want” and takes on more of a responsibility to “make the plant happy” since “the happier the plant is, the more it will produce” (Interview 19, grower, Manchester). The goal of making the plants happy is serious since, as one grower explained, the plants are like the growers’ children:

Just like how you have a baby and if you supposed to feed him every 2 hours- you have to be on time... if you don’t put on the right amount of water and the water at the right time you find that just like how you would come now and you thirsty, and you consume too much water so it cause you to be bloated. The system overload. (Interview 10, grower St. Mary).

In addition to the biopolitical concern with the entire stock of plants in the greenhouse, the grower must therefore be attuned to the needs of each and every plant. In this way, the greenhouse makes it possible for power to get down to the level of the individual plants. This individualization of the plants means that the conduct of each individual plant is intervened upon (Fig. 7.5). The vitality of the plant is checked at both the level of the entire population of plants, and the individual plant, which can be acted upon by adjusting the essential flows of water and nutrients which support plant life. As one grower explained, his ability to control his plants’ life is basically amplified in the greenhouse: “When it comes down to the riff-raff all you have to do is make the trees dead. You lock of the water and you just leave them- make them die... But

Right in the greenhouse you determine the peppers them. If mi want them dead of right now, mi just stop send water go give them” (Interview 5, grower, St. Mary).



Figure 7.4 Fertigation system in greenhouse, with emitters at the root of each plant

Each plant is stimulated in a systematic way so that crop yield is maximized and homogenized.

This management of the plants, and of the particular balances that bring about good plant life and profitable harvest, are achieved in part through the use of specific varieties of seeds for greenhouse cultivation. In a sense, the ability to affect the conduct of plants is genetically induced to make the growers’ work easier. Through the genetic modification, these so called ‘hybrid’ varieties are made conducive to greenhouse government. This sense can be gleaned from the popular training manual which advises growers that:

Varieties are available, with new ones constantly in development, to provide the best possible advantage to the success of a crop. These new varieties are developed by crossing plants with desired characteristics. The advantage of cultivating hybrids is a stable, uniform crop with the uniformly extending not only to the fruit, but also to height of the plants and yield. Additionally, varieties are bred for disease resistance and to minimize or limit physiological problems such as blossom end-rot. Whenever possible, select high quality seeds from reputable seed companies. It is of note that field production varieties are not bred for protected agriculture conditions, and it is therefore recommended that only greenhouse varieties be used for protected agriculture production.

It is also important to remember that “resistance” labelling does not indicate that a crop will be completely immune to a disease or pest. (USAID, 2008, p. 33)

Through the management of the conditions of the plant’s life, the grower governs the conduct of plants for the most favorable outcome with regard to yield and income. The greenhouse and its component parts enables the growers to more effectively take hold of the life of their plants with less concern for pests and the natural environment outside the greenhouse. Through genetic predisposition and the meticulous adjustment in the balance of nutrients that the plant is supplied, the grower steers the growth and development of the plant.

7.6 Conclusion

Greenhouse governmentality presents the greenhouse as a new kind of farm, one which enables the farmer to exercise a certain control over the production process that they otherwise would not be able to in the open field. There is, however, some contestation over the idea that the addition of technology to the farm is enough to bring about an entirely new kind of space. While some growers assert that the greenhouse is a new kind of farm, others refute the notion. These contestations are also motivated by the differentiated outcomes of greenhouse farming owing to the physical terrain. The landscape and geography mediates the success of greenhouse farming and is therefore bound up in the contestation about this new kind of farming.

The greenhouse can also be viewed through the lens of biopower; within its frame, growers are concerned with the staging of life. This is a biopolitical aspiration that is preoccupied with the management of the circulations that make production possible. Structurally, the greenhouse prevents the contingent realities that attend to open field production from materializing, and then acts on the plants within its domain through a meticulous regulation of physiological functions.

Greenhouse governmentality is involved, then, in an extension of government down to every aspect of farm life.

CHAPTER 8: WITHER GREENHOUSE FARMING?

8.1 Introduction

The promotion of greenhouse farming in Jamaica has been an important feature of recent agricultural policy. Greenhouses are now common features of the island's farming landscape, and greenhouse production is responsible for a significant share of certain crops and markets. The expansion of greenhouses in Jamaica, however, signals more than simply a new niche within the agricultural system. Through the programmatic and discursive deployment of greenhouses, the state and a number of international aid agencies have pursued a rural revolution. The dynamics involved in the greenhouse model of agricultural transformation and development are imbricated with relations of power that are governmental in nature and have as their ends a new agricultural subjectivity. For this reason, I argue that Jamaica's greenhouse industry should be examined with attention to Foucault's notion of governmentality. This kind of analysis, I believe, makes more visible the ways that governmental rationalities become mobilized through various tactics of governing and also illustrates the ways that subjectivities respond and negotiate government.

In just over a decade, greenhouse farming in Jamaica has expanded from a fledgling sub-sector to an industry that now dominates the production of vegetable crops for some key local markets. The strengthening, or has some have termed it, the renaissance, of greenhouse farming has been the outcome of a sustained program of promotion and actual funding from both state and extra-state agents. Beginning with just 11 greenhouses under a 2004 project, the industry is estimated to have some 195 active greenhouses, 1.8 million sq. ft. of area under cultivation. The agenda has not been entirely uniform, but the common idea in the promotion of greenhouses has

been that it is beneficial for farmers and essential for rural development. The primary benefits, as severally expressed are: increased efficiency competitiveness, wealth, and rural development.

The greenhouses, though limited in number in comparison to open field plots, are now a distinctive part of the rural landscape. The structures used for protected agriculture are as diverse as the growers who assemble them. In these variously configured greenhouses, growers mobilize different structural and technological components in interesting ways. These assemblages reflect, among other things, the socio-economic and natural resources that growers have access to.

8.1.1 Jamaica's Greenhouse Governmentality

The expansion of greenhouses in Jamaica signals more than simply a new niche within the agricultural system. Through the programmatic and discursive deployment of greenhouses, the Jamaican state has pursued transformation of farming itself, a rural revolution. The dynamics involved in the greenhouse model of agricultural transformation and development are therefore imbricated with relations of power that are governmental in nature and have as their ends a new agricultural subjectivity. The dynamics at work in the promotion of greenhouse technology, and the new kind of farming and farmer that implementation of the technology is envisioned to produce, can be read as a greenhouse governmentality. This is governmental program that envisions a new agricultural landscape that is characterized by increased use of technology and a neoliberal approach to farming as a business. This agenda has become operationalized through multiple governmental mechanisms meant to cultivate a more modern farmer in contrast to the backward and dirty traditional farmer.

This rationality of government has been steeped in notions of beneficence and duty. Through this kind of pastoral ethic, the state has legitimated a program of calculated

interventions aimed at producing a new agricultural subject. This new kind of farmer is a model agricultural citizen who comes to embody and reflect the interests of the state.

The arguments of some agents of greenhouse government are unambiguous in their assertion that the work of greenhouse government is engaged in a transformation of the mind and the body of the traditional farmer. The way the farmer thinks and articulates himself on the farm are the targets of power. The new ideal farm subject, the grower who embraces greenhouse farming, has an entrepreneurial mentality appropriate to a neoliberal agrarian modernity. I term this new kind of farmer *Homo agro-economicus*, an agricultural being committed to competition and calculated self-governance, thereby relieving state from burden to manage farming. The farmer who is *Homo agro-economicus* is committed to self-care and takes responsibility for their action. Thus life and livelihood are reoriented.

8.1.2 Greenhouse Subjectivities

Through the implementation of a greenhouse, the farmer signals a subscription to greenhouse subjectivity. This was at least how it was envisioned by government. In reality, the subjectivity associated with farming, both old and new, is attended by contestations. Some open field farmers take on the mentality of the new model of farming even without a greenhouse, while among some greenhouse growers there is a rejection of the new agricultural subjectivity. The spectrum of attitudes and opinions does not reflect neat or discrete subjectivities. There are contradictions and points of disjuncture and this suggests that far from a governmental project that can be evaluated in terms of completeness, greenhouse governmentality is ongoing and defined by farmers' negotiations. This ongoing relationship between government and the governed brings to the fore the networked nature of governmentality. Governmentality flows

through formal and informal network, not only from the state to the farmer, but also among farmers, even hidden behind group projects that ostensibly empower groups and enable cooperative development.

8.1.3 Uneven Terrain

The greenhouse farm is a site of contestation, not just of farmer subjectivity but also about the nature of farming itself. The greenhouse farm, once convened, is negotiated by farmers in relation to specific farming practices and how the performance of these practices should be interpreted. These negotiations are mediated by the landscape of farming in a real way. Temperature variations, distribution of water resources and the island's vulnerability to hurricanes are all key considerations, or rather, are primary limitations to the ability of greenhouse growers to successfully take up greenhouse farming and make the new agricultural reality in the process. Once convened, and notwithstanding the environmental limitations, the greenhouse grower pursues a biopolitical form of life. Through the greenhouse apparatus, the grower mobilizes a form of biopower that acts upon each and every plant in the greenhouse in order to achieve desired production outcomes. This biopolitics extends government from the farmer onto the very farm itself and into a conduct of plants.

8.2 Final Thoughts

The notion of governmentality, outlined by Foucault and developed by a number of his interlocutors, is concerned with the way that governmental rationalities become operationalized through the various mechanisms and tactics by which government is done.

This thesis has been concerned with the ways that the relations of power involved in greenhouse industry legitimate and are implicated in rationalities of government that serve certain ends. Through such an analysis, I believe, we can gain insight into the mechanisms and tactics that seek to promulgate a new kind of agricultural subjectivity. In this sense, greenhouse governmentality has an effect, even if few farmers end up adopting greenhouse structures; It has had an effect because it has put power into action towards specific ends. The conduct of some has been conducted. The meaning of farming and the identity of the Jamaican farmer has changed, even if this change is contested on the ground and mediated by the physical geography, and by the financial and social realities, of farmers.

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APPENDICES

APPENDIX A: INTERVIEW GUIDE- GREENHOUSE GROWERS

Background

- How long have you been in this community? How long have you been involved in farming
- How did you learn about greenhouse farming? Why did you decide to establish a greenhouse?
- How do you see greenhouse farming compared to traditional open field farming?
- Are there a lot of greenhouses in this area? How are they doing compared to open field farming?
- What do you currently plant? Have you planted or plan to plant different crops?
- How do you decide what to plant?
- How do you think your crops compare to open field produce crops? (taste, appearance, cost)
- How do you manage your water/ how do you access, store and regulate use of your water
- What are some of the problems you have with the greenhouse structure
- Before greenhouse, were you involved in farming?
- Do you have other sources of income- another occupation?
- Would you describe the surrounding area as a farming area? What are the crops being grown? Do you grow the same crops in the greenhouse?
- How big is the greenhouse? Describe the design- describe the structure
- Do you own the land the greenhouse is on?
- How many hours a day a day do you normally spend in your greenhouse?

Credit, Financing and Marketing

- How expensive is greenhouse farming? What are the main costs associated with running a greenhouse?
- Give me an estimate of the monthly operating costs for the greenhouse. Would you say your operation is profitable?
- How did you finance the greenhouse? Has the cost been recovered yet? How long before it is recovered?
- What is your main market? How do you get it to market? Is this a contract market?
- Are the prices you get good?
- Do you think greenhouse production affects small farmers in the local market?
- What impact do you think greenhouse farming has on the local market situation?
- How easy is it for you to obtain credit? Do you have insurance?
- Do you consider yourself a big farmer?
- Do you think this is like running a business?

Network and Relationships Institutional setting and Extension Services

- Are you a member of any farmers' organizations?
- Do you maintain network with other greenhouse growers? Do greenhouse growers work together?

- Would you say that you have a closer relationship with greenhouse growers than open-field farmers?
- Who are the key individuals in your production, marketing and distribution network?
- Do you have a good relationship with extension officers?
- Do you think the government has done enough promote greenhouses and help greenhouse growers? Has there been any recent government initiatives or programs specifically targeting greenhouse growers?
- What more do you think the government can do to help greenhouse growers?
- Why do you think more farmers have not adopted greenhouses?

Natural Hazards and Climate Change

- Do you think there have been environmental changes over the past 10-20 years?
- How do you prepare for storms of hurricanes? Has the greenhouse been affected by any storms or hurricanes? What was the extent of the damage?
- Are there disasters/ hazards that greenhouse growers actually benefit from- like droughts?
- Are there times of the year when the weather is particularly important to your success as a greenhouse grower?

Broader Context

- How would you describe the state of agriculture today? What are your thoughts on the future of agriculture as it relates to the national economy?
- What are the key issues that need to be addressed for domestic agriculture to be improved?
- Do you think greenhouse production can alleviate the need for importation? Do you think it fosters food security?
- How important do you think technology is for farming today? Are you in greenhouse because it is seen as high tech farming?

Closing

- Do you consider a business man or a farmer?
- Do you get enjoyment from your farming or is it more about the business?
- Do you plan to remain in farming?
- Do you think greenhouse farming takes a particular/ special type of person? What are the top three most important things that make a good greenhouse grower?
- How is greenhouse farming different from open field farming?
- Do you think young people are getting involved in farming?

APPENDIX B: INTERVIEW GUIDE- GREENHOUSE GROWERS

General

- What is your role/ function in the ministry/ department/ organization?
- How long have you been involved in agriculture/ greenhouse related farming?
- What is the governments/ ministry's current position on greenhouse farming?
- How did greenhouse technology get to Jamaica? What was the beginning of the recent thrust for greenhouse? What motivated or encouraged the recent promotion of greenhouse technology in farming?
- How many greenhouse do you estimate have been deployed? What is the success rate/ how many are still operational?
- Why do you think so many of the greenhouses have not been successful?

Credit, Financing and Marketing

- Are there government financing or funding facilities set up specifically for greenhouse farming or available for greenhouse farming
- What are the marketing channels or arrangements that the government or the ministry has set up or encouraged farmers to utilize in getting their crops out?
- Do you think greenhouse production affects small farmers in the local market?
- What impact do you think greenhouse farming has on the local market situation?
- When the government articulates he desire to support serious farmers, are they speaking about greenhouse farers? How does greenhouse growers fit into the mold of what the government considers a serious farmer?

Network and Relationships Institutional setting and Extension Services

- Are you a member of any farmers' organizations?
- Do you maintain network with other greenhouse growers? Do greenhouse growers work together?
- Would you say that you have a closer relationship with greenhouse growers than open-field farmers?
- Who are the key individuals in the current greenhouse sub-sector in agriculture? Who are the main proponents, consultants or actors in greenhouse farming form the government/ extension side?
- Has there been any recent government initiatives or programs specifically targeting greenhouse growers?
- What are some of the current or projected plans help greenhouse growers?
- Why do you think more farmers have not adopted greenhouses?

Natural Hazards and Climate Change

- How practical do you think the promotion of greenhouse farming is in the context of climate change?
- How does greenhouse fit into the response to climate variability and natural hazards?

Broader Context

- How would you describe the state of agriculture today? What are your thoughts on the future of agriculture as it relates to the national economy?
- What are the key issues that need to be addressed for domestic agriculture to be improved
- Do you think greenhouse production can alleviate the need for importation? Do you think it fosters food security?
- How important do you think technology is for farming today? Are you in greenhouse because it is seen as high tech farming?

Closing

- Does the government/ ministry consider farming as a business man or as a livelihood/way of life for rural communities?
- Do you think greenhouse farming takes a particular/ special type of person? What are the top three most important things that make a good greenhouse grower?
- How is greenhouse farming different from open field farming
Do you think young people are getting involved in farming?

APPENDIX C: INTERVIEW INFORMATION SHEET

Interview #	Respondent	Status of Greenhouse	Location
1	Male (grower)	Active	Kingston
2	Male, 60s (grower/ key informant)	Inactive	St. James
3	Male, 60s (grower)	Inactive	St. James
4	Male, 50s (grower)	Active	St. Ann
5	Male, 50s (grower)	Active	St. Ann
6	Female, 30s (grower)	Active	St. Ann
7	Male, 40s (grower)	Inactive	St. Ann
8	Male, 60s (grower)	Active	St. Mary
9	Male, 60s (grower)	Inactive	St. Mary
10	Male, 20s (grower)	Inactive	St. Mary
11	Male, 30s (grower)	Active	Manchester
12	Female, 40s (grower)	Active	Clarendon
13	Female, 50s (grower)	Active	Manchester
14	Male, 60s (grower)	Inactive	Clarendon
15	Male, 50s (grower/ key informant)	Active	Manchester
16	Male, 60s (grower/ key informant)	Active	St. Elizabeth
17	Male, 60s (grower)	Inactive	St. Elizabeth
18	Male, 30s (grower)	Active	Manchester
19	Male, 40s (grower)	Active	Manchester
20	Male, 60s (grower)	Inactive	St. Elizabeth
21	Male, 60s (grower)	Active	St. Elizabeth
22	Male, 50s (grower)	Active	St. Elizabeth
23	Female, 60s (grower/ key informant)	Inactive	St. Elizabeth
24	Male, 50s (grower)	Active	St. Elizabeth
25	Male, 30s (grower)	Active	Manchester
26	Male, 20s (grower)	Active	St. Elizabeth
27	Male, 30s (grower)	Active	St. Elizabeth
28	Male, 40s (key informant)	N/A (MOAF)	Kingston
29	Male, 50s (key informant)	N/A (IICA)	Kingston
30	Male, 20s (key informant)	N/A (JSIF)	Manchester
31	Female, 30s (key informant)	N/A (RADA)	Manchester
32	Male, 60s (farmer)	N/A (open field)	St. Elizabeth
33	Male, 30s (farmer)	N/A (open field)	St. Elizabeth
34	Male, 60s (farmer)	N/A (open field)	St. Elizabeth
35	Male, 20s (farmer)	N/A (open field)	St. Elizabeth
36	Male, 40s (farmer)	N/A (open field)	St. Elizabeth
37	Male, 30s (farmer)	N/A (open field)	St. Elizabeth

38	Male, 30s (key informant)	N/A (NIC)	St. Elizabeth
39	Male, 30s (key informant)	N/A (open field)	St. Elizabeth
40	Male, 70s (key informant)	N/A (private well owner)	St. Elizabeth
41	Male, 50s (farmer)	N/A (open field)	St. Elizabeth
42	Male, 40s (key informant)	N/A (NIC)	St. Elizabeth
43	Male, 30s (farmer)	N/A (open field)	St. Elizabeth
44	Female, 60s (farmer)	N/A (open field)	St. Elizabeth
45	Male, 30s (farmer)	N/A (open field)	St. Elizabeth
46	Male, 30s (farmer)	N/A (open field)	St. Elizabeth
47	Male, 60s (farmer)	N/A (open field)	St. Elizabeth
48	Male, 40s(farmer)	N/A (open field)	St. Elizabeth
49	Female, 30s (farmer)	N/A (open field)	St. Elizabeth
50	Female, 50s (key informant)	N/A (open field)	St. Elizabeth
51	Female, 30s (farmer)	N/A (open field)	St. Elizabeth
52	Male, 40s (farmer)	N/A (open field)	St. Elizabeth

APPENDIX D: INSTITUTIONAL REVIEW BOARD APPROVAL

EAST CAROLINA UNIVERSITY

University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard Greenville, NC 27834
Office: 252-744-2914 Fax: 252-744-2284 www.ecu.edu/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB

To: Alex Moulton

CC: Jeff Popke

Date: 6/9/2014

Re: UMCIRB 14-000431

Catalyzing agrarian change among Jamaican small-farmers? The role greenhouse farming technology in doubly exposed tropical agricultural systems.

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 6/9/2014 to 6/8/2015. The research study is eligible for review under expedited category #6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Informed-Consent-Template-No-More-Than-Minimal-Risk-03-28-2013_Modified_AMoulton.doc	Consent Forms
Proposal Draft_edited.docx	Study Protocol or Grant Application
questions	Surveys and Questionnaires
questions.doc	Interview/Focus Group Scripts/Questions

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX E: INFORMED CONSENT DOCUMENT

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: The role greenhouse farming technology in doubly exposed tropical agricultural systems

Principal Investigator: Alex Moulton

Institution/Department: Geography, Planning and Environment

Address: Brewster, A227

Telephone #: 252-328-6078

Study Sponsor/Funding Source: National Science Foundation

The purpose of this research is to gain some insight in the impact of greenhouses in Jamaica as part of a broader and ongoing study by researchers at East Carolina University collaborating with the University of North Carolina at Wilmington. Greenhouses have been identified as a rising technology aimed at reducing vulnerability and increasing resilience. Recognizing the importance of traditional agriculture this study aims to explore the impact of the promotion and adoption of greenhouses in farming. The decision to take part in this research is yours to make. By doing this research, we hope to learn how greenhouse are changing the traditional ways of farming and marketing here in Jamaica. You are being invited to take part in this research because you are a greenhouse grower and we want to hear your point of view- hear what you think. If you volunteer to take part in this research, you will be one of about 20 people to do so.

There are no reasons why you should not participate, all the study requires is a bit of your time and you are not expected to say or do anything that will put you at harm. Your participation is being sought because I believe that farmers like at center of the farming system have a wealth of information relevant to understanding what greenhouses mean for farming as a system. You can choose not to participate. The research procedures will be conducted at a place of your convenience preferable your farm site where the greenhouse is or at your home. The total amount of time you will be asked to volunteer for this study is not expected to be more than an hour.

You are being asked to do the following: tell me about your greenhouse farming, the challenges and strategies used in production and marketing. I am going to record our conversation if that is ok with you, just so that I can focus on taking some notes and really talking with you about some of the issues you may be having. I have a few themes to cover and we can just go through those or you can answer to what you feel comfortable. I want to covers some background information on your farming operation, get a sense of your credit, financing and marketing situation, look at the networks and relationships involved in your farming as well as look at some of the challenges related to climate change and he broader economic context.

It has been determined that the risks associated with this research are no more than what you would experience in everyday life. We do not know if you will get any benefits by taking part in this study. This research might help us learn more about farming and the impact of greenhouses on farmers and the rural economy is expected to give us information that we can share with other

academics and with government. There may be no personal benefit from your participation but the information gained by doing this research may help others in the future. We will not be able to pay you for the time you volunteer while being in this study. It will not cost you any money to be part of the research.

To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- The National Science Foundation who have sponsored this research.
- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the Office for Human Research Protections
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff

Your data will not be identified by name or any other label that will be able to tie it back to you. The data will only be used for academic purposes and will be stored in secure drives that are password protected. As per the requirements of the IRB the research data will be stored for 3 years after completion of the research.

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive. I will be available to answer any questions concerning this research, now or in the future. You may contact at 252-328-6078 (week days, between 8:00 and 5:00). You can also contact me by email: moultona13@students.ecu.edu at any time. If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971

I am asking that you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT)

Signature

Date

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)	Signature	Date
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<i>Principal Investigator (PRINT)</i>	<i>Signature</i>	<i>Date</i>
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